Midwest Biodiversity Institute
4673 Northwest Parkway
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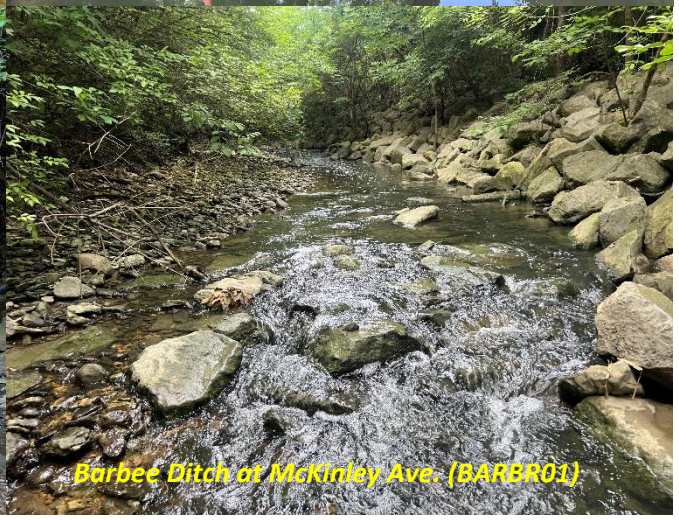
Biological and Water Quality Assessment of the Roberts Millikin Ditch, Barbee Ditch, and Dry Run Subwatersheds 2024


Millikin Falls at Quarry Trails Metro Park (RMD02)


Kian Run at mouth ust. Scioto R. (KR01)


Dry Run off of Hague Ave. (DRY02)


Barbee Ditch at McKinley Ave. (BARBR01)

Trent A. Dougherty, Executive Director
Jim Lane, Board President

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Biological and Water Quality Assessment of the Roberts Millikin Ditch, Barbee Ditch, and Dry Run Subwatersheds 2024

Franklin County, Ohio

MBI Technical Report MBI 2025-9-13

October 31, 2025

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Glossary of Terms

Ambient Monitoring	Sampling and evaluation of receiving waters not necessarily associated with episodic perturbations.
Aquatic Assemblage	An association of interacting populations of organisms in a given waterbody, for example, the fish assemblage or the benthic macroinvertebrate assemblage.
Aquatic Community	An association of interacting assemblages in a given waterbody, the biotic component of an ecosystem.
Aquatic Life Use (ALU)	A beneficial use designation in which the waterbody provides suitable habitat for survival and reproduction of desirable fish, shellfish, and other aquatic organisms; classifications specified in State water quality standards relating to the level of protection afforded to the resident biological community by the custodial State agency.
Assemblage	Refers to all of the various species of a particular taxonomic grouping (e.g., fish, macroinvertebrates, algae, submergent aquatic plants, etc.) that exist in a particular habitat. Operationally this term is useful for defining biological assessment methods and their attendant assessment mechanisms, i.e., indices of biotic integrity (IBI), O/E models, or fuzzy set models.
Attainment Status	The state of condition of a waterbody as measured by chemical, physical, and biological indicators. Full attainment is the point at which measured indicators signify that a water quality standard has been met and it signifies that the designated use is both attained and protected. Non-attainment is when the designated use is not attained based on one or more of these indicators being below the required condition or state for that measure or parameter.
Attribute	A measurable part or process of a biological system.
Beneficial Uses	Desirable uses that acceptable water quality should support. Examples are drinking water supply, primary contact recreation (such as swimming), and aquatic life support.

Benthic Macroinvertebrates	Animals without backbones, living in or on the substrates, of a size large enough to be seen by the unaided eye, and which can be retained by a U.S. Standard No. 30 sieve (0.595 mm openings). Also referred to as benthos, infauna, or macrobenthos.
Best Management Practice	An engineered structure or management activity, or combination of these that eliminates or reduces an adverse environmental effect of a pollutant, pollution, or stressor effect.
Biological Assessment	An evaluation of the biological condition of a waterbody using surveys of the structure and function of a community of resident biota; also known as bioassessment. It also includes the interdisciplinary process of determining condition and relating that condition to chemical, physical, and biological factors that are measured along with the biological sampling.
Biological Criteria (Biocriteria)	Scientific meaning: quantified values representing the biological condition of a waterbody as measured by structure and function of the aquatic communities typically at reference condition; also known as biocriteria. Regulatory meaning: narrative descriptions or numerical values of the structure and function of aquatic communities in a waterbody necessary to protect a designated aquatic life use, implemented in, or through state water quality standards.
Biological Condition Gradient	A scientific model that describes the biological responses within an aquatic ecosystem to the increasing effects of stressors.
Biological Diversity	Refers to the variety and variability among living organisms and the ecological complexes in which they occur. Diversity can be defined as the number of different taxa and their relative frequencies. For biological diversity, these taxa are organized at many levels, ranging from complete ecosystems to the biochemical structures that are the molecular basis of heredity. Thus, the term encompasses different ecosystems, species, and genes; also known as biodiversity.

Biological Indicator	An organism, species, assemblage, or community characteristic of a particular habitat, or indicative of a particular set of environmental conditions; also known as a bioindicator.
Biological Integrity	The ability of an aquatic ecosystem to support and maintain a balanced, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of natural habitats within a region (after Karr and Dudley 1981).
Biological Monitoring	The use of a biological entity (taxon, species, assemblage) as a detector and its response as a measure of response to determine environmental conditions. Ambient biological surveys and toxicity tests are common biological monitoring methods; also known as biomonitoring.
Biological Survey	The collection, processing, and analysis of a representative portion of the resident aquatic community to determine its structural and/or functional characteristics and hence its condition using standardized methods.
Clean Water Act (CWA)	An act passed by the U.S. Congress to control water pollution (formally referred to as the Federal Water Pollution Control Act of 1972). Public Law 92-500, as amended. 33 U.S.C. 1251 et seq.; referred to herein as the CWA.
CWA Section 303(d)	This section of the Act requires States, territories, and authorized Tribes to develop lists of impaired waters for which applicable water quality standards are not being met, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop TMDLs for these waters. States, territories, and authorized Tribes are to submit their list of waters on April 1 in every even-numbered year.
CWA Section 305(b)	Biennial reporting required by the Act to describe the quality of the Nation's surface waters, to serve as an evaluation of progress made in maintaining and restoring water quality, and describe the extent of remaining problems.

Criteria	Limits on a particular pollutant or condition of a waterbody presumed to support or protect the designated use or uses of a waterbody. Criteria may be narrative or numeric and are commonly expressed as a chemical concentration, a physical parameter, or a biological assemblage endpoint.
DELT Anomalies	The percentage of Deformities, Erosions (e.g., fins, barbels), Lesions and Tumors on fish assemblages (DELT). An important fish assemblage attribute that is a commonly employed metric in fish IBIs.
Designated Uses	Those uses specified in state water quality standards for each waterbody or segment whether or not they are being attained.
Designed Sewer Relief	Points within the sanitary/combined collection system where sewage is diverted to relief pipes, and ultimately an outfall, during periods of heavy precipitation, pump failures, or other maintenance issues.
Disturbance	Any activity of natural or human causes that alters the natural state of the environment and its attributes and which can occur at or across many spatial and temporal scales.
Ecological integrity	The summation of chemical, physical, and biological integrity capable of supporting and maintaining a balanced, integrated adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of natural habitats in the region.
Ecoregion	A relatively homogeneous geographical area defined by a similarity of climate, landform, soil, potential natural vegetation, hydrology, or other ecologically relevant variables; ecoregions are portioned at increasing levels of spatial detail from level I to level IV.
Existing Use	A use that was actually attained in a waterbody on or after November 28, 1975, whether or not they are included in the state water quality standards (November 28, 1975 is the date on which U.S. EPA promulgated its first water quality standards regulation in 40CFR Part 131). Existing uses must be maintained and cannot be removed.

Index of Biotic Integrity (IBI)	An integrative expression of site condition across multiple metrics comprised of attributes of a biological assemblage. It refers to the index developed by Karr (1981) and explained by Karr et al. (1986). It has been used to express the condition of fish, macroinvertebrate, algal, and terrestrial assemblages throughout the U.S. and in each of five major continents.
MIwb	The Modified Index of Well-Being (MIwb) is based on fish assemblage measures including numbers, biomass, and two diversity indices (Shannon Index) based on numbers and biomass. The numbers and biomass metrics exclude highly tolerant species. It reflects the overall productivity and diversity of the fish assemblage and it frequently responds before the IBI to improvements in water quality and habitat.
Metric	A calculated term or enumeration representing an attribute of a biological assemblage, usually a structural aspect, that changes in a predictable manner with an increased effect of human disturbance.
Monitoring and Assessment	The entire process of collecting data from the aquatic environment using standardized methods and protocols, managing that data, analyzing that data to make assessments in support of multiple program objectives, and disseminating the assessments to stakeholders and the public.
Multimetric Index	An index that combines assemblage attributes, or metrics, into a single index value. Each metric is tested and calibrated to a scale and transformed into a unitless score prior to being aggregated into a multimetric index. Both the index and metrics are useful in assessing and diagnosing ecological condition.
Narrative Biocriteria	Written statements describing the narrative attributes of the structure and function of aquatic communities in a waterbody necessary to protect a designated aquatic life use.
Natural Condition	This includes the multiplicity of factors that determine the physical, chemical, or biological conditions that would exist

	in a waterbody in the absence of measurable impacts from human activity or influence.
Numeric Biocriteria	Specific quantitative and numeric measures of the structure and function of aquatic communities in a waterbody necessary to protect a designated aquatic life use.
Pump Station	A component of the sewerage collection system that lifts water from one elevation to a higher elevation.
Qualitative Habitat Evaluation Index	A qualitative habitat evaluation assessment tool that is applied to streams and rivers in Ohio and which is used to identify habitat variables that are important to attainment of the Ohio biological criteria.
Reference Condition	The condition that approximates natural, unimpacted, or best attainable conditions (biological, chemical, physical, etc.) for a waterbody. Reference condition is best determined by collecting measurements at a number of sites in a similar waterbody class or region under minimally or least disturbed conditions (by human activity), if they exist. Since undisturbed or minimally disturbed conditions may be difficult or impossible to find in some states, least disturbed conditions, combined with historical information, models or other methods may be used to approximate reference condition as long as the departure from natural or ideal is comprehended. Reference condition is used as a benchmark to establish numeric biocriteria.
Reference Site	A site selected to represent an approximation of reference condition and by comparison to other sites being assessed. For the purpose of assessing the ecological condition of other sites, a reference site is a specific locality on a waterbody that is minimally or least disturbed and is representative of the expected ecological condition of other localities on the same waterbody or nearby waterbodies.
Regional Reference Condition	A description of the chemical, physical, or biological condition based on an aggregation of data from reference sites that are representative of a waterbody type in an ecoregion, subregion, bioregion, or major drainage unit.

Sanitary Sewershed	Polygons that define a network of sanitary/combined pipe draining basins. Similar to a watershed, but defined by pipes, not by surface drainage characteristics.
Stressors	Physical, chemical, and biological factors that can adversely affect aquatic organisms. The effect of stressors is apparent in the biological responses.
Use Attainability Analysis (UAA)	A structured scientific assessment of the physical, chemical, biological or economic factors affecting attainment of the uses of waterbodies.
Use Classes	A broad capture of a designated use for general purposes such as recreation, water supply, and aquatic life.
Use Subclasses	A subcategorization of use classes into discrete and meaningful descriptions. For aquatic life this would include a hierarchy of warmwater and cold water uses and additional stratification provided by different levels of warmwater uses and further stratification by waterbody types.
TALU Based Approach	This approach includes tiered aquatic life uses (TALU) based on numeric biological criteria and implementation via an adequate monitoring and assessment program that includes biological, chemical, and physical measures, parameters, indicators and a process for stressor identification.
Tiered Aquatic Life Uses (TALUs)	<u>As defined</u>: The structure of designated aquatic life uses that incorporates a hierarchy of use subclasses and stratification by natural divisions that pertain to geographical and waterbody class strata. TALUs are based on representative ecological attributes and these should be reflected in the narrative description of each TALU tier and be embodied in the measurements that extend to expressions of that narrative through numeric biocriteria and by extension to chemical and physical indictors and criteria. <u>As used</u>: TALUs are assigned to water bodies based on the protection and restoration of ecological potential. This means that the assignment of a TALU tier to a specific waterbody is done with regard to reasonable restoration or

	protection expectations and attainability. Hence knowledge of the current condition of a waterbody and an accompanying and adequate assessment of stressors affecting that waterbody are needed to make these assignments.
Total Maximum Daily Load (TMDL)	The maximum amount of a pollutant that a body of water can receive while still meeting water quality standards. Alternatively, a TMDL is an allocation of a water pollutant deemed acceptable to attain the designated use assigned to the receiving water.
Water Quality Standards (WQS)	A law or regulation that consists of the designated use or uses of a waterbody, the narrative or numerical water quality criteria (including biocriteria) that are necessary to protect the use or uses of that particular waterbody, and an antidegradation policy.
Water Quality Management	A collection of management programs relevant to a water resource protection that includes problem identification, the need for and placement of best management practices, pollution abatement actions, and measuring the effectiveness of management actions.

List of Acronyms

AAV	Area of Attainment Value
ADV	Area of Degradation Value
ALU	Aquatic Life Use
BCG	Biological Condition Gradient
BMP	Best Management Practice
BNA	Base Neutral Acid Compound
CSO	Combined Sewer Overflow
CWA	Clean Water Act
CWP	Columbus Water and Power (formerly DPU)
DELT	Deformities, Erosions, Lesions, and Tumors (fish)
DWR	Division of Water Reclamation (formerly DOSD)
DOW	Division of Water
DPU	Department of Public Utilities (now CPW)
DSR	Designed Sewer Relief
ECOS	Ohio EPA database framework used by MBI
EPA	Environmental Protection Agency
EPT	Ephemeroptera, Plecoptera, Trichoptera
EWH	Exceptional Warmwater Habitat
FCSWCD	Franklin Co. Soil and Water Conservation District
HD (or H-D)	Hester Dendy artificial substrate sampler
HHEI	Headwater Habitat Evaluation Index

HSTS	Home Sewage Treatment system
IBI	Index of Biotic Integrity for fish assemblages
ICI	Invertebrate Community Index
LOS	Level of Service
LOT	Lower Olentangy Tunnel
LIMS	Laboratory Information Management System
M&A	Monitoring and Assessment
MBI	Midwest Biodiversity Institute
MIwb	Modified Index of Well-Being
NPDES	National Pollutant Discharge Elimination System
OAC	Ohio Administrative Code
OARS	OSIS Augmentation Relief Sewer
OCDL	Ohio Credible Data Law
ORC	Ohio Revised Code
OSIS	Olentangy Scioto Interceptor Sewer
OWEA	Ohio Water Environment Association
PAH	Polycyclic Aromatic Hydrocarbon
PCR	Primary Contact Recreation
PSP	Project Study Plan
QAPP	Quality Assurance Program Plan
QDC	Qualified Data Collector
QHEI	Qualitative Habitat Evaluation Index

RDII	Rainfall Derived Inflow & Infiltration
SCR	Secondary Contact Recreation
SCPZ	Stream Corridor Protection Zones
STV	Statistical Threshold Value
SWIMS	Surface Water Information Management System
TALU	Tiered Aquatic Life Use
TMDL	Total Maximum Daily Load
UAA	Use Attainability Analysis
VOC	Volatile Organic Compound
WIB	Water In Basement
WLA	Waste Load Allocation
WMAO	Water Management Association of Ohio
WQS	Water Quality Standards
WRP	Water Reclamation Plant (formerly WWTP)
WWH	Warmwater Habitat
WWMP	Wet Weather Management Plan
WWTP	Wastewater Treatment Plant (now WRP)

FOREWORD

What is a Biological and Water Quality Survey?

A biological and water quality survey, or "biosurvey", is an interdisciplinary monitoring effort coordinated on a waterbody specific or watershed scale. This may involve a relatively simple setting focusing on one or two small streams, one or two principal stressors, and a handful of sampling sites or a much more complex effort including entire subwatersheds, drainage basins, multiple and overlapping stressors, and tens of sites. The latter is the case with this study in that the Roberts Millikin, Barbee Ditch, and Dry Run HUC12 subwatershed along with Evans Run and Kian Run include a mix of overlapping stressors and sources in a mosaic of heavily urban and suburban land uses in the west side of Columbus including Hilliard and the Hilltop areas. The 2024 assessment is the first survey for most of the 25 sites, with historical data available in the Ohio EPA database (not published) for approximately 10 sites all of which are in Trabue Run and Dry Run dating back to 1994-98 and 2010.

Scope of the 2024 Roberts Millikin Ditch, Barbee Ditch, and Dry Run Subwatersheds Biological and Water Quality Assessment

The scope of the 2024 biological and water quality assessment included the Roberts Millikin Ditch, Barbee Ditch, and Dry Run subwatersheds, a portion of the latter which is part of Blueprint Columbus[1]. Two other direct Scioto River tributaries, Evans Run and Kian Run, were also included in the 2024 survey. This survey presents the first accomplished under a regional monitoring plan that was developed in 2023-24 (MBI 2024a) with support from the Columbus Division of Water Reclamation (DWR). The *Central Ohio Watersheds Biological and Water Quality Assessment Plan*[2] was developed to implement a watershed based approach to assessing the quality and status of streams within DWR sewersheds, Blueprint Columbus areas, and the MS4 areas of Central Ohio beyond the previous surveys of the Scioto River and Olentangy River mainstems in 2020 and 2022 (MBI 2022).

The overall objectives of the 2024 survey included:

1. Evaluate the appropriateness of existing aquatic life use designations and make recommendations for any changes to those designations;
2. Determine the aquatic life status of streams and rivers in quantitative terms including the spatial extent and severity of impairments and their respective departures from established criteria;
3. Identify new or emerging threats to reaches of full attainment;
4. Determine the effectiveness of best management practices and other restoration efforts

[1] https://www.columbus.gov/Services/Columbus-Water-Power/About-Columbus-Water-Power/Sustainability-at-Columbus-Water-Power/Blueprint-Columbus

[2] https://mwbinst.com/publications/tech-reports/watershed-monitoring-and-bioassessment-plan-for-the-central-ohio-watersheds

within the surveyed subwatersheds;
5. Provide an assessment of potential nutrient enrichment effects using the Steam Nutrient Assessment Procedure developed by Ohio EPA (2015a);
6. Provide baseline data for the assessment of Blueprint Columbus in the Dry Run subwatershed;
7. Determine the effects, if any, of sewage releases from the sanitary system to study area stream quality and attainment status;
8. Provide updated data for the assessment of the subwatersheds last done by Ohio EPA in 2023 and prior years in relation to sanitary sewer system impacts, MS4 stormwater permitting, and issues of interest to local stakeholders.

The data presented herein were processed, evaluated, and synthesized as a biological and water quality assessment of aquatic life and recreational use attainment status. The 2024 bioassessment is spatially more comprehensive than prior assessments accomplished by Ohio EPA thus it will fill important gaps left by prior surveys. Trends over time were limited to site-specific comparisons. The 2024 bioassessment was conducted under a Level 3 Project Study Plan (PSP; MBI 2024b) submitted to and approved by the Ohio Credible Data Program. As such the results of the biological and habitat assessment can be used for purposes specified by the Ohio Credible Data Law and Regulations[3]. Each of the 25 monitoring sites were sampled for biological assemblages (fish, macroinvertebrates, and salamanders), habitat (QHEI/HHEI), and water quality (grab samples), with six sites sampled for a suite of nutrient effect indicators (continuous and grab samples), and sediment chemistry (Figure 1).

[3] Ohio Revised Code 6111.5 and Ohio Administrative Code 3745-4.

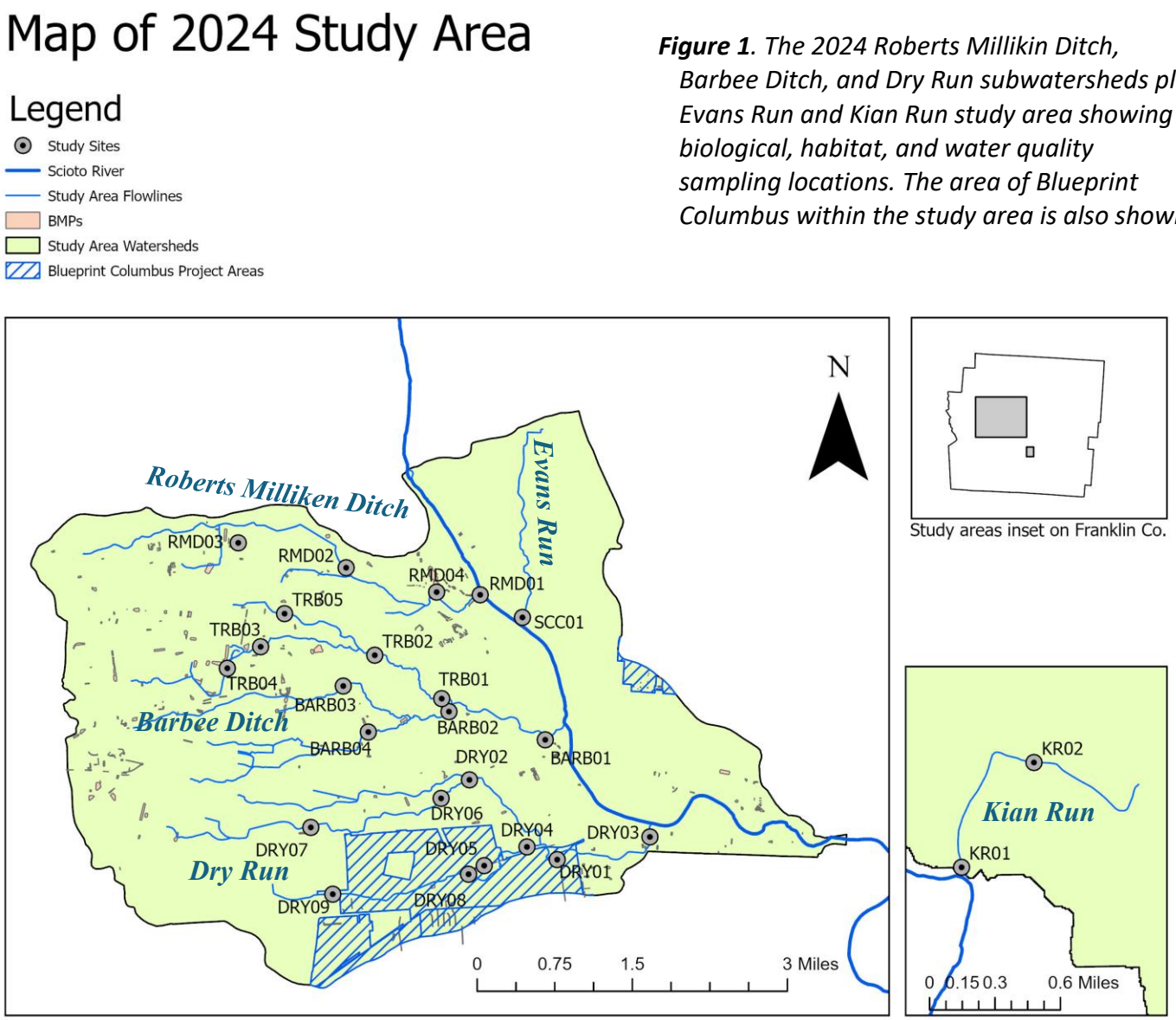

***Figure 1**. The 2024 Roberts Millikin Ditch, Barbee Ditch, and Dry Run subwatersheds plus Evans Run and Kian Run study area showing biological, habitat, and water quality sampling locations. The area of Blueprint Columbus within the study area is also shown.*

SUMMARY AND CONCLUSIONS

Overview of the 2024 DWR Sponsored Monitoring and Assessment Program

The Columbus Water and Power (AKA Columbus Public Utilities), Division of Water Reclamation (DWR) sponsored a comprehensive biological and water quality assessment of the Roberts Millikin Ditch, Barbee Ditch, and Dry Run subwatersheds took place during June-October 2024. It included 25 total sites including four (4) in the Roberts Millikin Ditch subwatershed, nine (9) in the Barbee Ditch subwatershed, nine (9) in the Dry Run subwatershed, two (2) in Kian Run, and a single site in Evans Run. All have small watershed areas between 1.4 and 9.4 square miles. Dry Run is directly related to Blueprint Columbus with all others related to MS4 stormwater permitting, the DWR sewer system, and local interests. Sampling was conducted for water chemistry, sediment chemistry, habitat, and biological assemblages. Chemical analyses were conducted for 26 laboratory analytes and four field parameters in water and seven (7) heavy metals and multiple organic chemical compounds in both water and sediments. *E. coli* bacteria counts were determined to assess the status of the Primary Contact Recreational (PCR) use, but was also used as an indicator of organic pollution. Parameters consistent with a proposed Ohio EPA nutrient effects assessment methodology were also collected including two forms of chlorophyll a and continuous dissolved oxygen (D.O.), temperature, pH, and conductivity at six (6) locations in the downstream portions of Roberts Millikin Ditch (1 site), Barbee Ditch (2 sites), Dry Run (2 sites), and Kian Run (1 site). Habitat quality was assessed with the Qualitative Habitat Evaluation Index (QHEI) and the biological assemblages included fish and macroinvertebrates consistent with Ohio EPA methods and the biological criteria for assessing the status of aquatic life use designations per the Ohio WQS (OAC 3745-1-07) at all sites.

The 2024 biological and water quality assessment was focused on the following issues of importance to DWR and other stakeholders:

1. Documentation of the current status of existing and recommended aquatic life uses in the 2024 study area subwatersheds.
2. Only three (3) of 15 individual streams sampled and assessed in 2024 had existing aquatic life and recreational use designations in the Ohio WQS - each was verified by the 2024 assessment.
3. Of the 12 streams that are currently not listed and thus designated in the WQS, five (5) were recommended as WWH and the remaining seven (7) as Primary Headwater Habitat Class II (PHW2). All were recommended for the PCR recreational use per current Ohio EPA policy.
4. Identification of chemical/physical or habitat related stressors associated with observed aquatic life use impairments or threats to existing full attainment were accomplished.
5. Assessment of nutrient impacts using the Ohio EPA SNAP methodology that consists of a multiparameter, “combined” approach about nutrient effects was conducted at six (6) sites.
6. Documentation of the current status of recreational uses based on *E. coli* bacteria levels and adhering to the *E. coli* criteria in the Ohio WQS (OAC 3745-1-37[C]) was conducted at all

sites in the 2024 study area.
7. The accounting of potential pollution sources included the novel use of the CWP GIS database about “sewer features” within the 2024 study area.

Aquatic Life Use Attainment Status

Aquatic Life and Recreation Use Recommendations

The principal goal of the 2024 biological and water quality assessment was to assess the status of the fish and macroinvertebrate assemblages that are the principal determinant of aquatic life use attainment status. Surveys of the 2024 study area subwatersheds by Ohio EPA have been sparse, but what sampling that has been accomplished dates back to 1995 with the most comprehensive surveys in 1995 and 2003. These datasets were included in the 2024 biological and water quality assessment as a limited analysis of trends. The 2024 survey represents the first comprehensive baseline assessment done to date.

Twenty-five sites within five (5) tributaries that enter the Scioto River between RM 137.52 and RM 126.5 were sampled in 2024. All have small watershed areas of generally between 1.4 and 9.4 square miles and, with exception of Kian Run, are in the trellised watersheds of Roberts Millikin Ditch, Barbee Ditch, Dry Run, and Evans Run. The 2024 sampling is the first of a rotation of monitoring through rivers and streams with potential and realized impacts of interest to DWR. This includes a focused effort on establishing a more comprehensive baseline for Blueprint Columbus and to clarify the impaired waters status for small urban watershed assessment in support of the DWR sewerage management and MS4 programs.

Each subwatershed has varying intensities of urban/suburban, commercial, and industrial land uses with an accompanying mosaic of water quality, hydrological, and habitat alterations, some of which pose difficult restoration and protection challenges. Out of the 15 individual streams assessed in 2024, only three (3) are currently designated in the Ohio WQS (OAC 3745-1-09; Table 9-1) while the remaining 12 are unlisted and hence are undesignated. Trabue Run is listed as being designated, but being tributary to the currently undesignated Barbee Ditch, it is listed out of sequence in the WQS. Table 1 lists the existing or recommended aquatic life and recreation uses for the 15 stream reaches that comprise the 2024 study area. Seven (7) or nearly one-half of the 15 stream reaches are recommended for Primary Headwater Habitat Class 2 with all except two (2) sites in the Dry Run subwatershed and the single site in Evans Run having drainage areas <1.0 square miles, the smallest being 0.22 square miles for site TRB04 in an unnamed tributary to Trabue Run at RM 2.70 (Table 2). The Dry Run sites at DRY07 and DRY09 had drainage areas of 1.37 and 1.28 square miles respectively. The Evans Run site (SCC01) has a drainage area of 1.39 square miles. The remaining stream reaches are recommended as WWH with Kian Run retaining the current designation of MWH-C. All sites were evaluated against the PCR recreation use following current Ohio EPA policy.

Aquatic Life Use Attainment Status

A single site in Trabue Run (TRB01) was in full attainment of WWH, two (2) sites, one in Dry Run

***Table 1**. Current and recommended use designations for 15 stream reaches in the 2024 Roberts Millikin Ditch, Barbee Ditch, Dry Run, Evans Run, and Kian Run reaches and subwatersheds in the Columbus DWR study area. Recommendations are made for the aquatic life and recreational uses only. WWH – Warmwater Habitat; MWH – Modified Warmwater Habitat; PWH2 – Primary Head water Habit Class 2; PCR – Primary Contact Recreation.*

Water Body Segment	SRW	WWH	EWH	MWH	PWH2	LRW	AWS	IWS	PCR	SCR	Comments
Kian run				+			+	+	+		ECBP ecoregion – channel modification
Dry run		+					+	+	+		Designated Tributary to Scioto R.
Trib. to Dry Run @RM 1.61 ust. RM 2.40					+				+		Undesignated Tributary to Dry Run
Trib. to Dry Run @RM 1.61 dst. RM 2.40		+							+		Undesignated Tributary to Dry Run
Trib. to Dry Run @RM 2.61					+				+		Undesignated Tributary to Dry Run
Barbee Ditch dst. RM 2.10		+							+		Undesignated Tributary to Scioto R.
Barbee Ditch ust. RM 2.10					+				+		Undesignated Tributary to Scioto R.
Trabue run		+					+	+	+		Designated Tributary to Barbee Ditch
Trib. to Trabue Run @RM 2.70					+				+		Undesignated Tributary to Trabue Run
Trib. to Trabue Run @RM 1.21					+				+		Undesignated Tributary to Trabue Run
Trib. to Trib. to Barbee Ditch @RM 1.87					+				+		Undesignated Tributary to Tributary to Barbee Ditch
Evans Run (Scioto R. @RM 136.97)		+							+		Undesignated Tributary to Scioto R.
Roberts Millikin Ditch dst. Quarry Metropark		+							+		Undesignated Tributary to Scioto R.
Roberts Millikin Ditch ust. Quarry Metropark					+				+		Undesignated Tributary to Scioto R.
Trib. to Roberts Millikin @RM 0.20		+							+		Undesignated Tributary to Roberts Millikin Ditch

Legend: **+** - use desingation verified by an Ohio EPA biological and habitat assessment; + - recommeded use based on Level 3 data collectedin 2024; blue highlght - use in current WQS; yellow highlight - currently unlisted in WQS.

***Table 2**. Status of aquatic life use attainment at 25 sites in 2024 study area between mid-June through mid-October, 2024 based on existing and recommended uses. The Ohio biocriteria, Primary Headwater Habitat (PHW) class thresholds, and other acronyms appear in the legend below. Table 2 is continued on the next page.*

Site_ID	Ohio EPA Basin-Stream Code	River Mile Fish/Macros	Drainage Area (mi.^{2})	Current Aqutic Life Use[a]	Recomm-ended Aquatic Life Use[b]	IBI[c]	Qual. Narrative[d]	Aquatic Life Use Status[e]	QHEI	PHWH Class[f]	HHEI	Location	Comments
Roberts Millikin Ditch (Scioto R. @137.52)													
RMD03	02	937	2.75/2.80	0.61	Undes.	PHW2	26	P	na	69.00	PHW2	69.00	Ust. I-270; Ust Westbelt Drive	Organic enrichment signatures, very high *E. coli* ; meth. chlor.
RMD02	02	937	1.59/1.50	1.03	Undes.	PHW2	26	P	na	61.00	PHW2	77.00	Roberts road	Organic enrichment signatures, elevated *E. coli* ; meth. chlor.
RMD01	02	937	- / 0.1	3.25	Undes.	WWH	NS	F*	NON-FAIR	Dry	na		Quarry Trails Dr. (Walking Bridge)	Severe organic enrichment inndicators; elevated ammonia-N
Unnamed Tributary to Roberts Millikin Ditch @RM 0.40													
RMD04	02	938	0.39/0.50	2.90	Undes.	WWH	22*	P*	NON-POOR	69.50	na	88.00	Quarry Trail Metro Park off Old Dublin Rd. below Millikin falls	Organic enrichment signatures, very high *E. coli* ; meth. chlor.
Barbee Ditch (Scioto R. @RM135.75)													
BARB03	02	932	2.76/2.70	0.90	WWH	PHW2	24	P	na	56.75	PHW2	87.00	Wilson Road	Very high *E. coli* ; highly elevated chlorides
BARB02	02	932	1.51/1.45	2.36	WWH	WWH	26*	VP*	NON-V.POOR	65.00	na		Hague Ave	Very high *E. coli* ; highly elevated chlorides
BARB01	02	932	0.34/0.30	5.88	WWH	WWH	32*	P*	NON-POOR	66.75	na		McKinley Ave near Police Academy	Organic enrichment signatures, very high *E. coli*
Trabue Run (Tributary to Barbee Ditch @RM 1.39)													
TRB03	02	266	2.18/2.20	0.50	WWH	WWH	30*	F*	NON-FAIR	65.25	na	74.00	Dst Dividend Drive	Elevated nickel
TRB02	02	266	1.10/1.05	1.00	WWH	WWH	26*	HF*	NON-FAIR	76.50	na	79.00	Trabue Rd	Toxaphene
TRB01	02	266	0.05/0.13	1.40	WWH	WWH	40	MG^{ns}	FULL	67.50	na	76.00	Hague Ave	
Unnamed Tributary to Trabue Run @RM 1.21													
TRB05	02	934	0.90/0.85	0.82	Undes.	PHW2	32	F	na	59.50	PHW2	86.00	Arlingate Ln.	Highly elevated chlorides; methylene chloride; nickel
Unnamed Tributary to Trabue Run @RM 2.7													
TRB04	02	933	0.22/0.22	0.22	Undes.	PHW2	26	LF	na	54.00	PHW2	77.00	Behind Westbelt historic Ohio EPA site	Elevated nickel
Unnamed Tributary @RM 0.5 to Unnamed Tributary to Barbee Ditch @RM 1.87													
BARB04	02	935	0.43/0.43	0.95	Undes.	PHW2	30	VP	na	58.50	PHW2	89.00	Wilson road	Highly elevated chlorides
Dry Run (Scioto R. @134.43)													
DRY02	02	095	2.75/2.61	0.95	WWH	WWH	32*	MG^{ns}	PARTIAL	54.00	na	89.00	Drive off of Hague Ave	Very high *E. coli* ; elevated ammonia-N
DRY01	02	095	1.41/1.25	7.24	WWH	WWH	24*	F*	NON-POOR	67.50	na		Holton Park	Very high *E. coli* ; elevated ammonia-N
DRY03	02	095	0.08/0.10	7.86	WWH	WWH	28*	LF*	NON-FAIR	60.50	na		Mckinley Ave	Organic enrichment signatures, very high *E. coli*
Unnamed Tributary to Dry Run@RM 1.61													
DRY09	02	930	2.40/2.45	1.28	Undes.	PHW2	20	P	na	56.50	PHW2	83.00	Site of Old USGS Gauge, Back of Parking Lot	Organic enrichment signatures, very high *E. coli*
DRY08	02	930	1.11/1.00	2.57	Undes.	WWH	26*	HF*	NON-FAIR	67.25	na		Westmoor Park, Ust Restored Stream Reach	Organic enrichment signatures, very high *E. coli*
DRY05	02	930	0.75/0.75	2.73	Undes.	WWH	32*	P*	NON-POOR	71.25	na		Westmoor Middle School	Organic enrichment signatures, very high *E. coli* ; toluene
DRY04	02	930	0.10/0.14	3.43	Undes.	WWH	26*	HF*	NON-FAIR	67.00	na	83.00	Valley View Drive	Organic enrichment signatures, very high *E. coli*
Unnamed Tributary to Dry Run @ RM 2.61													
DRY07	02	931	1.74/1.74	1.37	Undes.	PHW2	30	F	na	56.50	PHW2	68.00	Phillipi Road	Organic enrichment signatures, very high *E. coli*
DRY06	02	931	0.40/0.34	2.15	Undes.	WWH	30*	MG^{ns}	PARTIAL	45.50	na	79.00	Drive off Fisher Road	Elevated *E. coli*

Narrative Ratings							
EWH	Exceptional	46-60	E	FULL	>75	PHW3B	>70
WWH	Good	36-45	G	FULL	60-74	PWH3A	>70
MWH	Fair	26-35	F	PART./NON	46-59	PWH2	>50
MWH/LRW	Poor	19-25	P	NON-Poor	30-45	PWH1	<30
NA	Very Poor	12-18	VP	NON-V.Poor	<30	NA	na

Footnotes: [a] Current use in OAC 3745-1-09; [b] Recommened use based on this survey; [c] Biocriteria codified in OAC 3745-1-07, Table 7-1; [d] Narrative assessment used in lieu of ICI; [e] FULL - all biocriteria attain; PARTIAL - one/two biocriteria fail attain; NON - no biocriteria attain or one assemblage poor/very poor narrative; Primary Headwater Habitat (PHW) assessment used in lieu of IBI/ICI narrative; NS - not sampled; na - not applicable; NA - not acceptable.

***Table 2**. continued.*

Site_ID	Ohio EPA Basin	Stream	River Mile Fish/Macros	Drainage Area	Current Aqutic	Recomm-ended	IBI[c]	Qual. Narrative[d]	Aquatic Life Use Status[e]	QHEI	PHWH Class[f]	HHEI	Location	Comments
SCC01	02	939	0.10/0.10	1.39	Undes.	PHW2	30	VP	na	67.50	PHW2	85.00	Scioto Point Dr.	Elevated Cu; elevated conductivity
Kian Run (Scioto R. @126.5)														
KR02	02	197	0.82/0.80	1.36	MWH-C	MWH-C	28	P*	NON-POOR	49.00	na	67.00	High Street	Highly elevated P; very high *E. coli* ; elvated Zn;meth. chlor.
KR01	02	197	0.05/0.05	9.44	MWH-C	MWH-C	28	VP*	NON-V.POOR	49.00	na	73.00	Access from Scioto	Highly elevated P; very high *E. coli* ; elvated Zn; acetone; nickel
			Narrative Ratings		EWH	Exceptional	46-60	E	FULL	>75	PHW3B	>70		
					WWH	Good	36-45	G	FULL	60-74	PWH3A	>70		
					MWH	Fair	26-35	F	PART./NON	46-59	PWH2	>50		
					MWH/LRW	Poor	19-25	P	NON-Poor	30-45	PWH1	<30		
					NA	Very Poor	12-18	VP	NON-V.Poor	<30	NA	na		

Footnotes: [a] Current use in OAC 3745-1-09; [b] Recommened use based on this survey; [c] Biocriteria codified in OAC 3745-1-07, Table 7-1; [d] Narrative assessment used in lieu of ICI; [e] FULL - all biocriteria attain; PARTIAL - one/two biocriteria fail attain; NON - no biocriteria attain or one assemblage poor/very poor narrative; Primary Headwater Habitat (PHW) assessment used in lieu of IBI/ICI narrative; NS - not sampled; na - not applicable; NA - not acceptable.

(DRY02) and one in the unnamed tributary to Dry Run (DRY06), were in partial attainment (Table 2). The remaining 14 sites that were evaluated as WWH, six (6) were NON-Fair, four (4) were in NON-Poor, and two (2) in NON-Very Poor. Five (5) sites were limited by poor or very poor macroinvertebrate narratives accompanied by fair IBI scores and one (1) site limited by a poor IBI score. The remaining seven (7) sites had equivalent fish and macroinvertebrate narratives (Table 2).

Levels of urban pollutants in this study reflected the mosaic of stressors that result in the uniform impairment of the aquatic life uses. This includes diverse sources that range from organic enrichment signatures and exceedances of upper reference and other chemical effect thresholds for aquatic life. The most pervasive indicator of organic enrichment was *E. coli* in combination with biological organic enrichment signatures. While these occurred throughout the 2024 study area, they tended to be the most concentrated in the Dry Run subwatershed, a tributary of which includes a Blueprint Columbus project and other sources including the concentration of sewage features, FCSWCD located conveyances, and a scattering of home sewage treatment systems (HSTS). Chlorides were uniformly elevated, but moreso in certain subwatersheds and in proximity to concentrations of commercial developments. Sporadic elevated concentrations of pollutants such as ammonia-N in the lower mainstem of Dry Run are an indication of episodic releases of sewage. Industrial pollutants were the most numerous in Kian Run. An elevated copper value in Evans Run may be an indication of periodic biocide applications. Nutrients were not an issue of concern based on the Ohio Stream Nutrient Assessment Procedure (SNAP) assessments at six (6) representative sites in five (5) of the six (6) subwatersheds that were assessed.

Recreational Use Assessment

The assessment of recreational use attainment using mean and maximum *E. coli* results revealed consistent exceedances of the mean and Statistical Threshold Value criteria for Primary Contact Recreation (PCR) at every site sampled in 2024. Twelve (12) mean values exceeded the STV while eight (8) exceeded the SCR criterion a result that amplifies the magnitude of the *E. coli* PCR exceedances. All except three (3) of the maximum values exceeded the SCR criterion with the highest value of 9,600 cfu/100 mL at the lowermost site in Dry Run. Generally the mean and STV exceedances were the highest and most consistent in the Dry Run subwatershed with the maximum at all sites exceeding the Secondary Contact Recreation (SCR) criterion and the mean at five (5) sites. The remaining mean values and two of the *minimum* values exceeded the STV with 4 minimums exceeding the mean criterion. The minimum at a site in upper Dry Run had a very low minimum value of 41 cfu/100 mL.

The Barbee Ditch subwatershed also had numerous maximum value exceedances of the SCR criterion, but at a lesser magnitude of exceedance compared to Dry Run. The four sites in Roberts Millikin Ditch also had maximum exceedances of the SCR criterion at three (3) sites with the highest values in the unnamed tributary at RM 0.40. Evans Run had similar exceedances of the minimum, mean, and maximum values to Barbee Ditch. Kian Run had a maximum *E. coli* of 3,600 cfu/100 mL at the upstream site. Taken together the results indicate sustained exceedances of the PCR recreational use *E. coli* criteria during summer-fall normal

flows, an indicator of organic enrichment persisting during low flow conditions instream. While these are what are considered dry weather data, the residual effects of wet weather related inputs are also a factor. However, rainfall was well below normal in 2024 hence dry weather inputs are likely occurring on a regular basis.

The accounting of potential pollution sources included the novel use of the Columbus DWR GIS database about "sewer features" that occur within the 2024 study area. Data about the collection system that conveys wastewater to one of the two major wastewater reclamation plants (Jackson Pike or Southerly) was furnished by Columbus Water and Power (formerly Department of Public Utilities, DPU) in the form of shapefiles that contained dimensional and locational information about 41 different features of the system, 21 of which were deemed a *potential* source of sewage or other pollutant releases to surface waters (see Appendix F). The sanitary sewer system in the 2024 study area includes 1,082 miles of separate sanitary sewers that transport wastewater to the Jackson Pike Water Reclamation Plant (WRP; formerly labeled Wastewater Treatment Plant, WWTP) that serves the western half of Franklin County and the central portion of Columbus. The stormwater collection system consists of an additional 36.1 miles of piping. This system collects rain water and snow melt runoff that enter the storm sewer system through drainage ditches or via drains on curbed streets. Any materials on the surface of streets, roofs, sidewalks, and yards can be washed into the storm sewer system, which empties directly into nearby streams or rivers with no treatment. The Franklin Co. SWCD performed an inventory of conveyances to area streams based on walking each and recording the conveyances and their type (e.g., pipe type, swale). The term "illicit" was assigned to any discharges that had visual or odorous evidence of carrying pollutants (FCSWCD 2007). Descriptions of a major initiative to abate sewage pollution, Blueprint Columbus, in the 2024 study area is also described in the Study Area Description.

Synopsis of Current Issues

Organic Enrichment Signatures

Signatures of organic enrichment were the most evident in the highly elevated *E. coli* levels measured in the 2024 study area with a scattering of detections of other indicators such as ammonia-N and organic enrichment response signatures in the macroinvertebrate results. *E. coli* values were especially elevated in Dry Run which is a Blueprint Columbus area where the goal is to reduce the entry of sewage into local waterways via stormwater or sanitary sewer overflows. The grab chemical/physical results showed marginal D.O. values in Roberts Millikin Ditch in the headwaters and at the mouth below the Quarry Trails Metro Park. The Datasonde results indicated near zero levels of D.O. during July 29-August 1 presumably due to intermittent flows that occurred on those dates. Other indicators of organic enrichment included mean ammonia-N levels above the 95th percentile reference value at two Dry Run sites (DRY01 and DRY02) that are downstream from the Hilltop Blueprint Columbus project area. Both Kian Run sites had total and orthophosphate above the 90th and 95th percentile reference values, which is likely due to a mix of sewage and stormwater given the descriptions of the sources by Ohio EPA (2012). However, these are localized instances of chemical indications that are not nearly as pervasive as the *E. coli* exceedances.

Nutrient Effects Assessment

The assessment of nutrient effects is a relatively recent concept (Ohio EPA 2015b) and is intended to focus on the *effect* of nutrients on aquatic life use attainment. Consistent non-attainment of the applicable WWH or MWH aquatic life use was observed at all six (6) SNAP sites. In such cases the SNAP indicators are examined for any adverse effects of nutrient enrichment based on exceedance thresholds set by Ohio EPA (Appendix E). All of the benthic chlorophyll a values were well within acceptable thresholds. All of the D.O indicators showed a low potential for adverse impacts. Allied parameters such as TKN, BOD_5, and TSS also showed very low risk values. Two total P and one minimum D.O. were at moderate risk levels, but these occurred in Kian Run which being designated MWH has a less stringent threshold for nutrient impairment. All six (6) sites were evaluated as Impaired, Not Nutrients.

Dissolved Ions and Other Chemical Parameters

The remainder of the chemical data revealed no other exceedances of chronic or acute water quality criteria in the Ohio WQS, which is not an unexpected finding. Common pollutants such as ammonia-N and heavy metals have largely been controlled and are infrequently measured at levels exceeding detection limits in grab water samples under summer normal flows. Other parameters that either have outdated criteria or no criteria at all have emerged as being more indicative of potential pollution problems. Dissolved ionic strength parameters such as chlorides, total dissolved solids, and conductivity are such examples. Chloride in particular showed exceedances of the recently developed Ohio hazard threshold of 52 mg/L (Miltner 2021) and regional reference thresholds on a regular basis. While no values exceeded the U.S. EPA criterion of 230 mg/L, the data presented herein are summer-fall values that reflect residual levels from winter salt applications to highways, streets, parking lots, and other pavements. Chemicals were also measured in sediments and these, too, were evaluated by available effect and reference thresholds. There was only one exceedance of the more serious MacDonald (2000) TEC for zinc in Kian Run at the upstream site KR02 (Table 9). Four (4) sites in the Barbee Ditch subwatershed had exceedances of the CCME (1999) PEC for nickel in three tributaries to Barbee Ditch and lower Kian Run at KR01. There were a total of 15 exceedances of the MacDonald (2000) TEC threshold for arsenic with at least one exceedance in each of the 15 subwatershed and stream reaches, a single exceedance of the cadmium PEC in lower Kian Run (KR01), and two (2) exceedances of lead in Dry Run (DRY03 and DRY09). There was one (1) SRV exceedance for lead in Kian Run at KR02. Kian Run had the most total exceedances with four (4) and the remaining sites with one (1) or two (2) each. The number of detections of all metals (excepting iron, which has no threshold) ranged from three (3) to six (6) at all sites being more numerous in the Barbee Ditch and Kian Run tributaries, a reflection of the sources of these compounds in each subwatershed. Acetone was detected at a single site in lower Kian Run (KR01) which exceeded a low risk guideline developed by U.S. EPA (2015). Carbon disulfide and toluene were detected at single sites each (KR01 and DRY05 respectively), but below adverse effect thresholds. Methylene chloride was the most frequently detected organic compound and exceeding low risk guidelines of U.S EPA, Region III BTAG guidelines at five (5) locations three (3) of which occurred in the Robets Millikin Ditch subwatershed. Most of these compounds are common by products of various manufacturing processes and the likely source is urban runoff from commercial facilities. Evans Run (SCC01) was the only site that had zero detections of any

organic compound in the 2024 study area. PAH compounds in particular were either below effect levels or not detected at all, which is highly unusual for an urban watershed. Sediment chemistry can be more revealing than water column sampling about the longer term occurrence of certain contaminants and compounds. In the smaller tributary subwatersheds this could have implications for stormwater management.

Recreational Use Assessment

Recreational use attainment was determined by using *Escherichia coli (E. coli)* mean and maximum values that approximate the water quality criterion expressed as a 90-day geometric mean and a Statistical Threshold Value (STV). These criteria are codified in OAC 3745-1-37(C) with 126 cfu/100 mL for the 90-day geometric mean and 410 cfu/100 mL for the STV, respectively. With only six samples collected at each mainstem site this amounts to a screening assessment using the average and maximum values in lieu of true geometric mean and STVs at each site for the Primary Contact Recreational (PCR) use subcategory (Table 3). Exceedances of the geometric mean and STV thresholds were numerous and highest in the areas of the Dry Run subwatershed that were within and downstream from the Blueprint Columbus project area. Maximum values frequently exceeded the Secondary Contact Recreation (SCR) criterion at 22 of the 25 sites sampled in 2024. Fecal bacteria indictors like *E. coli* are vulnerable to false positives from non-human sources and are predictably elevated in urbanized areas. Taken together the results indicate extreme and sustained exceedances of the PCR mean and STV recreational use *E. coli* criteria during summer-fall normal flows, an indicator of organic enrichment remaining during low flow conditions instream. The consistent relationship of the very high minimums and means to the maximum values at most sites in each subwatershed suggests both higher sustained loadings with very high intermittent pulses of *E. coli* sources. While these are all what are considered to be dry weather data, the residual effects of wet weather related inputs are also a factor. However, rainfall was well below normal in 2024 hence dry weather inputs are likely occurring on a regular basis.

***Table 3**. E. coli values (cfu/100 mL) for samples collected in Roberts Millikin Ditch, Barbee Ditch, Dry Run, Evans Run, and Kian Run during June-October 2024. Yellow shaded values exceeded the recommended 90-day geometric mean (126 cfu/100 mL) and orange shaded values exceeded the maximum STV (410 cfu/100 mL) Primary Contact Recreation (PCR) use criteria. Red shaded values exceeded the Secondary Contact Recreation (SCR) use criterion.*

Site ID	River Mile	Drainage Area (mi.^{2})	Samples	Date of Minimum	Minimum	Geometric Mean	Maximum	Date of Maximum
Roberts Millikin Ditch (Scioto R. @137.52)								
RMD03	1.75/1.80	0.61	4	9/4	110	567	2400	10/2
RMD02	1.59/1.50	1.03	4	9/4	75	257	670	10/2
RMD01	0.10/0.10	3.25	4	9/4	<10	152	1200	10/2
Tributary to Roberts Milliken Ditch @RM 0.40								
RMD04	0.39/0.50	2.90	4	9/4	170	1089	4600	7/15
Barbee Ditch (Scioto R. @RM 135.75)								
BARB03	2.76/2.70	0.90	4	10/15	10	384	1800	6/24
BARB02	1.51/1.45	2.36	4	9/4/;10/1	910	1120	1900	7/16
BARB01	0.34/0.30	5.88	4	9/4	140	723	2500	7/15
Tributary to Trabue Run @ RM 2.7								
TRB04	0.22/0.22	0.04	4	9/4	250	915	2000	7/15
Tributary to Trabue Run @RM 1.21								
TRB05	0.90/0.85	0.82	4	6/25	220	378	570	7/15
Tributary @RM 0.5 To Tributary To Barbee Ditch @RM 1.87								
BARB04	0.43/0.43	0.95	4	7/17	480	716	1400	9/5
Trabue Run (Tributary to Barbee Ditch @ RM 1.39)								
TRB03	2.18/2.20	0.63	4	9/4	31	368	1200	6/25
TRB02	1.00/1.05	2.60	4	9/5	470	595	700	7/17
TRB01	0.05/0.13	3.00	4	9/4	230	846	1700	7/16
Dry Run (Scioto R. @134.43)								
DRY02	2.75/2.61	0.75	4	9/3	63	1189	5500	6/24
DRY01	1.41/1.25	7.24	4	10/1	390	2366	7700	6/24
DRY03	0.08/0.10	7.86	4	9/5	240	2410	9600	7/15
Tributary to Dry Run @RM 1.61								
DRY09	2.40/2.45	1.28	4	9/3	840	2378	4600	6/26
DRY08	1.11/1.00	2.57	4	10/1	370	990	2400	6/26
DRY05	0.75/0.75	2.73	4	9/3	120	842	9200	6/24
DRY04	0.10/0.14	3.43	3	10/1	450	1520	3900	6/24
Tributary to Dry Run @ RM 2.61								
DRY07	1.74/1.74	1.37	4	9/3	250	790	3600	6/24
DRY06	0.40/0.34	2.15	4	9/3	41	424	1400	7/16
	exccedance of Primary Contact Recreation (PCR) geometric mean criterion of 126 cfu/mL.							
	exccedance of PCR Statistical Maximum Value (STN) criterion of 410 cfu/mL.							
	exccedance of Secondary Contact Recreation (SCR) maximum criterion of 1030 cfu/mL.							

***Table 3**. continued.*

Site ID	River Mile	Drainage Area ($mi.^2$)	Samples	Date of Minimum	Minimum	Geometric Mean	Maximum	Date of Maximum
Evans Run (Scioto R. @136.97)								
SCC01	0.10/0.10	1.39	4	9/5	270	608	1100	6/26
Kian Run (Scioto R. @126.5)								
KR02	0.82/0.80	1.36	4	10/2	280	1073	2500	9/3
KR01	0.05/0.05	9.44	5	9/3	460	796	1600	6/26
	exccedance of Primary Contact Recreation (PCR) geometric mean criterion of 126 cfu/mL.							
	exccedance of PCR Statistical Maximum Value (STN) criterion of 410 cfu/mL.							
	exccedance of Secondary Contact Recreation (SCR) maximum criterion of 1030 cfu/mL.							

INTRODUCTION

The status of aquatic life and water quality in the 2024 Roberts Millikin Ditch, Barbee Ditch, Dry Run, Evans Run, and Kian Run study area has direct implications for the City of Columbus of Water and Power (DWP), Division of Water Reclamation (DWR). The streams are the principal receiving waters of discharges from the DWR managed sewer system and stormwater runoff. It is therefore important to have an accurate understanding of the current status of biological condition, habitat, and water quality baseline in order to be able to relate it to abatement efforts and restoration projects that are planned or underway. This can critically affect our understanding of the efficacy of current regulations, the need for future regulations, and the capacity and operation of critical infrastructure to meet the challenges of a growing population and expanding human activities across Central Ohio. This survey is the first year of rotation of surveys throughout the DWR service area under a long range plan that was developed in 2024.

More recently U.S. EPA, trade organizations such as the Water Research Foundation (WRP), and major municipal water and wastewater utilities have been collaborating on an approach termed One Water. In a recent summary of One Water, Blueprint Columbus was cited as a prime example (Kent 2022):

> *"Integrated planning approaches, such as EPA's Framework for Integrated Planning for Municipal Stormwater and Wastewater, facilitate collaboration between multiple departments and agencies to implement shared solutions that meet multiple objectives. For example, Columbus Department of Public Utilities, in Ohio, is implementing Blueprint Columbus, a plan to redirect stormwater from the sanitary laterals and foundations on private property to public streets and to green infrastructure located in the right-of-way to reduce sanitary sewer overflows (SSO). This will reduce the amount of inflow and infiltration in the sewers, addressing the root cause of SSOs, without the need to build additional tunnels to handle the excess flow,* ***and improving water quality in streams.****"(emphasis added)*

It is documenting the *"improving water quality in streams"* in the vision for One Water that the 2024 DWR Plan is intended to fulfill with biological, physical, and chemical data supporting an integrated analysis of causes and sources of impairment and threat. However, initiatives like One Water have historically been long on planning exercises and administrative measures, but weak to non-existent on demonstrating environmental results with sufficiently rigorous monitoring and assessment. With the exception of only a handful of examples across the U.S. (e.g., the Southern California Stormwater Monitoring Coalition[4]), documenting improvements in water quality is largely an assumed outcome, much the same as it has been done over 50+ years of Clean Water Act (CWA) administration by U.S. EPA and the states. Through the execution of this Monitoring and Assessment (M&A) Plan, DWR will be a leader in completing the cycle of water quality management espoused by the U.S. EPA Environmental Indicators Initiatives of the 1990s (U.S. EPA 1995a,b), as described in the National Academy of Sciences

[4] https://socalsmc.org/about/organizational-goals/

(NAS) Committee on Science in TMDLs report (NRC 2001), and by Karr and Yoder (2004) as a follow on to the NAS effort. It will also meet a key recommendation of the National Academy of Sciences report on urban stormwater management in the United States (NRC 2009) that *". . . more comprehensive biological monitoring of waterbodies will be critical to better understanding the cumulative impacts of urbanization on stream condition."*

Prior surveys of streams in the 2024 study area have been restricted to a total 10 sites sampled during 1994-2001 and single sites by Ohio EPA in 2010. Most of these sites were located in the Barbee Ditch, Dry Run, and Kian Run portions of the 2024 study area. Hence the 2024 survey is the first spatially comprehensive assessment of these subwatersheds. DWR has made and is making substantial improvements to wastewater infrastructure by addressing urban sewage and stormwater infrastructure via Blueprint Columbus in portions of the Dry Run subwatershed. Furthermore, use designations for aquatic life and recreation are either missing, incomplete, or inaccurate in the Ohio WQS for some of the 2024 study area streams. Making recommendations for attainable uses for aquatic life and recreation is another major objective of this assessment.

In 2017-18 Ohio EPA reduced the intensity and frequency of watershed monitoring and assessment that had been a staple of that program for nearly 40 years. This was followed in 2018-19 by the agency proposing and implementing a new Two-Pronged strategy for statewide monitoring and assessment that reduces the acuity and relevance of prior assessments of mainstem rivers and watersheds and lessening the connection with historical trends by virtue of that reduction. An Ohio EPA survey in 2023 included only three (3) sites compared to 25 sites sampled in the 2024 DWR survey. It is therefore critical for DWR to have the most accurate and up to date knowledge at a level of detail that allows for better planning and responding to pending initiatives from Ohio EPA, U.S. EPA, and third parties. One such example is the newly proposed Ohio EPA Nutrient Assessment Procedure that has implications for assessing the impacts of nutrients in the 2024 study area and from the sewer system itself. This could eventually impact MS4 requirements in the near future. Addressing such issues independently an apart from a watershed-based monitoring and assessment design is not only imprudent, but could produce requirements that conflict with the realities of the current status of these highly urbanized subwatersheds resulting in potentially costly and unnecessary expenditures. This study undertook an extensive inventory of sewer system features that were available in GIS coverages provided by Columbus Water and Power (CWP) and DWR in order to better inform the analysis of the chemical/physical, habitat, and biological data that was collected in 2024.

METHODS

Monitoring Design

An intensive pollution survey design that employs a high density of sampling sites and paired biological, chemical, and physical indicators and parameters was followed in 2024 and as prescribed by the 2024 DWR Monitoring and Assessment Plan (MBI 2024a). The principal objectives of the 2024 assessment are to report aquatic life and recreational use attainment status, following the Ohio WQS and Ohio EPA practices, and determine associated causes and sources of impairments. To accomplish this monitoring sites were distributed across the subwatersheds to assess the impacts of sources of potential sewage releases and other contaminants, and major physical modifications to provide a "pollution assessment" of the streams in the 2024 study area. The result was a design that included chemical, physical, and biological sampling at 25 sites in the Roberts Millikin Ditch, Barbee Ditch, Dry Run, Evans Run, and Kian Run subwatersheds. Each site was assigned a unique site code as depicted in Figure 1 and in Appendix Table A-1. The majority of the sites are "new" never having been sampled with Level 3 methods by prior Ohio EPA surveys.

Biological and Water Quality Surveys

A biological and water quality survey, or "biosurvey", is an interdisciplinary monitoring effort coordinated on a water body specific or watershed scale. Biological, chemical, and physical monitoring and assessment techniques are employed in biosurveys to meet three major objectives:

1. Determine if use designations and/or goals set for or assigned to a given water body are appropriate and attainable;
2. Determine the extent to which use designations assigned in the state Water Quality Standards (WQS), or equivalent policies or procedures, are either attained or not attained; and,
3. Determine if any changes in ambient biological, chemical, or physical indicators have taken place over time, particularly before and after the implementation of point source pollution controls or best management practices.

The data were managed by MBI in a relational database that supports the integrated analysis of ambient chemical, physical, and biological data and pollution source information and characterization. The findings are analyzed and depicted in a written report with causes and sources of impairments being described as to their extent and severity along with any recommendations for their eventual resolution.

Measuring Incremental Changes

Incremental change is defined here to represent a measurable and technically defensible change in the condition of a water body within which it has been measured. Most commonly this is termed "incremental improvement" in which the condition of a water body that does not yet fully meet all applicable water quality standards (WQS) can be tracked as to the direction or

trajectory of any changes. The general principles of incremental change are defined as follows (after Yoder and Rankin 2008):

- ***Measurement of incremental change*** can be accomplished in different ways, provided the measurement method is scientifically sound, appropriately used, and sufficiently sensitive enough to generate data from which signal can be discerned from noise;
- ***Measurable parameters and indicators*** of incremental change include biological, chemical, and physical properties or attributes of an aquatic ecosystem or pollution source that can be used to reliably indicate a change in condition; and,
- ***A positive change in condition*** means a measurable improvement that is related to a reduction in a specific pollutant load, a reduction in the number of impairment causes, a reduction in an accepted non-pollutant measure of degradation, or an increase in an accepted measure of waterbody condition relevant to designated use support.

The ability to accomplish this was limited by the dearth of historical data of sufficient quality and rigor. However, what little historical data that does exist was utilized to assess for any apparent changes over time.

Biological Methods

All biological sampling methods are defined by the applicable protocols published by the Ohio EPA (1987a,b; 1989a,b; 2006, 2015a,b). These meet the specifications of the Ohio WQS and are used to assess aquatic life and recreational use designations, to determine the extent and severity of impairments, and to document incremental changes that result from pollution abatement actions.

Fish Assemblage Methods

Methods for the collection of fish at wadeable headwater sites was performed using a bank set long-line pulsed D.C. electrofishing equipment using a Smith-Root 2.5 GPP electrofishing unit described by Ohio EPA (1989a). An ETS AbP-3 battery powered backpack electrofishing unit was used as an alternative to the long line in the smallest headwater streams and in accordance with the restrictions on the use of backpack units described by Ohio EPA (1989a). A three person crew carried out the sampling protocol for each type of wading equipment. Sampling effort was indexed to lineal distance ranging from 150-200 meters in length for headwater sites. Sampling distance was measured with a Global Positioning System (GPS) unit or laser range finder. Sampling locations were delineated using the GPS mechanism and indexed to latitude/longitude and Universal Transverse Mercator (UTM) coordinates at the beginning, end, and mid-point of each site. The location of each sampling site was indexed by river mile using the Ohio EPA River Mile Index (RMI) system[5]. Sampling was conducted during the June 16-October 15 seasonal index period once at headwater sites draining <20 square miles. Sampling was conducted in a general upstream direction and in and adjacent to the most heterogeneous

[5] https://data-oepa.opendata.arcgis.com/apps/river-miles-index/explore

habitat. Stunned fish were collected by a primary and one secondary netter with the third crew member tending the electrofishing unit for the long line or the live net with the backpack unit.

Samples from each site were processed by enumerating and recording numbers by species and in some cases by life stage (y-o-y, juvenile, adult). All captured fish were immediately placed in in a floating live net (long line and backpack) for processing. Water was replaced and/or aerated regularly to maintain adequate dissolved oxygen levels in the water and to minimize handling mortality. Fish not retained for voucher or other purposes were released back into the water after they had been identified to species, examined for external anomalies, and counted. Larval or post-larval stage individuals measuring less than 15-20 mm in length (excluding species with small size as adults) were generally not included in the data as a matter of practice.

The incidence of external anomalies was recorded following procedures outlined by Ohio EPA (1989a; 1996) and refinements made by Sanders et al. (1999). While the majority of captured fish were identified to species in the field, any uncertainty about the field identification of individual fish required their preservation for later laboratory identification. Vouchers were preserved in borax buffered 10% formalin and labeled by date, river or stream, and geographic identifier (e.g., river mile). Identification was to the species level at a minimum and to the sub-specific level if necessary. A number of regional ichthyology keys were used and included the Fishes of Ohio (Trautman 1981). Vouchers were deposited at and verified by The Ohio State University Museum of Biodiversity (OSUMB). Data were recorded on water resistant data forms for entry into the MBI ECOS data management system with all entries proofread for accuracy.

Macroinvertebrate Assemblage Methods

Because all of the sites drained <10 square miles, macroinvertebrates were sampled using a qualitative dip net/hand pick method as a standalone method in accordance with Ohio EPA macroinvertebrate assessment procedures (Ohio EPA 1989a, 2015a) and MBI policy. The qualitative samples were collected using a triangular frame dip net and hand picking with organisms initially preserved in 95% ethanol. Identifications were performed to the lowest taxonomic resolution possible for the commonly encountered orders and families, which is genus/species for most taxa. From these results, the richness of macroinvertebrates and general comments about their abundance were used to produce a narrative assessment of Exceptional, Very Good, Good, High Fair, Fair, Low Fair, Poor, or Very Poor for each sample in accordance with the currently published Ohio EPA practices (Ohio EPA 2015a).

Trajectories in Key Indicators

Developing an understanding of the temporal trajectory of the different indicators and parameters that are provided by a spatially adequate monitoring design is important feedback to Columbus DWR, Ohio EPA, and stakeholders in the Scioto and Olentangy River study area. The study area has a complex mosaic of watershed level and site-specific impacts the complexity of which makes being able to understand and then develop management responses to impairments an immense challenge. The documentation of incremental improvement as opposed to a singular focus on the full restoration of impairments allows program effectiveness

to receive credit short of achieving full restoration. Furthermore, failing to recognize if waters are improving and on a positive trajectory can lead to erroneous conclusions about the attainability of CWA goals and the viability of restoration efforts. Simply put, a selective focus on individual and selected pollutants alone is insufficient in a complex setting like the 2024 study area. It is for these reasons that being able to detect, measure, and express incremental improvements in key indicators is vital. Showing incremental progress not only provides confirmation that restoration efforts are working, it also provides important feedback for those programs which because of uncertainties in their control must be adaptive in order to succeed. As such, the type of monitoring and assessment that was employed in this survey was designed to provide results that could be used to demonstrate the degree and direction of incremental change.

The results of the bioassessment using the primary indices that comprise the Ohio biocriteria were used to quantify the degree to which overall aquatic life conditions have improved through time up to and including the 2024 survey. The limited amount of historic data in the 2024 study area precluded the use of quantitative tools such as the Area of Degradation (ADV) and Area of Attainment (AAV) methodology (Yoder et al. 2005). The ADV/AAV term is an expression of the degree to which one of the biological index values is either above or below the WWH biocriterion and the distance of the mainstem over which it occurs. As such it is a quantification of the "quantity" of biological attainment and impairment. When normalized to a standard distance (e.g., per mile) it can be an effective indicator of the degree of change which is taking place between river reaches and through time in the same river reach and between different rivers. For the 2024 survey this was reduced to simple comparisons of fish IBIs and macroinvertebrate qualitative narratives on a site-by-site basis where historical data existed. In the future the 2024 results will serve as the baseline against which future survey results in accordance with the DWR Monitoring and Assessment Plan (MBI 2024a) cab be more completely assessed.

Habitat Assessment

Physical habitat was evaluated using the Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA for streams and rivers in Ohio (Rankin 1989, 1995; Ohio EPA 2006). Various attributes of the habitat are scored based on the overall importance of each to the maintenance of viable, diverse, and functional aquatic assemblages. The type(s) and quality of substrates, amount and quality of instream cover, channel morphology, extent and quality of riparian vegetation, pool, run, and riffle development and quality, and gradient are some of the metrics used to determine the QHEI score which generally ranges from 20 to less than 100. The QHEI is also used to evaluate the characteristics of a stream or river segment, as opposed to the solely assessing the characteristics of a single sampling site. As such, individual sites may have poorer physical habitat due to a localized disturbance yet still support aquatic communities closely resembling those sampled at adjacent sites with better habitat, provided water quality conditions are similar. QHEI scores from hundreds of segments across Ohio headwater streams have indicated that values greater than 55 are generally conducive to the existence of warmwater faunas whereas scores less than 45 generally cannot support a warmwater assemblage (Ohio EPA 1989b, Rankin 1995) consistent with baseline CWA goal expectations

(e.g., the WWH in the Ohio WQS). A QHEI matrix (Rankin 1989, 1995) that compares the number of good to modified attributes and their ratio was used as the principal method to evaluate aquatic life use attainability in the 2024 study area.

Chemical/Physical Methods

Chemical/physical sampling for the 2024 study area included the collection and analysis of water samples for chemical/physical and bacterial analysis and sediment samples for determining organic chemicals and metals levels. Methods for the collection of water column chemical/physical and bacterial samples followed the procedures of Ohio EPA (2023a,b). Sediment chemical sampling followed that described by Ohio EPA (2023c). All laboratory analyses except benthic and sestonic chlorophyll *a* was performed by the Columbus DWR Surveillance Laboratory. Chlorophyll *a* biomass analysis was performed by Alloway Laboratories located in Marion, OH.

Water Column Chemical Quality

Water column chemical quality was determined by the collection and analysis of grab water samples, instantaneous measurements recorded with a water quality meter, and continuous measurements recorded at multiple day intervals at six sites in the six major streams sampled in 2024.

Grab Sampling

Grab samples of water were collected with a stainless steel bucket from a location as close to the center point of the stream channel as possible by the MBI sampling crew. Samples were collected from the upper "12-24" of the surface and then transferred to sample containers in accordance with Ohio EPA (2023a,b) procedures. Sampling was conducted between mid-June and mid-October and under "normal" summer-fall low flows – elevated flows following precipitation events were avoided and sampling was delayed until the elevated flows subsided. The frequency of sampling was four (4) times at all sites. Instantaneous values for temperature (°C), conductivity (µS/cm), pH (S.U.), and dissolved oxygen (D.O.; mg/L) were recorded with a YSI Model 664 meter at the time of grab sample collection and with the fish/habitat sampling.

Continuous Recordings

Continuous readings of temperature (°C), conductivity (µS/cm), pH (S.U.), and dissolved oxygen (D.O.; mg/L) were recorded with YSI EXO 2 and EXO3 Sonde ("Datasonde") instruments at 32 Scioto and Olentangy mainstem locations. The Datasondes were set as close as possible to the Thalweg (i.e., deepest part of the stream channel) in a PVC enclosure that ensured no contact with the stream bottom or other solid objects. The Datasondes were positioned vertically where depth allowed by driving steel fence posts into the bottom and positioning the PVC enclosure in an upright position. Where the depth was too shallow or deep, the PVC enclosure was secured in a horizontal position in an area of the stream channel with continuous flow. All Datasondes were secured against theft or vandalism. "Short-term" deployments were made over 3-4 day continuous intervals during periods of maximum summer temperatures and

normal summer flows. Readings were recorded at 15 minute intervals. At the time of retrieval data was downloaded to a YSI Model 650 Instrument with high memory capacity and then transferred to a PC for storage and later analysis. “Long term” deployments were made during July and August 2024 at six (6) sites in the lower reaches of Roberts Millikin Ditch (1 site), Barbee Ditch (2 sites), Dry Run (2 sites), and Kian Run (1 site).

Sediment Chemical Quality

Fine grain sediment samples were collected in the upper strata of bottom material at each sampling location using decontaminated stainless steel spoons and excavated using nitrile gloves. Decontamination of sediment sampling equipment followed the procedures outlined in the Ohio EPA sediment sampling guidance manual (Ohio EPA 2023c). Grab samples were homogenized as a composite in stainless steel pans (material for VOC analysis was not homogenized), transferred into glass jars with Teflon® lined lids, placed on ice (to 4^{o}C) in a cooler, and delivered to the Columbus DWR Surveillance Lab. Sediment data was reported on a dry weight basis. Sediment samples were analyzed for a total analyte list of inorganics (metals), volatile organic compounds, semi-volatile organic compounds, PCBs, pesticides, and total petroleum hydrocarbons.

Determining Use Attainment Status

Use attainment status is a term which describes the degree to which environmental parameters or indicators are either above or below criteria specified by the Ohio Water Quality Standards (WQS; Ohio Administrative Code 3745-1). For the 2024 study area two use designations were evaluated, aquatic life and recreation in and on the water by humans. Hence the process herein is referred to as the determination of aquatic life and recreational status for each sampling site. The process was applied to data collected by ambient assessments and applies to ambient locations outside of discharger mixing zones.

Aquatic Life Use Attainment Status

Aquatic life use attainment status is determined by the Ohio EPA biological criteria (OAC 3745-1-07; Table 7-1). Numerical biological criteria are based on multimetric biological indices which include the Index of Biotic Integrity (IBI) and modified Index of Well-Being (MIwb), which indicate the health and well-being of the fish assemblage, and the Invertebrate Community Index (ICI), which indicates the quality of the macroinvertebrate assemblage. The IBI and ICI are multimetric indices patterned after an original IBI described by Karr (1981), Fausch et al. (1984), and Karr et al. (1986) and subsequently modified by Ohio EPA (1987b) for application to Ohio rivers and streams. The ICI was developed by Ohio EPA (1987b) and was further described by DeShon (1995). The MIwb is a measure of fish community abundance and diversity using numbers and weight information and is a modification of the original Index of Well-Being originally applied to fish community information (Gammon 1976; Gammon et al. 1981). Numerical biocriteria are stratified by ecoregion, use designation, and stream or river size per OAC 3745-1-07(C). Since the study area was comprised of headwater streams draining <10

square miles the fish IBI and a narrative evaluation of the qualitative samples were used in lieu of an ICI. The MIwb of fish does not apply in headwaters streams draining <20 square miles.

Three attainment status results are possible at each sampling location - full, partial, or non-attainment as follows:

- **FULL** attainment means that all of the indices meet the applicable biocriteria.
- **PARTIAL** attainment means that one or more of the indices fails to meet the applicable biocriteria.
- **NON**-attainment means that none of the indices meet the applicable biocriteria or one of the organism groups reflects poor or very poor quality.

An aquatic life use attainment table was constructed based on the sampling results and is arranged from upstream to downstream and includes the sampling locations indicated by site code, river mile, the applicable biological indices, the use attainment status (*i.e.,* full, partial, or non), the Qualitative Habitat Evaluation Index (QHEI) score, and pertinent comments and observations about each sampling location and proximity to sources of stress.

Recreation

Criteria for determining attainment of recreational uses are established in the Ohio Water Quality Standards (OAC 3745-1-07; Table 7-13) based upon the counts of fecal bacteria *(Escherichia coli)* present in the water column expressed as colony forming units (cfu) per 100 mL. *E. coli* bacteria are microscopic organisms that are normally present in the feces and intestinal tracts of humans and other warm-blooded animals. *E. coli* typically comprises approximately 97 percent of the organisms found in the fecal coliform bacteria of human feces (Dufour 1977). There is currently no easy way to differentiate between human and animal sources of fecal coliform bacteria in surface waters, although methodologies for this determination include DNA analysis. These microorganisms can enter water bodies where there is a direct discharge of human and/or animal wastes, or they may enter water bodies via runoff from soils where such wastes have been deposited. Pathogenic (disease-causing) organisms are typically present in the environment in such small amounts that it is impractical to directly monitor each specific type of pathogen. Fecal indicator bacteria by themselves, including *E. coli,* are generally not pathogenic. However, some strains of *E. coli* can be pathogenic, being capable of causing serious illness. Although not necessarily agents of disease, fecal indicator bacteria such as *E. coli* may signal the *potential* presence of pathogenic organisms that can enter the aquatic environment via the same pathways. When *E. coli* are present in extremely high numbers in a water sample, it invariably means the water has received fecal matter from one or more sources of raw sewage that are likely human in origin.

The Ohio WQS for recreational uses were revised in 2016 to reflect a more rigid adherence to any form of contact with surface waters as ensuing the same level of risk. This replaced a former framework that was stratified to account for the degree of body contact with three (3) subcategories of the Primary Contact Recreational (PCR) use as PCR-A, PCR-B, and PCR-C. Those

subcategories are now merged into a single use. The application of the Secondary Contact Recreational (SCR) use was also changed to a more restrictive interpretation of the potential for human contact with surface waters. Existing SCR designations remain, but could potentially be reviewed and revised to PCR by Ohio EPA. Any new SCR recommendations would need to document that there is no human contact possible due to impermeable physical restrictions to access a surface water. As a result the evaluation of the recreational uses in the 2024 study area were done in accordance with the existing designations of PCR and SCR as applicable.

Streams in the 2024 basin are either designated as or assumed to be Primary Contact Recreation (PCR) in the Ohio WQS (OAC 3745-1- 09). Water bodies with a designated recreation use of PCR *". . . are suitable for one or more full-body contact recreation activities such as, but not limited to, wading, swimming, boating, water skiing, canoeing, kayaking, and scuba diving"* (OAC 3745-1- 07(B)(4)(b)). SCR includes waters that *". . . result in minimal exposure potential to water borne pathogens because the waters are; rarely used for water based recreation such as, but not limited to, wading; situated in remote, sparsely populated areas; have restricted access points; and have insufficient depth to provide full body immersion, thereby greatly limiting the potential for water based recreation activities."*

The *E. coli* criterion that applies to PCR is expressed as a 90-day geometric mean of ≤126 colony forming units (cfu)/100 mL with a Statistical Threshold Value of 410 cfu/100 mL[6]. The criterion that applies to SCR designated streams is ≤1,030 cfu/100 mL for both the 90-day geometric mean and the STV. An arithmetic mean based on two or more samples can be used as the basis for determining the attainment status of the PCR use.

Determining Use Attainability

Use designation reviews and recommendations for revisions, whenever necessary, have been a consistent focus of prior Ohio EPA biological and water quality assessments conducted throughout the Scioto River basin. Given the status of 2024 data as Level 3 credible data, it is eligible to be used by Ohio EPA to revise certain use designations. The use attainment tables are based on the most applicable of the existing use designation or a recommended use designation, particularly for sites that are attaining the recommended designation. Many of the outstanding use designation changes had been made following the Ohio EPA assessments of the 1980s and 1990s, but several streams in the 2024 study have not been designated hence that is a task of the data analysis herein.

Determining Causal Associations

Using the results, conclusions, and recommendations of this report requires an understanding of the methodology used to determine biological status (i.e., unimpaired or impaired, narrative ratings of quality) and assigning associated causes and sources of impairment utilizing the accompanying chemical/physical data and source information (e.g., point source loadings, land

[6] These criteria shall not be exceeded in more than ten per cent of the samples taken during any ninety-day period.

use). The identification of impairment in rivers and streams is straightforward - the numerical biological indices are the principal arbiter of aquatic life use attainment and impairment per OAC 3745-1-07[C]. The rationale for using the biological results in the role as the principal arbiter within a weight of evidence framework has been extensively discussed elsewhere (Karr et al. 1986; Karr 1991; Ohio EPA 1987a,b; Yoder 1991; Yoder 1995). Describing the causes and sources associated with observed biological impairments relies on an interpretation of multiple lines of evidence including the water chemistry data, sediment data, habitat data, effluent data, land use data, and biological response signatures (Yoder and Rankin 1995b; Yoder and DeShon 2003). Thus the assignment of associated causes and sources of biological impairment in this assessment represents the association of impairments (based on response indicators) with stressor and exposure indicators using linkages to the bioassessment data based on previous experiences within the experience with analogous situations and impacts. For example, exceedances of established chemical thresholds such as chronic and acute water quality criteria or sediment effect thresholds are grounds for listing such categories of parameters to include individual pollutants provided that they co-occur with a biological impairment.

Hierarchy of Water Indicators

A carefully conceived ambient monitoring approach, using cost-effective indicators comprised of ecological, chemical, and toxicological measures, can ensure that all pollution sources are judged objectively on the basis of environmental results. A tiered approach that links the results of administrative actions with environmental measures was employed in the analyses and within the limitations of the data that is =available for certain sources. This integrated approach is outlined in Figure 2 and includes a hierarchical continuum from administrative to true environmental indicators. The six “levels” of indicators include:

1. Actions taken by regulatory agencies (permitting, enforcement, grants);
2. Responses by the regulated community (treatment works, pollution prevention);
3. Changes in discharged quantities (pollutant loadings);
4. Changes in ambient conditions (water quality, habitat);
5. Changes in uptake and/or assimilation (tissue contamination, biomarkers, assimilative capacity); and, changes in health, ecology, or other effects (ecological condition, pathogens).

In this process the results of administrative activities (levels 1 and 2) can be linked to efforts to improve water quality (levels 3, 4, and 5) which should translate into the environmental “results” (level 6). An example is the aggregate effect of billions of dollars spent on water pollution control since the early 1970s that have been determined with quantifiable measures of environmental condition (Yoder et al. 2005). Superimposed on this hierarchy is the concept of stressor, exposure, and response indicators. *Stressor* indicators generally include activities which have the potential to degrade the aquatic environment such as pollutant discharges (permitted and unpermitted), land use effects, and habitat modifications. *Exposure* indicators are those which measure the effects of stressors and can include whole effluent toxicity tests, tissue residues, and biomarkers, each of which provides evidence of biological exposure to a stressor or bioaccumulative agent. *Response* indicators are generally composite measures of

the cumulative effects of stress and exposure and include the more direct measures of community and population response that are represented here by the biological indices which comprise the Ohio EPA biological endpoints. Other response indicators can include target assemblages, *i.e.,* rare, threatened, endangered, special status, and declining species or bacterial levels that serve as surrogates for the recreational uses. These indicators represent the essential technical elements for watershed-based management approaches. The key, however, is to use the different indicators *within* a strict adherence to the roles which are most appropriate for each (Yoder and Rankin 1998).

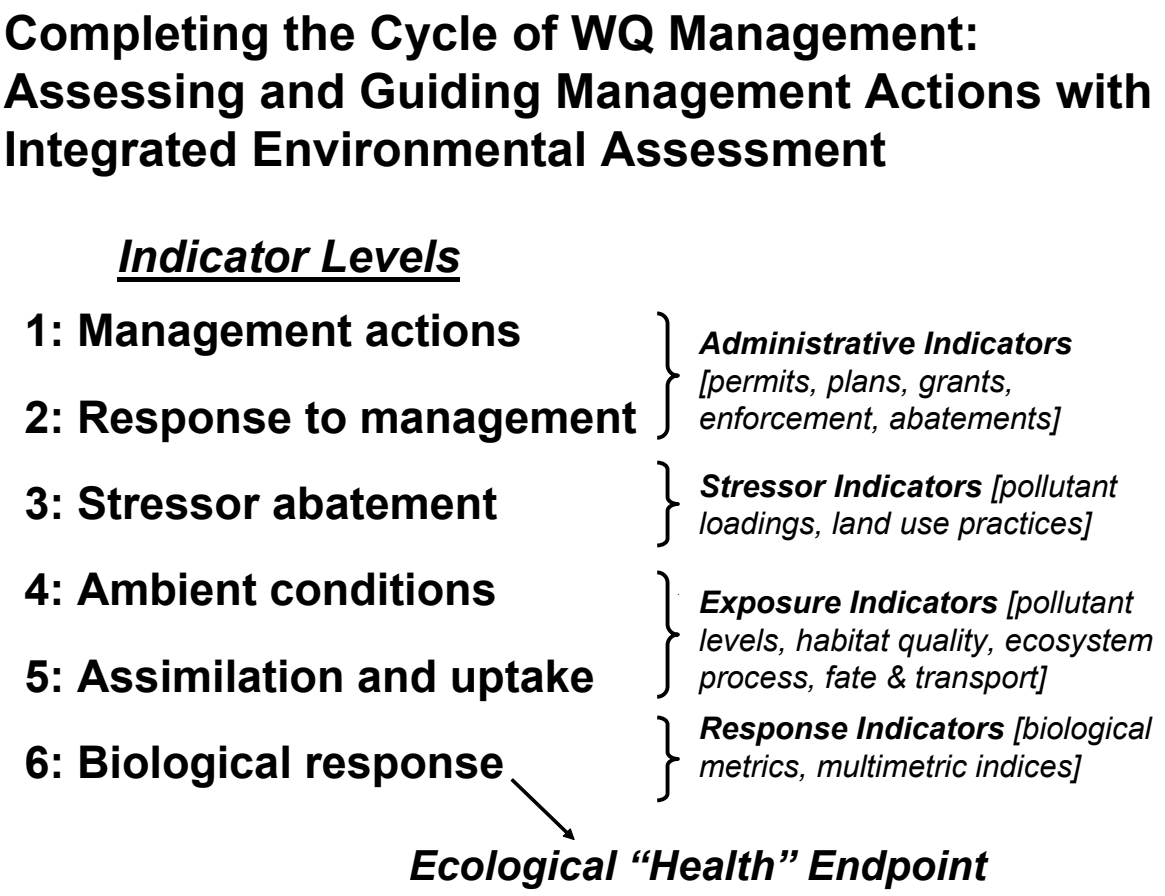

Figure 2*. Hierarchy of administrative and environmental indicators which can be used for water quality management activities such as monitoring and assessment, reporting, and the evaluation of overall program effectiveness. This is patterned after a model developed by U.S. EPA (1995a,b) and further enhanced by Karr and Yoder (2004).*

STUDY AREA DESCRIPTION

The 2024 study area includes five tributaries to the Scioto River between RMs 137.2 and 126.6, three of which consist of small watersheds with multiple tributaries and two with single streams. Four are located on the near west side of Columbus between south Hilliard and the Hilltop areas, a portion of Upper Arlington, and the industrialized south side of Columbus. These are in order from upstream to downstream Roberts Millikin Ditch, Barbee Ditch, Dry Run, all flowing in from the West, and Evans Run and Kian Run flowing in from the East. The watershed size, land uses, and low flow characteristics appear in Table 4. Each is considered to be a small headwater stream. The site locations, drainage areas, and gradient characteristics are found in Appendix Table A-1.

A Description of the Major Streams and Pollution Sources

Land uses, pollution sources, and general stressors are typical for the mixed residential, commercial, and industrial settings in the 2024 study area subwatersheds as described below. There are no active major permitted discharges of wastewater in any of the 2024 study area subwatersheds, but there are four permitted minor facilities some of which store and handle complex organic compounds. Designated uses in the WQS for aquatic life and recreation range from unlisted to designated for the WWH and MWH-C aquatic life uses and PCR for the recreation uses. Use designation recommendations were previously outlined in the Summary.

Roberts Millikin Ditch

This small tributary to the Scioto River, like a number of small streams in Franklin Co., is named for the petitioner under the then 19th century Ohio Drainage law. Andrew Millikin petitioned the township to get permission to dig a drainage ditch in 1879 on his then rural property. It was approved and Andrew Millikin paid for the work done. Survey maps show that the ditch was named “Millikin Ditch” or alternatively “Roberts - Millikin Ditch.” Roberts was an adjacent landowner just west of Millikin. It was also the basis for the naming of a scenic waterfall that formerly flowed into a stone quarry, which after being abandoned, recently became the Quarry Trails Metropark. As part of the park development the connection between the Quarry Pond and Scioto River is an outlet from the quarry pond via an artificial channel with flow intermittency commonplace during dry weather. It has a very high gradient (62.5-75.0 ft./mi.) and enters the Scioto River at RM 137.52 within Griggs Reservoir upstream for Trabue Rd. and is currently unlisted in the Ohio WQS. The watershed area is small at 3.26 square miles with a length of 5.41 miles according to the USGS StreamStats[7] database and tool (Figure 4; USGS 2019). After decades of sustained urban development the current land uses are 97.6% developed land of which 45.8% is impervious surfaces, and 12.9% forested. Critical low flows are extremely low at 0.0045 cfs and variable with the 80th percentile at 0.309 cfs. There were four sites located in the subwatershed, three (3) sites in Roberts Millikin Ditch, two upstream and one downstream from Quarry Trails. A fourth site was located on an unnamed tributary that enters the Quarry Pond at RM 0.40 that has an extremely high gradient of 250 ft./mi.

[7] https://streamstats.usgs.gov/ss/

Barbee Ditch

While there is no specific information about the history of Barbee Ditch in the published literature or on the internet, it was likely established through a formal petition process during the 19th or early 20th century to improve drainage for private landowners. It is probably named after an early property owner or local family. For instance, a "Barbee Cemetery" dating to the mid-1800s is also located in western Franklin County. It drains a commercialized area of south Hilliard in its headwaters including the expansive Buckeye Rail Yard. It then flows through residential areas south of Wilson Bridge Rd. and enters the Scioto River at RM 135.75 downstream from Fifth Ave. and in an area of abandoned gravel quarries that remain connected to the mainstem. A major tributary named Trabue Run by Ohio EPA (River Code 02-266; OAC 3745-1-09) is listed as WWH and PCR in the current Ohio WQS as the mainstem with Barbee Ditch being unlisted. The watershed area is small at 6.55 square miles with a length of 6.12 miles according to the USGS StreamStats[8] database and tool (Figure 4; USGS 2019). It has a high to very high gradient of 27.8-41.7 ft./mi. After decades of sustained urban and commercial development the current land uses are 93.0% developed land of which 42.1% is impervious surfaces, and 14.6% forested. Critical low flows are extremely low at 0.0136 cfs and variable with the 80th percentile at 0.706 cfs. Nine (9) sites were located in the subwatershed, three (3) sites in Barbee Ditch, one (1) in an unnamed tributary of another unnamed tributary to Barbee Ditch at RM 1.87, three (3) sites in Trabue Run with its confluence with Barbee Ditch at RM 1.39, and two on unnamed tributaries to Trabue Run at RM 1.21 and 2.70, the latter draining the Buckeye Rail Yard. All have high to very high gradients (24.4-52.6 ft./mi.) except TRB04 which has a moderately high gradient of 17.9 ft./mi.

Dry Run

Dry Run is the second largest of the 2024 subwatersheds at 7.86 square miles drainage area, a length of 7.78 miles, and a high to very high gradient (33.3-49.8 ft./mi.). The Dry Run watershed transitions from an older residential core in the Hilltop Area, moving west it changes to commercial and industrial terminals, and with newer residential developments in the headwaters (Liu 2012). Land use is 100% developed land of which 49.8% is impervious surfaces, and 9.1% forested. Critical low flows are extremely low at 0.0133 cfs and variable with the 80th percentile at 0.788 cfs. Nine (9) sites were located in the subwatershed, three in the Dry Run mainstem, four (4) in an unnamed tributary at RM 1.61 (within a Blueprint Columbus project area), and two in another unnamed tributary at RM 2.61. The tributaries all have high to very high gradients (29.4-64.9 ft./mi.). Dry Run has three (3) minor NPDES permitted discharges including the Columbus West Terminal (NPDES Permit 4IN00065*JD) owned by MPLX Terminals LLC and which is limited to limited to the retention pond effluent and sampled only during a discharge event. Being a gas and oil storage facility monitoring includes volatile, semi-volatile, base/neutrals and acid compounds, and cyanide. Heritage Asphalt LLC - Columbus Plant (NPDES Permit 4IN00011*FD) is located on the unnamed tributary to Dry Run at RM 2.61 and is limited to samples being collected when a discharge comprised of stormwater runoff occurs. The third permitted discharge is from Buckeye Terminals LLC - Columbus South Terminal owned by Buckeye Partners L.P. presumably discharges to the unnamed tributary at RM 1.61

[8] https://streamstats.usgs.gov/ss/

and which is limited to limited to the retention pond effluent and sampled only during a discharge event. Being a gas and oil storage facility monitoring includes volatile, base/neutrals and acid compounds, and cyanide, total phenols, and total xylene.

Dry Run was the subject of a use attainability analysis by Ohio EPA (1995) that confirmed the WWH use designation that was originally assigned by 1978 WQS. PCR is the designated use for recreation. The unnamed tributaries are undesignated. Dry Run was the subject of a The Ohio State University Masters Thesis (Liu 2012) that focused on hydrology and modeling. The site at Holton Park (DRY01 at RM 1.70) was the site of a major stream restoration "daylighting" project completed in 2020 and sponsored by the City of Columbus Recreation and Parks Department[9].

Evans Run

Evans Run enters the Scioto River from the east and drains a residential portion of Upper Arlington and the Scioto Country Club. It is the smallest of the tributaries sampled in 2024 with a drainage area of 1.39 square miles, a length of 2.71 miles, and extremely high gradient of 250 ft./mi. Land use is 100% developed land of which 32.0% is impervious surfaces, and 19.4% forested. Critical low flows are extremely low at 0.0023 cfs and variable with the 80th percentile at 0.162 cfs. A single site was sampled at RM 0.20 at Scioto Point Drive. Evans Run is currently unlisted in the Ohio WQS.

Kian Run

Kian Run enters the Scioto River at RM 126.50 from the east in south Columbus and nearly adjacent to the Columbus Jackson Pike Water Reclamation Plant (WRP) 001 discharge at RM 126.7 on the opposite site of the mainstem. It is the largest watershed area of the 2024 study area tributaries at a drainage area of 9.44 square miles. a length of 5.93 miles, and the lowest gradient in the study area of 12.3 ft./mi. at the mouth (KR01) increasing to a very high gradient at the upstream site KR02 only 0.7 miles upstream. Land use is 91.5% developed land of which 48.5% is impervious surfaces, and 9.9% forested. Critical low flows are low at 0.0.0748 cfs and variable with the 80th percentile at 1.580 cfs, the two highest values in the study area. Two sites were sampled in 2024 at RM 0.10 at the mouth and at RM 0.80 at High Street. One active NPDES permit is located in the upper watershed, the Capital Resin Corporation (NPDES 4IF00011*HD) which is limited to storm water runoff and non-contact cooling water. Former industries included Buckeye Steel Castings and several satellite industries some of which terminated operations in the 2000s. Kian Run is also impacted by stormwater runoff from the former industrial areas and a large railyard. The Ohio EPA survey of Kian Run in 2009-10 (Ohio EPA 2012) showed it to be markedly impacted by poor sediment chemistry conditions including high concentrations of polycyclic aromatic hydrocarbons (PAHs) and heavy metals (e.g. zinc, lead and chromium) with NPDES permitted industrial dischargers and storm water runoff as the sources of this impact to Kian Run. The report further states that *". . . the headwaters of Kian Run are comprised of a network of storm sewers which receive numerous industrial discharges. Some of these entities have been discharging into Kian Run for decades. As a result, the bottom sediments of Kian Run are laden with toxic levels of metals"*. Kian Run is currently designated for

[9] https://www.ercontractor.com/project/daylighting-design-build/

the Modified Warmwater Habitat for channel modifications (MWH-C) based on the extent of historical channelization and lack of recovery potential as a result of the 2009-10 biological and water quality survey by Ohio EPA (2012). It was previously designated WWH by default in the 1978 and 1985 WQS, but retained the PCR use.

Current Pollution Sources and Other Stressors

Pollution sources and general stressors are typical for the mixed residential, commercial and industrial settings in the 2024 study area subwatersheds as previously described. There are no active major permitted discharges of wastewater in any of the 2024 study area. However, sanitary sewer overflows (SSO), minor permitted discharges, releases from commercial and industrial facilities, and general urban runoff and its associated chemical pollution, hydrological alterations, and direct and indirect habitat alterations are all present.

Adding to the challenges of managing the largest pollution source in the form of the municipal sewerage system, the Columbus metropolitan area is experiencing the fastest population growth of any major city in the Midwest U.S. The population increased by more than 230,000 persons during 2010 to 2020, a 12.2% increase (U.S. Census Bureau 2020). The population is projected to grow by another 500,000 persons through 2050 under current trends. As would be expected this will place significant capacity demands on the sewerage system infrastructure and treatment facilities as well as demands on the remaining assimilative capacity of the receiving rivers and streams.

City of Columbus Collections System

The City of Columbus collects and treats residential and industrial sanitary wastewater from the city and most of the surrounding suburbs including the 2024 study area subwatersheds. Data about the collection system that conveys wastewater to one of the two major wastewater reclamation facilities (Jackson Pike or Southerly) was furnished by CPW in the form of GIS shapefiles that contained dimensional and locational information about 41 different features of the system, 21 of which were deemed a *potential* source of sewage or other pollutant releases to surface waters (Table 4; Appendix F). The sanitary sewer system in the 2024 study area includes 1,082 miles of separate sanitary sewers that transport wastewater to the Jackson Pike Water Reclamation Plant (WRP) that serves the western half of Franklin County and the central portion of Columbus. The stormwater collection system consists of an additional 36.1 miles of piping. This system collects rain water and snow melt runoff that enter the storm sewer system through drainage ditches or via drains on curbed streets. Any materials on the surface of streets, roofs, sidewalks, and yards can be washed into the storm sewer system, which empties directly into nearby streams or rivers with no treatment. The Franklin Co. SWCD performed an inventory of conveyances to area streams based on walking each and recording the conveyances and their type (pipe type, swale) and assigned the term “illicit” for any discharges that showed visual or odorous evidence of carrying pollutants (FCSWCD 2007). Descriptions of a major initiative to abate pollution delivered by the sewer system is described as follows. A map of the major features appears in Figure 3.

***Table 4**. An accounting of sewer system features provide by Columbus DPW that include sewer mains, design relief structures (DSR), open channels, maintenance structures, pump stations, 10 year Level of Service data, HSTS, the Franklin Co. SWCD stream conveyance inventory any of which is a potential release of sewage or pollutants. There are no CSO discharges in the study area.*

Site_ID	River Mile	River_Stream	Drainage Area	Sewer Main		Sewer Open Channel		10yrLOS Conduit		10yrLOS CSO	10yrLOS DSR	Flow Regulator	HSTS	Pipe End	FCSWCD	FCSWCD Illicit	Structure	Manhole	Blind Connect	Inlet	Clean Out	Bulk-head	Main Change	Flapgate	10yrLOS WIB	10yrLOS_ Flooded Manhole	Pump Stations	Total Features
Roberts Millikin Ditch (Scioto R. @137.52)																												
RMD03	2.75/2.80	Roberts Millikin Ditch	0.61	28.7	151,375	0.5	2,596	3.5	18,623	0	0	0	6	105	64	0	13	497	6	516	16	11	13	0	0	0	0	1,247
RMD02	1.59/1.50	Roberts Millikin Ditch	1.03	39.1	206,595	1.2	6,126	5.8	30,375	0	0	0	6	193	136	4	19	595	8	725	29	13	20	0	0	0	0	1,748
RMD01	0.10/0.10	Roberts Millikin Ditch	3.25	116.6	615,435	4.8	25,323	10.2	53,995	0	0	0	7	469	271	6	84	1782	40	2541	45	42	123	0	0	0	3	5,413
Tributary to Roberts Milliken Ditch @RM 0.40																												
RMD04	0.39/0.50	Trib to Robts. Millikin D.	2.90	103.4	545,889	3.1	16,326	9.6	50,434	0	0	0	7	433	271	6	59	1533	36	2183	39	40	88	0	0	0	1	4,696
Barbee Ditch (Scioto R. @RM 135.75)																												
BARB03	2.76/2.70	Barbee Ditch	0.90	30.5	160,778	1.3	7,028	2.8	14,818	0	0	0	7	189	133	3	47	429	10	686	0	12	58	0	0	0	1	1,575
BARB02	1.51/1.45	Barbee Ditch	2.36	66.0	348,461	2.0	10,574	6.6	34,637	0	0	0	9	410	362	7	60	973	18	1373	0	22	87	0	0	0	1	3,322
BARB01	0.34/0.30	Barbee Ditch	5.88	166.2	877,482	6.1	32,285	16.8	88,592	0	0	0	17	874	729	13	157	2389	48	3443	48	202	169	0	0	0	3	8,092
Tributary to Trabue Run @ RM 2.7																												
TRB04	0.22/0.22	UT to Trabue Run	0.04	19.5	102,808	1.2	6,213	1.8	9,638	0	0	0	0	81	37	0	24	229	6	412	24	9	21	0	0	0	0	843
Tributary to Trabue Run @RM 1.21																												
TRB05	0.90/0.85	UT to Trabue Run	0.82	29.8	157,247	0.7	3,477	2.6	13,808	0	0	0	0	76	77	1	30	356	8	589	8	16	30	0	0	0	1	1,192
Tributary @RM 0.5 To Tributary To Barbee Ditch @RM 1.87																												
BARB04	0.43/0.43	Trib to Barbee Ditch	0.95	19.8	104,567	0.4	2,185	1.7	8,996	0	0	0	0	157	156	1	8	219	5	399	3	7	17	0	0	0	0	972
Trabue Run (Tributary to Barbee Ditch @ RM 1.39)																												
TRB03	2.18/2.20	Trabue Run	0.63	23.1	121,842	1.6	8,283	1.8	9,733	0	0	0	0	128	60	1	28	269	6	478	24	11	25	0	0	0	0	1,030
TRB02	1.00/1.05	Trabue Run	2.60	80.7	426,333	3.8	20,218	7.1	37,247	0	0	0	5	406	296	4	92	992	27	1784	39	43	73	0	0	0	2	3,763
TRB01	0.05/0.13	Trabue Run	3.00	88.7	468,325	3.8	20,091	8.3	43,837	0	0	0	5	414	321	5	92	1146	28	1908	40	43	77	0	0	0	2	4,081
Dry Run (Scioto R. @134.43)																												
DRY02	2.75/2.61	Dry Run	0.75	43.4	229,392	1.9	10,004	4.1	21,390	0	0	0	5	334	243	4	39	511	9	1063	7	12	24	0	81	0	2	2,334
DRY01	1.41/1.25	Dry Run	7.24	155.1	819,097	5.9	31,367	31.4	165,626	0	0	0	27	788	616	11	734	2276	68	2803	63	43	145	1	578	13	5	8,171
DRY03	0.08/0.10	Dry Run	7.86	179.4	946,986	6.1	32,236	39.7	209,695	0	0	0	26	894	654	11	135	2737	109	3242	81	57	166	3	662	16	5	8,798
Tributary to Dry Run @RM 1.61																												
DRY09	2.40/2.45	Trib to Dry Run	1.28	6.5	34,206	0.0	62	2.2	11,812	0	0	0	0	16	35	1	0	99	1	16	0	0	0	0	12	2	0	182
DRY08	1.11/1.00	Trib to Dry Run	2.57	57.2	301,855	2.5	13,008	13.9	73,375	0	0	0	2	173	119	3	33	917	18	764	27	0	48	1	140	6	3	2,254
DRY05	0.75/0.75	Trib to Dry Run	2.73	65.4	345,100	3.3	17,280	17.8	93,928	0	0	0	2	201	132	3	54	1071	22	861	47	16	67	1	284	9	3	2,773
DRY04	0.10/0.14	Trib to Dry Run	3.43	74.1	391,454	3.3	17,663	20.2	106,724	0	0	0	12	234	186	4	61	1228	30	1034	53	17	101	1	344	9	3	3,317
Tributary to Dry Run @ RM 2.61																												
DRY07	1.74/1.74	Trib to Dry Run	1.37	33.6	177,670	1.9	9,967	3.5	18,385	0	0	0	1	266	159	0	38	387	6	883	2	9	20	0	4	0	2	1,777
DRY06	0.40/0.34	Trib to Dry Run	2.15	43.1	227,776	1.9	10,004	3.9	20,819	0	0	0	5	335	217	2	39	507	9	1066	7	12	25	0	81	0	2	2,307
Evans Run (Scioto R. @RM 136.97)																												
SCC01	0.10/0.10	Evans Run	1.39	23.9	126,343	21.6	113,997	3.1	16,123	0	0	0	0	2	177	1	0	495	0	2	2	0	1	0	0	0	0	680
Kian Run (Scioto R. @RM 126.5)																												
KR02	0.82/0.80	Kian Run	1.36	31.1	164,149	0.6	3,048	12.2	64,163	0	0	0	4	116	15	0	14	493	38	591	27	30	16	0	0	0	0	1,344
KR01	0.05/0.05	Kian Run	9.44	241.6	1,275,701	4.7	24,693	101.1	533,554	1	10	2	90	770	95	1	143	4240	284	4390	202	126	189	11	542	12	16	11,124
Sewer Line Distance or Count of Structures at Pour Points				**1082.1**	**5,713,672**	**36.1**	**190,496**	**215.9**	**1,140,092**	**1**	**10**	**2**	**169**	**4,737**	**3,014**	**50**	**832**	**16,366**	**603**	**21,207**	**550**	**571**	**1,006**	**15**	**1,629**	**37**	**36**	**50,835**
				Miles	**Feet**	**Miles**	**Feet**	**Miles**	**Feet**	**Ct.**	**Ct.**	**Ct.**	**Ct.**	**Ct.**	**Ct.**	**Ct.**	**Ct.**	**Ct.**	**Ct.**	**Ct.**	**Ct.**	**Ct.**	**Ct.**	**Ct.**	**Ct.**	**Ct.**	**Ct.**	**Ct.**

Legend: 10 yrLOS - 10 Year Level of Service capacity for highest rainfall event;CSO - combined sewer overflow; DSR - design relief structure, HSTS - Home Sewage Treatment System; FCSWCD - Franklin Co. Soil and Water Conservation District stream conveyance inventory; FCSWCD Illicit - observed illicit discharge of pollutants; WIB- water in basement event; all terms defined in Appendix F.

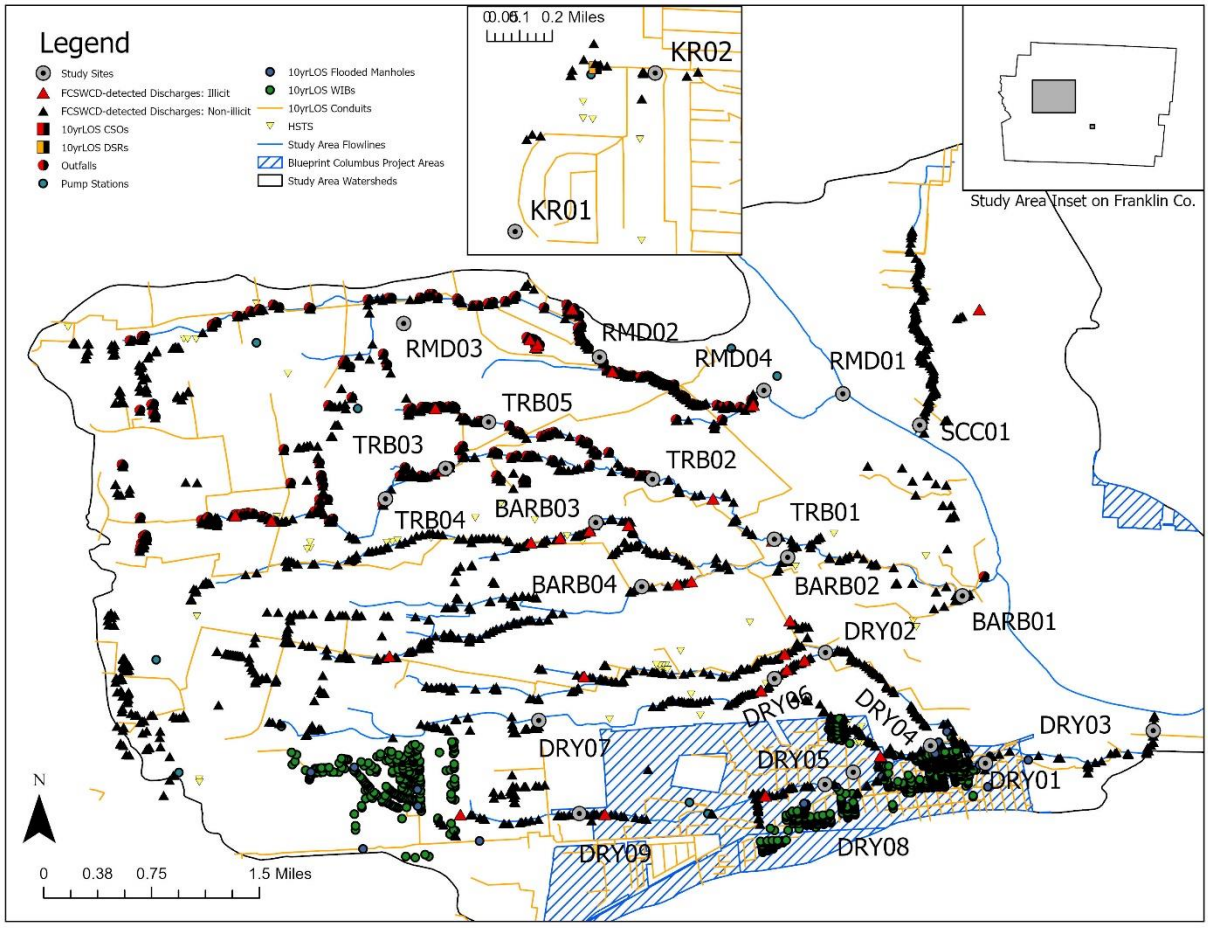

***Figure 3**. Map of major sewer features listed in Table 4 in the 2024 subwatersheds. The legend lists the features by their individual symbols. Data provided by Columbus DPW and DWR.*

Blueprint Columbus

The original WWMP submitted to the Ohio EPA in 2005 made use of the established technology of the time that called for deep underground tunnels to store and convey excessive wet weather flow or Rainfall Derived Inflow and Infiltration (RDII). When excessive RDII occurs, the amount of water entering the sanitary sewer system can exceed the capacity of the sanitary sewer system resulting in a sanitary sewer overflow or SSO. Over time, sewer pipes have developed cracks and leaky joints that allow the infiltration of storm water into the sanitary sewer, causing it to exceed capacity and overflow into streams and rivers or back-up into basements. Foundation drains that connect directly to the sanitary sewer also contribute to the problem of rain water getting into the sanitary sewer system. Blueprint Columbus employs current technology to address the source of the infiltration by keeping rain water and snow melt runoff out of the sanitary sewers and directing it into storm sewers. The goal is to prevent storm water from entering the sanitary sewer system through lateral lining, roof water redirection, and a voluntary sump pump program. Stormwater will instead be directed to green

infrastructure where it can filter through layers of stone, soil, and plants before it slowly releases into the storm sewer system that empties into local rivers and streams.
To date several areas across the city have been identified for the application of the aforementioned best management practices. One of these areas, the Hilltop neighborhood, has been the focus of project implementation. Dry Run is the most affected receiving stream and portions of the subwatershed have had the highest Water In Basement (WIB) events in the 2024 study area (Table 4). Blueprint Columbus is documented in more detail in the 2015 Wet Weather Management Plan (WWMP) Update Report (Columbus DWR 2015). This WWMP update was approved by Ohio EPA on December 1, 2015.

Nonpoint Sources and Subecoregion Characteristics

The 2024 study area lies entirely within the Loamy, High Lime Till Plains subregion (55b) of the Eastern Corn Belt Plains ecoregion (ECBP; Omernik 1987; Woods et al. 1998). The Level IV subregions offer more relevant detail about the four components of ecoregions; surficial geology, soils, potential natural vegetation, and land use (Woods et al. 1998) that affect the make-up and characteristics of nonpoint sources of pollution. The key characteristics of each subregion appears in Table 5.

Nonpoint sources within and upstream of the 2024 study area are typical of land form, soils, and land uses within the Loamy, High-Lime Till Plains subregions (55b) of the Eastern Corn Belt Plains ecoregion. These subregions are differentiated from the surrounding subregions by having loamy, high lime, late-Wisconsinan glacial till and also glacial outwash and scattered loess that overlies Paleozoic carbonates and shale. Both subregions are glaciated with level to rolling glacial till plains with end moraines and glacial outwash landforms. Originally, beech and oak-sugar maple forests predominated in the uplands with elm-ash swamp forests in poorly-drained valley bottoms and ground moraines, and mixed oak forests on the Pickaway Plains south and west of Franklin Co. Predominant land uses include agricultural row cropping mostly outside of the 2024 study area. Urban and suburban land uses are concentrated in the 2024 subwatersheds. The intensity of urban development is highest inside the city limits with the subcategory of suburban land use consisting of lower density residential development in the suburbs which are rapidly expanding all around Columbus. The increase in impervious surfaces (i.e., parking lots, highways, driveways, rooftops, etc.) in both the suburban and metropolitan areas has altered the hydrology by fostering flashy flows and increasing the delivery of pollutants to tributaries and the mainstem rivers. An increased frequency of high flows can increase streambank erosion particularly those denuded of woody riparian vegetation by encroaching land uses, thus degrading habitat and contributing excess sediment to receiving streams and rivers.

Table 5. *Level IV subregions of the 2024 study area and their key attributes (from Woods et al. 1998).*

Level IV Subregion	Physiography	Geology	Soils	Potential Natural Vegetation	Land Use/Land Cover
Clayey, High Lime Till Plains (55a)	Glaciated; broad nearly level glacial till plain; also basins and end moraines; low gradient streams.	Clayey, high lime, late-Wisconsinan glacial till, lacustrine deposits, and scattered loess overlie Paleozoic shales, carbonates, and sandstones.	Alfisols (Epiaqualfs, Hapludalfs), Mollisols (Argiaquolls, Endoaquolls)	Mostly beech forest; scatter-ed elm-ash swamp forest in lacustrine basins and poorly-drained areas; wet prairies behind end moraines in northern counties.	Extensive corn, soybean, wheat, livestock, and dairy farming on artificially drained soils; scattered pin oak-swamp, white oak wood-land, and beech-maple woodland.
Loamy, High Lime Till Plains (55b)	Glaciated; level to rolling glacial till plain with low gradient streams; also end moraines and glacial outwash landforms.	Loamy, high lime, late-Wisconsinan glacial till and also glacial outwash and scattered loess overlie Paleozoic carbonates and shale.	Alfisols (Hapludalfs, Epiaqualfs, Endoaqualfs), Mollisols (Argiaquolls, Endoaquolls, Argiudolls), Entisols (Fluvaquents)	Mostly beech forest; also, oak-sugar maple forest, elm-ash swamp forest on poorly-drained valley bottoms and ground moraines.	Extensive corn, soybean, and livestock farming; also scattered beech-maple, pin oak-swamp, white oak woodlands. Urban-industrial activity in municipal areas.

RESULTS AND DISCUSSION – 2024 STUDY AREA

Flow Regime

There are no direct or continuous measurements of flow in any of the 2024 subwatersheds that were sampled in 2024. As small headwater catchments draining less than 1-9 square miles the flow regime in each is subject to localized precipitation and runoff events. All of the tributaries have high percentages of urban land use characteristics that foster "flashy" flows that peak rapidly during runoff events interspersed with varying durations of low flow extremes during dry weather periods, in some cases including intermittent or ephemeral flows. These irregular flow conditions can also be exacerbated by direct habitat modifications. Almost all of the sites have moderately high to very high gradients. All of the streams receive stormwater from numerous storm sewers and some of it apparently mixed with sewage. The weather pattern in 2024 was extremely dry with severe drought conditions later in the summer hence flows were low. However, only the downstream site in Roberts Millikin Ditch had intermittent flows that were likely exacerbated by the retention of flows by the quarry pond at Quarry Trails Park.

2024 Study Area Water Column Chemistry

Water quality was assessed by grab samples collected at all tributary sampling locations four times (meter parameters five times) during the summer-fall index period in 2024. Parameter groupings include field, demand, ionic strength, nutrients, and heavy metals. Sediment chemistry samples were collected at all locations in each stream. All of the data is analyzed in a tabular format with multiple sampling sites in the same stream arrayed from upstream to downstream in order to reveal pollution gradients. There is very little historic chemical water quality data from which to make comparisons with the 2024 results. Grab samples were collected four (4) times at each site during the summer-fall seasonal index period with select meter parameters sampled at each fish site. The results were evaluated against percentiles of regional reference values from Ohio EPA (1999) and recent effect threshold derivations as they were available (e.g., Miltner 2018, 2021; Johnson et al. 2014; Pond et al. 2008; Pond 2010; Rankin 2010; U.S. EPA 2011). Several parameters either do not have criteria in the Ohio WQS or they seem outdated (e.g., chloride, total dissolved solids) when compared to more recent thresholds in the scientific literature. However, the WQS are listed as applicable and considered in the evaluation of the 2024 results.

Conventional, Demand, and Nutrient Parameters

Conventional parameters include the most commonly collected parameters in water quality surveys such as temperature and pH, but these are covered under urban parameters. Demand and nutrient related parameters consist of those related to the discharges of treated and untreated sewage, organic enrichment from point and nonpoint sources (ammonia-N, BOD, TKN), nutrient related parameters (phosphorus, nitrates) and their effects, dissolved oxygen (D.O.), and physical parameters such as total suspended solids, temperature, and pH.

Temperature (°C)

Temperature is a critical factor in aquatic systems as it both directly and indirectly influences individual organism health and well-being and various physicochemical processes that also have direct and indirect effects. Fish will avoid lethal temperatures and will seek the temperature regime each species prefers. Temperature affects chemical rates and processes and the toxicity of certain pollutants (e.g., ammonia-N). While much of the concern with temperature has centered on discharges of heat, modifications and alterations to natural temperature regimes have received increased attention due to the effects of urbanization and climate change.

Temperature was measured at all 25 locations with the collection of each chemical grab sample and during each fish sampling event over the seasonal June-October index period. It was included as part of the conventional and demand parameters (Table 6) as it can be affected by the interaction of several facets of urban land uses such as hardened surfaces, flow intermittency, exposure of the stream channel to full sunlight, and permitted and unpermitted discharges via storm sewers and other releases. The results were compared to the criteria in the Ohio WQS and regional reference values for headwater streams in the ECBP ecoregion (Ohio EPA 1999a). All grab temperature values were within the regional reference threshold median + 2 inter quartile ranges above that value of 22.8°C. Two median values of 23.3°C at BARB04 and 22.9°C at TRB04 barely exceeded this threshold. No values approached the applicable Ohio WQS average criterion of 27.8°C.

Temperature was also measured continuously during July 29-August 1 at the six (6) sites used to perform the Ohio EPA SNAP methods for assessing nutrient effects. Like the grab data none of the median values approached the average criterion of 27.8°C (Figure 4). The downstream site Dry Run at DRY03 showed the highest widest fluctuations in temperature across the short-term Datasonde deployment ranging from 18-29°C, but with the maximum below the daily maximum criterion of 29.4°C. Kian Run had the coolest temperatures, but also exhibited a wide fluctuation ranging from 14.5-23.0°C. The cause of the fluctuations is unknown, but urban watersheds can show such fluxes due to daytime heating of shallow pools without tree canopies and runoff from warmed hard surfaces.

pH (S.U.)

pH is a measure of how acidic/basic water is with a measurement range of 0 to 14. It is a measure of the relative amount of free hydrogen (acidic) and hydroxyl (basic) ions in the water. pH is measured on a logarithmic scale where each number represents a 10-fold change in the acidity or basicness of the water. For example, water with a pH of five is ten times more acidic than water having a pH of six. It is an important factor in how chemicals affect aquatic life and other biological processes. It determines the solubility (amount that can be dissolved in the water) and biological availability (amount that can be utilized by aquatic life) of chemical constituents such as nutrients (phosphorus, nitrogen, and carbon) and heavy metals (lead, copper, cadmium, etc.). For example, pH affects the amount of total ammonia-N that is present in the unionized and toxic form and along with temperature is part of the water quality criterion. At a temperature of 25°C, which is typical of maximum summer ambient

***Table 6**. Mean and median values for demand and nutrient related parameters in the 2024 study area. All values are color coded in accordance with the legend at the bottom that represents percentiles of headwater reference site values from the Eastern Corn Belt Plain (ECBP) ecoregion (Ohio EPA 1999) and other thresholds including the Ohio WQS.*

Site ID	River Mile	Drainage Area (sq. mi.)	Field Temperature (°C)		Field Dissolved Oxygen (mg/L)		Field pH (SU)		Ammonia-N (mg/L)		BOD 5 Day (mg/L)		Total Kjeldahl Nitrogen (mg/L)		Nitrate-N (mg/L)		Total Phosphorus (mg/L)		Phosphorus, Dissolved Orthophosphate (mg/L)	
			Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean
Roberts Millikin Ditch (Scioto R. @137.52)																				
RMD03	2.75/2.80	0.61	21.0	19.9	4.97	5.42	7.6	7.6	0.000	0.008	0.0	0.3	0.43	0.41	0.65	0.54	0.155	0.278	0.125	0.113
RMD02	1.59/1.50	1.03	21.0	19.9	6.79	6.94	7.8	7.9	ND	ND	ND	ND	0.41	0.37	0.43	0.37	ND	ND	0.027	0.029
RMD01	0.10/0.10	3.25	21.7	21.7	4.04	4.04	7.6	7.6	0.085	0.100	0.8	1.0	0.58	0.58	0.07	0.07	ND	ND	0.021	0.023
Unnamed Tributary to Roberts Millikin Ditch @RM 0.40																				
RMD04	0.39/0.50	2.90	20.1	19.6	8.12	8.87	8.2	8.2	ND	ND	0.8	0.8	0.37	0.38	0.60	0.57	ND	ND	0.090	0.098
Barbee Ditch (Scioto R. @RM135.75)																				
BARB03	2.76/2.70	0.90	20.9	19.9	5.60	5.72	7.7	7.6	0.000	0.007	0.7	0.7	0.35	0.34	0.69	0.74	0.120	0.175	0.100	0.100
BARB02	1.51/1.45	2.36	21.9	21.3	6.93	6.10	7.8	7.7	ND	ND	0.9	1.5	0.47	0.53	0.33	0.35	ND	0.080	0.095	0.133
BARB01	0.34/0.30	5.88	20.6	19.5	8.03	8.29	7.8	7.8	ND	ND	0.0	0.4	0.39	0.32	0.77	0.73	ND	ND	0.048	0.044
BARB04	0.43/0.43	0.95	23.3	21.8	7.14	7.49	8.0	8.0	ND	ND	0.0	0.3	0.40	0.40	0.29	0.32	ND	0.063	0.046	0.070
Trabue Run (Tributary to Barbee Ditch @RM 1.39)																				
TRB03	2.18/2.20	0.63	21.5	21.2	5.81	5.70	7.6	7.6	0.000	0.007	1.1	1.6	0.73	0.69	0.48	0.74	ND	0.083	0.118	0.125
TRB02	1.00/1.05	2.60	21.2	21.6	5.81	6.61	7.7	7.7	0.000	0.004	0.0	0.4	0.47	0.45	0.30	0.26	ND	ND	0.053	0.052
TRB01	0.05/0.13	3.00	21.0	20.8	7.28	7.54	7.9	7.8	ND	ND	0.0	0.4	0.45	0.41	0.41	0.44	ND	ND	0.087	0.090
Unnamed Tributary to Trabue Run @RM 2.7																				
TRB04	0.22/0.22	0.04	22.9	21.6	6.20	5.65	7.6	7.7	0.007	0.027	0.8	0.8	0.65	0.67	0.48	0.40	ND	0.070	0.115	0.108
Unnamed Tributary @RM 0.5 to Unnamed Tributary to Barbee Ditch @RM 1.87																				
TRB05	0.90/0.85	0.82	21.3	20.9	6.83	6.27	7.7	7.7	ND	ND	ND	ND	0.41	0.43	0.08	0.17	ND	ND	0.020	0.021
Dry Run (Scioto R. @134.43)																				
DRY02	2.75/2.61	0.75	21.6	20.3	6.91	6.23	7.8	7.7	0.008	0.704	0.8	0.8	0.52	0.51	0.34	0.29	ND	0.120	0.083	0.097
DRY01	1.41/1.25	7.24	21.8	21.4	7.91	7.74	8.0	7.9	0.010	0.280	0.5	0.9	0.51	0.70	0.51	0.52	0.169	0.149	0.078	0.087
DRY03	0.08/0.10	7.86	21.7	21.0	9.27	8.74	8.1	8.0	ND	ND	0.9	1.0	0.45	0.43	0.57	0.48	ND	ND	0.028	0.033
Unnamed Tributary to Dry Run@RM 1.61																				
DRY09	2.40/2.45	1.28	21.3	20.9	8.93	8.19	7.8	8.0	0.026	0.060	0.9	1.3	0.46	0.56	0.26	0.30	ND	0.028	0.071	0.070
DRY08	1.11/1.00	2.57	21.8	21.2	7.38	6.91	7.9	7.9	ND	ND	0.0	0.5	0.39	0.30	0.24	0.34	ND	ND	0.052	0.053
DRY05	0.75/0.75	2.73	21.4	21.9	9.12	8.68	8.1	8.0	ND	ND	0.8	1.0	0.41	0.42	0.31	0.34	ND	0.088	0.043	0.038
DRY04	0.10/0.14	3.43	21.8	21.7	8.21	7.78	8.0	7.9	ND	ND	ND	ND	0.39	0.36	0.81	0.92	0.135	0.160	0.073	0.086
Unnamed Tributary to Dry Run @ RM 2.61																				
DRY07	1.74/1.74	1.37	22.1	21.4	6.06	5.61	7.6	7.5	ND	ND	1.8	1.6	0.49	0.49	0.13	0.16	ND	0.065	0.060	0.073
DRY06	0.40/0.34	2.15	20.7	20.8	5.11	5.41	7.8	7.7	0.034	0.039	1.1	0.9	0.53	0.49	0.25	0.29	ND	0.028	0.083	0.098
Evans Run (Scioto R. @136.97)																				
SCC01	0.10/0.10	1.39	21.7	20.4	7.74	7.98	8.1	8.1	0.000	0.017	0.9	1.3	0.44	0.49	0.16	0.40	ND	ND	0.069	0.067
Kian Run (Scioto R. @126.5)																				
KR02	0.82/0.80	1.36	20.6	20.4	6.96	7.22	7.8	7.7	ND	ND	0.0	0.2	0.29	0.27	0.08	0.08	0.425	0.385	0.215	0.233
KR01	0.05/0.05	9.44	18.0	17.9	7.91	7.21	7.7	7.7	0.000	0.006	0.9	0.9	0.24	0.33	0.08	0.29	0.270	0.286	0.110	0.236
Headwater Narrative Threshold Rankings	<50th Percentile		<19		>7.9		<8.0		<0.025		<1.1		<0.40		<0.98		<0.025		<0.025	
	Median +2IQR		<22.8		>5.3		<8.2		<0.075		<2.9		<0.80		<3.50		<0.135		<0.135	
	<90th Percentile		<23.1		>5.2		<8.3		<0.100		<3.4		<1.03		<4.60		<0.206		<0.206	
	<95th Percentile		<24.4		>3.2		<8.4		<0.184		<4.7		<1.40		<5.98		<0.416		<0.416	
	≥95th Percentile		>24.4		<3.2		>8.4		>0.184		>4.7		>1.40		>5.98		>0.416		>0.416	
Ohio EPA (1999); [a]Ohio WQS			27.8		>4.0		>6.5, <9.0		<1.1											

Footnotes: [b] total ammonia at 22°C and ph = 8.1 S.U.; ND = not detected.

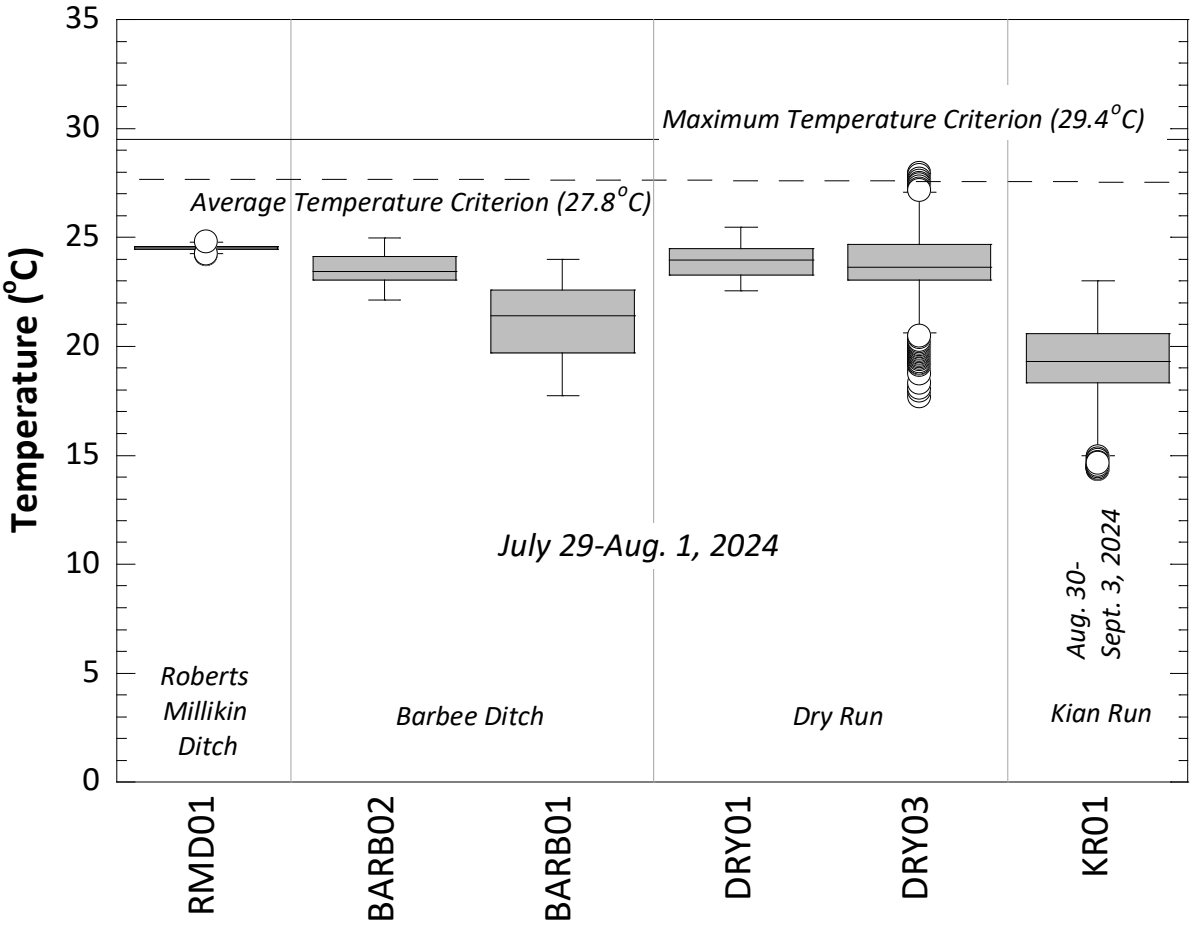

***Figure 4**. Continuously measured temperature results at six (6) locations used for the SNAP nutrient assessment in the 2024 study area during July 1-August 29 at five locations and August 30-September 3 in Kian Run. The Ohio water quality criteria for the summer period average is shown by a dashed line and the daily maximum by a solid line.*

temperatures in the study area, a change in pH from 8.5 S.U. to 9.0 S.U. changes the equivalent ammonia-N criterion from 3.20 mg/L to 1.10 mg/L, a decrease of almost 66%. It also affects how much and what form of phosphorus is most abundant in the water, and therefore affects how aquatic plants and animals can utilize it. As a result pH is responsive to algal photosynthesis and respiration similar to D.O. with a diel cycle of pH being higher in daytime and lower at night. Along with hardness it affects the degree to which heavy metals are soluble which determines their toxicity. Reference pH values for headwater streams in the ECBP ecoregion range between a median value of 7.9 S.U. and a statistical maximum of 8.2 S.U. The Ohio water quality criteria is expressed as a range of acceptable pH values between 6.5-9.0 S.U.

Only two grab pH values exceeded the statistical maximum pH reference value, the median and mean at site RMD04 and only slightly so at 8.3 S.U. Most pH values were well below the reference median value of 7.9 S.U. pH was also measured continuously during the July 29-August 1 short-term Datasonde deployments (Figure 5). All values including the median,

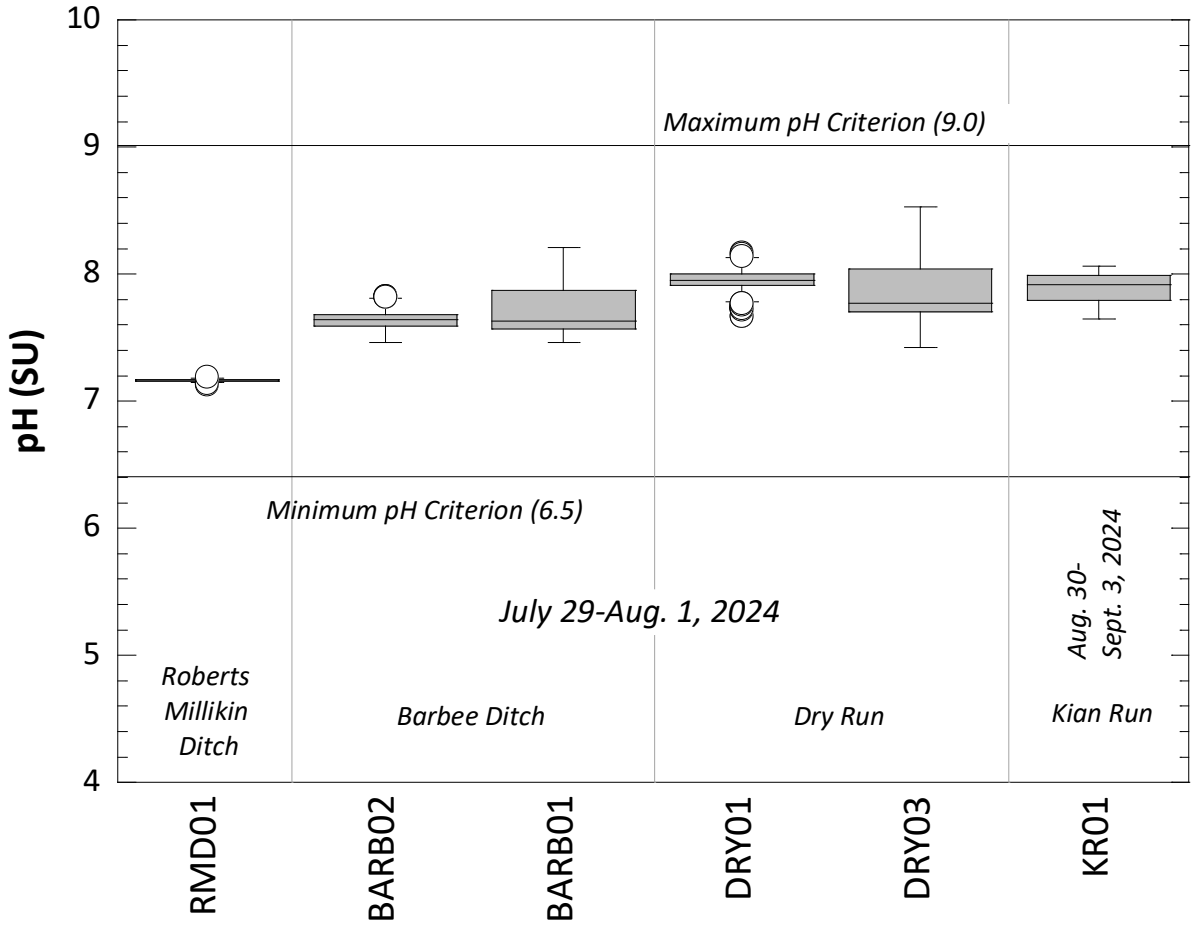

***Figure 5**. Continuously measured pH results at six (6) locations used for the SNAP nutrient assessment in the 2024 study area during July 1-August 29 at five locations and August 30-September 3 in Kian Run. The Ohio water quality criteria are shown by solid lines.*

maximum, and minimum values were well within the WQS criteria of 6.5-9.0 S.U. (Figure 5). The site at RMD01 located downstream from the quarry pond at the Quarry Trails Park had a very narrow range of pH just above 7.0 S.U. This was likely due to the very low, intermittent flows that occurred during the Datasonde deployment.

Dissolved Oxygen (D.O.)

Dissolved oxygen (D.O.) is essential for aerobic life including all higher forms of aquatic life (e.g., fish, macroinvertebrates, mussels, etc.). It is produced by aeration of the water and also by algal photosynthesis. The ability of the water to hold sufficient levels of D.O. to support healthy assemblages of aquatic life is affected by several factors including flow, temperature, the level of oxygen demanding materials that stimulate bacteria to utilize D.O., possibly lowering it to harmful levels including anerobic conditions under severe circumstances. It is one of the most critical parameters for water quality management including the discharge of organic wastewater and nutrient enrichment, the latter of which affects the minimum, maximum, and daily diel swings.

Grab data collected during daytime can trend toward higher values as part of the normal diel fluctuation as affected by algal photosynthesis during the day and respiration at night. Most all of the median and mean values in the 2024 study area were within the mean and statistical maximum of regional reference sites (Table 6). However, two median values at RMD03 and RMD01 were less than the 90th percentile reference value of 5.2 mg/L and the median and mean at RMD01 came very close the daily minimum WWH criterion of 4.0 mg/L. That site being located downstream from the quarry pond at the Quarry Trails Metropark was subject to extreme low flows during portions of the 2024 study period.

Exceedances of dissolved oxygen (D.O.) were also assessed with continuous data obtained from short term Datasonde deployments during July 29-August 1 at five (5) locations and August 30-Spetember 3 at KR01 (Figure 6). One of the primary purposes of the continuous D.O. monitoring was to support the SNAP assessment of nutrient effects (Ohio EPA 2015b). It also provides the data necessary for more fully evaluating the results against the D.O. criteria in the Ohio WQS. Exceedances of dissolved oxygen (D.O.) were observed at RMD01 and KR01. The exceedances at RMD01 were close to zero and presumably due to deoxygenation of the stream due to a lack of sustained flows. The exceedances at the Kian Run (KR01) site were low, at the MWH D.O. criteria of 4.0 mg/L daily average and 3.0 mg/L daily minimum, but neither was an exceedance.

Ammonia-Nitrogen (N)

The Ohio water quality criteria are expressed as total ammonia-N with pH and temperature being the key variables used to determine how total ammonia-N corresponds to the toxic unionized fraction. For the analysis of compliance with the Ohio water quality criteria, a representative temperature of 22°C and a pH of 8.1 S.U. was used. This resulted in total ammonia-N criteria for the WWH use designation of 1.10 mg/L. Most all of the grab median or mean values in the 2024 study area were well below this value with a mean of 0.704 mg/L being the highest at DRY02. The second highest mean value of 0.280 mg/L occurred at the next upstream site DRY01. This is likely an indication of an intermittent sewage input to Dry Run from the Hilltop area, possibly from one or more HSTS or an illicit source. The mean and median values at RMD01 located downstream from the quarry pond at the Quarry Trails Metropark were elevated above the 90th and 95th percentile reference values which corresponds to the low flow conditions at this site and other potentially related parameter exceedances such as extremely low D.O. measured during the short term Datasonde deployment. The majority of sites had ammonia-N levels below the reference median of 0.025 mg/L with numerous non-detects indicating that ammonia-N pollution is not widespread.

Five-Day Biochemical Oxygen Demand (BOD_5)

Biochemical oxygen demand (BOD) measures the amount of oxygen consumption in mg O_2/L by the aerobic oxidation and consumption of organic matter primarily by bacteria. The higher the BOD the more rapidly D.O. is depleted in the water. The principal sources of BOD in small streams are organic matter including sewage, leaves, soils high in organic matter, woody debris, and dead and decaying algae. Expressed here as the five-day biochemical oxygen demand (BOD_5), this parameter has reflected the effectiveness of wastewater treatment at WWTPs

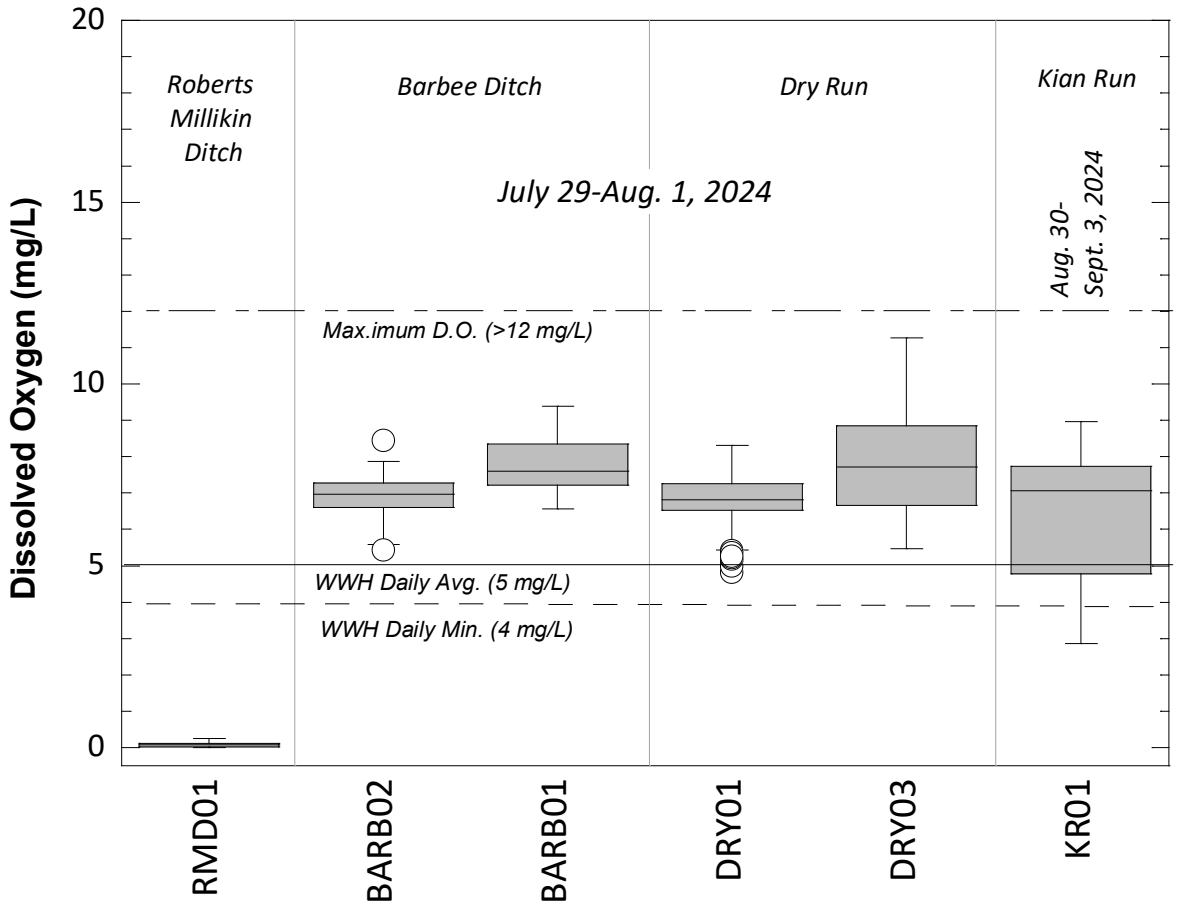

***Figure 6**. Continuously measured D.O. results at six (6) locations used for the SNAP nutrient assessment in the 2024 study area during July 1-August 29 at five locations and August 30-September 3 in Kian Run. The Ohio water quality criteria for the WWH and MWH daily average and minimum are shown by solid dashed lines, respectively.*

throughout Ohio particularly in larger streams and rivers. While elevated BOD can reflect excessive inputs by both point and nonpoint sources, the widespread control of this parameter by water quality based permitting and subsequent wastewater treatment has greatly reduced it as a major water quality concern in larger streams and rivers. In smaller headwater streams elevated BOD is a result of nonpoint source inputs and the indirect effects of flow and habitat alteration that exacerbate the effects particulate organic matter, nutrients, and algal dynamics as they are affected by excessive nutrient enrichment (McCabe et al. 2021). The BOD results in the 2024 study area indicate no issues with this source of organic enrichment on a sustained basis. Most median and mean values were below the reference median of 1.1 mg/L with seven (7) values below the statistical maximum.

Total Kjeldahl Nitrogen (TKN)

Total organic nitrogen as measured by Total Kjeldahl Nitrogen (TKN), an indicator of the living

or recently dead fraction of sestonic algae, can be an indicator of organic enrichment. While TKN is not a direct effect parameter, it is indicative of the effects of organic enrichment by nitrogenous biomass. It has proven to be an effective indicator of excessive organic enrichment in runoff from urban and suburban nonpoint sources. Miltner (2018) recognized TKN as a "stand alone" indicator of organic enrichment alongside BOD. In terms of assessment thresholds Miltner (2018) considered a TKN value of $\geq$0.75 mg/L to be indicative of over enriched conditions in large rivers. MBI (2015) in a regional analysis of Southwest Ohio rivers and streams derived a TKN threshold of 0.51 mg/L for WWH and 0.38 for EWH headwater sites. Regional reference levels derived by Ohio EPA (1999a) for headwater streams in the ECBP ecoregion include a median of 0.40 mg/L and a statistical maximum of 0.80 mg/L. The majority of values in the 2024 study area were below the statistical maximum of 0.80 with 15 values below the median of 0.40 mg/L (Table 6). These results indicate little nitrogenous enrichment at any site.

Nitrate-Nitrogen (NO_3-N)

Nitrate as nitrogen is generally expressed as nitrate-N and along with nitrite-N comprises dissolved inorganic nitrogen in water. The mean values reported herein are nitrate-N plus nitrite-N. Nitrates are not toxic to aquatic life under normal ambient concentrations, are a primary and essential plant nutrient, but can contribute to water quality problems in excessive amounts. Together with the other primary nutrient phosphorus, nitrates in excess amounts can stimulate excessive algal production leading and adverse effects to the D.O. regime that in turn can adversely affect aquatic life. Sources of nitrates in the 2024 study area include urban runoff and stormwater. Assessment thresholds for nitrate-N are available as regional reference values of 0.98 mg/L (median) and 3.50 mg/L (median +2IQR or the statistical maximum) for headwater streams in the ECBP ecoregion and TMDL targets of 1.00 mg/L for WWH and 0.50 mg/L for EWH streams (Ohio EPA 1999a). The much higher 95th percentile value of 5.98 mg/L is undoubtedly influenced by headwater reference sites that are affected predominantly by agricultural row cropping in their watersheds. In the 2024 study area nitrate-N values were extremely low with all below the reference median of 0.98 mg/L (Table 6).

Total Phosphorus (P)

Phosphorus (P) is both an essential and limiting nutrient for plant growth and animal life. It is the most limiting nutrient in freshwater systems primarily to algal growth and biomass. Elevated levels of phosphorus under certain conditions can result in excessive algal growth and activity that in turn affects the D.O. regime and consequently aquatic life. Elevated levels can also stimulate the production of toxic algae that can impact human health, recreation, and public water supplies. In flowing water bodies such as rivers and streams the adverse impacts of elevated P are indirect via how it impacts algal activity and ultimately the D.O. regime. Algal photosynthesis produces oxygen during daylight while algal respiration uses oxygen at night. The difference between daytime and nighttime D.O. value is termed the diel swing the width of which is indicative of nutrient stimulated algal activity. This cycle also impacts pH (high daytime, low nighttime values) which in turn can impact the toxicity of ammonia especially at higher pH levels (i.e., >8.0). Thus the management of P loads from both point and nonpoint sources is an

emerging water quality management issue. Sources of phosphorus in the 2024 study area primarily included urban runoff and sewage inputs via stormwater discharges and sewer overflows. The dynamics of how water quality and biological condition are affected by each is complex and related to physical factors such as flow (including retention time), habitat, and temperature (Ohio EPA 1999a; Miltner 2018). Assessment thresholds for total P are available as regional reference values of 0.025 mg/L (median) and 0.135 mg/L (statistical maximum) for headwater streams in the ECBP ecoregion and TMDL targets 0.08 mg/L for WWH and 0.05 mg/L for EWH headwater streams across Ohio (Ohio EPA 1999a), which are lower than the regional reference values. In the 2024 study area there were three sites (BARB03, DRY01, and DRY04) with median and/or mean values above the statistical maximum reference value which is an indication of intermittent enrichment (Table 6). Both sites in Kian Run had the three highest values in the 2024 study area including an exceedance of the 95th percentile reference value at 0.425 mg/L and three of the 90th percentile reference value of 0.206 mg/L. These results indicate a definite source of serious enrichment possibly from a pump station force main breaks combined with stormwater. Dissolved phosphorus (Orthophosphate) was also measured and all except sites Kian Run had values below the statistical maximum for total P. The two Kian Run sites showed the only elevated values of dissolved P in the study area.

Nutrient Effects Assessment

Stream Nutrient Assessment Procedure (SNAP)

The primary nutrients (phosphorus and nitrates) can pose a threat to aquatic life indirectly through the stimulation of excessive algal production and the corresponding effects that photosynthesis and respiration have on the minimum, maximum, and diel D.O. regime. The Ohio EPA SNAP procedure (Ohio EPA 2015b) was used to determine the extent, if any, of the effect of nutrients on aquatic life impairment at six (6) selected sites in the larger reaches of Roberts Millikin Dictch, Barbee Ditch, Dry Run, and Kian Run (Evans Run was not assessed). The SNAP clarifies the evaluation of total P concentration exceedance thresholds (e.g., Ohio EPA 1999) that were used to assess nutrients as a proximal cause of impairments prior to the development of SNAP. The SNAP was developed as a combined assessment of the *effects* of nutrient enrichment which goes beyond the prior reliance on concentration exceedances alone. The variables included in a SNAP assessment appear in Table 7 and include the aquatic life use attainment status based on the applicable biological criteria, total P, the diel D.O swing, and benthic chlorophyll a as the primary variables and several other supporting variables such as nitrate-N, TKN, BOD5, and TSS each of which can be affected by excessive nutrient enrichment. The QHEI is also included as stream habitat can be an important factor in how nutrients are processed by the aquatic ecosystem.

SNAP considers the actual effects of nutrients on aquatic life and aesthetics as opposed to strict compliance with numerical phosphorus and nitrogen criteria. Ohio EPA has been a leader in developing what are also referred to as “combined” nutrient criteria, first developing the Stream Nutrient Assessment Procedure (SNAP; Ohio EPA 2015b) and later with the large river nutrient assessment procedure (Miltner 2018). MBI has gained experience with conducting these types of assessments by using and modifying the SNAP procedure in Ohio and Illinois

***Table 7**. The results of the Ohio EPA Stream Nutrient Assessment Procedure (SNAP) at selected sites in the 2024 study area. Color shading is explained in the legend at the bottom of the table.*

Site ID	River Mile	Aq. Life Use (AQLU)	Drainage Area (sq. mi.)	IBI	Qualitative Narrative	AQLU Status	Total P (mg/L)		Nitrate (mg/L)		Dissolved Oxygen (mg/L)				Benthic Cholorphyll a		TKN (mg/L)		BOD_5		TSS (mg/L)		SNAP Status
							Mean	Median	Mean	Median	Max.	Min.	Max. Daily DO Swing	DO Swing Narrative	Benthic Chla (mg/m^2)	SNAP Narrative	Mean	Median	Mean	Median	Mean	Median	
Roberts Millikin Ditch (Scioto R. @137.52)																							
RMD01	0.10	WWH	3.25	NS	F*	NON-Fair	0.02	0.02	0.13	0.12	0.50	0.01	0.49	Normal-Low	157	Acceptable	0.58	0.58	1.85	1.80	12.0	12.0	Impaired Not Nutrients
Barbee Ditch (Scioto River at RM 135.75)																							
BARB02	1.45	WWH	2.36	26*	VP*	NON-V.Poor	0.10	0.02	0.38	0.33	8.45	5.44	3.01	Normal-Low	101	Acceptable	0.53	0.47	2.43	1.95	12.5	12.0	Impaired Not Nutrients
BARB01	0.30	WWH	5.88	32*	P*	NON-Poor	0.02	0.02	0.73	0.77	9.38	6.56	2.52	Normal-Low	116	Acceptable	0.36	0.39	1.55	1.55	12.0	12.0	Impaired Not Nutrients
Dry Run (Scioto R. @134.43)																							
DRY01	1.25	WWH	7.24	24*	F*	NON-Fair	0.16	0.17	0.52	0.51	8.31	4.82	3.16	Normal-Low	101	Acceptable	0.70	0.51	1.70	1.70	14.8	12.0	Impaired Not Nutrients
DRY03	0.10	WWH	7.86	28*	LF*	NON-Fair	0.02	0.02	0.48	0.57	11.28	5.48	5.44	Normal-Low	89	Acceptable	0.43	0.45	1.78	1.95	12.0	12.0	Impaired Not Nutrients
Kian Run (Scioto R. @126.5)																							
KR01	0.05	MWH_C	9.44	28	VP*	NON-V.Poor	0.30	0.27	0.34	0.11	8.97	2.87	5.15	Normal-Low	43.3	Acceptable	0.36	0.24	1.49	1.40	22.0	12.0	Impaired Not Nutrients
Ohio SNAP Thresholds				**Refrence**			≤0.025		≤0.98		<10	>6.0					≤0.40				<17		Attaining No Threat
				Very Low Risk			≤0.080		≤2.24		<12	>5.0	≤6.5	Low	≤182 mg/m^2	Acceptable	≤0.60		<2.00		<65		Attaining No Threat; Impaired Not Nutr.
				Low Risk			≤0.170		≤4.60		>12	>3.0			<320 mg/m^2	Enriched	≤1.03		<4.00		<165		Impaired Likely Nutirents
				Moderate Risk			≤0.307		≤5.98		>15	>2.0	>6.5	Wide	>320 mg/m^2	Over-Enrich.	≤1.40		>4.00		<215		Impaired Over-enriched
				High Risk			>0.307		>5.98		>18	<2.0					>1.40				>215		Impaired Severe-enriched
				Ohio SNAP			**Ohio EPA (1999)**		**Ohio EPA (1999)**		**MBI**	**OH WQS**	**Ohio SNAP**	**Ohio SNAP**	**Ohio SNAP**		**Ohio EPA (1999)**		**Ohio SNAP**		**Ohio EPA (1999)**		**Ohio SNAP**

since 2013 and merging it with the large river procedure in the Scioto and Olentangy Rivers in 2022. The primary parameters include total phosphorus, nitrate-N, the diel D.O. swing, minimum D.O., and maximum D.O., all from continuous measurements over 4-5 days, sestonic chlorophyll a, and benthic chlorophyll a. Secondary parameters that can be affected by nutrient enrichment include BOD_5, total suspended solids (TSS), and total Kjeldahl nitrogen (TKN). The status of aquatic life use attainment is also an important variable and can be a determining factor in the assignment of nutrient enrichment status and how specific sources are dealt with. For the 2024 nutrient effects assessment consistent non-attainment of the WWH aquatic life use was observed at all six (6) SNAP sites. In such cases the SNAP indicators are examined for any adverse effects of nutrient enrichment based on exceedance thresholds set by Ohio EPA (Appendix E). All of the benthic chlorophyll a values were well within acceptable thresholds. All of the D.O indicators showed a low potential for adverse impacts. Allied parameters such as TKN, BOD_5, and TSS also showed very low risk values. Two total P and one minimum D.O. were at moderate risk levels, but these occurred in Kian Run which being designated MWH has a lower threshold for nutrient impairment. All six (6) sites were evaluated as Impaired Not Nutrients.

Urban Parameters

Urban parameters include the common dissolved ions chloride, conductivity, total dissolved solids, and common heavy metals such as cadmium, copper, lead, and zinc. These parameters can become highly elevated in urbanized watersheds and are indicative of diverse sources and activities that exemplify urban land uses. Total suspended solids is included in this group because of its widespread use as an indicator of urban runoff and stormwater and for assigning credits for restoration practices such as bank stabilization. The performance of TSS as a single parameter indicative of the performance of stormwater management is highly questionable given the role that other pollutants coupled with the role that flow regime and habitat also play in determining the overall health of urban streams. Employing a mosaic of such indicators undergirded by a biological assessment is a more complete and accurate approach as used herein.

Chlorides

In temperate climates such as exist in central Ohio, dissolved materials in the form of chlorides are an emerging problem because they accumulate in soils and shallow groundwater and have been documented to reach concentrations that can threaten and impair aquatic life. Of particular concern in urban areas with high road density is the concentration of chlorides from winter road salt applications and point source loadings from water treatment blowdown. Chlorides have been documented to be increasing steadily in freshwaters including large rivers (Mullaney et al. 2009; Kelly et al. 2012). Chlorides do not exhibit a simple runoff and export mode of effect, but rather accumulate in near surface groundwater (Kelly 2008), soils, and land surfaces adjacent to streams. Seasonal studies have shown that elevated summer concentrations are correlated with higher, acute concentrations during late winter and spring periods (Kaushal et al. 2005). Research in New England (Kaushal et al. 2005) and Minnesota

***Table 8**. Mean values for urban related parameters in the in the 2024 study area in 2024. Values are color coded in accordance with the legend at the bottom that represents percentiles of headwater reference site values from the Eastern Corn Belt Plain (ECBP) ecoregion (Ohio EPA 1999) and other thresholds including the Ohio WQS.*

Site ID	River Mile	Drainage Area (sq. mi.)	Chloride (mg/L)		Conductance @25°C (µS/cm)		Field Conductivity (umhos/cm)		Total Dissolved Solids (TDS) (mg/L)		Total Suspended Solids (TSS) (mg/L)		Cadmium (µg/L)		Copper (µg/L)		Lead (µg/L)		Zinc (µg/L)	
			Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean
Roberts Millikin Ditch (Scioto R. @137.52)																				
RMD03	2.75/2.80	0.61	83	73	630	600	648	572	350	343	ND	ND	ND	ND	0.0	0.7	0.00	0.05	ND	ND
RMD02	1.59/1.50	1.03	88	79	470	577	750	654	360	358	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RMD01	0.10/0.10	3.25	63	59	520	500	550	533	295	280	ND	ND	ND	ND	ND	ND	0.00	0.08	ND	ND
Tributary to Roberts Milliken Ditch @RM 0.40																				
RMD04	0.39/0.50	2.90	80	78	680	633	620	609	335	340	ND	ND	ND	ND	ND	ND	0.00	0.10	16.7	17.5
Barbee Ditch (Scioto R. @RM 135.75)																				
BARB03	2.76/2.70	0.90	140	133	810	1028	812	969	450	550	ND	ND	0.023	0.024	ND	ND	ND	ND	ND	ND
BARB02	1.51/1.45	2.36	120	117	695	690	693	677	385	383	0	3.5	0.000	0.011	ND	ND	ND	ND	ND	ND
BARB01	0.34/0.30	5.88	92	98	645	723	633	674	350	403	ND	ND	ND	ND	ND	ND	0.00	0.06	ND	ND
Tributary to Trabue Run @ RM 2.7																				
TRB04	0.22/0.22	0.04	55	57	510	600	478	491	315	355	8	10.25	0.000	0.011	ND	ND	0.23	0.46	5.8	6.1
Tributary to Trabue Run @RM 1.21																				
TRB05	0.90/0.85	0.82	110	129	720	810	710	704	380	428	ND	ND	0.000	0.016	0.0	0.7	0.00	0.06	ND	ND
Tributary @RM 0.5 To Tributary To Barbee Ditch @RM 1.87																				
BARB04	0.43/0.43	0.95	140	128	690	730	773	770	430	423	ND	ND	0.000	0.015	ND	ND	0.00	0.05	0.0	4.0
Trabue Run (Tributary to Barbee Ditch @ RM 1.39)																				
TRB03	2.18/2.20	0.63	75	69	570	607	606	635	360	363	7	12.5	0.000	0.013	ND	ND	0.24	0.47	21.9	19.1
TRB02	1.00/1.05	2.60	70	69	540	620	555	579	320	343	ND	ND	0.000	0.011	0.0	1.1	0.00	0.08	ND	ND
TRB01	0.05/0.13	3.00	56	59	510	548	456	512	270	308	0	3.5	ND	ND	0.0	1.1	0.00	0.15	ND	ND
Dry Run (Scioto R. @134.43)																				
DRY02	2.75/2.61	0.75	66	76	530	568	481	552	285	320	ND	ND	ND	ND	ND	ND	0.00	0.05	0.0	4.5
DRY01	1.41/1.25	7.24	73	76	645	665	671	689	365	390	ND	ND	ND	ND	ND	ND	ND	ND	6.6	8.5
DRY03	0.08/0.10	7.86	74	78	565	645	511	608	300	358	ND	ND	0.000	0.020	ND	ND	0.00	0.10	0.0	3.0
Tributary to Dry Run @RM 1.61																				
DRY09	2.40/2.45	1.28	102	111	690	763	758	762	415	460	ND	ND	ND	ND	ND	ND	0.00	0.05	5.3	6.2
DRY08	1.11/1.00	2.57	88	86	900	820	703	719	440	473	ND	ND	0.000	0.011	0.0	0.8	ND	ND	0.0	3.2
DRY05	0.75/0.75	2.73	85	83	725	738	784	773	425	463	ND	ND	0.000	0.013	0.0	0.9	0.00	0.03	0.0	3.1
DRY04	0.10/0.14	3.43	84	78	755	710	665	707	440	430	ND	ND	0.021	0.141	0.0	0.8	ND	ND	13.8	23.1
Tributary to Dry Run @ RM 2.61																				
DRY07	1.74/1.74	1.37	52	66	480	548	491	555	280	328	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DRY06	0.40/0.34	2.15	76	75	560	573	560	609	340	348	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Evans Run (Scioto R. @RM 136.97)																				
SCC01	0.10/0.10	1.39	48	48	910	843	768	768	515	495	ND	ND	ND	ND	22.1	42.4	0.00	0.04	0.0	3.1
Kian Run (Scioto R. @RM 126.5)																				
KR02	0.82/0.80	1.36	66	78	830	847	697	745	485	475	ND	ND	0.000	0.012	ND	ND	0.20	1.32	77.4	71.1
KR01	0.05/0.05	9.44	79	69	935	945	950	909	590	538	0	12.4	0.044	0.055	ND	ND	0.34	1.29	17.0	18.4
Headwater Narrative Threshold Rankings	<50th Percentile		<17	<17	<645	<645	<500	<500	<399	<399	<7	<7	<0.25	<0.25	<6.0	<6.0	<3.0	<3.0	<6.0	<6.0
	Median +2IQR		<41	<41	<768	<768	<615	<615	<464	<464	<21	<21	<5.30	<5.30	<25.0	<25.0	<27.0	<27.0	<301.0	<301.0
	<90th Percentile		<77	<77	<800	<800	<881	<881	<476	<476	<48	<48								
	<95th Percentile		<108	<108	<1012	<1012	<914	<914	<508	<508	<70	<70	<29.00	<29.00	<80.0	<80.0	<991.0	<991.0	<611.0	<611.0
	>95th Percentile		>108	>108	>1012	>1012	>914	>914	>508	>508	>70	>70								
Ohio EPA (1999), [a]Miltner (2021)			52[a]	52[a]	Ohio EPA (1999)				WQS = 1500 mg/L		Ohio EPA 1999		Ohio WQS							

(Novotny et al. 2008) show that chlorides can accumulate in watersheds and that there is a strong association between high winter and elevated summer concentrations. Novotny et al. (2008) identified that 78% of the road salt applied in a Minnesota watershed accumulated in a given year and contributed to an increase in summer chloride concentrations. Ohio does not have a chloride water quality criterion for the protection of aquatic life, although there is a maximum contaminant level of 250 mg/L that applies to public water supplies. U.S. EPA (1988) recommends a water quality criterion of 230 mg/L for the protection of aquatic life. A more recent Ohio study that examined several decades of ambient water quality data against biological assemblage response (Miltner 2021) recommends a "hazard" level for chloride at 52 mg/L for the protection of high quality waters. This value is in line with field derived values of 52.6 mg/L for WWH and 21.9 mg/L for EWH attainment at headwater sites in Southwest Ohio (MBI 2015). Regional reference values ranged from 17 mg/L (median) to 108 mg/L (95th percentile) with the statistical maximum at 41 mg/L. Median and mean chloride exceedances of the Miltner (2021) hazard level of 52 mg/L occurred at all except one site in the 2024 study area and that single site had a median of 52 mg/L (Table 8). Median values as high as 140 mg/L occurred at two sites (BARB03 and BARB04) and also exceeded the 95th percentile reference value (BARB03, BARB02, and TRB05) which are affected by runoff from commercial properties that are subject to private contractor salt applications that are not always employed with best practices to minimize the amount of salt that is applied. The other subwatershed sites had lower values, but which exceeded the 90th percentile reference value of 77 mg/L on a frequent basis. Macroinvertebrates are especially susceptible to chlorides and that is reflected in the numerous poor and very poor narrative ratings in the Roberts Millikin Ditch and Barbee Ditch subwatersheds.

Specific Conductance and Field Conductivity

Specific Conductance is a measure of how effectively water conducts an electrical current. Conductance increases with an increasing amount and mobility of ions and is correlated with the dissolved solids content of water. The ions conduct electricity because they are negatively or positively charged when dissolved in water. As such conductance is an indirect measure of the concentration of dissolved ions in solution and is defined as the electrical conductance of 1 cubic centimeter (cm^3) of a solution at 25°C. The Ohio WQS have a conductance criterion of 2400 μS/cm that is equivalent to the TDS criterion of 1500 mg/L. Regional reference specific conductance values for headwater streams in the ECBP ecoregion are lower with a median of 500 μS/cm, a statistical maximum of 768 μS/cm, and a 95th percentile of 1,012 μS/cm. The 2024 results (Table 8) show a different pattern of exceedances than chloride with fewer values above the reference median and elevated values above the statistical maximum in different subwatersheds. The highest median and mean conductance values occurred in Barbee Ditch (BARB03) with a mean of 1,028 μS/cm. Evans Run (SCC01) and Kian Run had high values with the second the highest mean of 945 μS/cm observed at KR01. However, no values exceeded the 95th percentile reference value. Field conductivity showed a similar pattern, but with two values, a mean of 969 μS/cm at BARB03 and a median of 950 μS/cm at KR01. There were also more frequent exceedances of the statistical maximum value of 881 μS/cm with only a single value below the reference mean of 500 μS/cm. These results are an indication of the

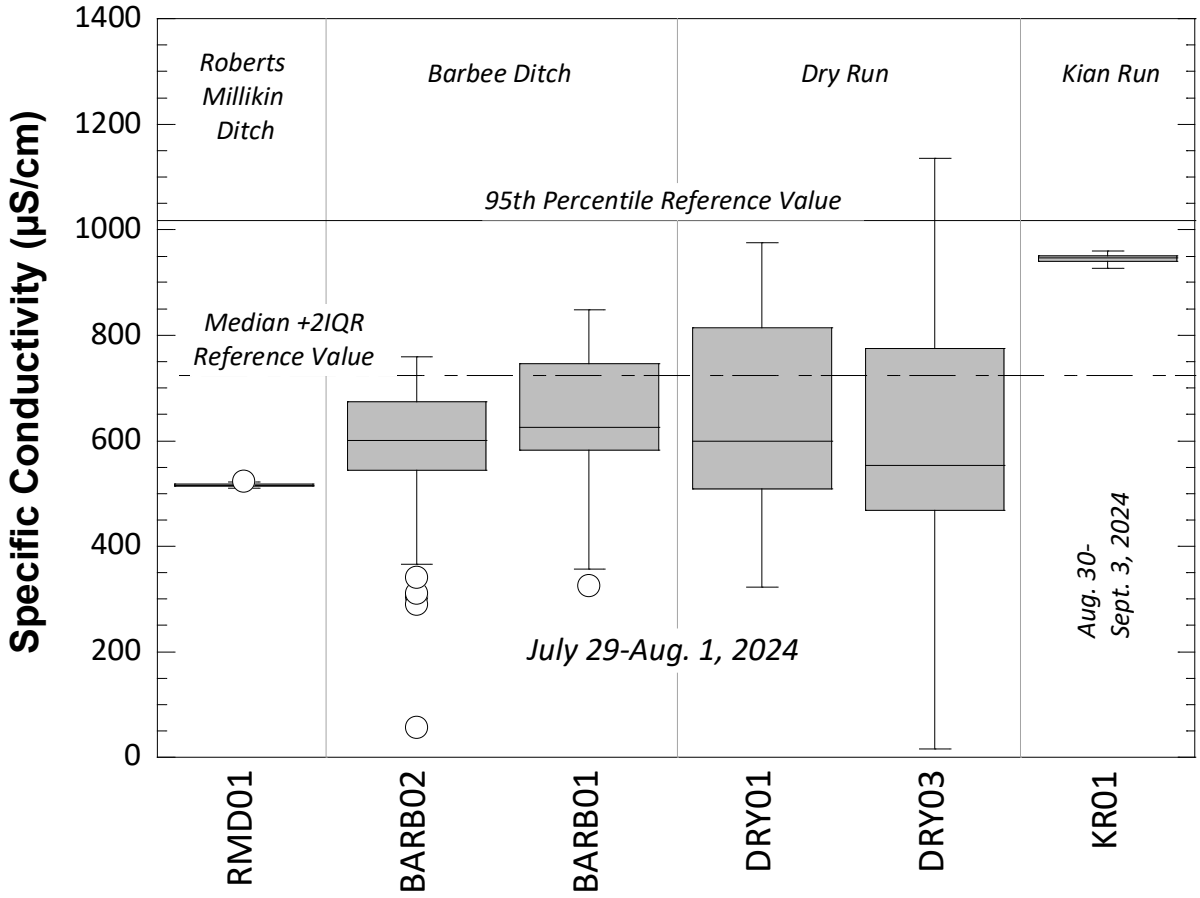

***Figure 7**. Continuously measured specific conductivity results at six (6) locations used for the SNAP nutrient assessment in the 2024 study area during July 1-August 29 at five locations and August 30-September 3 in Kian Run. The Ohio EPA (1999) reference values for headwater sites in the ECBP ecoregion are shown by solid dashed lines, respectively.*

widespread influence of urban runoff via stormwater, likely sewage inputs, and industrial discharges and stormwater runoff.

The short-term Datasonde deployments included continuous specific conductance measurement during July 29-August 1 at five (5) of the SNAP sites and August 30-September 3 in Kian Run (Figure 7). Median values were generally below the median + 2 IQR statistical maximum reference value except in Kian Run which had elevated conductivity compared the other sites. Some sites such as DRY03 had wide variations in conductivity suggesting an intermittent source upstream. These results are largely consistent with the grab sample data.

Total Dissolved Solids

Total dissolved solids (TDS) is a measure of the dissolved content of all inorganic and organic substances present in water consisting of solids small enough to pass through 2-micron filter. While TDS is not generally considered to be a pollutant it can be useful as an aggregate

indicator of the presence of a broad array of chemical pollutants. Common nonpoint sources of TDS in receiving waters are agricultural and urban runoff with parent geology and soils being important co-factors. Point sources of both industrial and municipal wastewater also influence TDS levels. The most common chemical constituents are calcium, phosphates, nitrates, sodium, potassium, and chloride, each of which can emanate from the aforementioned nonpoint and point sources. Total dissolved solids are differentiated from total suspended solids (TSS), in that the latter cannot pass through a 2 micron filter and are indefinitely suspended in solution. The Ohio TDS water quality criterion is 1500 mg/L. Regional reference values for headwater streams in the ECBP are a median of 399 mg/L, a statistical maximum of 464 mg/L, and a 95th percentile value of 508 mg/L. Only six (6) TDS median or mean values exceeded the statistical maximum reference threshold of 464 mg/L (Table 8). These exceedances included values >500 mg/L at BARB03 Evans Run, and Kian Run, four (4) of which exceeded the 95th percentile value of 508 mg/L. None of these values approached the current WQS of 1500 mg/L. The plurality of sites were below the reference median of 399 mg/L and statistical threshold value of 464 mg/L. The Ohio EPA WQS criterion of 1500 mg/L is regraded a being underproductive of aquatic life based on recent research. The detrimental effects of increased concentrations of TDS on the abundance of Ephemeroptera (Mayflies) and richness of Ephemeroptera taxa are well known (Kefford 2019). Studies in the Appalachian region of the U.S. have linked declines in mayflies to increased conductivity from coal mining operations that release dissolved ionic substances such as chlorides, magnesium, and sulfates (Pond et al. 2008, 2011; U.S. EPA 2011). Field studies have indicated that mayflies (Order Ephemeroptera) are particularly sensitive to high TDS with adverse effects occurring at equivalent conductivity values of 1500 μS/cm, which is well below the Ohio 1500 mg/L TDS equivalent of 2400 μS/cm, and an acutely toxic threshold of 2866 μS/cm (Johnson et al. 2014). Analyses by MBI with Ohio stream data indicates that declines in sensitive mayflies (e.g., *Ephemerella*) begin to occur at conductivities of ~1000 μS/cm (Rankin 2010), a TDS equivalent of 625 mg/L and which is 40% of the current WQS for TDS.

Total Suspended Solids (TSS)

Total suspended solids (TSS) are particles that are larger than 2 microns that are suspended in the water column. Anything that can pass through a 2 micron average filter size is considered a dissolved solid. TSS can include any particles drifting in the water column to include inorganic sediment, silt, and sand and organic matter such as plankton and algae. At typical ambient concentrations TSS has little or no direct effect on aquatic life. However, at extremely high concentrations that are rare in the natural environment, TSS can be harmful to fish and invertebrates by clogging gills and embedding substrates. It is easy to measure and thus it is commonly employed as a singular indicator of nonpoint source pollution (e.g., MS4 stormwater permitting and crediting) despite its inherent variability and shortcomings as a reliable standalone indicator of aquatic life impairment. Miltner (2018) included it as a tertiary large river nutrient effects parameter, but in a restricted role as a proxy parameter with a screening level of >25 mg/L indicating enriched conditions when other indicators such as BOD_5 and TKN are not available. Regional reference TSS values for headwater streams in the ECBP ecoregion are a median of 7.0 mg/L, a statistical maximum of 21 mg/L, and a 95th percentile of 70 mg/L. Only two sites had median and mean values that exceeded the reference median of 7 mg/L and

that were below the statistical maximum of 21 mg/L. Nineteen (19) of the 25 sites had below detect values for TSS. It was one of the most unresponsive parameters measured in the 2024 study area.

Heavy Metals

Cadmium, copper, lead, and zinc are heavy metals that are frequently detected in urbanized watersheds. Mean and median cadmium levels were mostly below the reference median value of 0.25 µg/L with only one mean value of 0.141 µg/L at DRY04 exceeding the reference median (Table 8). The WWH WQS at an equivalent hardness of 300 mg/L as CaCO3 is 5.30 µg/L for which is many times higher than any 2024 values. Copper values were at non-detection or less than the median reference value of 6.0 µg/L reference value of 5 µg/L in 2024 at all except the site in Evans Run the mean of 42.4 µg/L exceeded the WWH equivalent criterion of 25.0 µg/L. Evans Run drains the Scioto Country Club and it is possible that copper based pesticide runoff resulted in the elevated copper values. Other sources are possible and could include treated ponds in the watershed. Lead values were all at non-detect or below the reference median of 2.0 µg/L an unexpected result for an urbanized study area. Mean and median zinc values were low with most sites at non-detect or below the reference medina of 6.0 µg/L. The results in Kian Run exceeded the reference median with a high mean value of 77.4 µg/L at KR02 declining to 17.0 µg/L at KR01. While zinc is a common urban pollutant, it is also used in steelmaking which indicates a legacy effect at KR02. Still, none of the values approached the WWH equivalent criterion of 301 µg/L.

Sediment Chemistry

Sediment sample for chemical analysis were collected at each site in 2024 and analyzed for heavy metals and an array of organic compounds including volatile, semi-volatile, base neutral acid, polycyclic aromatic hydrocarbons, PCBs, and pesticide compounds that returned as detections in the laboratory analyses. Only compounds that were detected are reported herein.

Sediment Metals

Metals in sediment were analyzed for the eight (8) parameters and compared to Ohio EPA Sediment Reference Values (SRV; Ohio EPA 2008), the Probable Effect Concentration (PEC) and Threshold Effect Concentration (TEC) levels of MacDonald et al. (2000), and the Canadian Council of Ministers of the Environment (CCME 1999) guidelines for sediment contaminants. The SRVs are references values at least impacted sites, the MacDonald (2000) PEC means that most species and taxa may be adversely affected whereas the TEC means that the most sensitive species and taxa may be affected. The CCME (1999) guidelines are probable effect levels (PELs) that can be used to evaluate the degree to which adverse biological effects are likely to occur as a result of exposure to sediment contaminants.

There was only one exceedance of the more serious MacDonald (2000) TEC for zinc in Kian Run at the upstream site KR02 (Table 9). Four sites in the Barbee Ditch subwatershed had exceedances of the CCME (1999) PEC for nickel in three tributaries to Barbee Ditch and lower

***Table 9**. Concentrations of selected heavy metals in bulk sediment samples collected at 25 ambient locations in the 2024 study area. The Ohio EPA sediment reference values (SRV), MacDonald et al. (2000) threshold effect (TEC) and probable effect (PEC) thresholds, and Canadian Council of Ministers of the Environment (CCME)thresholds are indicated at the bottom of the table.*

Site ID	River Mile	Drainage Area (sq. mi.)	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Iron (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	Silver (mg/kg)	Zinc (mg/kg)
Roberts Millikin Ditch (Scioto R. @137.52)										
RMD03	2.75/2.80	0.61	7.4	0.36	11.0	14000	ND	ND	ND	ND
RMD02	1.59/1.50	1.03	9.4	ND	8.4	14000	13.3	ND	ND	ND
RMD01	0.10/0.10	3.25	11.0	ND	9.6	16000	24.8	ND	ND	ND
Tributary to Roberts Milliken Ditch @RM 0.20										
RMD04	0.39/0.50	2.90	8.6	ND	6.6	13000	9.0	ND	ND	ND
Barbee Ditch (Scioto River @ RM 135.75)										
BARB03	2.76/2.70	0.90	12.0	0.38	14.0	17000	15.8	20.8	ND	ND
BARB02	1.51/1.45	2.36	8.6	0.35	9.0	14000	11.3	ND	ND	ND
BARB01	0.34/0.30	5.88	13.0	ND	9.9	17000	15.6	ND	ND	ND
Tributary to Trabue Run @ RM 2.7										
TRB04	0.22/0.22	0.04	16.0	0.40	22.0	27000	17.7	35.9	ND	ND
Tributary to Trabue Run @RM 1.21										
TRB05	0.90/0.85	0.82	16.0	0.49	12.0	23000	18.8	27.9	ND	ND
Tributary @RM 0.5 To Tributary To Barbee Ditch @RM 1.87										
BARB04	0.43/0.43	0.95	13.0	0.50	33.0	16000	ND	ND	ND	ND
Trabue Run (Tributary to Barbee Ditch @ RM 1.39)										
TRB03	2.18/2.20	0.63	10.0	0.51	14.0	20000	16.4	22.7	ND	ND
TRB02	1.00/1.05	2.60	9.4	0.34	7.6	15000	ND	ND	ND	ND
TRB01	0.05/0.13	3.00	9.3	ND	7.7	14000	ND	ND	ND	ND
Dry Run (Scioto R. @134.43)										
DRY02	2.75/2.61	0.75	12.0	0.55	14.0	18000	22.5	ND	ND	ND
DRY01	1.41/1.25	7.24	10.0	0.66	7.2	15000	18.3	16.1	ND	ND
DRY03	0.08/0.10	7.86	17.0	ND	8.8	20000	41.8	ND	ND	ND
Tributary to Dry Run @RM 1.61										
DRY09	2.40/2.45	1.28	9.6	0.44	13.0	16000	38.2	ND	0.3	ND
DRY08	1.11/1.00	2.57	11.0	0.32	17.0	16000	19.0	18.0	ND	ND
DRY05	0.75/0.75	2.73	15.0	0.50	7.5	19000	20.6	20.9	ND	ND
DRY04	0.10/0.14	3.43	12.0	0.21	7.7	14000	14.2	15.9	ND	ND
Tributary to Dry Run @ RM 2.61										
DRY07	1.74/1.74	1.37	8.2	ND	8.7	15000	ND	ND	ND	ND
DRY06	0.40/0.34	2.15	10.0	0.39	16.0	17000	22.7	ND	ND	ND
Evans Run (Scioto R. @RM 136.97)										
SCC01	0.10/0.10	1.39	4.7	ND	5.1	9200	23.3	ND	ND	ND
Kian Run (Scioto R. @RM 126.5)										
KR02	0.82/0.80	1.36	15.0	0.78	22.0	23000	117.0	ND	ND	721
KR01	0.05/0.05	9.44	9.6	1.00	26.0	21000	39.3	24.7	ND	306
MacDonald et al.(2000) TEC			9.75	0.99			35.8			121
MacDonald et al.(2000) PEC			33.00	4.98			128			459
Ohio EPA Sediment Refrence Values			25.00	0.79			47			160
Canadian Council of Ministers of the Environment (CCME)					90.0			21.0		

Kian Run at KR01. There were a total of 15 exceedances of the MacDonald (2000) TEC threshold for arsenic with at least one exceedance in each of the 15 subwatershed and stream reaches, a single exceedance of the cadmium PEC in lower Kian Run (KR01), and two exceedances of lead in Dry Run (DRY03 and DRY09). There was one SRV exceedance for lead in Kian Run at KR02. Kian Run had the most total exceedances with four (4) and the remaining sites with one (1) or two (2) each. The number of detections of all metals (excepting iron which has no threshold) ranged from three (3) to six (6) at all sites being more numerous in the Barbee Ditch and Kian Run tributaries, a reflection of the sources of these compounds in each subwatershed.

Sediment Organics

Organic chemicals in sediment were analyzed for volatile, semi-volatile, base neutral acid, polycyclic aromatic hydrocarbons, PCBs, and pesticide compounds that returned as detections in the laboratory analyses. Only six total organic compounds were detected. Acetone was detected at a single site in lower Kian Run (KR01) which exceeded a low risk guideline developed by U.S. EPA (2015). Carbon disulfide and toluene were detected at single sites each (KR01 and DRY05), but below adverse effect thresholds. Methylene chloride was the most frequently detected organic compound and exceeding low risk guidelines of U.S EPA, Region III BTAG guidelines at five (5) locations three (3) of which occurred in the Robets Millikin Ditch subwatershed. Most of these compounds are common by products of various manufacturing processes and the likely source is urban runoff from commercial facilities. Evans Run (SCC01) was the only site that had zero detections of any organic compound in the 2024 study area.

Polycyclic Aromatic Hydrocarbon (PAH) compounds are generally more commonly detected in sediment samples at sites with elevated urban land uses. PAH compounds are by products of coal tar, gasoline exhaust, and incomplete combustion and several are known carcinogens. Most of these compounds are not manufactured and are more commonly detected in urban rivers and streams with runoff from asphalt pavements and heavy automobile traffic as the primary sources. Surprisingly, only one PAH compound, benzo(ghi)perylene, was detected at a single site in Barbee Ditch (BARB02; Table 10). All other PAH compounds were reported below detection. This was an unexpected result given the numerous PAH compounds that have been detected in recently sampled sites in the Scioto and Olentangy Rivers and lower Olentangy River tributaries in 2020 and 2022. Upon consulting the DWR Surveillance lab and the sediment collection field sheets, the amount of fine sediments that hold these compounds was sparse to non-existent at most sites in 2024. This is likely the result of an extremely low flow and rainfall year along with the high to very high stream gradients that are pervasive in the 2024 study area. In 2020, the Scioto River mainstem site downstream from Giggs Reservoir and upstream Fifth Ave. had 17 total PAH detections of which 12 were exceedances of an effect threshold. The next two sites downstream had 12 and 10 detections with fewer exceedances of an effect threshold, but more than was expected for the mainstem between Griggs Reservoir and the Olentangy River confluence. Roberts Millikin Ditch, Barbee Ditch, and Dry Run each enter the Scioto River in this reach which suggests that they are potential conduits for PAH compounds in the Scioto mainstem that are not being retained within those subwatersheds. Kian Run may also play a similar role as PAH compounds remained elevated in the Scioto River downstream to I-270 although other sources are present upstream.

Table 10. *Concentrations of various organic compounds in bulk sediment samples collected at 25 ambient locations in the 2024 study area. Threshold exceedances and detections are color coded with values in the footnotes. ND in blank cells were below the Method Detection Limit (MDL).*

Site ID	River Mile	Drainage Area (sq. mi.)	Acetone (µg/L)	Benzo(ghi)perylene (µg/L)	Carbon disulfide (µg/L)	Methylene Chloride (µg/L)	Toluene (µg/L)	Toxaphene (µg/L)
Roberts Millikin Ditch (Scioto R. @137.52)								
RMD03	2.75/2.80	0.61	ND	ND	ND	ND	ND	ND
RMD02	1.59/1.50	1.03	ND	ND	ND	13.2	ND	ND
RMD01	0.10/0.10	3.25	ND	ND	ND	17.1	ND	ND
Tributary to Roberts Milliken Ditch @RM 0.20								
RMD04	0.39/0.50	2.90	ND	ND	ND	10.6	ND	ND
Barbee Ditch (Scioto River @ RM 135.75)								
BARB03	2.76/2.70	0.90	ND	ND	ND	ND	ND	ND
BARB02	1.51/1.45	2.36	ND	1.49	ND	ND	ND	ND
BARB01	0.34/0.30	5.88	ND	ND	ND	ND	ND	ND
Tributary to Trabue Run @ RM 2.7								
TRB04	0.22/0.22	0.04	ND	ND	ND	ND	ND	ND
Tributary to Trabue Run @RM 1.21								
TRB05	0.90/0.85	0.82	ND	ND	ND	2.6	ND	ND
Tributary @RM 0.5 To Tributary To Barbee Ditch @RM 1.87								
BARB04	0.43/0.43	0.95	ND	ND	ND	ND	ND	ND
Trabue Run (Tributary to Barbee Ditch @ RM 1.39)								
TRB03	2.18/2.20	0.63	ND	ND	ND	ND	ND	ND
TRB02	1.00/1.05	2.60	ND	ND	ND	ND	ND	0.51
TRB01	0.05/0.13	3.00	ND	ND	ND	ND	ND	ND
Dry Run (Scioto R. @134.43)								
DRY02	2.75/2.61	0.75	ND	ND	ND	ND	ND	ND
DRY01	1.41/1.25	7.24	ND	ND	ND	ND	ND	ND
DRY03	0.08/0.10	7.86	ND	ND	ND	ND	ND	ND
Tributary to Dry Run @RM 1.61								
DRY09	2.40/2.45	1.28	ND	ND	ND	ND	ND	ND
DRY08	1.11/1.00	2.57	ND	ND	ND	ND	ND	ND
DRY05	0.75/0.75	2.73	ND	ND	ND	ND	4.28	ND
DRY04	0.10/0.14	3.43	ND	ND	ND	ND	ND	ND
Tributary to Dry Run @RM 1.61								
DRY07	1.74/1.74	1.37	ND	ND	ND	ND	ND	ND
DRY06	0.40/0.34	2.15	ND	ND	ND	ND	ND	ND
Evans Run (Scioto R. @RM 136.97)								
SCC01	0.10/0.10	1.39	ND	ND	ND	ND	ND	ND
Kian Run (Scioto R. @RM 126.5)								
KR02	0.82/0.80	1.36	ND	ND	ND	8.1	ND	ND
KR01	0.05/0.05	9.44	14.4	ND	7.3	ND	ND	ND
Key	Low Risk		0.04[a]		15.0[b]	2.00[c]	17,500[d]	0.039[e]
	High Risk				130.0[b]			0.800[e]
	Persaud et al. (1993) Thresholds			>320				
				>0.170				

[e] U.S. EPA. 2015. Region 4 Ecological Risk Assessment Supplemental Guidance

[b] Ohio EPA surface water quality criterion fact sheet, tier II (March 2006).

[c] EPA Region III BTAG, Freshwater Sediment Screening Benchmarks (Risk "Comparison Values), 8/2006

[d] U.S. EPA ambient water quality criteria for aquatic life for toluene 1980.

[e] U.S. EPA ambient water quality criteria for aquatic life for toxaphene 1980.

Physical Habitat for Aquatic Life

The physical habitat of a stream or river is a primary determinant of biological quality and potential. Rivers and streams in the glaciated Midwest, left in their natural state, typically offer pool-run-riffle sequences, moderate to high sinuosity, and well-developed channels with deep pools, heterogeneous substrates, and cover in the form of woody debris, hard substrates, and aquatic macrophytes. The Qualitative Habitat Evaluation Index (QHEI) categorically scores basic components of stream and riverine habitat into ranks according to the degree to which those components are found compared to a natural state, or conversely, in an altered or modified state. In the middle Scioto River study area, QHEI scores and physical habitat attributes were recorded in conjunction with the fish sampling conducted at each site. QHEI scores >55 are generally regarded as having the potential to support attainment of the WWH aquatic life use designation and scores >70 indicate excellent habitat in headwater streams. Conversely scores less than 55 have an increasingly limited potential to support WWH and scores less than 45 indicate low or no ability to attain WWH, thus interventions to improve the QHEI scores would be needed. Rankin (1989, 1995) developed a matrix of QHEI attributes that include good attributes that enhance physical habitat and modified attributes that deter attainment of WWH. Generally ratios of modified to good attributes of >2.0 indicate that altered habitat is a deterrent to attaining WWH.

Physical Habitat Modifications and Hydrological Alterations

The 2024 study area has had historical channelization as evidenced by the names of Roberts Millikin Ditch and Barbee Ditch resulting from petitioners requesting drainage enhancements via stream channelization under historical Ohio Drainage Laws as was previously described. Most of these two streams have recovered better quality habitat via natural processes that are enhanced by the high to very high gradients. Kian Run is channelized, has a lower gradient, and consequently less recovery as evidenced by the Ohio EPA designating it MWH-C after the 2009-10 survey (Ohio EPA 2012). The high gradients of most of the subwatersheds belie the need for additional drainage relief, but urban development can be an added issue that resulted in the employment of concrete revetments, stream channels, and rock basket gabions. One of the locations in Dry Run (DRY01) was “daylighted” and employed a natural channel design in 2020. In small, urbanized headwater streams such as the Olentangy River tributaries the principal impacts to instream and riparian habitat are from adjacent land uses, hydrological modifications including flashy flows and flow intermittency, and the direct modification of the stream channel, instream cover, and substrates, the latter resulting from excessive embeddedness where fines such as clayey silts and sand can fill the interstices formed by larger substrate types such as large gravel, cobbles, and boulders. All of the tributaries are nestled in wooded ravines to varying degrees with the stream channel bordered by small roads and bank stabilization structures, but most of the instream habitat being composed of bedrock and larger substrates has resulted in the stream channels being mostly intact.

2024 QHEI Results

Habitat as measured by the QHEI in the lower Olentangy River tributaries in 2020 was used to

***Table 11**. Qualitative Habitat Evaluation Index (QHEI) scores showing good and modified habitat attributes at sites in the 2024 study area. Narrative ratings and color coding in legend at bottom of the table based on the headwater site type after analyses based on Rankin 1989 and Rankin 1995.*

			Good Habitat Attributes												High Influence Modified Attributes						Moderate Influence Modified Attributes																	
Site ID	River Mile	QHEI	No Channelization	Boulder, Cobble, Gravel	Silt Free	Good-Excellent Development	Moderate-High Sinuosity	Moderate-Extensive Cover	Fast Flow w Eddies	Little to No Embeddedness	Max Depth > 40 cm	No Riffle Embeddedness	Good Habitat Attributes	Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparse No Cover	Max Depths <40 cm	High Influence Poor Attributes	Recovering from Channelization	Mod-High Silt Cover	Sand Substrates (Boatable sites)	Hardpan Origin	Fair- Poor Development	Low Sinuosity	< 2 Cover Types	Intermittent Flow or Pools <20 cm	No Fast Current Types	Mod-Extensive Embeddedness	Mod-Extensive Riffle Embeddedness	No Riffle	Poor Habitat Attributes	Ratio of Modified (High) to Good	Ratio of Modified (All) to Good
Roberts Millikin Ditch (Scioto R. @137.52)																																					
RMD03	2.75	69.0		■			■	■			■	■	5						0	●	●			●	●			●	●			6	0	1.2
RMD02	1.59	61.0		■				■		■	■	■	5						0	●				●	●			●	●			5	0	1
Tributary to Roberts Millikin Ditch @RM 0.40																																					
RMD04	0.39	64.5		■	■		■	■		■		■	6					●	1	●				●				●				3	0.17	0.67
Barbee Ditch (Tributary To Scioto River @RM 135.75)																																					
BARB03	2.76	56.8		■				■			■	■	4				●		1	●	●			●	●			●	●			6	0.25	1.75
BARB02	1.51	65.0	■	■		■	■	■		■	■	■	8						0					●				●				2	0	0.25
BARB01	0.34	66.8		■				■	■	■	■	■	6						0	●				●	●					●		4	0	0.67
Unnamed Tributary to Trabue Run @RM 2.7																																					
TRB04	0.22	54.0		■				■			■	■	4		●		●		2	●	●			●	●			●	●	●		7	0.5	2.25
Unnamed Tributary to Trabue Run @RM 1.21																																					
TRB05	0.90	59.5		■				■		■	■	■	5				●		1	●	●			●	●			●				5	0.2	1.2
Unnamed Tributary to Barbee Ditch @RM 1.87																																					
BARB04	0.43	58.5		■				■		■			3					●	1	●				●	●			●	●	●		6	0.33	2.33
Dry Run (Scioto R. @134.43)																																					
DRY02	2.75	54.0		■				■					2				●	●	2	●	●			●	●			●	●	●		7	1	4.5
DRY01	1.41	67.5		■		■	■	■		■	■	■	7						0	●				●				●				3	0	0.43
DRY03	0.08	60.5		■				■		■	■		4						0	●				●	●			●		●		5	0	1.25
Trabue Run (Tributary to Barbee Ditch @RM 1.39)																																					
TRB03	2.18	65.3		■		■	■	■			■	■	6						0	●	●			●				●	●			5	0	0.83
TRB02	1.00	76.5	■	■		■	■	■			■	■	7						0		●							●	●			3	0	0.43
TRB01	0.05	67.5		■		■	■	■	■	■	■	■	8						0	●	●				●				●	●		5	0	0.63
Unnamed Tributary to Dry Run@RM 1.61																																					
DRY09	2.40	56.5		■				■			■		3	●		●			2	●	●			●				●	●	●		6	0.67	2.67
DRY08	1.11	67.3		■				■			■		3						0	●				●	●			●	●	●		6	0	2
DRY05	0.75	71.3	■	■		■	■	■			■	■	7						0	●								●	●			3	0	0.43
DRY04	0.10	67.0		■		■		■	■	■	■		6						0	●				●	●					●		4	0	0.67
Unnamed Tributary to Dry Run @RM 2.61																																					
DRY07	1.74	56.5		■				■		■			3	●		●		●	3				●	●	●			●		●		5	1	2.67
DRY06	0.40	45.5		■				■			■		3	●		●	●		3					●	●			●	●	●		5	1	2.67
QHEI Narrative	Excellent	>70											≥8						0													≤1	<0.20	≤0.50
	Good	>55											≥6						0													≤4	<0.50	≤2.00
	Fair	>43											≥3						1													≤5	>1.00	>2.00
	Poor	>30											≥2						2													≥6	>2.00	>6.00
	Very Poor	<30											≤1						3													≥7	>4.00	>10.00

***Table 11**. continued.*

			No Channelization	Boulder, Cobble, Gravel	Silt Free	Good-Excellent Development	Moderate-High Sinuosity	Moderate-Extensive Cover	Fast Flow w Eddies	Little to No Embeddedness	Max Depth > 40 cm	No Riffle Embeddedness	Good Habitat Attributes	Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparse No Cover	Max Depths <40 cm	High Influence Poor Attributes	Recovering from Channelization	Mod-High Silt Cover	Sand Substrates (Boatable sites)	Hardpan Origin	Fair- Poor Development	Low Sinuosity	< 2 Cover Types	Intermittent Flow or Pools <20 cm	No Fast Current Types	Mod-Extensive Embeddedness	Mod-Extensive Riffle Embeddedness	No Riffle	Poor Habitat Attributes	Ratio of Modified (High) to Good	Ratio of Modified (All) to Good
Evans Run (Scioto R. @136.97)																																	
SCC01	0.10	**67.5**	■	■	■	■		■	■	■	■	■	**9**						**0**	●					●							**2**	**0**	**0.22**
Kian Run (Scioto R. @126.5)																																	
KR02	0.82	**49.0**						■			■		**2**		●				**1**	●	●			●	●			●	●		●	**7**	**0.5**	**4**
KR01	0.05	**49.0**						■			■		**2**	●	●	●			**3**		●			●	●			●	●		●	**6**	**1.5**	**4.5**
QHEI Narrative	**Excellent**	>70											≥8						0													≤1	<0.20	≤0.50
	Good	>55											≥6						0													≤4	<0.50	≤2.00
	Fair	>43											≥3						1													≤5	>1.00	>2.00
	Poor	>30											≥2						2													≥6	>2.00	>6.00
	Very Poor	<30											≤1						3													≥7	>4.00	>10.00

develop a matrix of good and modified habitat attributes (after Rankin 1995) for each site in the Olentangy River tributaries study area (Table 10). The matrix includes an accounting of the number good and modified habitat attributes (Rankin 1989, 1995) and their ratio. Modified attributes are subdivided between high and moderate influence as defined by Rankin (1989) based on an analysis of the Ohio statewide database. The analysis was detailed for the headwater site type, i.e., sites with drainage areas <20 mi.^{2}.

In terms of QHEI scores only four sites were less than the 55 good value with DRY02 having a score of 54.0 and DRY06 a score of 45.5, which is close to the poor boundary. Kian Run, which is now designated MWH had QHEI scores of 49.0 that are consistent with that designation and the highest number of high influence modified attributes. In terms of the QHEI matrix (excluding Kian Run), modified attributes outnumbered good attributes at eight (8) sites and by more than two at six (6) of those sites. Five (5) sites had poor or very poor numbers of modified attributes and eight (8) sites had at least one high influence modified attribute. None of the sites had poor or very poor modified:good attribute ratios, but four (4) had ratios >2.00 including a ratio of 4.50 at DRY02. The tendency in these results is that the predominance by modified attributes occurred at the smallest headwater sites. The habitat at all sites was adequate for the WWH designation based on adequate QHEI score and a preponderance of modified:good ratios of less than 2.0.

Biological Assemblages – Fish

The fish assemblages of the 2024 study area have been assessed in the prior years of 1994, 1996, 1995, 1997, 1998, and 2023, but only at a total of 10 sites. The 2024 survey is the most comprehensive one conducted to date. This analysis focuses on the 2024 results and what the data adds to the understanding of the quality and condition of the fish assemblages in these small, urbanized head water streams. An assessment of historical trends is limited by the span of the historical data and the few sites that were previously assessed Summarized data tables for 2024 appear in Appendix B.

2024 Fish Assemblage Results

A total of 15 native species, one non-native species, and two hybrids among 3,410 fish counted from the 24 sites sampled in 2024 (Appendix B). The site at RMD01 downstream from the quarry pond at the Quarry Run Metropark was not sampled due to a lack of sufficient water levels. Creek Chub (*Semotilus atromaculatus*) was the most common species comprising 52.9% by numbers. This was followed by Green Sunfish *(Lepomis cyanellus)* at 22.3%, Central Stoneroller *(Campostoma anomalum)* at 14.9%, White Sucker (*Catostomus commersonii*) at 4.3%, and Western Blacknose Dace *(Rhinichthys obtusus)* at 1.70%. The remaining 13 species and two hybrids comprised 3.9% by numbers. Four (4) out of the top five (5) species are highly tolerant with four moderately tolerant species that were represented by 7, 5, 3, and 2 individuals, respectively, and the remaining species being intermediate, moderately tolerant, or highly tolerant. Species such as Creek Chub and Western Blacknose Dace are common in small headwater streams with the latter an indication of permanent flow, but several of the other

species can be transient in flow variable streams. On the positive side there were 38 fantail darters, a flow dependent species, and 7 Rainbow Darters *(Etheostoma caeruleum),* a moderately intolerant species that is also an indicator of permanent flow.

To evaluate the overall quality of the fish assemblages and to gauge attainment of the numerical biological criteria the IBI derived and calibrated for headwater streams draining <20 $mi.^2$ was used. Other fish metrics were also examined including the number of native species, %DELT anomalies, the number of sensitive fish species, the %simple lithophils, and %tolerant fish were also examined for each site to gauge the response types exhibited by the fish assemblage (Table 12).

IBI scores in in 2024 ranged from 22-40 with the site TRB01 (RM 0.05) the only site being in attainment of the WWH ecoregional biocriterion of 40. Sixteen (16) sites had fair IBI scores of 26-32 with the remainder in the upper range of the poor narrative (Table 12.) This pattern was tracked by the number of native species that was 11 at TRB01, 8 at DRY03, 7 at DRY06, and 7 at BARB01. DELT anomalies were zero at all except DRY01 which had 0.35%. Sensitive species occurred at only 3 sites with two each at BARB01, DRY03, and TRB01. The percentage of simple lithophils was fair at only four (4) sites in 2024 compared to poor at six (6) sites and very poor at the remaining 14 sites. Tolerant species predominated by numbers at all sites in 2024 resulting in a consistent poor or very poor rating for this metric at all except one site BARB01 that was rated as fair. Overall the fish assemblage exhibited characteristics typical of small, urban headwater streams, but the attainment at TRB01 is unusual against the backdrop of nearly all urbanized sites in Ohio being impaired for WWH (Yoder et al. 2000). The attainment of the WWH IBI biocriterion was a significant improvement over the 1994 (26, poor) and 2010 (32, fair) IBI scores of mostly poor quality at all other historic sites in the 2024 study area.

2024 Macroinvertebrate Assemblage Results

A total of 123 macroinvertebrate taxa were collected in qualitative dip net, handpick samples from 25 sites in the 2024 study area (Appendix C). The most commonly collected taxa in terms of site occurrences were segmented worm Oligochaeta (20 sites), the flatworm Turbellaria (19 sites), the mayfly *Baetis flavistriga* (18 sites), the damselfly Coenagrionidae (16 sites), the darner *Argia sp.* (16 sites), the snail *Physella sp.* (16 sites), the amphipod *Hyalella azteca* (14 sites), the caddisfly *Cheumatopsyche sp.* (14 sites), the cranefly *Tipula sp.* (14 sites), the caddisfly *Hydropsyche depravata* group (13 sites), the blackfly *Simulium sp.* (13 sites), the non-biting midge *Ablabesmyia mallochi* (13 sites), the midge *Polypedilum (P.) illinoense* (13 sites), and the midge *Paratanytarsus sp.* (12 sites). Of these most frequently occurring taxa four (4) are highly tolerant and the remainder are all facultative in their tolerance rankings.

To evaluate the overall quality of macroinvertebrate assemblages and gauge attainment of the biological criteria, narrative ratings of the qualitative sample are used in lieu of the ICI are used in small headwater streams (Table 13). Other macroinvertebrate metrics and attributes were also examined including the total number of taxa, the number of sensitive taxa, the number of Mayfly taxa, the number of qualitative EPT taxa, the number of toxic tolerant taxa, and the

***Table 12**. Fish assemblage response indicators in the 2024 study area. The results for each indicator are color coded in accordance with the key at the bottom of the table.*

Site ID	River Mile	Drainage Area (sq. mi.)	IBI	Number of Species	%DELT Anomalies	Sensitive Species	% Simple Lithophils	% Tolerants
Roberts Millikin Ditch (Scioto R. @137.52)								
RMD03	2.75	0.61	26	3	0	0	0.43	100.00
RMD02	1.59	1.03	26	4	0	0	0.56	98.02
Tributary to Roberts Millikin Ditch @RM 0.40								
RMD04	0.39	2.90	22	2	0	0	0.00	100.00
Barbee Ditch (Scioto R. @RM 135.75)								
BARB03	2.76	0.90	24	2	0	0	0.00	100.00
BARB02	1.51	2.36	26	6	0	0	1.35	66.22
BARB01	0.34	5.88	32	7	0	2	6.32	42.11
Tributary to Trabue Run @RM 2.7								
TRB04	0.22	0.04	26	3	0	0	0.00	90.32
Tributary to Trabue Run @RM 1.21								
TRB05	0.90	0.82	32	5	0	0	2.82	65.49
Tributary @RM 0.5 to Tributary to Barbee Ditch @RM 1.87								
BARB04	0.43	0.95	30	4	0	0	0.00	71.70
Trabue Run (Tributary to Barbee Ditch @RM 1.39)								
TRB03	2.18	0.63	30	5	0	0	5.51	91.34
TRB02	1.00	2.60	26	6	0	0	8.45	80.99
TRB01	0.05	3.00	40	11	0	2	9.09	62.73
Dry Run (Scioto R. @134.43(								
DRY02	2.75	0.75	32	5	0	0	7.79	92.21
DRY01	1.41	7.24	24	6	0.35	0	15.09	92.98
DRY03	0.08	7.86	28	8	0	2	15.71	61.43
Tributary to Dry Run @RM 1.61								
DRY09	2.40	1.28	20	2	0	0	0.00	100.00
DRY08	1.11	2.57	26	5	0	0	18.52	91.11
DRY05	0.75	2.73	32	5	0	0	3.97	51.59
DRY04	0.10	3.43	26	6	0	0	18.62	94.74
Tributary to Dry Run @RM 2.61								
DRY07	1.74	1.37	30	5	0	0	2.42	77.78
DRY06	0.40	2.15	30	7	0	0	6.31	70.27
Evans Ditch (Scioto R. @RM 136.97)								
SCC01	0.10	1.39	30	6	0	0	0.00	84.29
Kian Run (Scioto R. @126.5)								
KR02	0.82	1.36	28	4	0	0	0.55	99.45
KR01	0.05	9.44	28	8	0	2	9.73	80.53
Narrative Ranking Thresholds	**Excellent**		44-60	>25	0.0	>15	>30	<15
	Good		38-43	>14	<1.3	11-15	>20-30	>15-30
	Fair		26-37	>10	<3.0	3-10	>10-20	>30-50
	Poor		19-25	≥7	>10	1-2	>5-10	>50-70
	Very Poor		12-18	<7	>20	0	<5	>70

***Table 13**. Macroinvertebrate assemblage response indicators in the 2024 study area. The results for each indicator are color coded in accordance with the key at the bottom of the table.*

Site ID	River Mile	Drainage Area (sq mi)	Narrative	Total Site Taxa	Sensitive Taxa	Mayfly Taxa	Qual EPT Taxa	Toxic Tolerant Taxa	Org. Enrich. Taxa
Roberts Millikin Ditch									
RMD03	2.80	0.61	P	21	0	1	2	1	6
RMD02	1.50	1.03	P	28	0	1	3	1	5
RMD01	0.10	3.25	F	26	1	5	5	1	5
Unnamed Tributary to Roberts Millikin Ditch @ RM 0.40									
RMD04	0.00	2.90	P	21	0	2	4	1	5
Barbee Ditch (Scioto R. @RM 135.75)									
BARB03	2.70	0.90	P	21	0	1	3	0	3
BARB02	1.45	2.36	VP	15	0	1	1	1	4
BARB01	0.30	5.88	P	31	2	1	3	1	5
Trabue Run (Tributary to Barbee Ditch @RM 1.39)									
TRB03	2.20	0.63	F	25	1	3	6	0	2
TRB02	1.05	2.60	HF	32	3	4	8	0	4
TRB01	0.13	3.00	MG	37	5	3	7	1	3
Unnamed Tributary to Trabue Run @RM 1.21									
TRB05	0.85	0.82	F	23	1	2	6	0	3
Unnamed Tributary to Trabue Run @RM 2.7									
TRB04	0.22	0.22	LF	26	1	2	5	0	2
Unnamed Tributary @RM 0.5 to Unnamed Tributary to Barbee Ditch @RM 1.87									
BARB04	0.43	0.95	VP	12	0	0	0	1	4
Dry Run									
DRY02	2.61	0.75	MG	27	2	4	8	2	2
DRY01	1.25	7.24	F	34	2	5	7	1	2
DRY03	0.10	7.86	LF	34	1	4	5	1	5
Unnamed Tributary to Dry Run@RM 1.61									
DRY09	2.45	1.28	P	29	0	2	3	1	6
DRY08	1.00	2.57	HF	26	3	3	7	0	7
DRY05	0.75	2.73	F	37	0	4	7	1	7
DRY04	0.14	3.43	F	29	2	3	6	1	5
Unnamed Tributary to Dry Run @ RM 2.61									
DRY07	1.74	1.37	F	42	2	4	5	0	6
DRY06	0.34	2.15	MG	39	4	5	10	1	4
Evans Run (Scioto R. @RM 136.97)									
SCC01	0.10	1.39	VP	8	0	0	0	0	1
Kian Run (Scioto R. @126.5)									
KR02	0.80	1.36	P	11	0	0	2	0	2
KR01	0.05	9.44	VP	6	0	0	0	0	1
Narrative Ranking Thresholds			E	>60	>16	> 7	>15	0	0
			G	>40-60	11-16	4-6	11-15	1	≤2
			F	>20-40	6-10	2-3	6-10	≥2	≤5
			P	>10-20	2-5	1	2-5	≥3	≤8
			VP	<10	<2	0	<2	≥4	≥9

number of organic tolerant taxa were also examined for each site to gauge the response types exhibited by the macroinvertebrate assemblage.

The macroinvertebrate narrative ratings in the 2024 study area were marginally good which marginally meets WWH at three (3) sites, fair at 11 sites, poor at seven (7) sites, and very poor at four (4) sites (Table 13). Total taxa counts were good at DRY07, fair at 19 sites, poor at three (3) sites, and very poor at two (2) sites. Sensitive taxa were poor at best at nine (9) sites and very poor at the remaining 16 sites being absent altogether at 11 sites. Mayfly taxa were good at eight (8) sites, fair at eight (8) sites, poor at five (5) sites, and very poor at four (4) sites. The number of qualitative EPT taxa ranged from 0-10 being fair at best at 10 sites, poor at 11 sites, and very poor at four (4) sites. Toxic tolerant taxa numbered no more than 1 (good) at 14 sites, zero (excellent) at 10 sites, and two (2) a fair rating at DRY02. Organic enrichment taxa signifying the presence of organic enrichment sources and pollutants ranged from 1-7 taxa with two (2) sites with a single taxon (good), 11 sites with 2-4 taxa (fair), and 11 sites with 5-8 taxa(poor) signifying the highest risk for organic pollution. These most consistently occurred in the Dry Run and Roberts Millikin Ditch subwatersheds.

Primary Headwater Habitat Assessment Results

Sixteen (16) of the 25 sites were also assessed with the Primary Headwater Habitat methodology (Ohio EPA 2020b) that employed the collection of salamanders and the Headwater Habitat Evaluation Index (HHEI; Appendix D-3) in addition to the WWH suite of habitat and biological assessment methods (QHEI, fish, qualitative macroinvertebrates). Nine of these sites were classified as PHW2 sites with sufficient macroinvertebrate taxa, no salamanders, and limited fish assemblages due to the small stream size characteristics such as pools <20 cm in depth. While Ohio EPA still does not recognize the Primary Headwater Habitat classification as a designated aquatic life use, it is to be treated the same as WWH for water quality management purposes.

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APPENDIX A: 2024 Site Characteristics and Location Data

***Appendix Table A-1**. Site location characteristics, indicators, and parameters at 25 sites sampled in the 2024 Roberts Millikin Ditch, Barbee Ditch, Dry Run, Evans Run, and Kian Run study area.*

Site_ID	Ohio EPA Basin-Stream Code		River_Stream	River Mile	Drainage Area ($mi.^2$)	Gradient (ft./mi.)	General Location	Latitude	Longitude	Fish	Macro-inverts.	Habitat	Data-sonde	Field Chem	Demand	Nutrient	Metals	Bacteria	Sediment Chemistry
Roberts Millikin Ditch (Scioto R. @137.52)																			
RMD02	02	937	Roberts Millikin Ditch	0.65	1.20	62.5	Roberts road	40.0037°	-83.1072°	E	QL/PHW	QHEI/HHEI		5X	4X	4X	2X	4X	X
RMD03	02	937	Roberts Millikin Ditch	0.65	1.20	71.4	Ust. I-270; Ust Westbelt Drive	40.0085°	-83.1229°	E,F	QL/PHW	QHEI/HHEI		5X	4X	4X	2X	4X	X
RMD01	02	937	Roberts Millikin Ditch	0.20	4.40	75.0	Quarry Trails Dr. (Walking Bridge)	39.9984°	-83.0815°	E	QL	QHEI	X	5X	4X	4X	2X	4X	X
Unnamed Tributary to Roberts Millikin Ditch @RM 0.40																			
RMD04	02	938	UT to Roberts Millikin Ditch @RM 0.2	0.30	2.30	250.0	Quarry Trail Metro Park (off Old Dublin Rd.) below the falls	39.9987°	-83.0895°	E	QL/PHW	QHEI/HHEI		5X	4X	4X	2X	4X	X
Barbee Ditch (Scioto R. @RM135.75)																			
BARB03	02	932	Barbee Ditch (Trib To Scioto River at RM 135.75)	2.70	1.20	27.80	Wilson Road	39.9852°	-83.1061°	E	QL/PHW	QHEI/HHEI		5X	4X	4X	2X	4X	X
BARB02	02	932	Barbee Ditch (Trib To Scioto River at RM 135.75)	1.45	3.20	34.50	Hague Ave	39.9820°	-83.0866°	E	QL	QHEI	X	5X	4X	4X	2X	4X	X
BARB01	02	932	Barbee Ditch (Trib To Scioto River at RM 135.75)	0.30	5.80	41.70	McKinley Ave near Police Academy	39.9786°	-83.0689°	E	QL	QHEI	X	5X	4X	4X	2X	4X	X
Trabue Run (Tributary to Barbee Ditch @RM 1.39)																			
TRB03	02	266	Trabue Run (Trib to Barbee Ditch @ RM 1.39)	2.20	0.50	58.80	Dst Dividend Drive	39.9910°	-83.1214°	E,F	QL/PHW	QHEI/HHEI		5X	4X	4X	2X	4X	X
TRB02	02	266	Trabue Run (Trib to Barbee Ditch @ RM 1.39)	1.10	1.00	45.50	Trabue Rd	39.9899°	-83.1004°	E,F	QL/PHW	QHEI/HHEI		5X	4X	4X	2X	4X	X
TRB01	02	266	Trabue Run (Trib to Barbee Ditch @ RM 1.39)	0.13	1.40	24.40	Hague Ave	39.9840°	-83.0879°	E	QL/PHW	QHEI/HHEI		5X	4X	4X	2X	4X	X
Unnamed Tributary to Trabue Run @RM 1.21																			
TRB05	02	934	UT to Trabue Run at RM 1.21	0.60	0.50	58.8	Arlingate Ln.	39.9955°	-83.1164°	E,F	QL/PHW	QHEI/HHEI		5X	4X	4X	2X	4X	X
Unnamed Tributary to Trabue Run @RM 2.7																			
TRB04	02	933	UT to Trabue Run at RM 2.7	0.30	0.22	17.9	Behind Westbelt historic Ohio EPA site	39.9878°	-83.1271°	E,F	QL/PHW	QHEI/HHEI		5X	4X	4X	2X	4X	X
Unnamed Tributary @RM 0.5 to Unnamed Tributary to Barbee Ditch @RM 1.87																			
BARB04	02	935	Trib to Barbee Ditch @ RM 1.87	0.45	1.80	52.6	Wilson road	39.9789°	-83.1020°	E,F	QL/PHW	QHEI/HHEI		5X	4X	4X	2X	4X	X
Dry Run (Scioto R. @134.43)																			
DRY02	02	095	Dry Run	2.70	0.95	33.30	Drive off of Hague Ave	39.9730°	-83.0839°	E,F	QL/PHW	QHEI/HHEI		5X	4X	4X	2X	4X	X
DRY01	02	095	Dry Run	1.70	4.00	49.80	Holton Park (Channel daylighting Restoration Site)	39.9619°	-83.0685°	E	QL	QHEI	X	5X	4X	4X	2X	4X	X
DRY03	02	095	Dry Run	0.10	7.10	41.70	Mckinley Ave	39.9642°	-83.0497°	E	QL	QHEI	X	5X	4X	4X	2X	4X	X
Unnamed Tributary to Dry Run@RM 1.61																			
DRY09	02	930	Trib to Dry Run at RM 1.61	2.40	1.29	31.30	Site of Old USGS Gauge, Back of Parking Lot	39.9564°	-83.1049°	E,F	QL/PHW	QHEI/HHEI		5X	4X	4X	2X	4X	X
DRY08	02	930	Trib to Dry Run at RM 1.61	1.00	2.68	32.30	Westmoor Park, Ust Restored Stream Reach	39.959268°	-83.0835°	E	QL	QHEI		5X	4X	4X	2X	4X	X
DRY05	02	930	Trib to Dry Run at RM 1.61	0.60	2.94	42.60	Westmoor Middle School	39.9607°	-83.0796°	E,F	QL	QHEI		5X	4X	4X	2X	4X	X
DRY04	02	930	Trib to Dry Run at RM 1.61	0.10	2.10	29.41	Valley View Drive	39.9635°	-83.0711°	E	QL/PHW	QHEI/HHEI		5X	4X	4X	2X	4X	X
Unnamed Tributary to Dry Run @ RM 2.61																			
DRY07	02	931	Trib to Dry Run at RM 2.61	1.70	1.00	37.00	Phillipi Road	39.9660°	-83.1115°	E,F	QL/PHW	QHEI/HHEI		5X	4X	4X	2X	4X	X
DRY06	02	931	Trib to Dry Run at RM 2.61	0.34	2.30	64.90	Drive off Fisher Road	39.9700°	-83.0877°	E	QL/PHW	QHEI/HHEI	X	5X	4X	4X	2X	4X	X
Evans Run (Scioto R. @136.97)																			
SCC01	02	939	Evans Run (Trib. to Scioto R. @RM 136.97)	0.20	1.70	250.0	Scioto Point Dr.	39.9953°	83.0732°	E	QL/PHW	QHEI/HHEI		5X	4X	4X	2X	4X	X
Kian Run (Scioto R. @126.5)																			
KR02	02	197	Kian run	0.80	1.00	35.70	High Street	39.9098°	-82.9959°	E,F	QL/PHW	QHEI/HHEI		5X	4X	4X	2X	4X	X
KR01	02	197	Kian Run	0.10	1.85	12.30	Access from Scioto	39.9023°	-83.0009°	E	QL/PHW	QHEI/HHEI		5X	4X	4X	2X	4X	X
Footnotes: UT - Unnamed tributary; RM - River Mile									**Total Sites**	**25**	**25**	**25**	**6**	**25**	**25**	**25**	**25**	**25**	**25**

***Appendix Table A-1**. Legend.*

Indicator Groups & Parameters							
Fish		**Field**	**Demand**	**Nutrients**	**Metals**	**Bacteria**	**Sed. Metals**
E - Longline		Temp.	BOD5	NH3-N	Cu	*E. coli*	Cd
F - Backpack		Conduct.	Chloride	NO3-N	Pb		Cu
Macroinvertebrates		D.O.	Sulfate	NO2-N	Zn		Pb
QL - Qualitative method		pH	TDS	TKN	TSS		Zn
PHW - Primary Headwater method				Total P	Cond.	Total P	Ni
Habitat				Ortho P	pH	Ortho P	Fe
QHEI - Qualitative Habitat Evaluation Index				Ben. Chla		Ben. Chla	As
HHEI - Headwater Habitat Evaluation Index							Ag
Datasonde - short-term (4-5 days)				Limited to 50 total samples			Cr
				Only at 6 Datasonde locations			**Sed. Organics**
							BNAs
							VOCs
							PAHs
							Pesticides

APPENDIX B: 2024 FISH ASSEMBLAGE DATA

B-1: IBI Metrics and IBI Scores 2024
B-2: Fish Species Grand Report 2024
B-3: Fish Species by Site and Sample 2024

Appendix Table B-1. Headwater IBI scores and metrics for sites sampled in Columbus 2024 study area.

Site ID	River Mile	Type	Date	Drainage area (sq mi)	Number of: Total species	Minnow species	Headwater species	Sensitive species	Darter & Sculpin species	Simple Lithophils	Percent of Individuals: Tolerant fishes	Omni-vores	Pioneering fishes	Insect-ivores	DELT anomalies	Rel.No. minus tolerants /(0.3km)	IBI
(02-095) - Dry Run																	
Year: 2024																	
DRY02	2.75	F	07/23/2024	0.75	5(3)	3(3)	2(3)	0(1)	1(3)	2(5)	92(1)	6(5)	84(1)	1(1)	0.0(5)	24(1)	32
DRY01	1.41	E	07/25/2024	7.24	6(1)	3(3)	2(3)	0(1)	1(1)	2(1)	93(1)	11(5)	78(1)	15(1)	0.4(5)	40(1)	24
DRY03	0.08	F	07/24/2024	7.86	8(3)	2(1)	1(1)	2(1)	3(3)	2(1)	61(1)	6(5)	59(1)	50(5)	0.0(5)	54(1) *	28
(02-197) - Kian Run																	
Year: 2024																	
KR02	0.82	F	07/25/2024	1.36	4(3)	2(3)	1(1)	0(1)	1(3)	1(1)	99(1)	0(5)	100(1)	21(3)	0.0(5)	2(1)	28
KR01	0.05	E	07/25/2024	9.44	8(3)	4(3)	0(1)	2(1)	1(1)	2(1)	81(1)	4(5)	81(1)	93(5)	0.0(5)	44(1)	28
(02-266) - Trabue Run (Trib to Barbee Ditch @ RM 1.39)																	
Year: 2024																	
TRB03	2.18	F	07/16/2024	0.63	5(3)	2(3)	0(1)	0(1)	0(1)	1(3)	91(1)	6(5)	86(1)	34(5)	0.0(5)	22(1)	30
TRB02	1.00	F	07/15/2024	2.60	6(3)	2(1)	1(1)	0(1)	1(1)	1(1)	81(1)	9(5)	73(1)	40(5)	0.0(5)	54(1)	26
TRB01	0.05	F	07/23/2024	3.00	11(5)	2(1)	1(1)	2(3)	3(5)	2(3)	63(1)	8(5)	55(3)	37(5)	0.0(5)	82(3)	40
(02-930) - Trib to Dry Run at RM 1.61																	
Year: 2024																	
DRY09	2.40	F	07/26/2024	1.28	2(1)	1(1)	0(1)	0(1)	0(1)	0(1)	100(1)	0(5)	100(1)	10(1)	0.0(5)	0(1) *	20
DRY08	1.11	F	07/24/2024	2.57	5(3)	3(3)	1(1)	0(1)	0(1)	2(3)	91(1)	10(5)	73(1)	2(1)	0.0(5)	24(1)	26
DRY05	0.75	F	07/24/2024	2.73	5(3)	3(3)	1(1)	0(1)	0(1)	2(3)	52(3)	2(5)	48(3)	1(1)	0.0(5)	244(3)	32
DRY04	0.10	F	07/24/2024	3.43	6(3)	3(3)	2(3)	0(1)	1(1)	2(1)	95(1)	10(5)	76(1)	5(1)	0.0(5)	26(1)	26
(02-931) - Trib to Dry Run at RM 2.61																	
Year: 2024																	
DRY07	1.74	F	07/24/2024	1.37	5(3)	2(3)	0(1)	0(1)	0(1)	1(1)	78(1)	2(5)	75(1)	31(5)	0.0(5)	92(3)	30
DRY06	0.40	F	07/24/2024	2.15	7(3)	3(3)	1(1)	0(1)	0(1)	2(3)	70(1)	6(5)	64(1)	21(3)	0.0(5)	198(3)	30

♦ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Appendix Table B-1. Headwater IBI scores and metrics for sites sampled in Columbus 2024 study area.

Site ID	River Mile	Type	Date	Drainage area (sq mi)	Number of: Total species	Minnow species	Headwater species	Sensitive species	Darter & Sculpin species	Simple Lithophils	Percent of Individuals: Tolerant fishes	Omni-vores	Pioneering fishes	Insect-ivores	DELT anomalies	Rel.No. minus tolerants /(0.3km)	IBI
(02-932) - Barbee Ditch (Trib To Scioto River at RM 135.75)																	
Year: 2024																	
BARB03	2.76	F	07/15/2024	0.90	2(1)	1(1)	0(1)	0(1)	0(1)	0(1)	100(1)	0(5)	100(1)	23(5)	0.0(5)	0(1) *	24
BARB02	1.51	F	07/16/2024	2.36	6(3)	2(1)	0(1)	0(1)	0(1)	1(1)	66(1)	1(5)	65(1)	30(5)	0.0(5)	50(1) *	26
BARB01	0.34	F	07/23/2024	5.88	7(3)	2(1)	1(1)	2(1)	3(3)	2(1)	42(3)	0(5)	42(3)	41(5)	0.0(5)	110(1) *	32
(02-933) - UT to Trabue Run at RM 2.7																	
Year: 2024																	
TRB04	0.22	F	07/16/2024	0.04	3(1)	2(3)	0(1)	0(1)	0(1)	0(1)	90(1)	0(5)	90(1)	26(5)	0.0(5)	18(1) *	26
(02-934) - UT to Trabue Run at RM 1.21																	
Year: 2024																	
TRB05	0.90	F	07/16/2024	0.82	5(3)	2(3)	0(1)	0(1)	0(1)	1(3)	65(1)	3(5)	63(1)	13(3)	0.0(5)	235(5)	32
(02-935) - Trib to Barbee Ditch @ RM 1.87																	
Year: 2024																	
BARB04	0.43	F	07/16/2024	0.95	4(3)	2(3)	0(1)	0(1)	0(1)	0(1)	72(1)	0(5)	72(1)	64(5)	0.0(5)	30(3) *	30
(02-937) - Roberts Millikin Ditch (02-001-011)																	
Year: 2024																	
RMD03	2.75	F	07/15/2024	0.61	3(1)	1(1)	0(1)	0(1)	0(1)	1(3)	100(1)	0(5)	100(1)	67(5)	0.0(5)	0(1)	26
RMD02	1.59	F	07/15/2024	1.03	4(3)	1(1)	0(1)	0(1)	0(1)	1(1)	98(1)	1(5)	98(1)	35(5)	0.0(5)	14(1)	26
(02-938) - Tirb to Roberts Millikin Ditch (02-001-011)																	
Year: 2024																	
RMD04	0.39	F	07/15/2024	2.90	2(1)	1(1)	0(1)	0(1)	0(1)	0(1)	100(1)	0(5)	100(1)	24(3)	0.0(5)	0(1) *	22
(02-939) - Scioto CC Creek @ RM 136.97 To Scioto (Evans Run)																	
Year: 2024																	
SCC01	0.10	F	07/23/2024	1.39	6(3)	2(3)	0(1)	0(1)	1(3)	0(1)	84(1)	3(5)	84(1)	47(5)	0.0(5)	22(1) *	30

♦ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Appendix B-2: Midwest Biodiversity Institute
Fish Species List - Grand Totals

Rivers: *Dry Run; Kian Run; Trabue Run; Trib to Dry Run at RM 1.61; Trib to Dry Run at RM 2.61; Barbee Ditch (Trib To Scioto River at RM 135.75); UT to Trabue Run at RM 2.7; UT to Trabue Run at RM 1.21; Trib to Barbee Ditch @ RM 1.87*

Years: 2024

Number of Samples: 24 Data Sources: 99 Data Types: E; F

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-015	Northern Hog Sucker	I	M	S	R	1	0.1	0.03	0	***.**	0.0
40-016	White Sucker	O	T	S	W	148	12.7	3.92	0	***.**	0.0
43-001	Common Carp	O	T	M	G	2	0.2	0.05	0	***.**	0.0
43-011	Western Blacknose Dace	G	T	S	N	59	5.1	1.56	0	***.**	0.0
43-013	Creek Chub	G	T	N	N	1974	169.8	52.28	0	***.**	0.0
43-025	Striped Shiner	I		S	N	10	0.9	0.26	0	***.**	0.0
43-032	Spotfin Shiner	I		M	N	6	0.5	0.16	0	***.**	0.0
43-043	Bluntnose Minnow	O	T	C	N	5	0.4	0.13	0	***.**	0.0
43-044	Central Stoneroller	H		N	N	507	43.6	13.43	0	***.**	0.0
47-004	Yellow Bullhead	I	T	C		2	0.2	0.05	0	***.**	0.0
57-001	Western Mosquitofish	I		N	E	1	0.1	0.03	0	***.**	0.0
77-004	Smallmouth Bass	C	M	C	F	3	0.3	0.08	0	***.**	0.0
77-006	Largemouth Bass	C		C	F	57	4.9	1.51	0	***.**	0.0
77-008	Green Sunfish	I	T	C	S	913	78.5	24.18	0	***.**	0.0
77-009	Bluegill	I	P	C	S	20	1.7	0.53	0	***.**	0.0
77-011	Longear Sunfish	I	M	C	S	1	0.1	0.03	0	***.**	0.0
77-015	Green X Bluegill					8	0.7	0.21	0	***.**	0.0
77-999	HYBRID X Sunfish					1	0.1	0.03	0	***.**	0.0
80-011	Logperch	I	M	S	D	2	0.2	0.05	0	***.**	0.0
80-014	Johnny Darter	I		C	D	6	0.5	0.16	0	***.**	0.0
80-015	Greenside Darter	I	M	S	D	5	0.4	0.13	0	***.**	0.0
80-022	Rainbow Darter	I	M	S	D	7	0.6	0.19	0	***.**	0.0
80-024	Fantail Darter	I		C	D	38	3.3	1.01	0	***.**	0.0

No Species: 23 **Nat. Species:** 19 **Hybrids:** 2 **Total Counted:** 3776 **Total Rel. Wt. :** 0

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: DRY02 River: 02-095 Dry Run RM: 2.75 Date: 07/23/2024

Time Fished: 1130 Distance: 0.150 Drainge (sq mi): 0.7 Depth: 0

Location: Drive off of Hague Ave Lat: 39.97314 Long: -83.08482

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	9	18.0	5.84	0	0.00	0.0
43-011	Western Blacknose Dace	G	T	S	N	3	6.0	1.95	0	0.00	0.0
43-013	Creek Chub	G	T	N	N	130	260.0	84.42	0	0.00	0.0
43-044	Central Stoneroller	H		N	N	11	22.0	7.14	0	0.00	0.0
80-024	Fantail Darter	I		C	D	1	2.0	0.65	0	0.00	0.0

No Species: 5 **Nat. Species:** 5 **Hybrids:** 0 **Total Counted:** 154 **Total Rel. Wt. :** 0

IBI: 32.0 **Mlwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: DRY01 River: 02-095 Dry Run RM: 1.41 Date: 07/25/2024

Time Fished: 1982 Distance: 0.150 Drainge (sq mi): 7.2 Depth: 0

Location: Holton Park Lat: 39.96136 Long: -83.06868

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	30	60.0	10.53	0	0.00	0.0
43-001	Common Carp	O	T	M	G	1	2.0	0.35	0	0.00	0.0
43-011	Western Blacknose Dace	G	T	S	N	13	26.0	4.56	0	0.00	0.0
43-013	Creek Chub	G	T	N	N	182	364.0	63.86	0	0.00	0.0
43-044	Central Stoneroller	H		N	N	17	34.0	5.96	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	39	78.0	13.68	0	0.00	0.0
80-024	Fantail Darter	I		C	D	3	6.0	1.05	0	0.00	0.0

No Species: 7 **Nat. Species:** 6 **Hybrids:** 0 **Total Counted:** 285 **Total Rel. Wt. :** 0

IBI: 24.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: DRY03 River: 02-095 Dry Run RM: 0.08 Date: 07/24/2024

Time Fished: 1434 Distance: 0.150 Drainge (sq mi): 7.8 Depth: 0

Location: Mckinley Ave Lat: 39.96502 Long: -83.04979

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	4	8.0	5.71	0	0.00	0.0
43-013	Creek Chub	G	T	N	N	21	42.0	30.00	0	0.00	0.0
43-044	Central Stoneroller	H		N	N	8	16.0	11.43	0	0.00	0.0
77-004	Smallmouth Bass	C	M	C	F	1	2.0	1.43	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	18	36.0	25.71	0	0.00	0.0
77-999	HYBRID X Sunfish					1	2.0	1.43	0	0.00	0.0
80-014	Johnny Darter	I		C	D	2	4.0	2.86	0	0.00	0.0
80-022	Rainbow Darter	I	M	S	D	7	14.0	10.00	0	0.00	0.0
80-024	Fantail Darter	I		C	D	8	16.0	11.43	0	0.00	0.0

No Species: 8 **Nat. Species:** 8 **Hybrids:** 1 **Total Counted:** 70 **Total Rel. Wt. :** 0

IBI: 28.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: KR02 River: 02-197 Kian Run RM: 0.82 Date: 07/25/2024

Time Fished: 1281 Distance: 0.150 Drainge (sq mi): 1.3 Depth: 0

Location: High Street Lat: 39.90954 Long: -82.99405

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-011	Western Blacknose Dace	G	T	S	N	1	2.0	0.55	0	0.00	0.0
43-013	Creek Chub	G	T	N	N	143	286.0	78.14	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	38	76.0	20.77	0	0.00	0.0
80-014	Johnny Darter	I		C	D	1	2.0	0.55	0	0.00	0.0

No Species: 4 **Nat. Species:** 4 **Hybrids:** 0 **Total Counted:** 183 **Total Rel. Wt. :** 0

IBI: 28.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: KR01 River: 02-197 Kian Run RM: 0.05 Date: 07/25/2024

Time Fished: 2130 Distance: 0.150 Drainge (sq mi): 9.4 Depth: 0

Location: Access from Scioto Lat: 39.90290 Long: -83.00137

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-015	Northern Hog Sucker	I	M	S	R	1	2.0	0.88	0	0.00	0.0
43-013	Creek Chub	G	T	N	N	1	2.0	0.88	0	0.00	0.0
43-025	Striped Shiner	I		S	N	10	20.0	8.85	0	0.00	0.0
43-032	Spotfin Shiner	I		M	N	6	12.0	5.31	0	0.00	0.0
43-043	Bluntnose Minnow	O	T	C	N	4	8.0	3.54	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	86	172.0	76.11	0	0.00	0.0
77-011	Longear Sunfish	I	M	C	S	1	2.0	0.88	0	0.00	0.0
77-015	Green X Bluegill					3	6.0	2.65	0	0.00	0.0
80-014	Johnny Darter	I		C	D	1	2.0	0.88	0	0.00	0.0

No Species: 8 **Nat. Species:** 8 **Hybrids:** 1 **Total Counted:** 113 **Total Rel. Wt. :** 0

IBI: 28.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: TRB03 River: 02-266 Trabue Run RM: 2.18 Date: 07/16/2024

Time Fished: 1188 Distance: 0.150 Drainge (sq mi): 0.6 Depth: 0

Location: Dst Dividend Drive Lat: 39.99115 Long: -83.12049

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	7	14.0	5.51	0	0.00	0.0
43-013	Creek Chub	G	T	N	N	66	132.0	51.97	0	0.00	0.0
43-044	Central Stoneroller	H		N	N	10	20.0	7.87	0	0.00	0.0
77-006	Largemouth Bass	C		C	F	1	2.0	0.79	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	43	86.0	33.86	0	0.00	0.0

No Species: 5 **Nat. Species:** 5 **Hybrids:** 0 **Total Counted:** 127 **Total Rel. Wt. :** 0

IBI: 30.0 **Mlwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: TRB02 River: 02-266 Trabue Run RM: 1.00 Date: 07/15/2024

Time Fished: 1635 Distance: 0.150 Drainge (sq mi): 2.6 Depth: 0

Location: Trabue Rd Lat: 39.98966 Long: -83.09938

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	12	24.0	8.45	0	0.00	0.0
43-013	Creek Chub	G	T	N	N	61	122.0	42.96	0	0.00	0.0
43-044	Central Stoneroller	H		N	N	9	18.0	6.34	0	0.00	0.0
77-006	Largemouth Bass	C		C	F	1	2.0	0.70	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	42	84.0	29.58	0	0.00	0.0
77-015	Green X Bluegill					2	4.0	1.41	0	0.00	0.0
80-024	Fantail Darter	I		C	D	15	30.0	10.56	0	0.00	0.0

No Species: 6 **Nat. Species:** 6 **Hybrids:** 1 **Total Counted:** 142 **Total Rel. Wt. :** 0

IBI: 26.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: TRB01 River: 02-266 Trabue Run RM: 0.05 Date: 07/23/2024

Time Fished: 1020 Distance: 0.150 Drainge (sq mi): 3.0 Depth: 0

Location: Hague Ave Lat: 39.98435 Long: -83.08654

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	9	18.0	8.18	0	0.00	0.0
43-013	Creek Chub	G	T	N	N	28	56.0	25.45	0	0.00	0.0
43-044	Central Stoneroller	H		N	N	9	18.0	8.18	0	0.00	0.0
47-004	Yellow Bullhead	I	T	C		1	2.0	0.91	0	0.00	0.0
77-004	Smallmouth Bass	C	M	C	F	2	4.0	1.82	0	0.00	0.0
77-006	Largemouth Bass	C		C	F	20	40.0	18.18	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	31	62.0	28.18	0	0.00	0.0
77-009	Bluegill	I	P	C	S	2	4.0	1.82	0	0.00	0.0
77-015	Green X Bluegill					1	2.0	0.91	0	0.00	0.0
80-011	Logperch	I	M	S	D	1	2.0	0.91	0	0.00	0.0
80-014	Johnny Darter	I		C	D	1	2.0	0.91	0	0.00	0.0
80-024	Fantail Darter	I		C	D	5	10.0	4.55	0	0.00	0.0

No Species: 11 **Nat. Species:** 11 **Hybrids:** 1 **Total Counted:** 110 **Total Rel. Wt. :** 0

IBI: 40.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: DRY09 River: 02-930 Trib to Dry Run at RM 1.61 RM: 2.40 Date: 07/26/2024

Time Fished: 0 Distance: 0.150 Drainge (sq mi): 1.2 Depth: 0

Location: Site of Old USGS Gauge, Back of Parking Lot Lat: 39.95619 Long: -83.10617

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-013	Creek Chub	G	T	N	N	53	106.0	89.83	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	6	12.0	10.17	0	0.00	0.0

No Species: 2 **Nat. Species:** 2 **Hybrids:** 0 **Total Counted:** 59 **Total Rel. Wt. :** 0

IBI: 20.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: DRY08 River: 02-930 Trib to Dry Run at RM 1.61 RM: 1.11 Date: 07/24/2024

Time Fished: 1490 Distance: 0.150 Drainge (sq mi): 2.5 Depth: 0

Location: Westmoor Park, Ust Restored Stream Reach Lat: 39.95906 Long: -83.08417

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	13	26.0	9.63	0	0.00	0.0
43-011	Western Blacknose Dace	G	T	S	N	12	24.0	8.89	0	0.00	0.0
43-013	Creek Chub	G	T	N	N	95	190.0	70.37	0	0.00	0.0
43-044	Central Stoneroller	H		N	N	12	24.0	8.89	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	3	6.0	2.22	0	0.00	0.0

No Species: 5 **Nat. Species:** 5 **Hybrids:** 0 **Total Counted:** 135 **Total Rel. Wt. :** 0

IBI: 26.0 **Mlwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: DRY05 River: 02-930 Trib to Dry Run at RM 1.61 RM: 0.75 Date: 07/24/2024

Time Fished: 1744 Distance: 0.150 Drainge (sq mi): 2.7 Depth: 0

Location: Westmoor Middle School, Dry Run Park Lat: 39.96031 Long: -83.08020

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	4	8.0	1.59	0	0.00	0.0
43-011	Western Blacknose Dace	G	T	S	N	6	12.0	2.38	0	0.00	0.0
43-013	Creek Chub	G	T	N	N	118	236.0	46.83	0	0.00	0.0
43-044	Central Stoneroller	H		N	N	121	242.0	48.02	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	2	4.0	0.79	0	0.00	0.0
77-015	Green X Bluegill					1	2.0	0.40	0	0.00	0.0

No Species: 5 **Nat. Species:** 5 **Hybrids:** 1 **Total Counted:** 252 **Total Rel. Wt. :** 0

IBI: 32.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: DRY04 River: 02-930 Trib to Dry Run at RM 1.61 RM: 0.10 Date: 07/24/2024

Time Fished: 1209 Distance: 0.150 Drainge (sq mi): 3.4 Depth: 0

Location: Valley View Drive Lat: 39.96320 Long: -83.07182

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	24	48.0	9.72	0	0.00	0.0
43-011	Western Blacknose Dace	G	T	S	N	22	44.0	8.91	0	0.00	0.0
43-013	Creek Chub	G	T	N	N	176	352.0	71.26	0	0.00	0.0
43-044	Central Stoneroller	H		N	N	12	24.0	4.86	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	12	24.0	4.86	0	0.00	0.0
80-024	Fantail Darter	I		C	D	1	2.0	0.40	0	0.00	0.0

No Species: 6 **Nat. Species:** 6 **Hybrids:** 0 **Total Counted:** 247 **Total Rel. Wt. :** 0

IBI: 26.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: DRY07 River: 02-931 Trib to Dry Run at RM 2.61 RM: 1.74 Date: 07/24/2024

Time Fished: 1000 Distance: 0.150 Drainge (sq mi): 1.3 Depth: 0

Location: Phillipi Road Lat: 39.96527 Long: -83.11162

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	5	10.0	2.42	0	0.00	0.0
43-013	Creek Chub	G	T	N	N	91	182.0	43.96	0	0.00	0.0
43-044	Central Stoneroller	H		N	N	44	88.0	21.26	0	0.00	0.0
77-006	Largemouth Bass	C		C	F	2	4.0	0.97	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	65	130.0	31.40	0	0.00	0.0

No Species: 5 **Nat. Species:** 5 **Hybrids:** 0 **Total Counted:** 207 **Total Rel. Wt. :** 0

IBI: 30.0 **Mlwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: DRY06 River: 02-931 Trib to Dry Run at RM 2.61 RM: 0.40 Date: 07/24/2024

Time Fished: 1033 Distance: 0.150 Drainge (sq mi): 2.1 Depth: 0

Location: Drive off Fisher Road Lat: 39.96936 Long: -83.08837

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	19	38.0	5.71	0	0.00	0.0
43-011	Western Blacknose Dace	G	T	S	N	2	4.0	0.60	0	0.00	0.0
43-013	Creek Chub	G	T	N	N	143	286.0	42.94	0	0.00	0.0
43-044	Central Stoneroller	H		N	N	97	194.0	29.13	0	0.00	0.0
47-004	Yellow Bullhead	I	T	C		1	2.0	0.30	0	0.00	0.0
77-006	Largemouth Bass	C		C	F	2	4.0	0.60	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	69	138.0	20.72	0	0.00	0.0

No Species: 7 **Nat. Species:** 7 **Hybrids:** 0 **Total Counted:** 333 **Total Rel. Wt. :** 0

IBI: 30.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: BARB03 River: 02-932 Barbee Ditch (Trib To Scioto River at RM 135.75) RM: 2.76 Date: 07/15/2024

Time Fished: 1034 Distance: 0.150 Drainge (sq mi): 0.9 Depth: 0

Location: Wilson Road Lat: 39.98461 Long: -83.10685

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-013	Creek Chub	G	T	N	N	65	130.0	77.38	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	19	38.0	22.62	0	0.00	0.0

No Species: 2 **Nat. Species:** 2 **Hybrids:** 0 **Total Counted:** 84 **Total Rel. Wt. :** 0

IBI: 24.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: BARB02 River: 02-932 Barbee Ditch (Trib To Scioto River at RM 135.75) RM: 1.51 Date: 07/16/2024

Time Fished:	Distance:	Drainge (sq mi):	Depth:
1167	0.150	2.3	0

Location:	Lat:	Long:
Hague Ave	39.98162	-83.08738

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	1	2.0	1.35	0	0.00	0.0
43-013	Creek Chub	G	T	N	N	30	60.0	40.54	0	0.00	0.0
43-044	Central Stoneroller	H		N	N	20	40.0	27.03	0	0.00	0.0
77-006	Largemouth Bass	C		C	F	1	2.0	1.35	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	18	36.0	24.32	0	0.00	0.0
77-009	Bluegill	I	P	C	S	4	8.0	5.41	0	0.00	0.0

No Species: 6 **Nat. Species:** 6 **Hybrids:** 0 **Total Counted:** 74 **Total Rel. Wt. :** 0

IBI: 26.0 **Mlwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: BARB01 River: 02-932 Barbee Ditch (Trib To Scioto River at RM 135.75) RM: 0.34 Date: 07/23/2024

Time Fished: 1762 Distance: 0.150 Drainge (sq mi): 5.8 Depth: 0

Location: McKinley Ave near Police Academy Lat: 39.97821 Long: -83.06967

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-013	Creek Chub	G	T	N	N	12	24.0	12.63	0	0.00	0.0
43-044	Central Stoneroller	H		N	N	22	44.0	23.16	0	0.00	0.0
77-006	Largemouth Bass	C		C	F	22	44.0	23.16	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	28	56.0	29.47	0	0.00	0.0
80-011	Logperch	I	M	S	D	1	2.0	1.05	0	0.00	0.0
80-015	Greenside Darter	I	M	S	D	5	10.0	5.26	0	0.00	0.0
80-024	Fantail Darter	I		C	D	5	10.0	5.26	0	0.00	0.0

No Species: 7 **Nat. Species:** 7 **Hybrids:** 0 **Total Counted:** 95 **Total Rel. Wt. :** 0

IBI: 32.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: TRB04 River: 02-933 UT to Trabue Run at RM 2.7 RM: 0.22 Date: 07/16/2024

Time Fished: 1219 Distance: 0.150 Drainge (sq mi): 0.0 Depth: 0

Location: Behind Westbelt historic Ohio EPA site Lat: 39.98840 Long: -83.12686

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-013	Creek Chub	G	T	N	N	60	120.0	64.52	0	0.00	0.0
43-044	Central Stoneroller	H		N	N	9	18.0	9.68	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	24	48.0	25.81	0	0.00	0.0

No Species: 3 **Nat. Species:** 3 **Hybrids:** 0 **Total Counted:** 93 **Total Rel. Wt. :** 0

IBI: 26.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: TRB05 River: 02-934 UT to Trabue Run at RM 1.21 RM: 0.90 Date: 07/16/2024

Time Fished: 1192 Distance: 0.130 Drainge (sq mi): 0.8 Depth: 0

Location: Wilson Road (ust. Gold Course) Lat: 39.99570 Long: -83.11749

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	8	18.5	2.82	0	0.00	0.0
43-013	Creek Chub	G	T	N	N	141	325.4	49.65	0	0.00	0.0
43-044	Central Stoneroller	H		N	N	97	223.9	34.15	0	0.00	0.0
77-006	Largemouth Bass	C		C	F	1	2.3	0.35	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	37	85.4	13.03	0	0.00	0.0

No Species: 5 **Nat. Species:** 5 **Hybrids:** 0 **Total Counted:** 284 **Total Rel. Wt. :** 0

IBI: 32.0 **Mlwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: BARB04 River: 02-935 Trib to Barbee Ditch @ RM 1.87 RM: 0.43 Date: 07/16/2024

Time Fished: 688 Distance: 0.150 Drainge (sq mi): 0.9 Depth: 0

Location: Wilson Road Lat: 39.97916 Long: -83.10101

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-013	Creek Chub	G	T	N	N	10	20.0	18.87	0	0.00	0.0
43-044	Central Stoneroller	H		N	N	9	18.0	16.98	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	28	56.0	52.83	0	0.00	0.0
77-009	Bluegill	I	P	C	S	6	12.0	11.32	0	0.00	0.0

No Species: 4 **Nat. Species:** 4 **Hybrids:** 0 **Total Counted:** 53 **Total Rel. Wt. :** 0

IBI: 30.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: RMD03 River: 02-937 Roberts Millikin Ditch (02-001-011) RM: 2.75 Date: 07/15/2024

Time Fished: 1786 Distance: 0.150 Drainge (sq mi): 0.6 Depth: 0

Location: Ust Westbelt Drive Lat: 40.00807 Long: -83.12376

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	1	2.0	0.43	0	0.00	0.0
43-013	Creek Chub	G	T	N	N	76	152.0	32.90	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	154	308.0	66.67	0	0.00	0.0

No Species: 3 **Nat. Species:** 3 **Hybrids:** 0 **Total Counted:** 231 **Total Rel. Wt. :** 0

IBI: 26.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: RMD02 River: 02-937 Roberts Millikin Ditch (02-001-011) RM: 1.59 Date: 07/15/2024

Time Fished: 1462 Distance: 0.150 Drainge (sq mi): 1.0 Depth: 0

Location: Off Roberts Road Lat: 40.00312 Long: -83.10675

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	2	4.0	0.56	0	0.00	0.0
43-013	Creek Chub	G	T	N	N	229	458.0	64.69	0	0.00	0.0
57-001	Western Mosquitofish	I		N	E	1	2.0	0.28	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	116	232.0	32.77	0	0.00	0.0
77-009	Bluegill	I	P	C	S	6	12.0	1.69	0	0.00	0.0

No Species: 5 **Nat. Species:** 4 **Hybrids:** 0 **Total Counted:** 354 **Total Rel. Wt. :** 0

IBI: 26.0 **Mlwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: RMD04 River: 02-938 Tirb to Roberts Millikin Ditch (02-001-011) RM: 0.39 Date: 07/15/2024

Time Fished: 691 Distance: 0.080 Drainge (sq mi): 2.9 Depth: 0

Location: Quarry Trail Metro Park (off Old Dublin Rd.) below the falls Lat: 39.99878 Long: -83.08883

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-013	Creek Chub	G	T	N	N	16	60.0	76.19	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	5	18.8	23.81	0	0.00	0.0

No Species: 2 **Nat. Species:** 2 **Hybrids:** 0 **Total Counted:** 21 **Total Rel. Wt. :** 0

IBI: 22.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: SCC01 River: 02-939 Scioto CC Creek @ RM 136.97 to Scioto River RM: 0.10 Date: 07/23/2024

Time Fished: 1545 Distance: 0.150 Drainge (sq mi): 1.3 Depth: 0

Location: Scioto Point Dr. Lat: 39.99499 Long: -83.07350

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-001	Common Carp	O	T	M	G	1	2.0	1.43	0	0.00	0.0
43-013	Creek Chub	G	T	N	N	27	54.0	38.57	0	0.00	0.0
43-043	Bluntnose Minnow	O	T	C	N	1	2.0	1.43	0	0.00	0.0
77-006	Largemouth Bass	C		C	F	7	14.0	10.00	0	0.00	0.0
77-008	Green Sunfish	I	T	C	S	30	60.0	42.86	0	0.00	0.0
77-009	Bluegill	I	P	C	S	2	4.0	2.86	0	0.00	0.0
77-015	Green X Bluegill					1	2.0	1.43	0	0.00	0.0
80-014	Johnny Darter	I		C	D	1	2.0	1.43	0	0.00	0.0

No Species: 7 **Nat. Species:** 6 **Hybrids:** 1 **Total Counted:** 70 **Total Rel. Wt. :** 0

IBI: 30.0 **MIwb:** N/A

APPENDIX C: 2024 MACROINVERTEBRATE ASSEMBLAGE DATA

C-1: Qualitative Narrative Ratings
C-2: Macroinvertebrate Taxa Grand 2024
C-3: Macroinvertebrate Taxa by Site 2024

Appendix Table B-1. ICI metrics for sites in the 2024 Roberts Millikin, Barbee Ditch, and Dry Run study area.

Site ID	River Mile	Drainage Area (sq mi)	Number of				Percent:						
			Total Taxa[a]	Mayfly Taxa	Caddisfly Taxa	Dipteran Taxa	Mayflies	Caddis-flies	Tany-tarsini	Other Dipt/NI	Tolerant Organisms	Qual. EPT	ICI or Narrative
Roberts Millikin Ditch Subwatershed (Scioto R. @137.52) (02-937)													
Year:2024													
RMD03	2.80	0.61	21									2	PHW2
RMD02	1.50	1.03	28									3	P
RMD01	0.10	3.25	26									5	F
Barbee Ditch (Tributary To Scioto River at RM 135.75) (02-932)													
Year:2024													
BARB03	2.70	0.90	21									3	PHW2
BARB02	1.45	2.36	15									1	VP
BARB01	0.30	5.88	31									3	P
Trabue Run (Tributary to Barbee Ditch @RM 1.39) (02-266)													
Year:2024													
TRB03	2.20	0.63	25									6	F
TRB02	1.05	2.60	32									8	HF
TRB01	0.13	3.00	37									7	MG
Unnamed Tributary to Trabue Run @RM 1.21 (02-934)													
Year:2024													
TRB05	0.85	0.82	23									6	PHW2
Unnamed Tributary to Trabue Run @RM 2.7 (02-933)													
Year:2024													
TRB04	0.22	0.22	26									5	PHW2
Unnamed Tributary to Barbee Ditch @ RM 1.87 (02-935)													
Year:2024													
BARB04	0.43	0.95	12									0	PHW2
Dry Run (Scioto R. @134.43) (02-095)													
Year:2024													
DRY02	2.61	0.75	27									8	MG
DRY01	1.25	7.24	34									7	F
DRY03	0.10	7.86	34									5	LF
Unnamed Tributary to Dry Run@RM 1.61 (02-930)													
Year:2024													
DRY09	2.45	1.28	29									3	PHW2
DRY08	1.00	2.57	26									7	HF
DRY05	0.75	2.73	37									7	F
DRY04	0.14	3.43	29									6	F
Unnamed Tributary to Dry Run @ RM 2.61 (02-931)													
Year:2024													

[a] For HD samples represents total QUANT taxa, but for QUAL samples represents QUAL taxa.

Appendix Table B-1. ICI metrics for sites in the LDWG24 study area.

Site ID	River Mile	Drainage Area (sq mi)	Number of				Percent:						
			Total Taxa[a]	Mayfly Taxa	Caddisfly Taxa	Dipteran Taxa	Mayflies	Caddis-flies	Tany-tarsini	Other Dipt/NI	Tolerant Organisms	Qual. EPT	ICI or Narrative
DRY07	1.74	1.37	42									5	PHW2
DRY06	0.34	2.15	39									10	MG
Evans Run (Scioto R. @136.97) (02-939)													
Year:2024													
SCC01	0.10	1.39	8									0	PHW2
Kian Run (Scioto R. @126.5) (02-197)													
Year:2024													
KR02	0.80	1.36	11									2	P
KR01	0.05	9.44	6									0	VP

[a] For HD samples represents total QUANT taxa, but for QUAL samples represents QUAL taxa.

***Appendix Table C-1**. Macroinvertebrate taxa collected at 25 sites in Roberts Millikin Ditch, Barbee Ditch, and the Dry Run subwatersheds in 2024. The taxa or ordered by the number of sites at which each occurred.*

Taxa Code	Taxa Name	Ohio Tolerance	Taxa Group	Samples Collected In
03600	*Oligochaeta*	T	N	20
01801	*Turbellaria*	F	N	19
11120	*Baetis flavistriga*	F	M	18
22001	*Coenagrionidae*	T	O	16
22300	*Argia sp*	F	O	16
95100	*Physella sp*	T	N	16
06201	*Hyalella azteca*	F	N	14
52200	*Cheumatopsyche sp*	F	C	14
71900	*Tipula sp*	F	D	14
52530	*Hydropsyche depravata group*	F	C	13
74100	*Simulium sp*	F	D	13
77120	*Ablabesmyia mallochi*	F	D	13
84470	*Polypedilum (P.) illinoense*	T	D	13
85500	*Paratanytarsus sp*	F	T	12
97601	*Corbicula fluminea*	F	N	12
11130	*Baetis intercalaris*	F	M	11
77800	*Helopelopia sp*	F	D	11
84210	*Paratendipes albimanus or P. duplicatus*	F	D	11
00401	*Spongillidae*	F	N	10
08200	*Faxonius sp*	F	N	10
13521	*Stenonema femoratum*	F	M	10
69400	*Stenelmis sp*	F	O	10
82820	*Cryptochironomus sp*	F	D	10
83040	*Dicrotendipes neomodestus*	F	D	10
08601	*Hydrachnidia*	F	N	9
17200	*Caenis sp*	F	M	9
77500	*Conchapelopia sp*	F	D	9
78655	*Procladius (Holotanypus) sp*	MT	D	9
04935	*Erpobdella punctata punctata*	MT	N	8
80420	*Cricotopus (C.) bicinctus*	T	D	8
84540	*Polypedilum (Tripodura) scalaenum group*	F	D	8
04964	*Erpobdella microstoma*	MT	N	7
11200	*Callibaetis sp*	MT	M	7
23600	*Aeshna sp*	MT	O	7
60900	*Peltodytes sp*	MT	O	7
85821	*Tanytarsus glabrescens group sp 7*	F	T	7
96900	*Ferrissia sp*	F	N	7
04664	*Helobdella stagnalis*	T	N	6
84300	*Phaenopsectra obediens group*	F	D	6
93200	*Hydrobiidae*	F	N	6

***Appendix Table C-1**. continued.*

Taxa Code	Taxa Name	Ohio Tolerance	Taxa Group	Samples Collected In
04666	*Helobdella papillata*	MT	N	5
08250	*Faxonius rusticus*	F	N	5
53800	*Hydroptila sp*	F	C	5
85625	*Rheotanytarsus sp*	F	T	5
93900	*Elimia sp*	MI	N	5
96002	*Helisoma anceps anceps*	F	N	5
06700	*Crangonyx sp*	MT	N	4
50301	*Chimarra aterrima*	MI	C	4
53501	*Hydroptilidae*	F	C	4
80510	*Cricotopus (Isocladius) sylvestris group*	T	D	4
98200	*Pisidium sp*	MT	N	4
58505	*Helicopsyche borealis*	MI	C	3
59970	*Petrophila sp*	MI	O	3
70600	*Antocha sp*	MI	D	3
78400	*Natarsia sp*	F	D	3
81825	*Rheocricotopus (Psilocricotopus) robacki*	F	D	3
82200	*Tvetenia bavarica group*	MI	D	3
96120	*Menetus (Micromenetus) dilatatus*	MT	N	3
98600	*Sphaerium sp*	F	N	3
03000	*Ectoprocta*	F		2
04901	*Erpobdellidae*	MT	N	2
13400	*Stenacron sp*	F	M	2
23700	*Anax sp*	MT	O	2
50315	*Chimarra obscura*	MI	C	2
59300	*Mystacides sp*	MI	C	2
65800	*Berosus sp*	MT	O	2
71300	*Limonia sp*	F	D	2
71700	*Pilaria sp*	F	D	2
77130	*Ablabesmyia rhamphe group*	MT	D	2
80430	*Cricotopus (C.) tremulus group*	MT	D	2
80710	*Eukiefferiella brehmi group*	MI	D	2
82710	*Chironomus (C.) sp*	MT	D	2
82730	*Chironomus (C.) decorus group*	T	D	2
83300	*Glyptotendipes (G.) sp*	MT	D	2
84450	*Polypedilum (Uresipedilum) flavum*	F	D	2
84460	*Polypedilum (P.) fallax group*	F	D	2
84700	*Stenochironomus sp*	F	D	2
84750	*Stictochironomus sp*	F	D	2
87540	*Hemerodromia sp*	F	D	2
01900	*Nemertea*	F	N	1

***Appendix Table C-1**. continued.*

Taxa Code	Taxa Name	Ohio Tolerance	Taxa Group	Samples Collected In
04685	*Placobdella ornata*	MT	N	1
05800	*Caecidotea sp*	T	N	1
05900	*Lirceus sp*	MT	N	1
07701	*Cambaridae*		N	1
07800	*Cambarus sp*		N	1
12200	*Isonychia sp*	MI	M	1
21604	*Archilestes grandis*	T	O	1
27000	*Corduliidae or Libellulidae*		O	1
28001	*Libellulidae*	MT	O	1
42700	*Belostoma sp*	T	O	1
45300	*Sigara sp*	MT	O	1
49101	*Sisyridae*	F	O	1
49200	*Climacia sp*	F	O	1
59310	*Mystacides sepulchralis*	MI	C	1
59728	*Triaenodes marginatus*	F	C	1
65501	*Hydrophilidae*	F	O	1
65700	*Anacaena sp*	MT	O	1
67700	*Paracymus sp*	MT	O	1
68075	*Psephenus herricki*	MI	O	1
68601	*Ancyronyx variegata*	F	O	1
68700	*Dubiraphia sp*	F	O	1
68708	*Dubiraphia vittata group*	F	O	1
71910	*Tipula abdominalis*	F	D	1
74501	*Ceratopogonidae*	T	D	1
78500	*Paramerina fragilis*	F	D	1
79720	*Diamesa sp*	F	D	1
80425	*Cricotopus (C.) luciae*	F	D	1
80490	*Cricotopus (Isocladius) intersectus group*	MT	D	1
80700	*Eukiefferiella sp*		D	1
81231	*Nanocladius (N.) crassicornus or N. (N.) "rectinervis"*	F	D	1
81650	*Parametriocnemus sp*	F	D	1
82880	*Cryptotendipes sp*	F	D	1
84315	*Phaenopsectra flavipes*	MT	D	1
84888	*Xenochironomus xenolabis*	F	D	1
86550	*Allognosta sp*		D	1
87400	*Stratiomys sp*	MT	D	1
87501	*Empididae*	F	D	1
89501	*Ephydridae*	F	D	1
94800	*Stagnicola sp*	T	N	1
95501	*Planorbidae*	MT	N	1
96264	*Planorbella (Pierosoma) pilsbryi*	T	N	1
96280	*Planorbella (Pierosoma) trivolvis*	MT	N	1
98001	*Pisidiidae*		N	1

Appendix Table C-2. Macroinvertebrate taxa list for sites in the ColsDOSD24 study area

River Code: **02-095** River: ***Dry Run*** Coll. Date: *06/22/2024* RM: **0.10**

Site ID: **DRY03** Location: *Mckinley Ave* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
01801	Turbellaria		**F**	+
03600	Oligochaeta		**T**	+
04664	Helobdella stagnalis		**T**	+
06201	Hyalella azteca		**F**	+
06700	Crangonyx sp		**MT**	+
08250	Faxonius rusticus		**F**	+
08601	Hydrachnidia		**F**	+
11120	Baetis flavistriga		**F**	+
11130	Baetis intercalaris		**F**	+
13521	Stenonema femoratum		**F**	+
17200	Caenis sp		**F**	+
52200	Cheumatopsyche sp		**F**	+
59970	Petrophila sp		**MI**	+
65700	Anacaena sp		**MT**	+
69400	Stenelmis sp		**F**	+
71900	Tipula sp		**F**	+
74100	Simulium sp		**F**	+
77120	Ablabesmyia mallochi		**F**	+
77500	Conchapelopia sp		**F**	+
77800	Helopelopia sp		**F**	+
80420	Cricotopus (C.) bicinctus		**T**	+
81231	Nanocladius (N.) crassicornus or N. (N.) "rectinervis"		**F**	+
82820	Cryptochironomus sp		**F**	+
84210	Paratendipes albimanus or P. duplicatus		**F**	+
84300	Phaenopsectra obediens group		**F**	+
84315	Phaenopsectra flavipes		**MT**	+
84470	Polypedilum (P.) illinoense		**T**	+
84540	Polypedilum (Tripodura) scalaenum group		**F**	+
84700	Stenochironomus sp		**F**	+
85500	Paratanytarsus sp		**F**	+
85821	Tanytarsus glabrescens group sp 7		**F**	+
87400	Stratiomys sp		**MT**	+
95100	Physella sp		**T**	+
96900	Ferrissia sp		**F**	+

No. Quantitative Taxa:	0	Total Taxa;	34
No. Qualitative Taxa:	34	ICI:	
Number of Organisms:	0	Qual EPT:	5

River Code: **02-095** River: ***Dry Run*** Coll. Date: *06/27/2024* RM: **1.25**

Site ID: **DRY01** Location: *Holton Park* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
01801	Turbellaria		**F**	+
03000	Ectoprocta		**F**	+
04664	Helobdella stagnalis		**T**	+
04935	Erpobdella punctata punctata		**MT**	+
04964	Erpobdella microstoma		**MT**	+
06201	Hyalella azteca		**F**	+
06700	Crangonyx sp		**MT**	+
08601	Hydrachnidia		**F**	+
11120	Baetis flavistriga		**F**	+
11130	Baetis intercalaris		**F**	+
11200	Callibaetis sp		**MT**	+
13521	Stenonema femoratum		**F**	+
17200	Caenis sp		**F**	+
22001	Coenagrionidae		**T**	+
22300	Argia sp		**F**	+
52200	Cheumatopsyche sp		**F**	+
52530	Hydropsyche depravata group		**F**	+
69400	Stenelmis sp		**F**	+
70600	Antocha sp		**MI**	+
71900	Tipula sp		**F**	+
77120	Ablabesmyia mallochi		**F**	+
77500	Conchapelopia sp		**F**	+
77800	Helopelopia sp		**F**	+
80710	Eukiefferiella brehmi group		**MI**	+
81825	Rheocricotopus (Psilocricotopus) robacki		**F**	+
84210	Paratendipes albimanus or P. duplicatus		**F**	+
84300	Phaenopsectra obediens group		**F**	+
84470	Polypedilum (P.) illinoense		**T**	+
85500	Paratanytarsus sp		**F**	+
85821	Tanytarsus glabrescens group sp 7		**F**	+
86550	Allognosta sp			+
95100	Physella sp		**T**	+
96900	Ferrissia sp		**F**	+
98600	Sphaerium sp		**F**	+

No. Quantitative Taxa:	0	Total Taxa;	34
No. Qualitative Taxa:	34	ICI:	
Number of Organisms:	0	Qual EPT:	7

Appendix Table B-2. Macroinvertebrate taxa list for sites in the ColsDOSD24 study area

River Code: **02-095** River: ***Dry Run*** Coll. Date: *07/18/2024* RM: **2.61**

Site ID: **DRY02** Location: *Drive off of Hague Ave* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
01801	Turbellaria		F	+
03600	Oligochaeta		T	+
04935	Erpobdella punctata punctata		MT	+
04964	Erpobdella microstoma		MT	+
06201	Hyalella azteca		F	+
08250	Faxonius rusticus		F	+
11120	Baetis flavistriga		F	+
11130	Baetis intercalaris		F	+
13521	Stenonema femoratum		F	+
17200	Caenis sp		F	+
22001	Coenagrionidae		T	+
23600	Aeshna sp		MT	+
50301	Chimarra aterrima		MI	+
52200	Cheumatopsyche sp		F	+
52530	Hydropsyche depravata group		F	+
58505	Helicopsyche borealis		MI	+
68601	Ancyronyx variegata		F	+
69400	Stenelmis sp		F	+
71900	Tipula sp		F	+
71910	Tipula abdominalis		F	+
77800	Helopelopia sp		F	+
79720	Diamesa sp	X	F	+
81650	Parametriocnemus sp	X	F	+
84460	Polypedilum (P.) fallax group		F	+
84470	Polypedilum (P.) illinoense		T	+
84750	Stictochironomus sp		F	+
97601	Corbicula fluminea		F	+

No. Quantitative Taxa:	0	Total Taxa;	27
No. Qualitative Taxa:	27	ICI:	
Number of Organisms:	0	Qual EPT:	8

Appendix Table B-2. Macroinvertebrate taxa list for sites in the ColsDOSD24 study area

River Code: **02-197** River: ***Kian Run*** Coll. Date: *07/17/2024* RM: **0.05**

Site ID: **KR01** Location: *Access from Scioto* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
03600	Oligochaeta		**T**	+
04901	Erpobdellidae		**MT**	+
05800	Caecidotea sp		**T**	+
06700	Crangonyx sp		**MT**	+
08200	Faxonius sp		**F**	+
72700	Anopheles sp		**F**	+

No. Quantitative Taxa:	0	Total Taxa;	6
No. Qualitative Taxa:	6	ICI:	
Number of Organisms:	0	Qual EPT:	0

Appendix Table B-2. Macroinvertebrate taxa list for sites in the ColsDOSD24 study area

River Code: **02-197** River: ***Kian Run*** Coll. Date: *07/18/2024* RM: **0.80**

Site ID: **KR02** Location: *High Street* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
03600	Oligochaeta		**T**	+
04666	Helobdella papillata		**MT**	+
04964	Erpobdella microstoma		**MT**	+
08601	Hydrachnidia		**F**	+
21200	Calopteryx sp		**F**	+
52200	Cheumatopsyche sp		**F**	+
52530	Hydropsyche depravata group		**F**	+
69400	Stenelmis sp		**F**	+
71700	Pilaria sp		**F**	+
71910	Tipula abdominalis		**F**	+
74100	Simulium sp		**F**	+

No. Quantitative Taxa:	0	Total Taxa;	11
No. Qualitative Taxa:	11	ICI:	
Number of Organisms:	0	Qual EPT:	2

River Code: **02-266** River: ***Trabue Run (Tributary to Barbee Ditch @ RM 1.39)*** Coll. Date: *06/26/2024* RM: **0.13**

Site ID: **TRB01** Location: *Hague Ave* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
01801	Turbellaria		**F**	+
03600	Oligochaeta		**T**	+
04964	Erpobdella microstoma		**MT**	+
06700	Crangonyx sp		**MT**	+
07800	Cambarus sp			+
08200	Faxonius sp		**F**	+
08601	Hydrachnidia		**F**	+
11120	Baetis flavistriga		**F**	+
11130	Baetis intercalaris		**F**	+
13521	Stenonema femoratum		**F**	+
22300	Argia sp		**F**	+
50301	Chimarra aterrima		**MI**	+
50315	Chimarra obscura		**MI**	+
52200	Cheumatopsyche sp		**F**	+
59310	Mystacides sepulchralis		**MI**	+
59970	Petrophila sp		**MI**	+
69400	Stenelmis sp		**F**	+
71700	Pilaria sp		**F**	+
71900	Tipula sp		**F**	+
77120	Ablabesmyia mallochi		**F**	+
77500	Conchapelopia sp		**F**	+
77800	Helopelopia sp		**F**	+
78400	Natarsia sp		**F**	+
78655	Procladius (Holotanypus) sp		**MT**	+
82820	Cryptochironomus sp		**F**	+
84210	Paratendipes albimanus or P. duplicatus		**F**	+
84300	Phaenopsectra obediens group		**F**	+
84460	Polypedilum (P.) fallax group		**F**	+
84540	Polypedilum (Tripodura) scalaenum group		**F**	+
84700	Stenochironomus sp		**F**	+
85500	Paratanytarsus sp		**F**	+
85625	Rheotanytarsus sp		**F**	+
93200	Hydrobiidae		**F**	+
93900	Elimia sp		**MI**	+
96002	Helisoma anceps anceps		**F**	+
96900	Ferrissia sp		**F**	+
98200	Pisidium sp		**MT**	+

No. Quantitative Taxa:	0	Total Taxa;	37
No. Qualitative Taxa:	37	ICI:	
Number of Organisms:	0	Qual EPT:	7

River Code: **02-266** River: ***Trabue Run (Tributary to Barbee Ditch @ RM 1.39)*** Coll. Date: *07/02/2024* RM: **1.05**

Site ID: **TRB02** Location: *Trabue Rd* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
01801	Turbellaria		**F**	+
03600	Oligochaeta		**T**	+
04666	Helobdella papillata		**MT**	+
04901	Erpobdellidae		**MT**	+
06201	Hyalella azteca		**F**	+
08250	Faxonius rusticus		**F**	+
08601	Hydrachnidia		**F**	+
11120	Baetis flavistriga		**F**	+
11130	Baetis intercalaris		**F**	+
13521	Stenonema femoratum		**F**	+
17200	Caenis sp		**F**	+
22001	Coenagrionidae		**T**	+
22300	Argia sp		**F**	+
50315	Chimarra obscura		**MI**	+
52200	Cheumatopsyche sp		**F**	+
53800	Hydroptila sp		**F**	+
59300	Mystacides sp		**MI**	+
60900	Peltodytes sp		**MT**	+
65800	Berosus sp		**MT**	+
69400	Stenelmis sp		**F**	+
77120	Ablabesmyia mallochi		**F**	+
77800	Helopelopia sp		**F**	+
83040	Dicrotendipes neomodestus		**F**	+
84210	Paratendipes albimanus or P. duplicatus		**F**	+
84888	Xenochironomus xenolabis		**F**	+
85500	Paratanytarsus sp		**F**	+
93200	Hydrobiidae		**F**	+
93900	Elimia sp		**MI**	+
95100	Physella sp		**T**	+
96002	Helisoma anceps anceps		**F**	+
96264	Planorbella (Pierosoma) pilsbryi		**T**	+
97601	Corbicula fluminea		**F**	+

No. Quantitative Taxa:	0	Total Taxa;	32
No. Qualitative Taxa:	32	ICI:	
Number of Organisms:	0	Qual EPT:	8

Appendix Table B-2. Macroinvertebrate taxa list for sites in the ColsDOSD24 study area

River Code: **02-266** River: ***Trabue Run (Tributary to Barbee Ditch @ RM 1.39)*** Coll. Date: *07/02/2024* RM: **2.20**

Site ID: **TRB03** Location: *Dst Dividend Drive* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
00401	Spongillidae		**F**	+
01801	Turbellaria		**F**	+
03600	Oligochaeta		**T**	+
04935	Erpobdella punctata punctata		**MT**	+
06201	Hyalella azteca		**F**	+
08200	Faxonius sp		**F**	+
11120	Baetis flavistriga		**F**	+
11130	Baetis intercalaris		**F**	+
13521	Stenonema femoratum		**F**	+
22001	Coenagrionidae		**T**	+
22300	Argia sp		**F**	+
23600	Aeshna sp		**MT**	+
52200	Cheumatopsyche sp		**F**	+
52530	Hydropsyche depravata group		**F**	+
53800	Hydroptila sp		**F**	+
60900	Peltodytes sp		**MT**	+
67700	Paracymus sp		**MT**	+
69400	Stenelmis sp		**F**	+
71900	Tipula sp		**F**	+
77120	Ablabesmyia mallochi		**F**	+
78655	Procladius (Holotanypus) sp		**MT**	+
93900	Elimia sp		**MI**	+
95501	Planorbidae		**MT**	+
96002	Helisoma anceps anceps		**F**	+
97601	Corbicula fluminea		**F**	+

No. Quantitative Taxa:	0	Total Taxa;	25
No. Qualitative Taxa:	25	ICI:	
Number of Organisms:	0	Qual EPT:	6

Appendix Table B-2. Macroinvertebrate taxa list for sites in the ColsDOSD24 study area

River Code: **02-930** River: ***Tributary to Dry Run at RM 1.61*** Coll. Date: *07/03/2024* RM: **0.14**

Site ID: **DRY04** Location: *Valley View Drive* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
03600	Oligochaeta		**T**	+
06201	Hyalella azteca		**F**	+
08200	Faxonius sp		**F**	+
08601	Hydrachnidia		**F**	+
11120	Baetis flavistriga		**F**	+
11130	Baetis intercalaris		**F**	+
17200	Caenis sp		**F**	+
22001	Coenagrionidae		**T**	+
22300	Argia sp		**F**	+
52200	Cheumatopsyche sp		**F**	+
52530	Hydropsyche depravata group		**F**	+
53501	Hydroptilidae		**F**	+
70600	Antocha sp		**MI**	+
74100	Simulium sp		**F**	+
77120	Ablabesmyia mallochi		**F**	+
77500	Conchapelopia sp		**F**	+
77800	Helopelopia sp		**F**	+
78655	Procladius (Holotanypus) sp		**MT**	+
80700	Eukiefferiella sp			+
80710	Eukiefferiella brehmi group		**MI**	+
81825	Rheocricotopus (Psilocricotopus) robacki		**F**	+
82820	Cryptochironomus sp		**F**	+
83040	Dicrotendipes neomodestus		**F**	+
84210	Paratendipes albimanus or P. duplicatus		**F**	+
84300	Phaenopsectra obediens group		**F**	+
84470	Polypedilum (P.) illinoense		**T**	+
84540	Polypedilum (Tripodura) scalaenum group		**F**	+
85821	Tanytarsus glabrescens group sp 7		**F**	+
95100	Physella sp		**T**	+

No. Quantitative Taxa:	0	Total Taxa;	29
No. Qualitative Taxa:	29	ICI:	
Number of Organisms:	0	Qual EPT:	6

River Code: **02-930** River: ***Tributary to Dry Run at RM 1.61*** Coll. Date: *06/27/2024* RM: **0.75**

Site ID: **DRY05** Location: *Westmoor Middle School, Dry Run Park* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
01801	Turbellaria		**F**	+
03600	Oligochaeta		**T**	+
04664	Helobdella stagnalis		**T**	+
06201	Hyalella azteca		**F**	+
08200	Faxonius sp		**F**	+
08601	Hydrachnidia		**F**	+
11120	Baetis flavistriga		**F**	+
11130	Baetis intercalaris		**F**	+
11200	Callibaetis sp		**MT**	+
17200	Caenis sp		**F**	+
22001	Coenagrionidae		**T**	+
22300	Argia sp		**F**	+
52200	Cheumatopsyche sp		**F**	+
52530	Hydropsyche depravata group		**F**	+
53501	Hydroptilidae		**F**	+
60900	Peltodytes sp		**MT**	+
68708	Dubiraphia vittata group		**F**	+
71900	Tipula sp		**F**	+
74100	Simulium sp		**F**	+
77120	Ablabesmyia mallochi		**F**	+
77500	Conchapelopia sp		**F**	+
78655	Procladius (Holotanypus) sp		**MT**	+
80420	Cricotopus (C.) bicinctus		**T**	+
80430	Cricotopus (C.) tremulus group		**MT**	+
80510	Cricotopus (Isocladius) sylvestris group		**T**	+
82710	Chironomus (C.) sp		**MT**	+
82820	Cryptochironomus sp		**F**	+
83040	Dicrotendipes neomodestus		**F**	+
83300	Glyptotendipes (G.) sp		**MT**	+
84210	Paratendipes albimanus or P. duplicatus		**F**	+
84470	Polypedilum (P.) illinoense		**T**	+
84540	Polypedilum (Tripodura) scalaenum group		**F**	+
85500	Paratanytarsus sp		**F**	+
85625	Rheotanytarsus sp		**F**	+
85821	Tanytarsus glabrescens group sp 7		**F**	+
87501	Empididae		**F**	+
95100	Physella sp		**T**	+

No. Quantitative Taxa:	0	Total Taxa;	37
No. Qualitative Taxa:	37	ICI:	
Number of Organisms:	0	Qual EPT:	7

Appendix Table B-2. Macroinvertebrate taxa list for sites in the ColsDOSD24 study area

River Code: **02-930** River: ***Tributary to Dry Run at RM 1.61*** Coll. Date: *06/27/2024* RM: **1.00**

Site ID: **DRY08** Location: *Westmoor Park, Ust Restored Stream Reach* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
01801	Turbellaria		**F**	+
03600	Oligochaeta		**T**	+
08601	Hydrachnidia		**F**	+
11120	Baetis flavistriga		**F**	+
11130	Baetis intercalaris		**F**	+
11200	Callibaetis sp		**MT**	+
22001	Coenagrionidae		**T**	+
22300	Argia sp		**F**	+
50301	Chimarra aterrima		**MI**	+
52200	Cheumatopsyche sp		**F**	+
52530	Hydropsyche depravata group		**F**	+
53800	Hydroptila sp		**F**	+
70600	Antocha sp		**MI**	+
74100	Simulium sp		**F**	+
77120	Ablabesmyia mallochi		**F**	+
77500	Conchapelopia sp		**F**	+
77800	Helopelopia sp		**F**	+
78655	Procladius (Holotanypus) sp		**MT**	+
80420	Cricotopus (C.) bicinctus		**T**	+
80510	Cricotopus (Isocladius) sylvestris group		**T**	+
82200	Tvetenia bavarica group		**MI**	+
82730	Chironomus (C.) decorus group		**T**	+
83040	Dicrotendipes neomodestus		**F**	+
84540	Polypedilum (Tripodura) scalaenum group		**F**	+
85821	Tanytarsus glabrescens group sp 7		**F**	+
95100	Physella sp		**T**	+

No. Quantitative Taxa:	0	Total Taxa;	26
No. Qualitative Taxa:	26	ICI:	
Number of Organisms:	0	Qual EPT:	7

Appendix Table B-2. Macroinvertebrate taxa list for sites in the ColsDOSD24 study area

River Code: **02-930** River: ***Tributary to Dry Run at RM 1.61*** Coll. Date: *07/18/2024* RM: **2.45**

Site ID: **DRY09** Location: *Site of Old USGS Gauge, Back of Parking Lot* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
01801	Turbellaria		**F**	+
03600	Oligochaeta		**T**	+
04666	Helobdella papillata		**MT**	+
04901	Erpobdellidae		**MT**	+
06201	Hyalella azteca		**F**	+
11120	Baetis flavistriga		**F**	+
11200	Callibaetis sp		**MT**	+
21604	Archilestes grandis		**T**	+
22001	Coenagrionidae		**T**	+
22300	Argia sp		**F**	+
23600	Aeshna sp		**MT**	+
23700	Anax sp		**MT**	+
28001	Libellulidae		**MT**	+
53800	Hydroptila sp		**F**	+
71900	Tipula sp		**F**	+
74100	Simulium sp		**F**	+
74501	Ceratopogonidae		**T**	+
77120	Ablabesmyia mallochi		**F**	+
78655	Procladius (Holotanypus) sp		**MT**	+
80420	Cricotopus (C.) bicinctus		**T**	+
80490	Cricotopus (Isocladius) intersectus group		**MT**	+
80510	Cricotopus (Isocladius) sylvestris group		**T**	+
83040	Dicrotendipes neomodestus		**F**	+
84470	Polypedilum (P.) illinoense		**T**	+
84540	Polypedilum (Tripodura) scalaenum group		**F**	+
87540	Hemerodromia sp		**F**	+
94800	Stagnicola sp		**T**	+
95100	Physella sp		**T**	+
98200	Pisidium sp		**MT**	+

No. Quantitative Taxa:	0	Total Taxa;	29
No. Qualitative Taxa:	29	ICI:	
Number of Organisms:	0	Qual EPT:	3

Appendix Table B-2. Macroinvertebrate taxa list for sites in the ColsDOSD24 study area

River Code: **02-931** River: ***Tributary to Dry Run at RM 1.61*** Coll. Date: *07/03/2024* RM: **0.34**

Site ID: **DRY06** Location: *Drive off Fisher Road* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
00401	Spongillidae		**F**	+
01801	Turbellaria		**F**	+
03600	Oligochaeta		**T**	+
04664	Helobdella stagnalis		**T**	+
04964	Erpobdella microstoma		**MT**	+
06201	Hyalella azteca		**F**	+
08200	Faxonius sp		**F**	+
11120	Baetis flavistriga		**F**	+
11130	Baetis intercalaris		**F**	+
12200	Isonychia sp		**MI**	+
13521	Stenonema femoratum		**F**	+
17200	Caenis sp		**F**	+
22001	Coenagrionidae		**T**	+
22300	Argia sp		**F**	+
23600	Aeshna sp		**MT**	+
49200	Climacia sp		**F**	+
52200	Cheumatopsyche sp		**F**	+
52530	Hydropsyche depravata group		**F**	+
58505	Helicopsyche borealis		**MI**	+
59300	Mystacides sp		**MI**	+
59728	Triaenodes marginatus		**F**	+
68700	Dubiraphia sp		**F**	+
69400	Stenelmis sp		**F**	+
71300	Limonia sp		**F**	+
71900	Tipula sp		**F**	+
77120	Ablabesmyia mallochi		**F**	+
77800	Helopelopia sp		**F**	+
78400	Natarsia sp		**F**	+
78500	Paramerina fragilis		**F**	+
81825	Rheocricotopus (Psilocricotopus) robacki		**F**	+
82200	Tvetenia bavarica group		**MI**	+
83040	Dicrotendipes neomodestus		**F**	+
84210	Paratendipes albimanus or P. duplicatus		**F**	+
84300	Phaenopsectra obediens group		**F**	+
84470	Polypedilum (P.) illinoense		**T**	+
85500	Paratanytarsus sp		**F**	+
85821	Tanytarsus glabrescens group sp 7		**F**	+
95100	Physella sp		**T**	+
97601	Corbicula fluminea		**F**	+

No. Quantitative Taxa:	0	Total Taxa;	39
No. Qualitative Taxa:	39	ICI:	
Number of Organisms:	0	Qual EPT:	10

River Code: **02-931** River: ***Tributary to Dry Run at RM 2.61*** Coll. Date: *07/15/2024* RM: **1.74**

Site ID: **DRY07** Location: *Phillipi Road* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
00401	Spongillidae		**F**	+
01801	Turbellaria		**F**	+
03600	Oligochaeta		**T**	+
04664	Helobdella stagnalis		**T**	+
04685	Placobdella ornata		**MT**	+
04935	Erpobdella punctata punctata		**MT**	+
04964	Erpobdella microstoma		**MT**	+
06201	Hyalella azteca		**F**	+
08200	Faxonius sp		**F**	+
08601	Hydrachnidia		**F**	+
11200	Callibaetis sp		**MT**	+
13400	Stenacron sp		**F**	+
13521	Stenonema femoratum		**F**	+
17200	Caenis sp		**F**	+
22001	Coenagrionidae		**T**	+
22300	Argia sp		**F**	+
23700	Anax sp		**MT**	+
42700	Belostoma sp		**T**	+
58505	Helicopsyche borealis		**MI**	+
60900	Peltodytes sp		**MT**	+
65501	Hydrophilidae		**F**	+
65800	Berosus sp		**MT**	+
68075	Psephenus herricki		**MI**	+
69400	Stenelmis sp		**F**	+
71900	Tipula sp		**F**	+
77500	Conchapelopia sp		**F**	+
77800	Helopelopia sp		**F**	+
78400	Natarsia sp		**F**	+
82730	Chironomus (C.) decorus group		**T**	+
82820	Cryptochironomus sp		**F**	+
82880	Cryptotendipes sp		**F**	+
83300	Glyptotendipes (G.) sp		**MT**	+
84210	Paratendipes albimanus or P. duplicatus		**F**	+
84300	Phaenopsectra obediens group		**F**	+
84540	Polypedilum (Tripodura) scalaenum group		**F**	+
85500	Paratanytarsus sp		**F**	+
89501	Ephydridae		**F**	+
95100	Physella sp		**T**	+
96280	Planorbella (Pierosoma) trivolvis		**MT**	+
96900	Ferrissia sp		**F**	+
97601	Corbicula fluminea		**F**	+
98001	Pisidiidae			+

No. Quantitative Taxa:	0	Total Taxa;	42
No. Qualitative Taxa:	42	ICI:	
Number of Organisms:	0	Qual EPT:	5

Appendix Table B-2. Macroinvertebrate taxa list for sites in the ColsDOSD24 study area

River Code: **02-932** River: ***Barbee Ditch (Tributary To Scioto River at RM*** Coll. Date: *07/02/2024* RM: **0.30**

Site ID: **BARB01** Location: *McKinley Ave near Police Academy* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
00401	Spongillidae		**F**	+
01801	Turbellaria		**F**	+
03600	Oligochaeta		**T**	+
04664	Helobdella stagnalis		**T**	+
04935	Erpobdella punctata punctata		**MT**	+
06201	Hyalella azteca		**F**	+
08200	Faxonius sp		**F**	+
08601	Hydrachnidia		**F**	+
11120	Baetis flavistriga		**F**	+
22300	Argia sp		**F**	+
52200	Cheumatopsyche sp		**F**	+
52530	Hydropsyche depravata group		**F**	+
71300	Limonia sp		**F**	+
71900	Tipula sp		**F**	+
74100	Simulium sp		**F**	+
80420	Cricotopus (C.) bicinctus		**T**	+
80425	Cricotopus (C.) luciae		**F**	+
80430	Cricotopus (C.) tremulus group		**MT**	+
80510	Cricotopus (Isocladius) sylvestris group		**T**	+
82200	Tvetenia bavarica group		**MI**	+
82820	Cryptochironomus sp		**F**	+
83040	Dicrotendipes neomodestus		**F**	+
84470	Polypedilum (P.) illinoense		**T**	+
85500	Paratanytarsus sp		**F**	+
85625	Rheotanytarsus sp		**F**	+
93200	Hydrobiidae		**F**	+
93900	Elimia sp		**MI**	+
95100	Physella sp		**T**	+
96900	Ferrissia sp		**F**	+
97601	Corbicula fluminea		**F**	+
98600	Sphaerium sp		**F**	+

No. Quantitative Taxa:	0	Total Taxa;	31
No. Qualitative Taxa:	31	ICI:	
Number of Organisms:	0	Qual EPT:	3

Appendix Table B-2. Macroinvertebrate taxa list for sites in the ColsDOSD24 study area

River Code: **02-932** River: ***Barbee Ditch (Tributary To Scioto River at RM*** Coll. Date: *06/25/2024* RM: **1.45**

Site ID: **BARB02** Location: *Hague Ave* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
00401	Spongillidae		**F**	+
01801	Turbellaria		**F**	+
03600	Oligochaeta		**T**	+
11120	Baetis flavistriga		**F**	+
74100	Simulium sp		**F**	+
77800	Helopelopia sp		**F**	+
80420	Cricotopus (C.) bicinctus		**T**	+
84450	Polypedilum (Uresipedilum) flavum		**F**	+
84470	Polypedilum (P.) illinoense		**T**	+
85500	Paratanytarsus sp		**F**	+
85625	Rheotanytarsus sp		**F**	+
95100	Physella sp		**T**	+
96002	Helisoma anceps anceps		**F**	+
97601	Corbicula fluminea		**F**	+
98200	Pisidium sp		**MT**	+

No. Quantitative Taxa:	0	Total Taxa;	15
No. Qualitative Taxa:	15	ICI:	
Number of Organisms:	0	Qual EPT:	1

Appendix Table B-2. Macroinvertebrate taxa list for sites in the ColsDOSD24 study area

River Code: **02-932** River: ***Barbee Ditch (Tributary To Scioto River at RM*** Coll. Date: *06/28/2024* RM: **2.70**

Site ID: **BARB03** Location: *Wilson Road* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
03600	Oligochaeta		**T**	+
04935	Erpobdella punctata punctata		**MT**	+
04964	Erpobdella microstoma		**MT**	+
07701	Cambaridae			+
11120	Baetis flavistriga		**F**	+
22001	Coenagrionidae		**T**	+
22300	Argia sp		**F**	+
23600	Aeshna sp		**MT**	+
52200	Cheumatopsyche sp		**F**	+
52530	Hydropsyche depravata group		**F**	+
69400	Stenelmis sp		**F**	+
71700	Pilaria sp		**F**	+
74100	Simulium sp		**F**	+
77500	Conchapelopia sp		**F**	+
77800	Helopelopia sp		**F**	+
84210	Paratendipes albimanus or P. duplicatus		**F**	+
85821	Tanytarsus glabrescens group sp 7		**F**	+
87540	Hemerodromia sp		**F**	+
95100	Physella sp		**T**	+
97601	Corbicula fluminea		**F**	+
98200	Pisidium sp		**MT**	+

No. Quantitative Taxa:	0	Total Taxa;	21
No. Qualitative Taxa:	21	ICI:	
Number of Organisms:	0	Qual EPT:	3

Appendix Table B-2. Macroinvertebrate taxa list for sites in the ColsDOSD24 study area

River Code: **02-933** River: ***Tributary to Trabue Run at RM 2.7*** Coll. Date: *07/02/2024* RM: **0.22**

Site ID: **TRB04** Location: *Behind Westbelt historic Ohio EPA site* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
00401	Spongillidae		**F**	+
01801	Turbellaria		**F**	+
03000	Ectoprocta		**F**	+
03600	Oligochaeta		**T**	+
04666	Helobdella papillata		**MT**	+
04964	Erpobdella microstoma		**MT**	+
06201	Hyalella azteca		**F**	+
08250	Faxonius rusticus		**F**	+
11200	Callibaetis sp		**MT**	+
13521	Stenonema femoratum		**F**	+
22001	Coenagrionidae		**T**	+
22300	Argia sp		**F**	+
27000	Corduliidae or Libellulidae			+
52200	Cheumatopsyche sp		**F**	+
52530	Hydropsyche depravata group		**F**	+
53800	Hydroptila sp		**F**	+
60900	Peltodytes sp		**MT**	+
71900	Tipula sp		**F**	+
77120	Ablabesmyia mallochi		**F**	+
77500	Conchapelopia sp		**F**	+
78655	Procladius (Holotanypus) sp		**MT**	+
82820	Cryptochironomus sp		**F**	+
93200	Hydrobiidae		**F**	+
93900	Elimia sp		**MI**	+
97601	Corbicula fluminea		**F**	+
98600	Sphaerium sp		**F**	+

No. Quantitative Taxa:	0	Total Taxa;	26
No. Qualitative Taxa:	26	ICI:	
Number of Organisms:	0	Qual EPT:	5

Appendix Table B-2. Macroinvertebrate taxa list for sites in the ColsDOSD24 study area

River Code: **02-934** River: ***Tributary to Trabue Run at RM 1.21*** Coll. Date: *07/18/2024* RM: **0.85**

Site ID: **TRB05** Location: *Wilson Road (ust. Gold Course)* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
00401	Spongillidae		**F**	+
01801	Turbellaria		**F**	+
03600	Oligochaeta		**T**	+
04666	Helobdella papillata		**MT**	+
06201	Hyalella azteca		**F**	+
08250	Faxonius rusticus		**F**	+
11120	Baetis flavistriga		**F**	+
11130	Baetis intercalaris		**F**	+
22001	Coenagrionidae		**T**	+
22300	Argia sp		**F**	+
23600	Aeshna sp		**MT**	+
50301	Chimarra aterrima		**MI**	+
52200	Cheumatopsyche sp		**F**	+
52530	Hydropsyche depravata group		**F**	+
53501	Hydroptilidae		**F**	+
60900	Peltodytes sp		**MT**	+
71900	Tipula sp		**F**	+
74100	Simulium sp		**F**	+
78655	Procladius (Holotanypus) sp		**MT**	+
93200	Hydrobiidae		**F**	+
96002	Helisoma anceps anceps		**F**	+
96900	Ferrissia sp		**F**	+
97601	Corbicula fluminea		**F**	+

No. Quantitative Taxa:	0	Total Taxa;	23
No. Qualitative Taxa:	23	ICI:	
Number of Organisms:	0	Qual EPT:	6

Appendix Table B-2. Macroinvertebrate taxa list for sites in the ColsDOSD24 study area

River Code: **02-935** River: ***Tributary to Barbee Ditch @ RM 1.87*** Coll. Date: *07/16/2024* RM: **0.43**

Site ID: **BARB04** Location: *Wilson Road* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
00401	Spongillidae		**F**	+
01801	Turbellaria		**F**	+
01900	Nemertea		**F**	+
03600	Oligochaeta		**T**	+
74100	Simulium sp		**F**	+
82820	Cryptochironomus sp		**F**	+
84210	Paratendipes albimanus or P. duplicatus		**F**	+
84470	Polypedilum (P.) illinoense		**T**	+
95100	Physella sp		**T**	+
96120	Menetus (Micromenetus) dilatatus		**MT**	+
96900	Ferrissia sp		**F**	+
97601	Corbicula fluminea		**F**	+

No. Quantitative Taxa:	0	Total Taxa;	12
No. Qualitative Taxa:	12	ICI:	
Number of Organisms:	0	Qual EPT:	0

Appendix Table B-2. Macroinvertebrate taxa list for sites in the ColsDOSD24 study area

River Code: **02-937** River: ***Roberts Millikin Ditch (02-001-011)*** Coll. Date: *06/28/2024* RM: **0.10**

Site ID: **RMD01** Location: *Quarry Trails Dr. (Walking Bridge)* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
01801	Turbellaria		**F**	+
03600	Oligochaeta		**T**	+
04935	Erpobdella punctata punctata		**MT**	+
05800	Caecidotea sp		**T**	+
05900	Lirceus sp		**MT**	+
06700	Crangonyx sp		**MT**	+
08200	Faxonius sp		**F**	+
11120	Baetis flavistriga		**F**	+
11200	Callibaetis sp		**MT**	+
13400	Stenacron sp		**F**	+
13521	Stenonema femoratum		**F**	+
17200	Caenis sp		**F**	+
22001	Coenagrionidae		**T**	+
45300	Sigara sp		**MT**	+
59970	Petrophila sp		**MI**	+
74100	Simulium sp		**F**	+
77120	Ablabesmyia mallochi		**F**	+
77130	Ablabesmyia rhamphe group		**MT**	+
80420	Cricotopus (C.) bicinctus		**T**	+
82710	Chironomus (C.) sp		**MT**	+
82820	Cryptochironomus sp		**F**	+
83040	Dicrotendipes neomodestus		**F**	+
84470	Polypedilum (P.) illinoense		**T**	+
84750	Stictochironomus sp		**F**	+
85500	Paratanytarsus sp		**F**	+
95100	Physella sp		**T**	+

No. Quantitative Taxa:	0	Total Taxa;	26
No. Qualitative Taxa:	26	ICI:	
Number of Organisms:	0	Qual EPT:	5

Appendix Table B-2. Macroinvertebrate taxa list for sites in the ColsDOSD24 study area

River Code: **02-937** River: ***Roberts Millikin Ditch (02-001-011)*** Coll. Date: *07/11/2024* RM: **1.50**

Site ID: **RMD02** Location: *Off Roberts Road* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
00401	Spongillidae		**F**	+
01801	Turbellaria		**F**	+
03600	Oligochaeta		**T**	+
04666	Helobdella papillata		**MT**	+
04935	Erpobdella punctata punctata		**MT**	+
08200	Faxonius sp		**F**	+
11120	Baetis flavistriga		**F**	+
22001	Coenagrionidae		**T**	+
22300	Argia sp		**F**	+
23600	Aeshna sp		**MT**	+
52530	Hydropsyche depravata group		**F**	+
53501	Hydroptilidae		**F**	+
60900	Peltodytes sp		**MT**	+
69400	Stenelmis sp		**F**	+
71900	Tipula sp		**F**	+
74100	Simulium sp		**F**	+
77120	Ablabesmyia mallochi		**F**	+
77130	Ablabesmyia rhamphe group		**MT**	+
78655	Procladius (Holotanypus) sp		**MT**	+
82820	Cryptochironomus sp		**F**	+
83040	Dicrotendipes neomodestus		**F**	+
84470	Polypedilum (P.) illinoense		**T**	+
85500	Paratanytarsus sp		**F**	+
85625	Rheotanytarsus sp		**F**	+
93200	Hydrobiidae		**F**	+
95100	Physella sp		**T**	+
96120	Menetus (Micromenetus) dilatatus		**MT**	+
97601	Corbicula fluminea		**F**	+

No. Quantitative Taxa:	0	Total Taxa;	28
No. Qualitative Taxa:	28	ICI:	
Number of Organisms:	0	Qual EPT:	3

Appendix Table B-2. Macroinvertebrate taxa list for sites in the ColsDOSD24 study area

River Code: **02-937** River: ***Roberts Millikin Ditch (02-001-011)*** Coll. Date: *07/11/2024* RM: **2.80**

Site ID: **RMD03** Location: *Ust Westbelt Drive* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
00401	Spongillidae		**F**	+
01801	Turbellaria		**F**	+
03600	Oligochaeta		**T**	+
06201	Hyalella azteca		**F**	+
08200	Faxonius sp		**F**	+
11120	Baetis flavistriga		**F**	+
22001	Coenagrionidae		**T**	+
22300	Argia sp		**F**	+
49101	Sisyridae		**F**	+
52530	Hydropsyche depravata group		**F**	+
71900	Tipula sp		**F**	+
74100	Simulium sp		**F**	+
80420	Cricotopus (C.) bicinctus		**T**	+
83040	Dicrotendipes neomodestus		**F**	+
84210	Paratendipes albimanus or P. duplicatus		**F**	+
84450	Polypedilum (Uresipedilum) flavum		**F**	+
84470	Polypedilum (P.) illinoense		**T**	+
84540	Polypedilum (Tripodura) scalaenum group		**F**	+
85500	Paratanytarsus sp		**F**	+
95100	Physella sp		**T**	+
96120	Menetus (Micromenetus) dilatatus		**MT**	+

No. Quantitative Taxa:	0	Total Taxa;	21
No. Qualitative Taxa:	21	ICI:	
Number of Organisms:	0	Qual EPT:	2

Appendix Table B-2. Macroinvertebrate taxa list for sites in the ColsDOSD24 study area

River Code: **02-939** River: ***Scioto CC Creek @ RM 136.97 To Scioto (Evans*** Coll. Date: *06/28/2024* RM: **0.10**

Site ID: **SCC01** Location: *Scioto Point Dr.* Sample:

Taxa Code	Taxa	CWH Taxa	Tol.	Qt./Ql.
01801	Turbellaria		**F**	+
04935	Erpobdella punctata punctata		**MT**	+
04964	Erpobdella microstoma		**MT**	+
06700	Crangonyx sp		**MT**	+
66500	Enochrus sp		**MT**	+
71900	Tipula sp		**F**	+
98200	Pisidium sp		**MT**	+
98600	Sphaerium sp		**F**	+

No. Quantitative Taxa:	0	Total Taxa;	8
No. Qualitative Taxa:	8	ICI:	
Number of Organisms:	0	Qual EPT:	0

APPENDIX D-1: 2024 QHEI Scores and Metrics

Appendix Table D-1 *. QHEI scores and metrics in the Roberts Millikin Dict, Barbee Ditch, Dry Run, Evans Run, and Kian Run subwatersheds in 2024.*

Site ID	River Mile	QHEI	Substrate Score	Cover Score	Channel Score	Riparian Score	Pool Score	Riffle Score	Gradient Value	Gradient Score
Roberts Millikin Ditch (Scioto R. @137.52)										
RMD03	2.75	69.00	16	14	11.5	5.5	6	6	21.70	10
RMD02	1.59	61.00	17	14	11	3	6	6	41.70	4
Tributary to Roberts Milliken Ditch @RM 0.20										
RMD04	0.39	64.50	19.5	11	12	7	4	7	200.00	4
Barbee Ditch (Scioto River @ RM 135.75)										
BARB03	2.76	56.75	16	12	10.5	4.75	5	4.5	45.50	4
BARB02	1.51	65.00	16	14	14	6.5	5	5.5	52.60	4
BARB01	0.34	66.75	18	15	11	7.75	7	4	50.00	4
Tributary to Trabue Run @ RM 2.7										
TRB04	0.22	54.00	9.5	12	11	4	5	4.5	38.50	8
Tributary to Trabue Run @RM 1.21										
TRB05	0.90	59.50	17	11	10	4	5	4.5	34.50	8
Tributary @RM 0.5 To Tributary To Barbee Ditch @RM 1.87										
BARB04	0.43	58.50	17.5	15	11	3	4	4	55.60	4
Trabue Run (Tributary to Barbee Ditch @ RM 1.39)										
TRB03	2.18	65.25	15	16	13	4.25	8	5	52.60	4
TRB02	1.00	76.50	16	16	15	5.5	10	6	38.50	8
TRB01	0.05	67.50	17	16	12.5	5.5	9	3.5	71.40	4
Dry Run (Scioto R. @134.43)										
DRY02	2.75	54.00	14	11	8.5	7	3	2.5	33.30	8
DRY01	1.41	67.50	18	13	12.5	5	6	5	30.30	8
DRY03	0.08	60.50	18	12	11	3.5	8	4	41.70	4
Tributary to Dry Run @RM 1.61										
DRY09	2.40	56.50	16	14	7	3.5	5	3	34.50	8
DRY08	1.11	67.25	17	16	9.5	4.75	8	4	30.30	8
DRY05	0.75	71.25	17	15	13.5	5.25	7.5	5	30.30	8
DRY04	0.10	67.00	18	16	11	6	9	3	47.60	4
Tributary to Dry Run @ RM 2.61										
DRY07	1.74	56.50	17	14	5.5	3	5	2.5	23.30	10
DRY06	0.40	45.50	9	10	6.5	3.5	6	2.5	38.50	8
Evans Run (Scioto R. @RM 136.97)										
SCC01	0.10	67.50	18.5	14	13.5	5.5	7	5	250.00	4
Kian Run (Scioto R. @RM 126.5)										
KR02	0.82	49.00	9	14	7.5	5.5	5	0	11.78	8
KR01	0.05	49.00	7	15	4.5	5.5	7	0	11.76	10

Excellent	>70
Good	>55
Fair	>43
Poor	>30
Very Poor	<30

APPENDIX D-2: 2024 QHEI Field Sheets

Ohio EPA — Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 54

Stream & Location: Dry Creek @ DR102 RM: 2.75 Date: 7/23/24

Scorers Full Name & Affiliation: Corbin Binkley, MRJ

River Code: 02-095-___ STORET #: _____ Lat./Long.: 39.97298 183.08398 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR/SLABS [10]	___	___	☐☐ HARDPAN [4]	✓	___
☐☐ BOULDER [9]	✓	✓	☐☐ DETRITUS [3]	___	___
☐☐ COBBLE [8]	✓	✓	☐☐ MUCK [2]	___	___
☑☐ GRAVEL [7]	✓	✓	☐☐ SILT [2]	✓	✓
☐☑ SAND [6]	✓	✓	☐☐ ARTIFICIAL [0]	___	___
☐☐ BEDROCK [5]	___	___			

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

(Score natural substrates; ignore sludge from point-sources)

ORIGIN: ☑ LIMESTONE [1] ☑ TILLS [1] ☐ WETLANDS [0] ☐ HARDPAN [0] ☐ SANDSTONE [0] ☐ RIP/RAP [0] ☐ LACUSTURINE [0] ☐ SHALE [-1] ☐ COAL FINES [-2]

QUALITY: SILT ☐ HEAVY [-2] ☑ MODERATE [-1] ☐ NORMAL [0] ☐ FREE [1]

EMBEDDEDNESS ☐ EXTENSIVE [-2] ☑ MODERATE [-1] ☐ NORMAL [0] ☐ NONE [1]

Substrate: 14 (Maximum 20)

Comments: very silty, lots of trash

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]
1 OVERHANGING VEGETATION [1]	0 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]
1 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	3 LOGS OR WOODY DEBRIS [1]
1 ROOTMATS [1]		

AMOUNT (Check ONE (Or 2 & average))

☐ EXTENSIVE >75% [11] ☑ MODERATE 25-75% [7] ☑ SPARSE 5-<25% [3] ☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 11

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☑ MODERATE [2]
☑ LOW [2]	☑ FAIR [3]	☑ RECOVERING [3]	☑ LOW [1]
☐ NONE [1]	☑ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 8.5

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION L	EROSION R	
☐	☐	NONE / LITTLE [3]
☑	☑	MODERATE [2]
☑	☑	HEAVY / SEVERE [1]

RIPARIAN WIDTH L	RIPARIAN WIDTH R	
☐	☐	WIDE > 50m [4]
☑	☑	MODERATE 10-50m [3]
☐	☐	NARROW 5-10m [2]
☐	☐	VERY NARROW < 5m [1]
☐	☐	NONE [0]

FLOOD PLAIN QUALITY L	FLOOD PLAIN QUALITY R	
☑	☑	FOREST, SWAMP [3]
☑	☑	SHRUB OR OLD FIELD [2]
☐	☐	RESIDENTIAL, PARK, NEW FIELD [1]
☐	☐	FENCED PASTURE [1]
☐	☐	OPEN PASTURE, ROWCROP [0]
☐	☐	CONSERVATION TILLAGE [1]
☐	☐	URBAN OR INDUSTRIAL [0]
☐	☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments: Honeysuckle dominant forested riparian zone

Riparian Maximum 10: 7

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (ONLY!))
- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☑ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH (Check ONE (Or 2 & average))
- ☐ POOL WIDTH > RIFFLE WIDTH [2]
- ☐ POOL WIDTH = RIFFLE WIDTH [1]
- ☑ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY (Check ALL that apply)
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ☐ FAST [1]
- ☑ MODERATE [1]
- ☑ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☐ INTERMITTENT [-2]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 3

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☑ MAXIMUM < 50cm [1]	☑ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☑ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☑ MODERATE [0] ☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 2.5

6] GRADIENT (33.3 ft/mi) DRAINAGE AREA (0.75 mi²)

☐ VERY LOW - LOW [2-4] ☐ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

%POOL: 2 %GLIDE: ___ %RUN: ___ %RIFFLE: ___

Gradient Maximum 10: 8

EPA 4520 06/16/06

1596ft = 10 / 0.30 = 33.3

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st-sample pass- 2nd	
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☑ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

150 meters

CLARITY

1st --sample pass-- 2nd	
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☑ <10%- CLOSED

1st pass _____ cm

2nd _____ cm

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

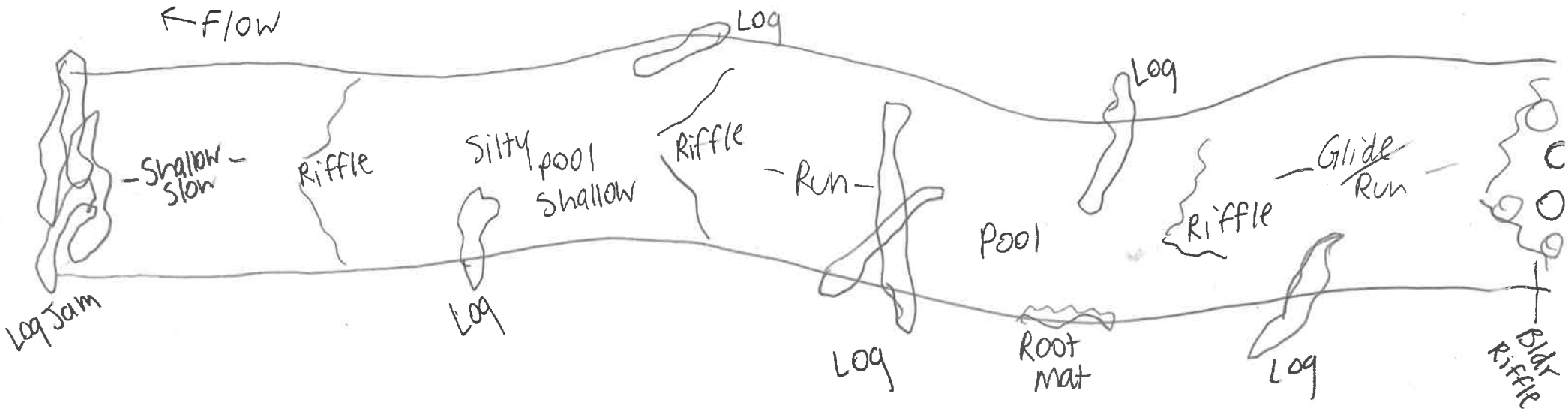
F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

Stream Drawing:



Ohio EPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 67.5

Stream & Location: Dry Run @ Holton Park RM: 1.41 Date: 7/25/24

DRY 01 Scorers Full Name & Affiliation: Corbin Binkley, MBI

River Code: 02 - 095 - ___ STORET #: _____ Lat./Long.: 39.96117 183.06789 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR/SLABS [10]			☐☐ HARDPAN [4]		
☐☐ BOULDER [9]	√	√	☐☐ DETRITUS [3]		
☐☑ COBBLE [8]	√	√	☐☐ MUCK [2]		
☑☐ GRAVEL [7]	√	√	☐☐ SILT [2]	√	√
☐☐ SAND [6]	√	√	☐☐ ARTIFICIAL [0]		
☐☐ BEDROCK [5]					

(Score natural substrates; ignore sludge from point-sources)

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

ORIGIN	QUALITY	
☑ LIMESTONE [1]	☐ HEAVY [-2]	
☑ TILLS [1]	☐ MODERATE [-1]	
☐ WETLANDS [0]	☑ NORMAL [0]	
☐ HARDPAN [0]	☐ FREE [1]	
☐ SANDSTONE [0]	SILT ☐ EXTENSIVE [-2]	
☐ RIP/RAP [0]	☐ MODERATE [-1]	
☐ LACUSTURINE [0]	EMBEDDEDNESS ☑ NORMAL [0]	
☐ SHALE [-1]	☐ NONE [1]	
☐ COAL FINES [-2]		

Substrate Maximum 20: 18

Comments

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]
1 OVERHANGING VEGETATION [1]	0 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]
1 SHALLOWS (IN SLOW WATER) [1]	3 BOULDERS [1]	2 LOGS OR WOODY DEBRIS [1]
1 ROOTMATS [1]		

AMOUNT (Check ONE (Or 2 & average))
☐ EXTENSIVE >75% [11]
☑ MODERATE 25-75% [7]
☐ SPARSE 5-<25% [3]
☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 13

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☑ HIGH [3]
☑ MODERATE [3]	☑ GOOD [5]	☐ RECOVERED [4]	☑ MODERATE [2]
☐ LOW [2]	☑ FAIR [3]	☑ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 12.5

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION L	EROSION R	RIPARIAN WIDTH L	RIPARIAN WIDTH R
☐ NONE / LITTLE [3]	☐	☐ WIDE > 50m [4]	☐
☑ MODERATE [2]	☑	☐ MODERATE 10-50m [3]	☐
☐ HEAVY / SEVERE [1]	☐	☑ NARROW 5-10m [2]	☑
		☐ VERY NARROW < 5m [1]	☐
		☐ NONE [0]	☐

FLOOD PLAIN QUALITY L	FLOOD PLAIN QUALITY R
☐ FOREST, SWAMP [3]	☐ CONSERVATION TILLAGE [1]
☐ SHRUB OR OLD FIELD [2]	☐ URBAN OR INDUSTRIAL [0]
☑ RESIDENTIAL, PARK, NEW FIELD [1]	☐ MINING / CONSTRUCTION [0]
☐ FENCED PASTURE [1]	
☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (ONLY!))
☐ > 1m [6]
☐ 0.7-<1m [4]
☑ 0.4-<0.7m [2]
☐ 0.2-<0.4m [1]
☐ < 0.2m [0]

CHANNEL WIDTH (Check ONE (Or 2 & average))
☑ POOL WIDTH > RIFFLE WIDTH [2]
☐ POOL WIDTH = RIFFLE WIDTH [1]
☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY (Check ALL that apply)
☐ TORRENTIAL [-1] ☑ SLOW [1]
☐ VERY FAST [1] ☐ INTERSTITIAL [-1]
☐ FAST [1] ☐ INTERMITTENT [-2]
☑ MODERATE [1] ☐ EDDIES [1]
Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 6

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☑ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☑ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	☑ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 5

6] GRADIENT (30.3 ft/mi) ☐ VERY LOW - LOW [2-4] ☐ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (7.24 mi²)

%POOL: 2 %GLIDE: ___ %RUN: ___ %RIFFLE: ___

Gradient Maximum 10: 8

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☑ L. LINE
- ☐ OTHER

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☑ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

STAGE

1st --sample pass-- 2nd	
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

CLARITY

1st --sample pass--	2nd
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☑ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

1st pass _____ cm

2nd _____ cm

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

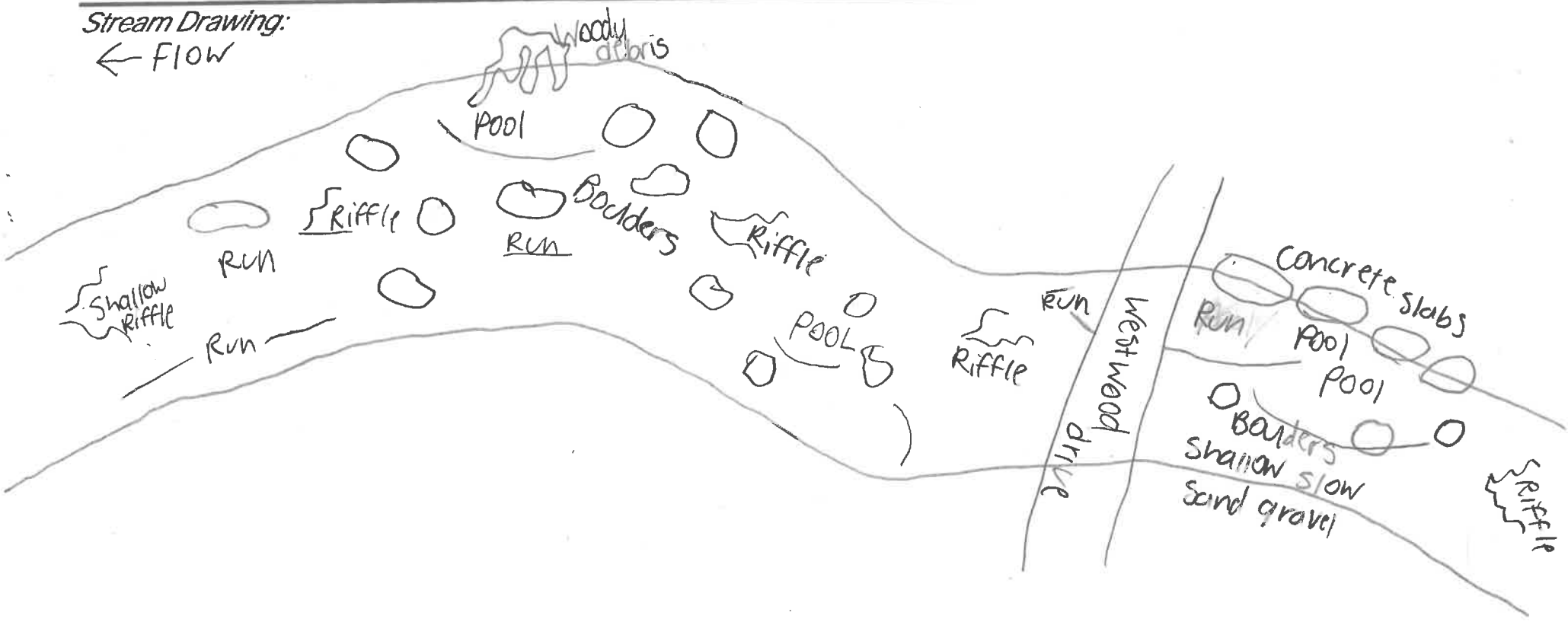
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



Ohio EPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 60.5

Stream & Location: Dry creek @ McKinley Ave RM: 0.08 Date: 7/24/24

DRY03 Scorers Full Name & Affiliation: Corbin Binkley, MBI

River Code: 02-095-___ STORET #: _____ Lat./Long.: 39.96567 183.04988 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR/SLABS [10]			☐☐ HARDPAN [4]		
☐☐ BOULDER [9]	✓	✓	☐☐ DETRITUS [3]		
☐☑ COBBLE [8]	✓	✓	☐☐ MUCK [2]		
☑☐ GRAVEL [7]	✓	✓	☐☐ SILT [2]	✓	✓
☐☐ SAND [6]	✓	✓	☐☐ ARTIFICIAL [0]	✓	✓
☐☐ BEDROCK [5]		✓	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

ORIGIN	QUALITY	
☑ LIMESTONE [1]	☐ HEAVY [-2]	
☑ TILLS [1]	☐ MODERATE [-1]	Substrate
☐ WETLANDS [0]	SILT ☑ NORMAL [0]	18
☐ HARDPAN [0]	☐ FREE [1]	
☐ SANDSTONE [0]	☐ EXTENSIVE [-2]	Maximum 20
☐ RIP/RAP [0]	EMBEDDEDNESS ☐ MODERATE [-1]	
☐ LACUSTURINE [0]	☑ NORMAL [0]	
☐ SHALE [-1]	☐ NONE [1]	
☐ COAL FINES [-2]		

Comments: lots of Large concrete slab/chunks in stream

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

0 UNDERCUT BANKS [1]	1 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	AMOUNT (Check ONE (Or 2 & average))
1 OVERHANGING VEGETATION [1]	0 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	☐ EXTENSIVE >75% [11]
1 SHALLOWS (IN SLOW WATER) [1]	2 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]	☑ MODERATE 25-75% [7]
0 ROOTMATS [1]			☐ SPARSE 5-<25% [3]
			☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 12

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☑ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☑ LOW [2]	☑ FAIR [3]	☑ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 11

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)	
☐☐ NONE / LITTLE [3]	☐☐ WIDE > 50m [4]	☐☐ FOREST, SWAMP [3]	☐☐ CONSERVATION TILLAGE [1]
☑☑ MODERATE [2]	☐☐ MODERATE 10-50m [3]	☐☐ SHRUB OR OLD FIELD [2]	☑☑ URBAN OR INDUSTRIAL [0]
☑☑ HEAVY / SEVERE [1]	☑☑ NARROW 5-10m [2]	☐☐ RESIDENTIAL, PARK, NEW FIELD [1]	☐☐ MINING / CONSTRUCTION [0]
	☐☐ VERY NARROW < 5m [1]	☐☐ FENCED PASTURE [1]	
	☐☐ NONE [0]	☐☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments: Very High, steep banks on both sides

Riparian Maximum 10: 3.5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH	CHANNEL WIDTH	CURRENT VELOCITY	
Check ONE (ONLY!)	Check ONE (Or 2 & average)	Check ALL that apply	
☐ > 1m [6]	☑ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1]	☑ SLOW [1]
☑ 0.7-<1m [4]	☐ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
☐ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	☐ FAST [1]	☐ INTERMITTENT [-2]
☐ 0.2-<0.4m [1]		☑ MODERATE [1]	☐ EDDIES [1]
☐ < 0.2m [0]		Indicate for reach - pools and riffles.	

Recreation Potential: Primary Contact / Secondary Contact (circle one and comment on back)

Comments

Pool / Current Maximum 12: 8

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☑ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	☑ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☑ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 4

6] GRADIENT (41.7 ft/mi) DRAINAGE AREA (7.86 mi²)

☐ VERY LOW - LOW [2-4] ☐ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

%POOL: 2 %GLIDE: %RUN: %RIFFLE:

Gradient Maximum 10: 4

EPA 4520 06/16/06

1277 ft = 10 ft / 0.24 mi = 41.7

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st-sample pass- 2nd		
☐	HIGH	☐
☐	UP	☐
☐	NORMAL	☐
☐	LOW	☐
☐	DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CLARITY

1st --sample pass--		2nd
☐	< 20 cm	☐
☐	20-<40 cm	☐
☐	40-70 cm	☐
☐	> 70 cm/ CTB	☐
☐	SECCHI DEPTH	☐

1st _____ cm

2nd _____ cm

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

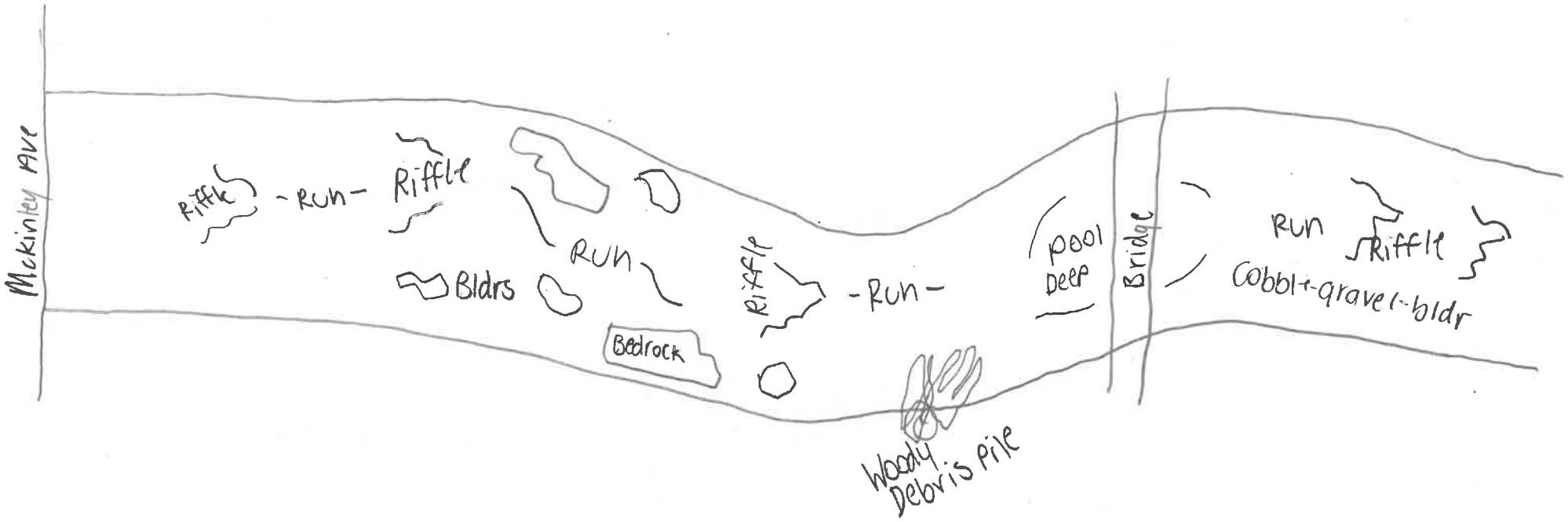
- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

Stream Drawing:

→ Flow



Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 56.5

Stream & Location: [redacted] Dry Run Trib RM: 2.4 Date: 7/26/24

[redacted] DRY09 Scorers Full Name & Affiliation: Corbin Binkley, MBI

River Code: 02-930- ___ STORET #: _____ Lat./Long.: 39.95625 183.10531 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE Check *ONLY* Two substrate *TYPE BOXES*; estimate % or note every type present

Check ONE (*Or 2 & average*)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR/SLABS [10]			☐ ☐ HARDPAN [4]		
☐ ☐ BOULDER [9]	✓	✓	☐ ☐ DETRITUS [3]		
☐ ☑ COBBLE [8]	✓	✓	☐ ☐ MUCK [2]		
☑ ☐ GRAVEL [7]	✓	✓	☐ ☐ SILT [2]	✓	
☐ ☐ SAND [6]	✓		☐ ☐ ARTIFICIAL [0]		
☐ ☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

ORIGIN	SILT	QUALITY
☐ LIMESTONE [1]		☐ HEAVY [-2]
☑ TILLS [1]		☑ MODERATE [-1]
☐ WETLANDS [0]		☐ NORMAL [0]
☐ HARDPAN [0]		☐ FREE [1]
☐ SANDSTONE [0]	EMBEDDEDNESS	☐ EXTENSIVE [-2]
☐ RIP/RAP [0]		☑ MODERATE [-1]
☐ LACUSTURINE [0]		☐ NORMAL [0]
☐ SHALE [-1]		☐ NONE [1]
☐ COAL FINES [-2]		

Comments

Substrate 16 Maximum 20

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	AMOUNT (Check ONE (*Or 2 & average*))
1 OVERHANGING VEGETATION [1]	1 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	☐ EXTENSIVE >75% [11]
2 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	3 LOGS OR WOODY DEBRIS [1]	☑ MODERATE 25-75% [7]
2 ROOTMATS [1]			☐ SPARSE 5-<25% [3]
			☐ NEARLY ABSENT <5% [1]

Comments

Lots of trash in stream, increased algae growth on rock substrates

Cover Maximum 20: 14

3] CHANNEL MORPHOLOGY Check ONE in each category (*Or 2 & average*)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☑ MODERATE [2]
☐ LOW [2]	☑ FAIR [3]	☑ RECOVERING [3]	☐ LOW [1]
☑ NONE [1]	☑ POOR [1]	☑ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 7

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for *EACH BANK* (*Or 2 per bank & average*)

River right looking downstream

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)	
☐ ☐ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	☐ ☐ FOREST, SWAMP [3]	☐ ☐ CONSERVATION TILLAGE [1]
☑ ☑ MODERATE [2]	☐ ☐ MODERATE 10-50m [3]	☐ ☐ SHRUB OR OLD FIELD [2]	☑ ☑ URBAN OR INDUSTRIAL [0]
☐ ☐ HEAVY / SEVERE [1]	☑ ☑ NARROW 5-10m [2]	☒ ☐ RESIDENTIAL, PARK, NEW FIELD [1]	☐ ☐ MINING / CONSTRUCTION [0]
	☑ ☑ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]	
	☐ ☐ NONE [0]	☐ ☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 3.5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH	CHANNEL WIDTH	CURRENT VELOCITY
Check ONE (*ONLY!*)	Check ONE (*Or 2 & average*)	Check ALL that apply
☐ > 1m [6]	☑ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1] ☑ SLOW [1]
☐ 0.7-<1m [4]	☐ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1] ☐ INTERSTITIAL [-1]
☑ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	☐ FAST [1] ☐ INTERMITTENT [-2]
☐ 0.2-<0.4m [1]		☐ MODERATE [1] ☐ EDDIES [1]
☐ < 0.2m [0]		Indicate for reach - pools and riffles.

Recreation Potential: Primary Contact / Secondary Contact (circle one and comment on back)

Comments

Pool / Current Maximum 12: 5

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☑ MAXIMUM < 50cm [1]	☑ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☑ MODERATE [0] ☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 3

6] GRADIENT (34.5 ft/mi) ☐ VERY LOW - LOW [2-4] ☐ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (1.28 mi²)

%POOL: 2 %GLIDE: ___ %RUN: ___ %RIFFLE: ___

Gradient Maximum 10: 8

EPA 4520 06/16/06

Habitat = 56

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☑ OTHER

STAGE

1st-sample pass- 2nd

- ☐ HIGH ☐
- ☐ UP ☐
- ☑ NORMAL ☐
- ☐ LOW ☐
- ☐ DRY ☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☑ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

150 meters

CLARITY

1st --sample pass-- 2nd

- ☐ < 20 cm ☐
- ☐ 20-<40 cm ☐
- ☑ 40-70 cm ☐
- ☐ > 70 cm/CTB ☐
- ☐ SECCHI DEPTH ☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☑ <10%- CLOSED

1st pass _____ cm

2nd _____ cm

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

Tall steep banks, LOTS of trash in stream

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

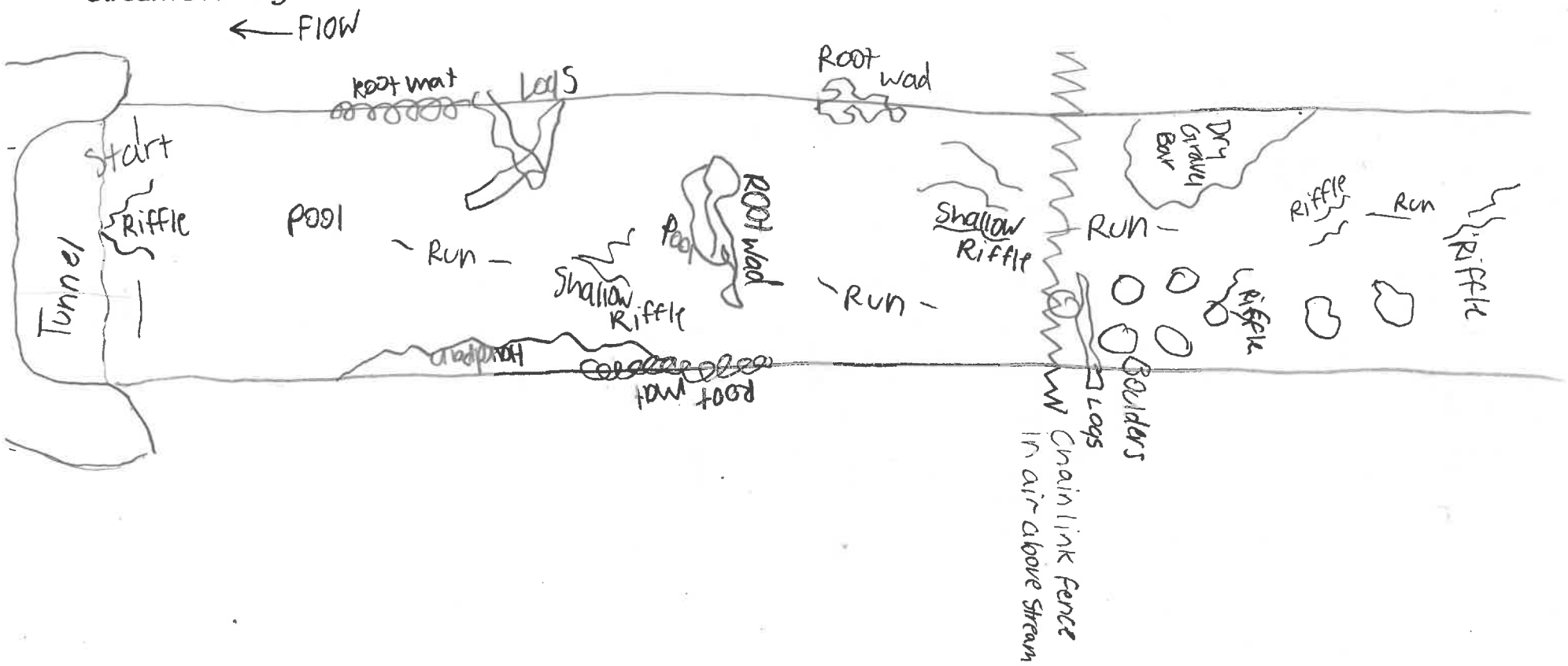
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



Ohio EPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 67.25

Stream & Location: Dry Run Trib @ Westmoor Park RM: 1.11 Date: 7/24/24

DRY 06

Scorers Full Name & Affiliation: Corbin Binkley, MOI

River Code: 02-930- STORET #: Lat./Long.: 39.9519 183.08340 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE

Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]			☐ ☐ HARDPAN [4]	✓	✓
☐ ☐ BOULDER [9]	✓	✓	☐ ☐ DETRITUS [3]		
☐ ☑ COBBLE [8]	✓	✓	☐ ☐ MUCK [2]		
☑ ☐ GRAVEL [7]	✓	✓	☐ ☐ SILT [2]	✓	✓
☐ ☐ SAND [6]	✓	✓	☐ ☐ ARTIFICIAL [0]		
☐ ☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

ORIGIN	SILT	QUALITY
☐ LIMESTONE [1]		☐ HEAVY [-2]
☑ TILLS [1]		☐ MODERATE [-1]
☐ WETLANDS [0]		☑ NORMAL [0]
☐ HARDPAN [0]		☐ FREE [1]
☐ SANDSTONE [0]	EMBEDDEDNESS	☐ EXTENSIVE [-2]
☐ RIP/RAP [0]		☑ MODERATE [-1]
☐ LACUSTURINE [0]		☐ NORMAL [0]
☐ SHALE [-1]		☐ NONE [1]
☐ COAL FINES [-2]		

Substrate 17 Maximum 20

Comments: Hardpan 3rd dominant

2] INSTREAM COVER

Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

2	UNDERCUT BANKS [1]	1	POOLS > 70cm [2]	0	OXBOWS, BACKWATERS [1]
2	OVERHANGING VEGETATION [1]	1	ROOTWADS [1]	0	AQUATIC MACROPHYTES [1]
1	SHALLOWS (IN SLOW WATER) [1]	1	BOULDERS [1]	2	LOGS OR WOODY DEBRIS [1]
2	ROOTMATS [1]				

AMOUNT (Check ONE (Or 2 & average))

☐ EXTENSIVE >75% [11]
☑ MODERATE 25-75% [7]
☐ SPARSE 5-<25% [3]
☐ NEARLY ABSENT <5% [1]

Comments:

Cover Maximum 20: 16

3] CHANNEL MORPHOLOGY

Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☑ MODERATE [2]
☑ LOW [2]	☑ FAIR [3]	☑ RECOVERING [3]	☑ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments: Mobile bedload evident

Channel Maximum 20: 9.5

4] BANK EROSION AND RIPARIAN ZONE

Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION L	EROSION R	RIPARIAN WIDTH L	RIPARIAN WIDTH R
☐	☐	☐	☐ WIDE > 50m [4]
☑	☑	☐	☑ MODERATE 10-50m [3]
☐	☑	☑	☑ NARROW 5-10m [2]
		☑	☐ VERY NARROW < 5m [1]
		☐	☐ NONE [0]

FLOOD PLAIN QUALITY L	FLOOD PLAIN QUALITY R	
☐	☐	FOREST, SWAMP [3]
☐	☐	SHRUB OR OLD FIELD [2]
☑	☑	RESIDENTIAL, PARK, NEW FIELD [1]
☐	☐	FENCED PASTURE [1]
☐	☐	OPEN PASTURE, ROWCROP [0]
☐	☐	CONSERVATION TILLAGE [1]
☐	☐	URBAN OR INDUSTRIAL [0]
☐	☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments:

Riparian Maximum 10: 4.75

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (ONLY))

☐ > 1m [6]
☑ 0.7-<1m [4]
☐ 0.4-<0.7m [2]
☐ 0.2-<0.4m [1]
☐ < 0.2m [0]

CHANNEL WIDTH (Check ONE (Or 2 & average))

☑ POOL WIDTH > RIFFLE WIDTH [2]
☐ POOL WIDTH = RIFFLE WIDTH [1]
☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY (Check ALL that apply)

☐ TORRENTIAL [-1]
☐ VERY FAST [1]
☐ FAST [1]
☑ MODERATE [1]
☑ SLOW [1]
☐ INTERSTITIAL [-1]
☐ INTERMITTENT [-2]
☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments:

Pool / Current Maximum 12: 8

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☑ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	☑ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☑ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments:

Riffle / Run Maximum 8: 4

6] GRADIENT (30.3 ft/mi) DRAINAGE AREA (2.57 mi²)

☐ VERY LOW - LOW [2-4]
☐ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: 2 %GLIDE: %RUN: %RIFFLE:

Gradient Maximum 10: 8

EPA 4520 06/16/06

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st-sample pass- 2nd

- ☐ HIGH ☐
- ☐ UP ☐
- ☐ NORMAL ☐
- ☐ LOW ☐
- ☐ DRY ☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☑ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

150 meters

CLARITY

1st --sample pass-- 2nd

- ☐ < 20 cm ☐
- ☐ 20-<40 cm ☐
- ☐ 40-70 cm ☐
- ☐ > 70 cm/ CTB ☐
- ☐ SECCHI DEPTH ☐

CANOPY

1st pass _____ cm

2nd _____ cm

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☑ 10%-<30%
- ☐ <10%- CLOSED

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

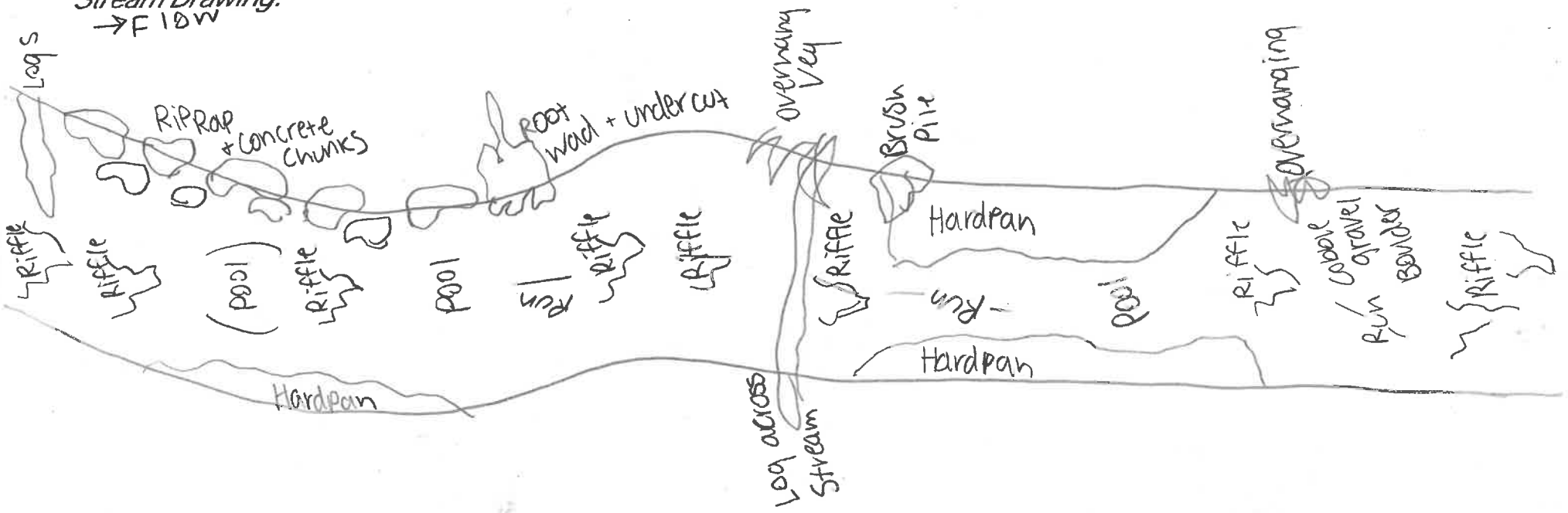
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 71.25

Stream & Location: Dry Creek Trib RM: 0.75 Date: 7/24/24

DRY05

Scorers Full Name & Affiliation: Corbin Binkley, MBI

River Code: 02-930-___ STORET #: _____ Lat/Long.: 39.96068 183.02952 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE

Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR/SLABS [10]			☐ ☐ HARDPAN [4]	✓	✓
☐ ☐ BOULDER [9]	✓	✓	☐ ☐ DETRITUS [3]		
☐ ☑ COBBLE [8]	✓	✓	☐ ☐ MUCK [2]		
☑ ☐ GRAVEL [7]	✓	✓	☐ ☐ SILT [2]	✓	✓
☐ ☐ SAND [6]	✓	✓	☐ ☐ ARTIFICIAL [0]	✓	
☐ ☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

Comments

Check ONE (Or 2 & average)

ORIGIN	SILT / EMBEDDEDNESS	QUALITY
☐ LIMESTONE [1]		☐ HEAVY [-2]
☑ TILLS [1]		☐ MODERATE [-1]
☐ WETLANDS [0]		☑ NORMAL [0]
☐ HARDPAN [0]		☐ FREE [1]
☐ SANDSTONE [0]		☐ EXTENSIVE [-2]
☐ RIP/RAP [0]		☑ MODERATE [-1]
☐ LACUSTURINE [0]		☐ NORMAL [0]
☐ SHALE [-1]		☐ NONE [1]
☐ COAL FINES [-2]		

Substrate 17 Maximum 20

2] INSTREAM COVER

Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

2 UNDERCUT BANKS [1]	1 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	
2 OVERHANGING VEGETATION [1]	0 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	
1 SHALLOWS (IN SLOW WATER) [1]	2 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]	
3 ROOTMATS [1]			

AMOUNT (Check ONE (Or 2 & average))

☐ EXTENSIVE >75% [11]
☑ MODERATE 25-75% [7]
☐ SPARSE 5-<25% [3]
☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 15

3] CHANNEL MORPHOLOGY

Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☑ MODERATE [3]	☑ GOOD [5]	☑ RECOVERED [4]	☑ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	☑ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 13.5

4] BANK EROSION AND RIPARIAN ZONE

Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION L	EROSION R	RIPARIAN WIDTH L	RIPARIAN WIDTH R
☐ NONE / LITTLE [3]	☐ NONE / LITTLE [3]	☐ WIDE > 50m [4]	☐ WIDE > 50m [4]
☐ MODERATE [2]	☐ MODERATE [2]	☑ MODERATE 10-50m [3]	☑ MODERATE 10-50m [3]
☑ HEAVY / SEVERE [1]	☑ HEAVY / SEVERE [1]	☐ NARROW 5-10m [2]	☑ NARROW 5-10m [2]
		☐ VERY NARROW < 5m [1]	☐ VERY NARROW < 5m [1]
		☐ NONE [0]	☐ NONE [0]

FLOOD PLAIN QUALITY L	FLOOD PLAIN QUALITY R
☐ FOREST, SWAMP [3]	☐ FOREST, SWAMP [3]
☑ SHRUB OR OLD FIELD [2]	☑ SHRUB OR OLD FIELD [2]
☐ RESIDENTIAL, PARK, NEW FIELD [1]	☑ RESIDENTIAL, PARK, NEW FIELD [1]
☐ FENCED PASTURE [1]	☐ FENCED PASTURE [1]
☐ OPEN PASTURE, ROWCROP [0]	☐ OPEN PASTURE, ROWCROP [0]

L	R	
☐	☐	CONSERVATION TILLAGE [1]
☐	☐	URBAN OR INDUSTRIAL [0]
☐	☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 5.25

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (ONLY!))

☐ > 1m [6]
☑ 0.7-<1m [4]
☐ 0.4-<0.7m [2]
☐ 0.2-<0.4m [1]
☐ < 0.2m [0]

CHANNEL WIDTH (Check ONE (Or 2 & average))

☑ POOL WIDTH > RIFFLE WIDTH [2]
☑ POOL WIDTH = RIFFLE WIDTH [1]
☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY (Check ALL that apply)

☐ TORRENTIAL [-1]	☑ SLOW [1]
☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
☐ FAST [1]	☐ INTERMITTENT [-2]
☑ MODERATE [1]	☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 7.5

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☑ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	☑ MOD. STABLE (e.g., Large Gravel) [1]	☑ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 5

6] GRADIENT

(30-3 ft/mi) ☐ VERY LOW - LOW [2-4] ☐ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (2.73 mi²)

%POOL: 2 %GLIDE: ____ %RUN: ____ %RIFFLE: ____

Gradient Maximum 10: 8

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st-sample pass- 2nd	
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☑ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

150 meters

CLARITY

1st --sample pass-- 2nd	
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

1st pass _____ cm

2nd _____ cm

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

Blue hue to Stream Water

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

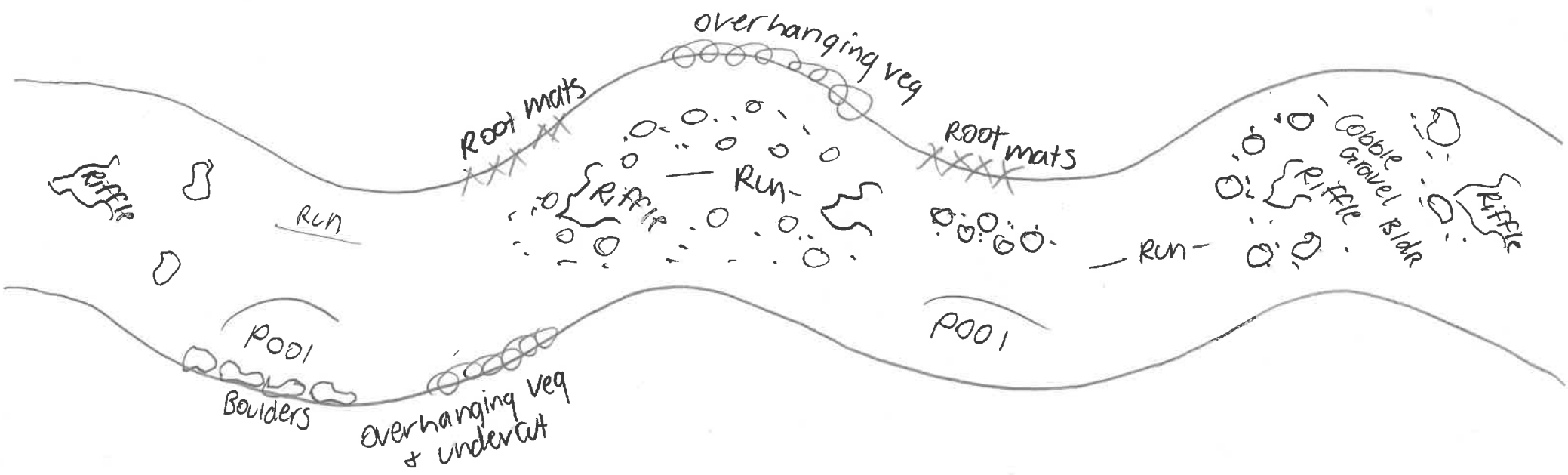
F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:

← FLOW



Ohio EPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 67

Stream & Location: Dry Run Trib @ Valleyview Drive RM: 0.10 Date: 7/24/24

DRY04 Scorers Full Name & Affiliation: Corbin Binkley, MBI

River Code: 02-930-___ STORET #: _____ Lat./Long.: 39.96321 183.02097 (NAD 83 - decimal) Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]			☐ ☐ HARDPAN [4]	✓	
☐ ☐ BOULDER [9]	✓	✓	☐ ☐ DETRITUS [3]		
☐ ☑ COBBLE [8]	✓	✓	☐ ☐ MUCK [2]		
☑ ☐ GRAVEL [7]	✓	✓	☐ ☐ SILT [2]	✓	✓
☐ ☐ SAND [6]	✓	✓	☐ ☐ ARTIFICIAL [0]	✓	✓
☐ ☐ BEDROCK [5]		✓	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

ORIGIN	SILT	QUALITY
☐ LIMESTONE [1]		☐ HEAVY [-2]
☑ TILLS [1]		☐ MODERATE [-1]
☐ WETLANDS [0]		☑ NORMAL [0]
☐ HARDPAN [0]	EMBEDDEDNESS	☐ FREE [1]
☐ SANDSTONE [0]		☐ EXTENSIVE [-2]
☐ RIP/RAP [0]		☑ MODERATE [-1]
☐ LACUSTURINE [0]		☐ NORMAL [0]
☐ SHALE [-1]		☐ NONE [1]
☐ COAL FINES [-2]		

Substrate 18 Maximum 20

Comments: Concrete Slab Chunks common in Stream & on bank, Trash in/around Stream

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]	1 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	AMOUNT (Check ONE (Or 2 & average))
1 OVERHANGING VEGETATION [1]	1 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	☐ EXTENSIVE >75% [11]
1 SHALLOWS (IN SLOW WATER) [1]	2 BOULDERS [1]	2 LOGS OR WOODY DEBRIS [1]	☑ MODERATE 25-75% [7]
2 ROOTMATS [1]			☐ SPARSE 5-<25% [3]
			☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 16

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☑ GOOD [5]	☐ RECOVERED [4]	☑ MODERATE [2]
☑ LOW [2]	☑ FAIR [3]	☑ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 11

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)	
☐ ☐ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	☐ ☑ FOREST, SWAMP [3]	☐ ☐ CONSERVATION TILLAGE [1]
☑ ☑ MODERATE [2]	☐ ☑ MODERATE 10-50m [3]	☐ ☐ SHRUB OR OLD FIELD [2]	☐ ☐ URBAN OR INDUSTRIAL [0]
☐ ☐ HEAVY / SEVERE [1]	☑ ☐ NARROW 5-10m [2]	☑ ☑ RESIDENTIAL, PARK, NEW FIELD [1]	☐ ☐ MINING / CONSTRUCTION [0]
	☐ ☐ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]	
	☐ ☐ NONE [0]	☐ ☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 6

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (ONLY!))	CHANNEL WIDTH (Check ONE (Or 2 & average))	CURRENT VELOCITY (Check ALL that apply)	
☐ > 1m [6]	☑ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1]	☑ SLOW [1]
☑ 0.7-<1m [4]	☐ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
☐ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	☑ FAST [1]	☐ INTERMITTENT [-2]
☐ 0.2-<0.4m [1]		☑ MODERATE [1]	☐ EDDIES [1]
☐ < 0.2m [0]		Indicate for reach - pools and riffles.	

Recreation Potential: Primary Contact / Secondary Contact (circle one and comment on back)

Comments

Pool / Current Maximum 12: 9

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☑ MAXIMUM < 50cm [1]	☑ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☑ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 3

6] GRADIENT (47.6 ft/mi) ☐ VERY LOW - LOW [2-4] ☐ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (3.43 mi²)

%POOL: 2 %GLIDE: ____ %RUN: ____ %RIFFLE: ____

Gradient Maximum 10: 4

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st –sample pass– 2nd	
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☑ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

150 meters

CLARITY

1st –sample pass– 2nd	
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

1st pass _____ cm

2nd _____ cm

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☑ 10%-<30%
- ☐ <10%- CLOSED

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

Blue hue to the water, suspect of dyed pond overflow?

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

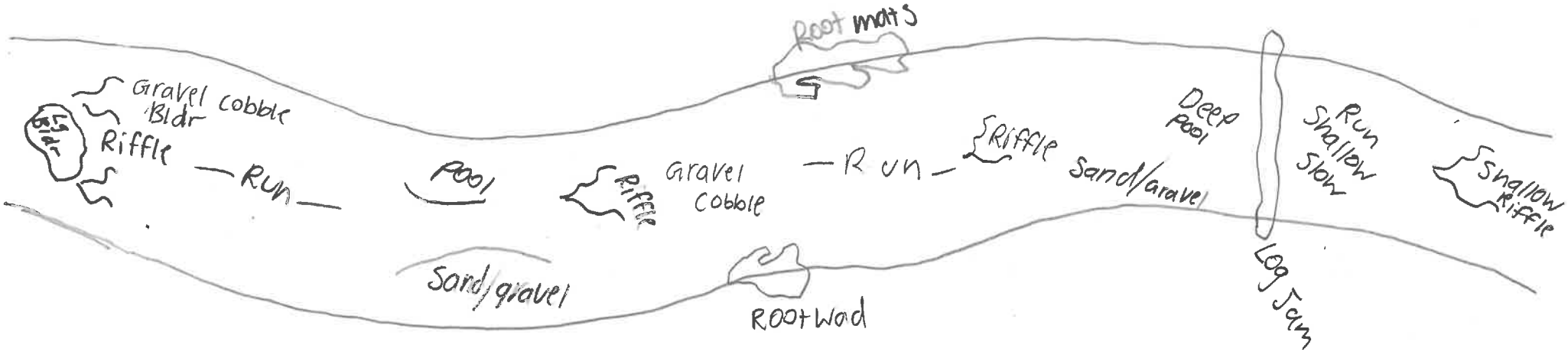
F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:

←Flow



Ohio EPA — Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 56.5

Stream & Location: Dry Run Trib @ Phillipi Rd RM: 1.74 Date: 7/24/24

DRY07 Scorers Full Name & Affiliation: Corbin Binkley, MBI

River Code: 02-931-___ STORET #: _____ Lat./Long.: 39.9658 83.1115 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR/SLABS [10]	___	___	☐ ☐ HARDPAN [4]	___	___
☐ ☐ BOULDER [9]	✓	✓	☐ ☐ DETRITUS [3]	___	___
☐ ☐ COBBLE [8]	✓	✓	☐ ☐ MUCK [2]	___	___
☑ ☑ GRAVEL [7]	✓	✓	☐ ☐ SILT [2]	___	___
☐ ☐ SAND [6]	✓	✓	☐ ☐ ARTIFICIAL [0]	✓	✓
☐ ☐ BEDROCK [5]	___	___			

(Score natural substrates; ignore sludge from point-sources)

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

Check ONE (Or 2 & average)

ORIGIN		QUALITY	
☐ LIMESTONE [1]	SILT	☐ HEAVY [-2]	Substrate
☑ TILLS [1]		☐ MODERATE [-1]	16.5
☐ WETLANDS [0]		☑ NORMAL [0]	
☑ HARDPAN [0]		☐ FREE [1]	
☐ SANDSTONE [0]	EMBEDDEDNESS	☐ EXTENSIVE [-2]	Maximum 20
☐ RIP/RAP [0]		☐ MODERATE [-1]	
☐ LACUSTURINE [0]		☑ NORMAL [0]	
☐ SHALE [-1]		☐ NONE [1]	
☐ COAL FINES [-2]			

Comments: Mostly fine gravel over hardpan

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	
3 OVERHANGING VEGETATION [1]	0 ROOTWADS [1]	3 AQUATIC MACROPHYTES [1]	
1 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]	
1 ROOTMATS [1]			

AMOUNT (Check ONE (Or 2 & average))

☐ EXTENSIVE >75% [11]
☑ MODERATE 25-75% [7]
☐ SPARSE 5-<25% [3]
☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 14

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☑ MODERATE [2]
☑ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☑ NONE [1]	☑ POOR [1]	☑ RECENT OR NO RECOVERY [1]	

Comments: Mostly a straight roadside ditch, mowed to within 1-2 ft of stream

Channel Maximum 20: 5.5

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION L	EROSION R	RIPARIAN WIDTH L	RIPARIAN WIDTH R
☑ NONE / LITTLE [3]	☑ NONE / LITTLE [3]	☐ WIDE > 50m [4]	☐ WIDE > 50m [4]
☐ MODERATE [2]	☐ MODERATE [2]	☐ MODERATE 10-50m [3]	☐ MODERATE 10-50m [3]
☐ HEAVY / SEVERE [1]	☐ HEAVY / SEVERE [1]	☐ NARROW 5-10m [2]	☐ NARROW 5-10m [2]
		☐ VERY NARROW < 5m [1]	☐ VERY NARROW < 5m [1]
		☑ NONE [0]	☑ NONE [0]

FLOOD PLAIN QUALITY L	FLOOD PLAIN QUALITY R
☐ FOREST, SWAMP [3]	☐ CONSERVATION TILLAGE [1]
☐ SHRUB OR OLD FIELD [2]	☑ URBAN OR INDUSTRIAL [0]
☐ RESIDENTIAL, PARK, NEW FIELD [1]	☐ MINING / CONSTRUCTION [0]
☐ FENCED PASTURE [1]	
☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments: Except for last 20 meters or so

Riparian Maximum 10: 3

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (ONLY!))

☐ > 1m [6]
☐ 0.7-<1m [4]
☐ 0.4-<0.7m [2]
☑ 0.2-<0.4m [1]
☐ < 0.2m [0]

CHANNEL WIDTH (Check ONE (Or 2 & average))

☑ POOL WIDTH > RIFFLE WIDTH [2]
☐ POOL WIDTH = RIFFLE WIDTH [1]
☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY (Check ALL that apply)

☐ TORRENTIAL [-1]
☑ SLOW [1]
☐ VERY FAST [1]
☐ INTERSTITIAL [-1]
☐ FAST [1]
☐ INTERMITTENT [-2]
☑ MODERATE [1]
☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 5

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☑ MAXIMUM < 50cm [1]	☑ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☑ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☑ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 2.5

6] GRADIENT (23.3 ft/mi) DRAINAGE AREA (1.37 mi²)

☐ VERY LOW - LOW [2-4]
☐ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: 2 %GLIDE: ___ %RUN: ___ %RIFFLE: ___

Gradient Maximum 10: 10

EPA 4520 06/16/06

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass-	2nd
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☑ 0.12 Km
- ☐ OTHER

125 meters

CLARITY

1st --sample pass--	2nd
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

1st pass _____ cm

2nd _____ cm

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

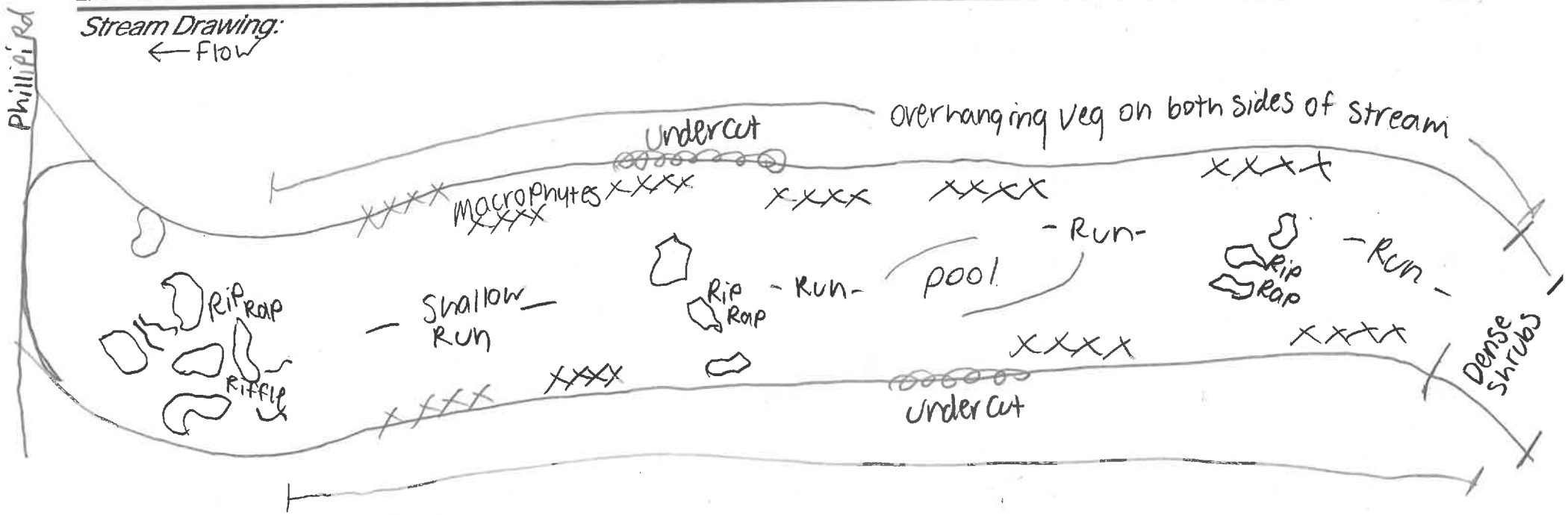
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 45.5

Stream & Location: Dry Run trib @ Nixon Drive RM: 0.40 Date: 7/24/24

DRY 06

Scorers Full Name & Affiliation: Corbin Binkley, MBI

River Code: 02-931-___ STORET #: _____ Lat/Long.: 39.96982 183.08787 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE

Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR/SLABS [10]	___	___	☐☐ HARDPAN [4]	___	___
☐☐ BOULDER [9]	✓	___	☐☐ DETRITUS [3]	___	___
☐☐ COBBLE [8]	✓	✓	☐☐ MUCK [2]	___	___
☑☐ GRAVEL [7]	✓	✓	☐☐ SILT [2]	___	___
☐☐ SAND [6]	✓	✓	☐☑ ARTIFICIAL [0]	✓	✓
☐☐ BEDROCK [5]	___	✓	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

Check ONE (Or 2 & average)

ORIGIN	SILT	QUALITY
☐ LIMESTONE [1]		☐ HEAVY [-2]
☑ TILLS [1]		☐ MODERATE [-1]
☐ WETLANDS [0]		☑ NORMAL [0]
☐ HARDPAN [0]		☐ FREE [1]
☐ SANDSTONE [0]	EMBEDDEDNESS	☐ EXTENSIVE [-2]
☐ RIP/RAP [0]		☑ MODERATE [-1]
☐ LACUSTURINE [0]		☐ NORMAL [0]
☐ SHALE [-1]		☐ NONE [1]
☐ COAL FINES [-2]		

Substrate 9 Maximum 20

Comments

Pavers, Cinder blocks, & concrete chunks in stream & bank as stabilization

2] INSTREAM COVER

Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1	UNDERCUT BANKS [1]	0	POOLS > 70cm [2]	0	OXBOWS, BACKWATERS [1]
1	OVERHANGING VEGETATION [1]	0	ROOTWADS [1]	0	AQUATIC MACROPHYTES [1]
2	SHALLOWS (IN SLOW WATER) [1]	1	BOULDERS [1]	1	LOGS OR WOODY DEBRIS [1]
0	ROOTMATS [1]				

AMOUNT (Check ONE (Or 2 & average))

☐ EXTENSIVE >75% [11]
☑ MODERATE 25-75% [7]
☑ SPARSE 5-<25% [3]
☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 10

3] CHANNEL MORPHOLOGY

Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☑ MODERATE [2]
☑ LOW [2]	☑ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☑ NONE [1]	☑ POOR [1]	☑ RECENT OR NO RECOVERY [1]	

Comments

Channelized through residential area

Channel Maximum 20: 6.5

4] BANK EROSION AND RIPARIAN ZONE

Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION L	EROSION R	RIPARIAN WIDTH L	RIPARIAN WIDTH R
☐	☐	☐	☐ WIDE > 50m [4]
☐	☐	☐	☐ MODERATE 10-50m [3]
☑	☑	☐	☐ NARROW 5-10m [2]
☐	☐	☑	☑ VERY NARROW < 5m [1]
☐	☐	☑	☑ NONE [0]

FLOOD PLAIN QUALITY L	FLOOD PLAIN QUALITY R	
☐	☐	FOREST, SWAMP [3]
☐	☐	SHRUB OR OLD FIELD [2]
☑	☑	RESIDENTIAL, PARK, NEW FIELD [1]
☐	☐	FENCED PASTURE [1]
☐	☐	OPEN PASTURE, ROWCROP [0]

L	R	
☐	☐	CONSERVATION TILLAGE [1]
☐	☐	URBAN OR INDUSTRIAL [0]
☐	☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 3.5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (ONLY!))

☐ > 1m [6]
☐ 0.7-<1m [4]
☑ 0.4-<0.7m [2]
☐ 0.2-<0.4m [1]
☐ < 0.2m [0]

CHANNEL WIDTH (Check ONE (Or 2 & average))

☑ POOL WIDTH > RIFFLE WIDTH [2]
☐ POOL WIDTH = RIFFLE WIDTH [1]
☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY (Check ALL that apply)

☐ TORRENTIAL [-1]
☐ VERY FAST [1]
☐ FAST [1]
☑ MODERATE [1]
☑ SLOW [1]
☐ INTERSTITIAL [-1]
☐ INTERMITTENT [-2]
☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 6

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: ☐ NO RIFFLE [metric=0]

Check ONE (Or 2 & average).

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☑ MAXIMUM < 50cm [1]	☑ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☑ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☑ MODERATE [0]
		Even mix of both	☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 2.5

6] GRADIENT (38.5 ft/mi)

DRAINAGE AREA (2.15 mi²)

☐ VERY LOW - LOW [2-4]
☐ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: ? %GLIDE: ___
%RUN: ___ %RIFFLE: ___

Gradient Maximum 10: 8

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st-sample pass- 2nd	
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☑ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

150 meters

CLARITY

1st --sample pass-- 2nd	
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

1st _____ cm pass

2nd _____ cm

CANOPY

- ☐ > 85%- OPEN
- ☑ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

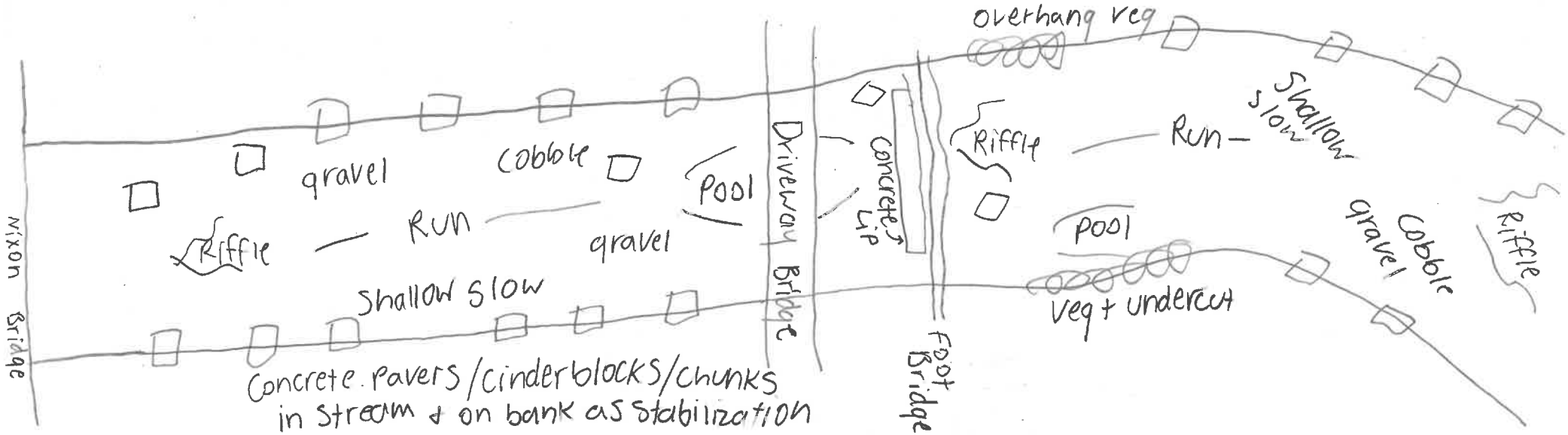
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



Ohio EPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 56.75

Stream & Location: Barbee Ditch Ust Wilson Rd RM: 2.76 Date: 7/15/24

BARB03 Scorers Full Name & Affiliation: MAS -> MBI

River Code: 02-932-___ STORET #: _____ Lat./Long.: 39.98505 183.10624 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR/SLABS [10]	___	___	☐☐ HARDPAN [4]	X	___
☐☐ BOULDER [9]	___	X	☐☐ DETRITUS [3]	___	___
☐☒ COBBLE [8]	X	X	☐☐ MUCK [2]	___	___
☒☐ GRAVEL [7]	X	X	☐☐ SILT [2]	X	___
☐☐ SAND [6]	X	___	☐☐ ARTIFICIAL [0]	X	X
☐☐ BEDROCK [5]	___	___	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☒ 4 or more [2] ☐ 3 or less [0]

ORIGIN	QUALITY	
☐ LIMESTONE [1]	☐ HEAVY [-2]	
☒ TILLS [1]	☒ MODERATE [-1]	
☐ WETLANDS [0]	☐ NORMAL [0]	
☐ HARDPAN [0]	☐ FREE [1]	
☐ SANDSTONE [0]	SILT / EMBEDDEDNESS ☐ EXTENSIVE [-2]	
☐ RIP/RAP [0]	☒ MODERATE [-1]	
☐ LACUSTURINE [0]	☐ NORMAL [0]	
☐ SHALE [-1]	☐ NONE [1]	
☐ COAL FINES [-2]		

Comments

Substrate: 16 (Maximum 20)

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	
2 OVERHANGING VEGETATION [1]	1 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	
1 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	2 LOGS OR WOODY DEBRIS [1]	
1 ROOTMATS [1]			

AMOUNT Check ONE (Or 2 & average)

☐ EXTENSIVE >75% [11] ☒ MODERATE 25-75% [7] ☒ SPARSE 5-<25% [3] ☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 17

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☒ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☒ MODERATE [2]
☒ LOW [2]	☒ FAIR [3]	☒ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 10.5

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION L	EROSION R	RIPARIAN WIDTH L	RIPARIAN WIDTH R
☒	☒	☐	☐ WIDE > 50m [4]
☒	☐	☐	☐ MODERATE 10-50m [3]
☐	☐	☐	☐ NARROW 5-10m [2]
☒	☒	☐	☐ VERY NARROW < 5m [1]
☐	☐	☐	☐ NONE [0]

FLOOD PLAIN QUALITY L	FLOOD PLAIN QUALITY R	
☐	☐	FOREST, SWAMP [3]
☐	☐	SHRUB OR OLD FIELD [2]
☒	☒	RESIDENTIAL, PARK, NEW FIELD [1]
☐	☐	FENCED PASTURE [1]
☐	☐	OPEN PASTURE, ROWCROP [0]
☐	☐	CONSERVATION TILLAGE [1]
☐	☐	URBAN OR INDUSTRIAL [0]
☐	☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 4.75

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check ONE (ONLY!)

☐ > 1m [6] ☐ 0.7-<1m [4] ☒ 0.4-<0.7m [2] ☐ 0.2-<0.4m [1] ☐ < 0.2m [0]

CHANNEL WIDTH Check ONE (Or 2 & average)

☐ POOL WIDTH > RIFFLE WIDTH [2] ☒ POOL WIDTH = RIFFLE WIDTH [1] ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply

☐ TORRENTIAL [-1] ☒ SLOW [1] ☐ INTERSTITIAL [-1] ☐ INTERMITTENT [-2] ☐ EDDIES [1] ☒ MODERATE [1] ☐ VERY FAST [1] ☐ FAST [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 5

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☒ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☒ BEST AREAS 5-10cm [1]	☒ MAXIMUM < 50cm [1]	☒ MOD. STABLE (e.g., Large Gravel) [1]	☒ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0] ☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 4.5

6] GRADIENT (45.5 ft/mi) ☐ VERY LOW - LOW [2-4] ☐ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (0.9 mi²)

%POOL: 2 %GLIDE: ___ %RUN: ___ %RIFFLE: ___

Gradient Maximum 10: 4

EPA 4520 06/16/06

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☒ OTHER

STAGE

1st -sample pass-	2nd
☐ HIGH	☐
☒ UP	☐
☒ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☒ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

CLARITY

1st --sample pass--	2nd
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☒ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

____ meters

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☒ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

1st pass ____ cm

2nd ____ cm

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☒ TRASH / LITTER
- ☒ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & *COMMENT*

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

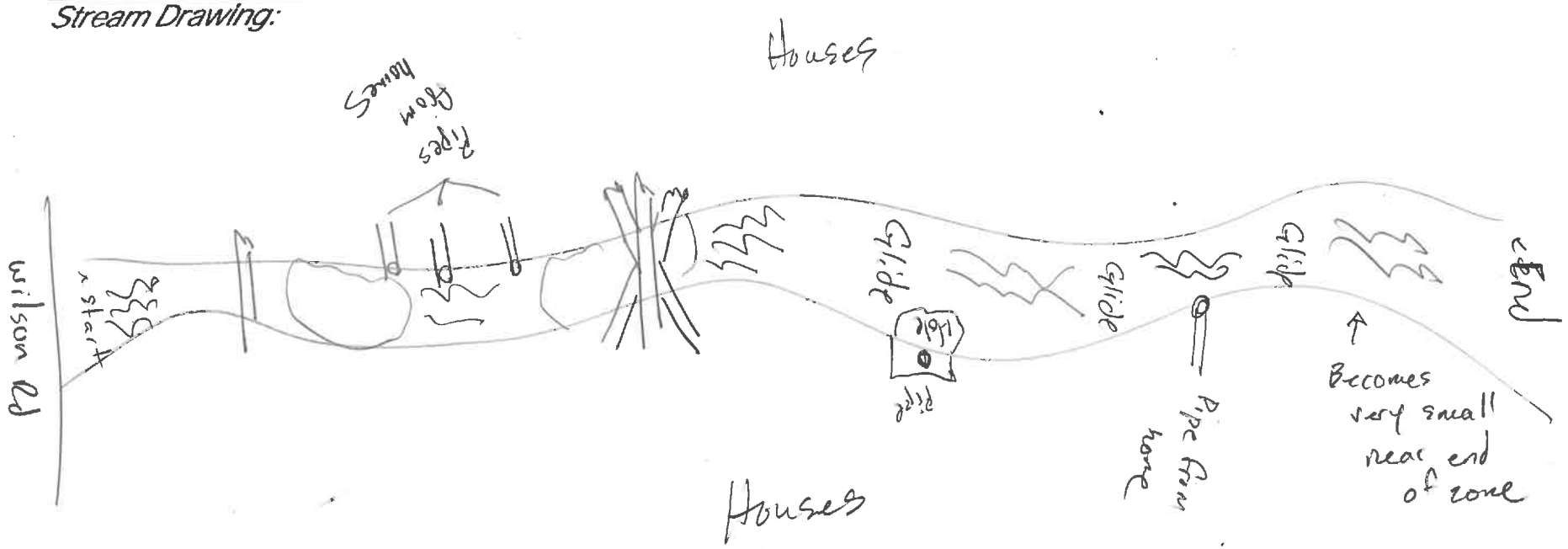
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

$\bar{x}$ width
$\bar{x}$ depth
max. depth
$\bar{x}$ bankfull width
bankfull $\bar{x}$ depth
W/D ratio
bankfull max. depth
floodprone x^2 width
entrench. ratio

Legacy Tree:

Stream Drawing:



15
15
30
30
60
25
85
15
100

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 67

Stream & Location: Barbee Ditch ust. Hague Ave RM: 1.51 Date: 7/16/24

BARB02 Scorers Full Name & Affiliation: MAS -> MBI

River Code: 02-932- ___ STORET #: _____ Lat./Long.: 39.98175 183.08675 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR/SLABS [10]	___	___	☐☐ HARDPAN [4]	X	___
☐☐ BOULDER [9]	X	___	☐☐ DETRITUS [3]	___	___
☐☐ COBBLE [8]	X	X	☐☐ MUCK [2]	___	___
☑☐ GRAVEL [7]	X	X	☐☐ SILT [2]	X	___
☐☑ SAND [6]	X	___	☐☐ ARTIFICIAL [0]	___	___
☐☐ BEDROCK [5]	___	___	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

ORIGIN	QUALITY
☐ LIMESTONE [1]	☐ HEAVY [-2]
☑ TILLS [1]	☐ MODERATE [-1]
☐ WETLANDS [0]	☑ NORMAL [0]
☐ HARDPAN [0]	☐ FREE [1]
☐ SANDSTONE [0]	SILT ☐ EXTENSIVE [-2]
☐ RIP/RAP [0]	☐ MODERATE [-1]
☐ LACUSTURINE [0]	EMBEDDEDNESS ☑ NORMAL [0]
☐ SHALE [-1]	☐ NONE [1]
☐ COAL FINES [-2]	

Comments

Substrate 16 Maximum 20

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]
1 OVERHANGING VEGETATION [1]	2 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]
2 SHALLOWS (IN SLOW WATER) [1]	2 BOULDERS [1]	2 LOGS OR WOODY DEBRIS [1]
2 ROOTMATS [1]		

AMOUNT (Check ONE (Or 2 & average))

☐ EXTENSIVE >75% [11]
☑ MODERATE 25-75% [7]
☐ SPARSE 5-<25% [3]
☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 14

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☑ HIGH [3]
☑ MODERATE [3]	☑ GOOD [5]	☑ RECOVERED [4]	☐ MODERATE [2]
☐ LOW [2]	☑ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 14

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION L	EROSION R	RIPARIAN WIDTH L	RIPARIAN WIDTH R
☑ NONE / LITTLE [3]	☑	☐ WIDE > 50m [4]	☐
☑ MODERATE [2]	☑	☑ MODERATE 10-50m [3]	☑
☐ HEAVY / SEVERE [1]	☐	☐ NARROW 5-10m [2]	☐
		☐ VERY NARROW < 5m [1]	☐
		☐ NONE [0]	☐

FLOOD PLAIN QUALITY L	FLOOD PLAIN QUALITY R
☐ FOREST, SWAMP [3]	☐
☐ SHRUB OR OLD FIELD [2]	☐
☑ RESIDENTIAL, PARK, NEW FIELD [1]	☑
☐ FENCED PASTURE [1]	☐
☐ OPEN PASTURE, ROWCROP [0]	☐
☐ CONSERVATION TILLAGE [1]	☐
☐ URBAN OR INDUSTRIAL [0]	☐
☐ MINING / CONSTRUCTION [0]	☐

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 6.5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (ONLY!))	CHANNEL WIDTH (Check ONE (Or 2 & average))	CURRENT VELOCITY (Check ALL that apply)	
☐ > 1m [6]	☐ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1]	☑ SLOW [1]
☐ 0.7-<1m [4]	☑ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
☑ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	☐ FAST [1]	☐ INTERMITTENT [-2]
☐ 0.2-<0.4m [1]		☑ MODERATE [1]	☐ EDDIES [1]
☐ < 0.2m [0]		Indicate for reach - pools and riffles.	

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 5

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☑ STABLE (e.g., Cobble, Boulder) [2]	☑ NONE [2]
☑ BEST AREAS 5-10cm [1]	☑ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	☑ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 6.5

6] GRADIENT (52.6 ft/mi)

DRAINAGE AREA (2.36 mi²)

☐ VERY LOW - LOW [2-4]
☐ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: 2 %GLIDE: ___ %RUN: ___ %RIFFLE: ___

Gradient Maximum 10: 4

EPA 4520 06/16/06

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☑ OTHER

STAGE

1st-sample pass-	2nd
☐ HIGH	☐
☐ UP	☐
☑ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☑ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

CLARITY

1st --sample pass--	2nd
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

_____ meters

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☑ <10%- CLOSED

1st pass _____ cm

2nd pass _____ cm

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 66.75

Stream & Location: Barbee Ditch @ Mckinley Ave RM: 0.34 Date: 7/23/24

BARB01 Scorers Full Name & Affiliation: Corbin Binkley, MBI

River Code: 02-932-___ STORET #: _____ Lat./Long.: 39.97811 183.06894 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR/SLABS [10]			☐ ☐ HARDPAN [4]	✓	
☐ ☐ BOULDER [9]	✓	✓	☐ ☐ DETRITUS [3]		
☑ ☑ COBBLE [8]	✓	✓	☐ ☐ MUCK [2]		
☑ ☐ GRAVEL [7]	✓	✓	☐ ☐ SILT [2]	✓	✓
☐ ☐ SAND [6]	✓		☐ ☐ ARTIFICIAL [0]		
☐ ☐ BEDROCK [5]	✓		(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

ORIGIN	QUALITY	
☑ LIMESTONE [1]	SILT: ☐ HEAVY [-2] ☐ MODERATE [-1] ☑ NORMAL [0] ☐ FREE [1]	
☑ TILLS [1]	EMBEDDEDNESS: ☐ EXTENSIVE [-2] ☐ MODERATE [-1] ☑ NORMAL [0] ☐ NONE [1]	
☐ WETLANDS [0]		
☐ HARDPAN [0]		
☐ SANDSTONE [0]		
☐ RIP/RAP [0]		
☐ LACUSTURINE [0]		
☐ SHALE [-1]		
☐ COAL FINES [-2]		

Substrate Maximum 20: 18

Comments

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	AMOUNT (Check ONE (Or 2 & average))
2 OVERHANGING VEGETATION [1]	1 ROOTWADS [1]	1 AQUATIC MACROPHYTES [1]	☐ EXTENSIVE >75% [11]
1 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	2 LOGS OR WOODY DEBRIS [1]	☑ MODERATE 25-75% [7]
2 ROOTMATS [1]			☐ SPARSE 5-<25% [3]
			☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 12

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☑ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☑ LOW [2]	☑ FAIR [3]	☑ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 11

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION L	EROSION R	RIPARIAN WIDTH L	RIPARIAN WIDTH R
☑	☑	☐	☐ WIDE > 50m [4]
☑	☐	☑	☑ MODERATE 10-50m [3]
☐	☐	☑	☐ NARROW 5-10m [2]
☐	☐	☐	☐ VERY NARROW < 5m [1]
☐	☐	☐	☐ NONE [0]

EROSION: ☑ NONE / LITTLE [3] ☐ MODERATE [2] ☐ HEAVY / SEVERE [1]

FLOOD PLAIN QUALITY L	FLOOD PLAIN QUALITY R	
☑	☑	FOREST, SWAMP [3]
☐	☐	SHRUB OR OLD FIELD [2]
☐	☐	RESIDENTIAL, PARK, NEW FIELD [1]
☐	☐	FENCED PASTURE [1]
☐	☐	OPEN PASTURE, ROWCROP [0]
☐	☐	CONSERVATION TILLAGE [1]
☑	☐	URBAN OR INDUSTRIAL [0]
☐	☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 7.75

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check ONE (ONLY!)
- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ☑ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH Check ONE (Or 2 & average)
- ☑ POOL WIDTH > RIFFLE WIDTH [2]
- ☐ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ☑ FAST [1]
- ☑ MODERATE [1]
- ☑ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☐ INTERMITTENT [-2]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 7

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☑ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☑ MAXIMUM < 50cm [1]	☑ MOD. STABLE (e.g., Large Gravel) [1]	☑ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☑ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 4

6] GRADIENT (50.0 ft/mi) DRAINAGE AREA (5.88 mi²)

☐ VERY LOW - LOW [2-4]
☐ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: 2 %GLIDE: ____
%RUN: ____ %RIFFLE: ____

Gradient Maximum 10: 4

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st-sample pass-	2nd
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☑ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

150 meters

CLARITY

1st --sample pass--	2nd
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☑ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

1st pass: _____ cm

2nd: _____ cm

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

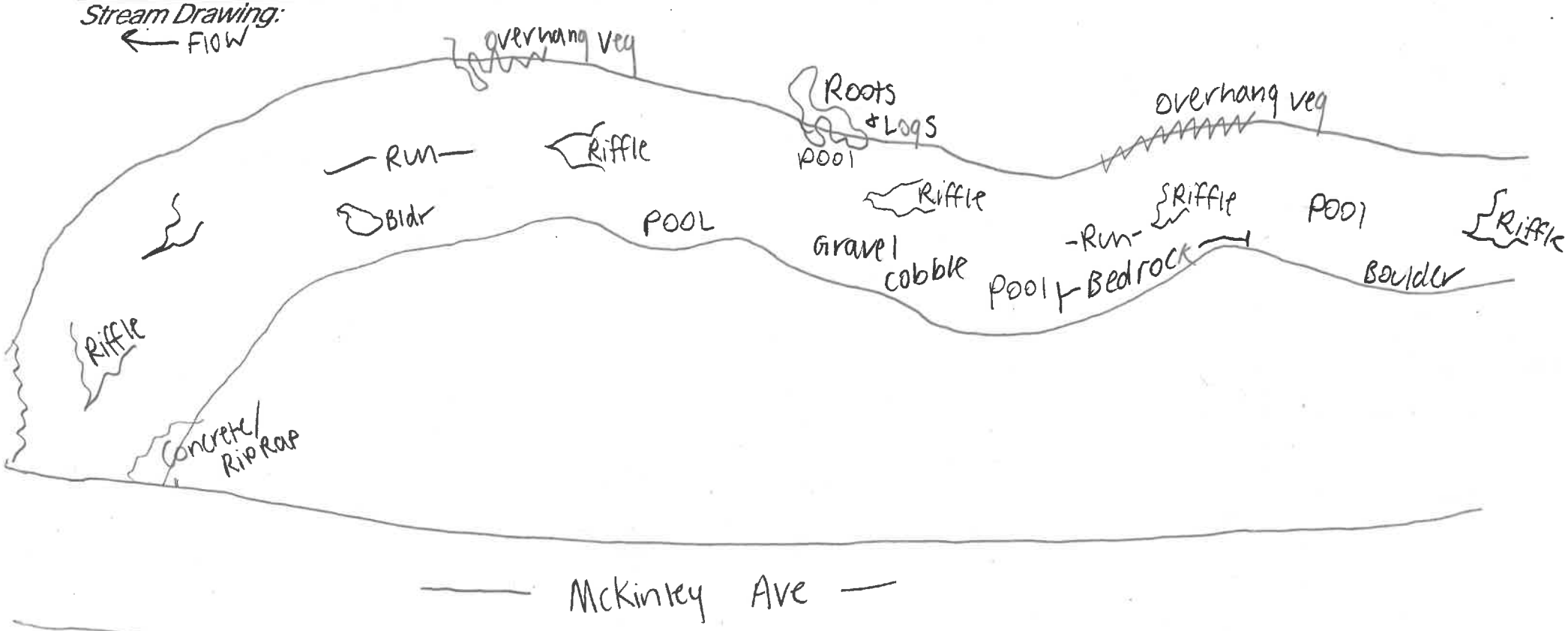
F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

Stream Drawing:



Ohio EPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 68.5

Stream & Location: Trib to Barbee Ditch Dst. Wilson Rd RM: 0.43 Date: 7/16/24

BARB04

Scorers Full Name & Affiliation: MAS - MBI

River Code: 02-935-___ STORET #: _____ Lat./Long.: 39.17906 183.10024 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR/SLABS [10]	___	___	☐ ☐ HARDPAN [4]	___	___
☐ ☐ BOULDER [9]	___	x	☐ ☐ DETRITUS [3]	___	___
☐ ☒ COBBLE [8]	x	x	☐ ☐ MUCK [2]	___	___
☒ ☐ GRAVEL [7]	x	x	☐ ☐ SILT [2]	___	___
☐ ☐ SAND [6]	x	___	☐ ☐ ARTIFICIAL [0]	___	___
☐ ☐ BEDROCK [5]	___	___	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☒ 4 or more [2] ☐ 3 or less [0]

ORIGIN: ☐ LIMESTONE [1] ☒ TILLS [1] ☐ WETLANDS [0] ☐ HARDPAN [0] ☐ SANDSTONE [0] ☐ RIP/RAP [0] ☐ LACUSTURINE [0] ☐ SHALE [-1] ☐ COAL FINES [-2]

QUALITY — SILT: ☐ HEAVY [-2] ☐ MODERATE [-1] ☒ NORMAL [0] ☐ FREE [1]

QUALITY — EMBEDDEDNESS: ☐ EXTENSIVE [-2] ☒ MODERATE [-1] ☐ NORMAL [0] ☐ NONE [1]

Substrate: 17.5 (Maximum 20)

Comments

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]
1 OVERHANGING VEGETATION [1]	1 ROOTWADS [1]	1 AQUATIC MACROPHYTES [1]
1 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]
1 ROOTMATS [1]		

AMOUNT — Check ONE (Or 2 & average)

☐ EXTENSIVE >75% [11] ☒ MODERATE 25-75% [7] ☐ SPARSE 5-<25% [3] ☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 15

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☒ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☒ LOW [2]	☒ FAIR [3]	☒ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 11

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION (L / R)	RIPARIAN WIDTH (L / R)	FLOOD PLAIN QUALITY (L / R)
☐ ☐ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	☐ ☐ FOREST, SWAMP [3]
☒ ☒ MODERATE [2]	☐ ☐ MODERATE 10-50m [3]	☐ ☐ SHRUB OR OLD FIELD [2]
☒ ☐ HEAVY / SEVERE [1]	☐ ☐ NARROW 5-10m [2]	☐ ☐ RESIDENTIAL, PARK, NEW FIELD [1]
	☒ ☒ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]
	☐ ☐ NONE [0]	☐ ☐ OPEN PASTURE, ROWCROP [0]

☐ ☐	CONSERVATION TILLAGE [1]
☒ ☒	URBAN OR INDUSTRIAL [0]
☐ ☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 3

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check ONE (ONLY!)

☐ > 1m [6] ☐ 0.7-<1m [4] ☐ 0.4-<0.7m [2] ☒ 0.2-<0.4m [1] ☐ < 0.2m [0]

CHANNEL WIDTH Check ONE (Or 2 & average)

☐ POOL WIDTH > RIFFLE WIDTH [2] ☒ POOL WIDTH = RIFFLE WIDTH [1] ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply

☐ TORRENTIAL [-1] ☒ SLOW [1] ☐ VERY FAST [1] ☐ INTERSTITIAL [-1] ☐ FAST [1] ☐ INTERMITTENT [-2] ☒ MODERATE [1] ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 4

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☒ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☒ BEST AREAS 5-10cm [1]	☒ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☒ MODERATE [0] ☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 4

6] GRADIENT (55.6 ft/mi) DRAINAGE AREA (0.95 mi²)

☐ VERY LOW - LOW [2-4] ☐ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

%POOL: 2 %GLIDE: ___ %RUN: ___ %RIFFLE: ___

Gradient Maximum 10: 4

EPA 4520 06/16/06

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☒ OTHER

STAGE

1st-sample pass- 2nd

- ☐ HIGH ☐
- ☐ UP ☐
- ☒ NORMAL ☐
- ☐ LOW ☐
- ☐ DRY ☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☒ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

meters

CLARITY

1st --sample pass-- 2nd

- ☐ < 20 cm ☐
- ☐ 20-<40 cm ☐
- ☐ 40-70 cm ☐
- ☐ > 70 cm/ CTB ☐
- ☐ SECCHI DEPTH ☐

CANOPY

1st pass _____ cm

2nd _____ cm

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☒ <10%- CLOSED

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☒ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

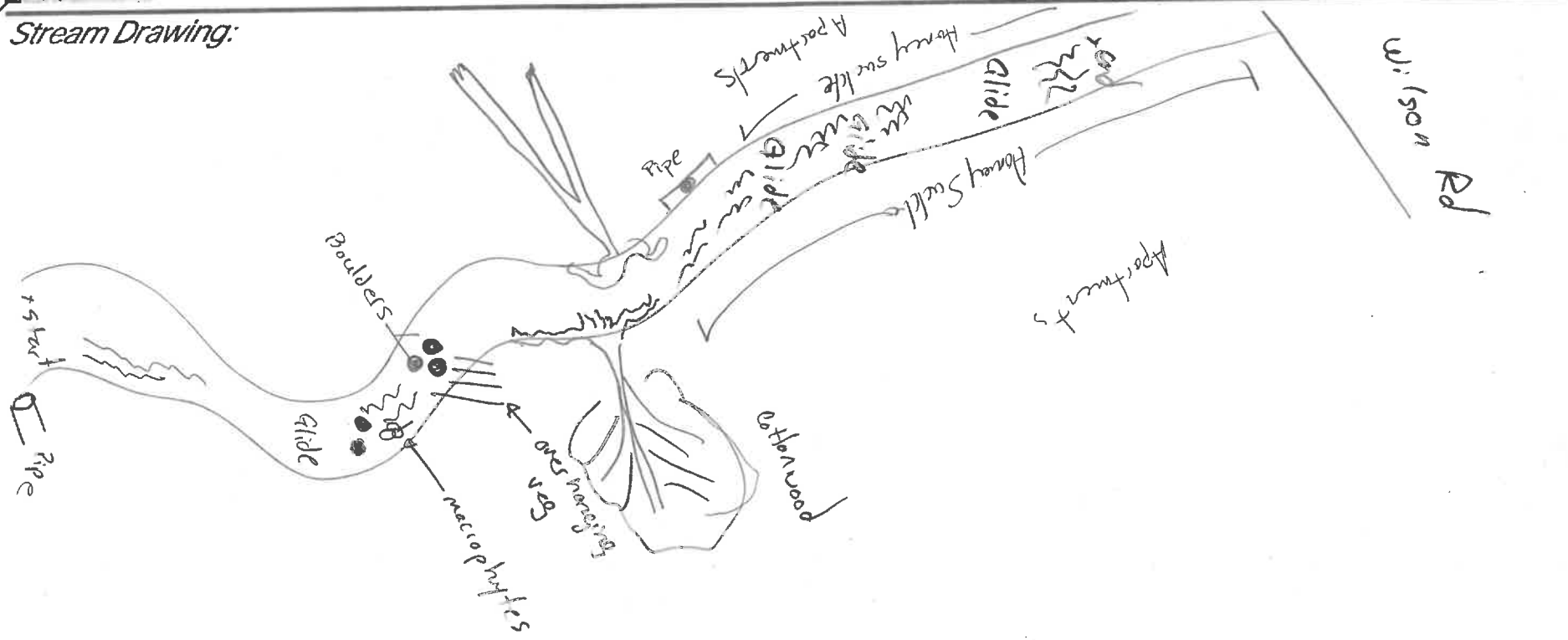
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 65.25

Stream & Location: Trabue Run Dst. Dividend Dr RM: 2.18 Date: 7/16/24

TRB03 Scorers Full Name & Affiliation: MAS -> MBT

River Code: 02-266-___ STORET #: _____ Lat/Long: (NAD 83 - decimal) 39.99155 183.11990 Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR/SLABS [10]	___	___	☐☐ HARDPAN [4]	X	___
☐☐ BOULDER [9]	X	___	☐☐ DETRITUS [3]	___	___
☐☒ COBBLE [8]	X	X	☐☐ MUCK [2]	___	___
☒☐ GRAVEL [7]	X	X	☐☐ SILT [2]	X	X
☐☐ SAND [6]	X	___	☐☐ ARTIFICIAL [0]	___	___
☐☐ BEDROCK [5]	___	___			

(Score natural substrates; ignore sludge from point-sources)

NUMBER OF BEST TYPES: ☒ 4 or more [2] ☐ 3 or less [0]

ORIGIN	SILT	QUALITY
☐ LIMESTONE [1]		☒ HEAVY [-2]
☒ TILLS [1]		☐ MODERATE [-1]
☐ WETLANDS [0]		☐ NORMAL [0]
☐ HARDPAN [0]		☐ FREE [1]
☐ SANDSTONE [0]	EMBEDDEDNESS	☐ EXTENSIVE [-2]
☐ RIP/RAP [0]		☒ MODERATE [-1]
☐ LACUSTURINE [0]		☐ NORMAL [0]
☐ SHALE [-1]		☐ NONE [1]
☐ COAL FINES [-2]		

Substrate 15 Maximum 20

Comments

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]	1 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	
2 OVERHANGING VEGETATION [1]	1 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	
1 SHALLOWS (IN SLOW WATER) [1]	2 BOULDERS [1]	2 LOGS OR WOODY DEBRIS [1]	
1 ROOTMATS [1]			

AMOUNT Check ONE (Or 2 & average)

☐ EXTENSIVE >75% [11]
☒ MODERATE 25-75% [7]
☐ SPARSE 5-<25% [3]
☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 16

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☒ HIGH [3]
☒ MODERATE [3]	☒ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☐ LOW [2]	☒ FAIR [3]	☒ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 13

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION L	EROSION R	RIPARIAN WIDTH L	RIPARIAN WIDTH R
☒ NONE / LITTLE [3]	☒	☐ WIDE > 50m [4]	☐
☐ MODERATE [2]	☒	☐ MODERATE 10-50m [3]	☐
☒ HEAVY / SEVERE [1]	☐	☒ NARROW 5-10m [2]	☒
		☐ VERY NARROW < 5m [1]	☐
		☐ NONE [0]	☐

FLOOD PLAIN QUALITY L	FLOOD PLAIN QUALITY R
☐ FOREST, SWAMP [3]	☐
☐ SHRUB OR OLD FIELD [2]	☐
☐ RESIDENTIAL, PARK, NEW FIELD [1]	☐
☐ FENCED PASTURE [1]	☐
☐ OPEN PASTURE, ROWCROP [0]	☐

☐ CONSERVATION TILLAGE [1]	☐
☒ URBAN OR INDUSTRIAL [0]	☒
☐ MINING / CONSTRUCTION [0]	☐

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 4.25

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check ONE (ONLY!)

☐ > 1m [6]
☒ 0.7-<1m [4]
☐ 0.4-<0.7m [2]
☐ 0.2-<0.4m [1]
☐ < 0.2m [0]

CHANNEL WIDTH Check ONE (Or 2 & average)

☒ POOL WIDTH > RIFFLE WIDTH [2]
☐ POOL WIDTH = RIFFLE WIDTH [1]
☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply

☐ TORRENTIAL [-1]
☐ VERY FAST [1]
☐ FAST [1]
☒ MODERATE [1]
☒ SLOW [1]
☐ INTERSTITIAL [-1]
☐ INTERMITTENT [-2]
☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 8

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☒ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☒ BEST AREAS 5-10cm [1]	☒ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	☒ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 5

6] GRADIENT (52.6 ft/mi) DRAINAGE AREA (0.03 mi²)

☐ VERY LOW - LOW [2-4]
☐ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: 2 %GLIDE: ___
%RUN: ___ %RIFFLE: ___

Gradient Maximum 10: 4

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☒ OTHER

STAGE

1st-sample pass- 2nd

- ☐ HIGH ☐
- ☐ UP ☐
- ☑ NORMAL ☐
- ☐ LOW ☐
- ☐ DRY ☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☒ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

CLARITY

1st --sample pass-- 2nd

- ☐ < 20 cm ☐
- ☐ 20-<40 cm ☐
- ☑ 40-70 cm ☐
- ☐ > 70 cm/ CTB ☐
- ☐ SECCHI DEPTH ☐

____ meters

1st pass ____ cm

2nd ____ cm

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☒ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

Comment RE: *Reach consistency/* Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☒ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☒ CSOs/SSOs/OUTFALLS

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
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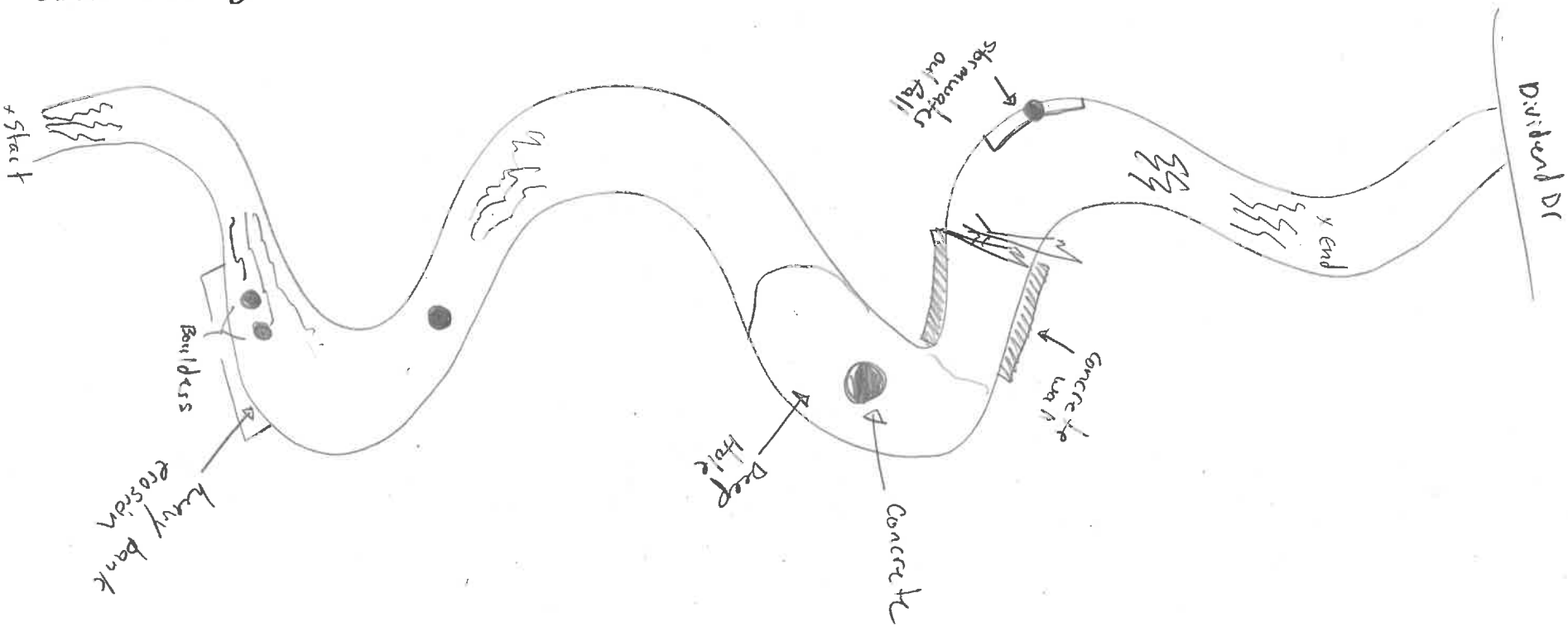
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 76.5

Stream & Location: Trabue Run Dst. Trabue Rd RM: 1.0 Date: 7/15/24

TRB02 Scorers Full Name & Affiliation: MAS -> MBI

River Code: 02-266-___ STORET #: _____ Lat./Long.: 39.98980 / 83.09869 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR/SLABS [10]			☐☐ HARDPAN [4]	X	
☐☐ BOULDER [9]	X	X	☐☐ DETRITUS [3]		
☒☐ COBBLE [8]	X	X	☐☐ MUCK [2]		
☐☒ GRAVEL [7]	X	X	☐☐ SILT [2]	X	
☐☐ SAND [6]	X		☐☐ ARTIFICIAL [0]		
☐☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☒ 4 or more [2] ☐ 3 or less [0]

ORIGIN: ☐ LIMESTONE [1] ☒ TILLS [1] ☐ WETLANDS [0] ☐ HARDPAN [0] ☐ SANDSTONE [0] ☐ RIP/RAP [0] ☐ LACUSTURINE [0] ☐ SHALE [-1] ☐ COAL FINES [-2]

QUALITY: ☐ HEAVY [-2] ☒ MODERATE [-1] ☐ NORMAL [0] ☐ FREE [1]

SILT / EMBEDDEDNESS: ☐ EXTENSIVE [-2] ☒ MODERATE [-1] ☐ NORMAL [0] ☐ NONE [1]

Comments

Substrate Maximum 20: 16

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]	2 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	AMOUNT (Check ONE (Or 2 & average))
2 OVERHANGING VEGETATION [1]	1 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	☐ EXTENSIVE >75% [11]
1 SHALLOWS (IN SLOW WATER) [1]	2 BOULDERS [1]	2 LOGS OR WOODY DEBRIS [1]	☒ MODERATE 25-75% [7]
2 ROOTMATS [1]			☐ SPARSE 5-<25% [3]
			☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 16

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☒ HIGH [3]
☒ MODERATE [3]	☒ GOOD [5]	☒ RECOVERED [4]	☐ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 15

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)	(L R)
☐☐ NONE / LITTLE [3]	☐☐ WIDE > 50m [4]	☐☐ FOREST, SWAMP [3]	☐☐ CONSERVATION TILLAGE [1]
☒☒ MODERATE [2]	☐☒ MODERATE 10-50m [3]	☐☐ SHRUB OR OLD FIELD [2]	☐☐ URBAN OR INDUSTRIAL [0]
☐☐ HEAVY / SEVERE [1]	☒☐ NARROW 5-10m [2]	☒☒ RESIDENTIAL, PARK, NEW FIELD [1]	☐☐ MINING / CONSTRUCTION [0]
	☐☐ VERY NARROW < 5m [1]	☐☐ FENCED PASTURE [1]	
	☐☐ NONE [0]	☐☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 5.5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH	CHANNEL WIDTH	CURRENT VELOCITY	
Check ONE (ONLY!)	Check ONE (Or 2 & average)	Check ALL that apply	
☒ > 1m [6]	☒ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1]	☒ SLOW [1]
☐ 0.7-<1m [4]	☐ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
☐ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	☐ FAST [1]	☐ INTERMITTENT [-2]
☐ 0.2-<0.4m [1]		☒ MODERATE [1]	☐ EDDIES [1]
☐ < 0.2m [0]		Indicate for reach - pools and riffles.	

Recreation Potential: Primary Contact / Secondary Contact (circle one and comment on back)

Comments

Pool / Current Maximum 12: 10

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☒ STABLE (e.g., Cobble, Boulder) [2]	☒ NONE [2]
☒ BEST AREAS 5-10cm [1]	☒ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 6

6] GRADIENT (38.5 ft/mi) ☐ VERY LOW - LOW [2-4] ☐ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (2.6 mi²)

%POOL: 2 %GLIDE: ____ %RUN: ____ %RIFFLE: ____

Gradient Maximum 10: 8

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☑ OTHER

STAGE

1st -sample pass- 2nd

- ☐ HIGH ☐
- ☑ UP ☐
- ☑ NORMAL ☐
- ☐ LOW ☐
- ☐ DRY ☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☑ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

CLARITY

1st --sample pass-- 2nd

- ☐ < 20 cm ☐
- ☐ 20-<40 cm ☐
- ☐ 40-70 cm ☐
- ☑ > 70 cm/ CTB ☐
- ☐ SECCHI DEPTH ☐

_____ meters

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☑ <10%- CLOSED

1st pass _____ cm

2nd _____ cm

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & *COMMENT*

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

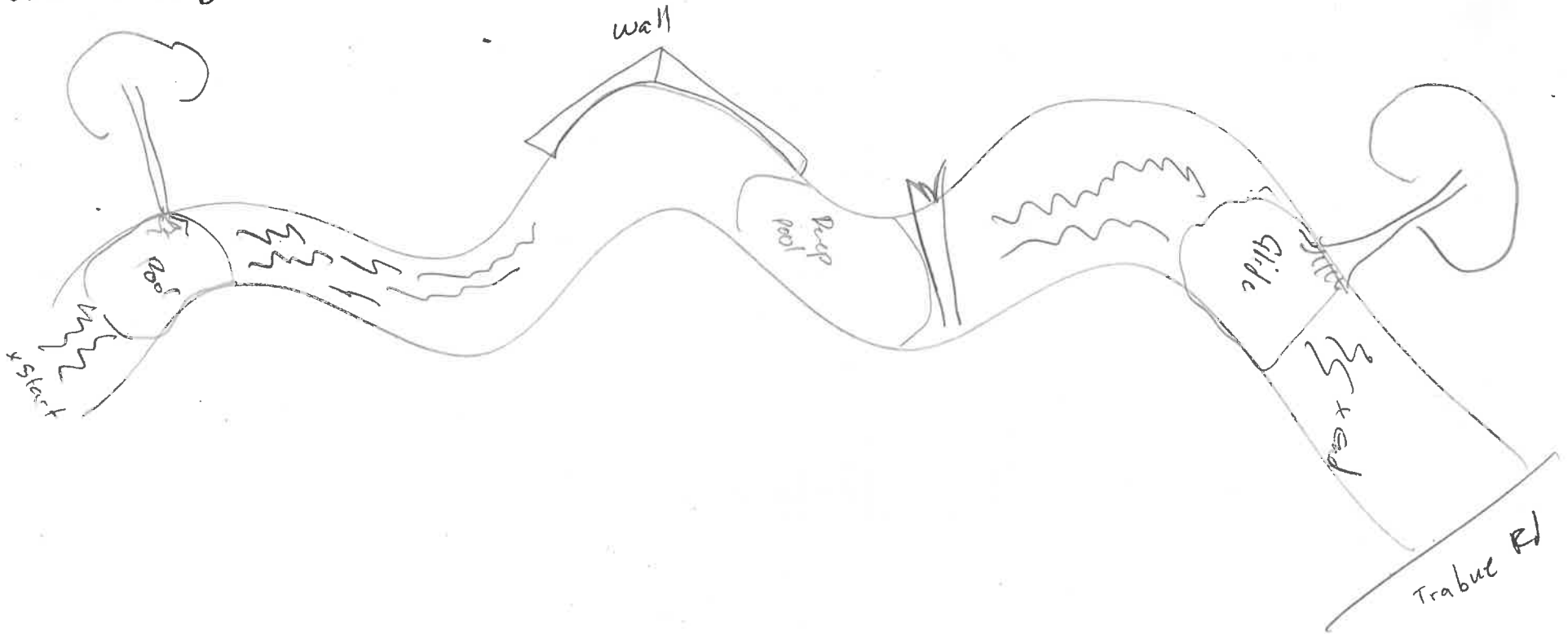
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 67.5

Stream & Location: Trabue Run @ Hague rd RM: 0.05 Date: 7/23/24

IRB01 Scorers Full Name & Affiliation: Corbin Binkley, MBI

River Code: 02-266-___ STORET #: _____ Lat./Long.: 39.98388 183.08627 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR/SLABS [10]	___	___	☐☐ HARDPAN [4]	✓	✓
☐☐ BOULDER [9]	✓	✓	☐☐ DETRITUS [3]	___	___
☐☑ COBBLE [8]	✓	✓	☐☐ MUCK [2]	___	___
☑☐ GRAVEL [7]	✓	✓	☐☐ SILT [2]	✓	✓
☐☐ SAND [6]	✓	___	☐☐ ARTIFICIAL [0]	___	___
☐☐ BEDROCK [5]	___	___			

(Score natural substrates; ignore sludge from point-sources)

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

ORIGIN	QUALITY	
☑ LIMESTONE [1]	☐ HEAVY [-2]	
☑ TILLS [1]	☑ MODERATE [-1]	
☐ WETLANDS [0]	☑ NORMAL [0]	
☐ HARDPAN [0]	☐ FREE [1]	
☐ SANDSTONE [0]	SILT ☐ EXTENSIVE [-2]	
☐ RIP/RAP [0]	EMBEDDEDNESS ☑ MODERATE [-1]	
☐ LACUSTURINE [0]	☐ NORMAL [0]	
☐ SHALE [-1]	☐ NONE [1]	
☐ COAL FINES [-2]		

Substrate 17 Maximum 20

Comments

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]	1 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	AMOUNT (Check ONE (Or 2 & average))
1 OVERHANGING VEGETATION [1]	1 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	☐ EXTENSIVE >75% [11]
1 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	3 LOGS OR WOODY DEBRIS [1]	☑ MODERATE 25-75% [7]
1 ROOTMATS [1]			☐ SPARSE 5-<25% [3]
			☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 16

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☑ MODERATE [3]	☑ GOOD [5]	☐ RECOVERED [4]	☑ MODERATE [2]
☑ LOW [2]	☐ FAIR [3]	☑ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 12.5

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)	
☐☐ NONE / LITTLE [3]	☐☐ WIDE > 50m [4]	☐☐ FOREST, SWAMP [3]	☐☐ CONSERVATION TILLAGE [1]
☑☑ MODERATE [2]	☑☐ MODERATE 10-50m [3]	☑☐ SHRUB OR OLD FIELD [2]	☐☐ URBAN OR INDUSTRIAL [0]
☐☐ HEAVY / SEVERE [1]	☑☑ NARROW 5-10m [2]	☑☑ RESIDENTIAL, PARK, NEW FIELD [1]	☐☐ MINING / CONSTRUCTION [0]
	☐☐ VERY NARROW < 5m [1]	☐☐ FENCED PASTURE [1]	
	☐☐ NONE [0]	☐☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 6.5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH	CHANNEL WIDTH	CURRENT VELOCITY	
Check ONE (ONLY!)	Check ONE (Or 2 & average)	Check ALL that apply	
☐ > 1m [6]	☑ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1]	☑ SLOW [1]
☑ 0.7-<1m [4]	☐ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
☐ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	☑ FAST [1]	☐ INTERMITTENT [-2]
☐ 0.2-<0.4m [1]		☑ MODERATE [1]	☐ EDDIES [1]
☐ < 0.2m [0]		Indicate for reach - pools and riffles.	

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 9

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☑ MAXIMUM < 50cm [1]	☑ MOD. STABLE (e.g., Large Gravel) [1]	☑ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☑ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 3.5

6] GRADIENT (7.4 ft/mi) ☐ VERY LOW - LOW [2-4] ☐ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (3 mi²)

%POOL: 2 %GLIDE: ___ %RUN: ___ %RIFFLE: ___

Gradient Maximum 10: 4

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st-sample pass-	2nd
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☑ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

150 meters

CLARITY

1st --sample pass--	2nd
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☑ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

1st pass _____ cm

2nd pass _____ cm

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

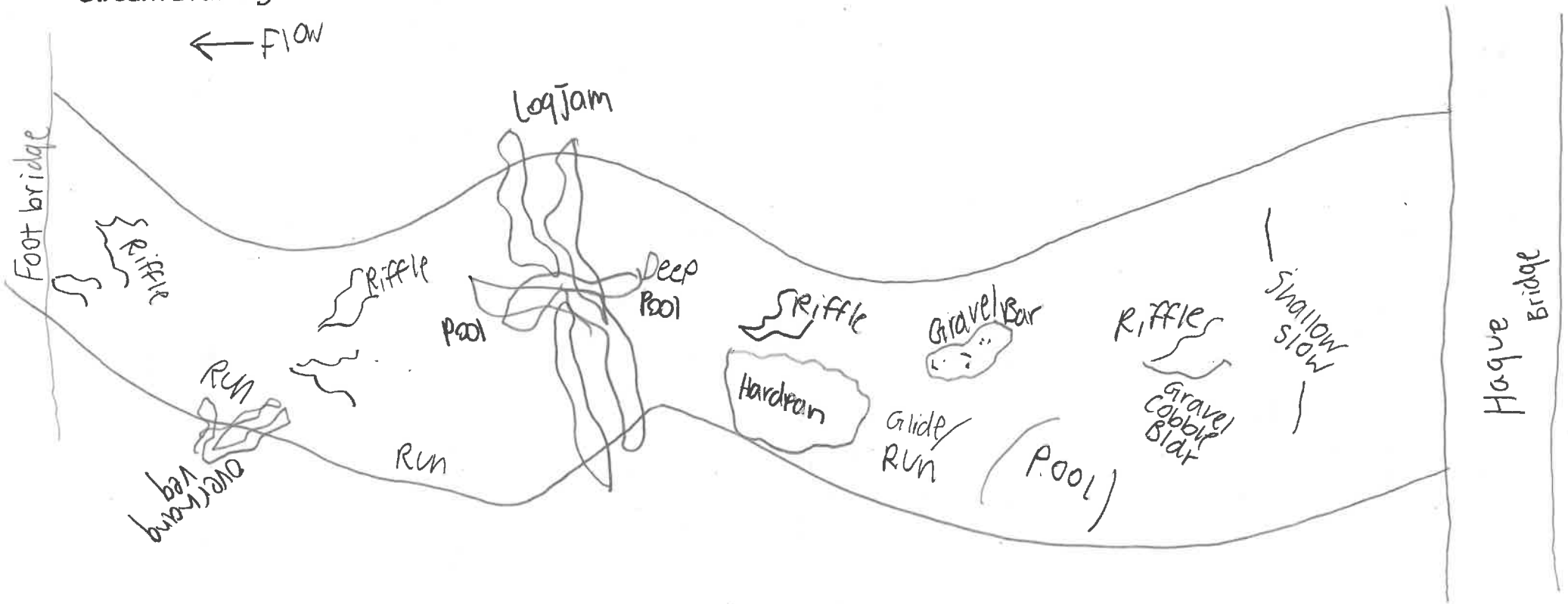
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



Ohio EPA — Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 54

Stream & Location: UT to Trabue Run @ RM 2.7 Ust. Westbelt Dr TRB04 RM: 0.22 Date: 7/16/24

Scorers Full Name & Affiliation: MAS → MBZ

River Code: 02-933- STORET #: Lat./Long.: 39.98875 183.12643 (NAD 83 - decimal) Office verified location ☐

1] SUBSTRATE
Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR/SLABS [10]			☐☐ HARDPAN [4]	X	
☐☐ BOULDER [9]	X		☐☐ DETRITUS [3]		
☑☐ COBBLE [8]	X	X	☐☐ MUCK [2]		
☐☐ GRAVEL [7]	X	X	☐☑ SILT [2]	X	X
☐☐ SAND [6]	X		☐☐ ARTIFICIAL [0]		
☐☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

Check ONE (Or 2 & average)

ORIGIN	QUALITY	
☐ LIMESTONE [1]	☑ HEAVY [-2]	
☑ TILLS [1]	☐ MODERATE [-1]	
☐ WETLANDS [0]	☐ NORMAL [0]	
☐ HARDPAN [0]	☐ FREE [1]	
☐ SANDSTONE [0]	SILT ☑ EXTENSIVE [-2]	
☐ RIP/RAP [0]	☑ MODERATE [-1]	
☐ LACUSTURINE [0]	EMBEDDEDNESS ☐ NORMAL [0]	
☐ SHALE [-1]	☐ NONE [1]	
☐ COAL FINES [-2]		

Substrate 9.5 Maximum 20

Comments

2] INSTREAM COVER
Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]
1 OVERHANGING VEGETATION [1]	1 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]
1 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]
2 ROOTMATS [1]		

AMOUNT Check ONE (Or 2 & average)
- ☐ EXTENSIVE >75% [11]
- ☑ MODERATE 25-75% [7]
- ☑ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 12

3] CHANNEL MORPHOLOGY
Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☑ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☑ LOW [2]	☑ FAIR [3]	☑ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 11

4] BANK EROSION AND RIPARIAN ZONE
Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION L	EROSION R	RIPARIAN WIDTH L	RIPARIAN WIDTH R
☑ NONE / LITTLE [3]	☑	☐ WIDE > 50m [4]	☐
☐ MODERATE [2]	☐	☐ MODERATE 10-50m [3]	☐
☐ HEAVY / SEVERE [1]	☐	☐ NARROW 5-10m [2]	☐
		☑ VERY NARROW < 5m [1]	☑
		☐ NONE [0]	☐

FLOOD PLAIN QUALITY L	FLOOD PLAIN QUALITY R	
☐ FOREST, SWAMP [3]	☐	☐ CONSERVATION TILLAGE [1]
☐ SHRUB OR OLD FIELD [2]	☐	☑ URBAN OR INDUSTRIAL [0]
☐ RESIDENTIAL, PARK, NEW FIELD [1]	☐	☐ MINING / CONSTRUCTION [0]
☐ FENCED PASTURE [1]	☐	
☐ OPEN PASTURE, ROWCROP [0]	☐	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 4

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check ONE (ONLY!)
- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ☑ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH Check ONE (Or 2 & average)
- ☐ POOL WIDTH > RIFFLE WIDTH [2]
- ☑ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ☐ FAST [1]
- ☑ MODERATE [1]
- ☑ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☐ INTERMITTENT [-2]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 6

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☑ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	☑ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☑ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 4.5

6] GRADIENT (38.5 ft/mi)
DRAINAGE AREA (0.036 mi²)
- ☐ VERY LOW - LOW [2-4]
- ☐ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

%POOL: 2 %GLIDE: %RUN: %RIFFLE:

Gradient Maximum 10: 8

EPA 4520 06/16/06

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☒ OTHER

STAGE

1st - sample pass - 2nd

- ☐ HIGH ☐
- ☐ UP ☐
- ☒ NORMAL ☐
- ☐ LOW ☐
- ☐ DRY ☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☒ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CLARITY

1st – sample pass – 2nd

- ☐ < 20 cm ☐
- ☐ 20-<40 cm ☐
- ☐ 40-70 cm ☐
- ☒ > 70 cm/ CTB ☐
- ☐ SECCHI DEPTH ☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☒ 10%-<30%
- ☐ <10%- CLOSED

1st pass _____ cm

2nd _____ cm

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

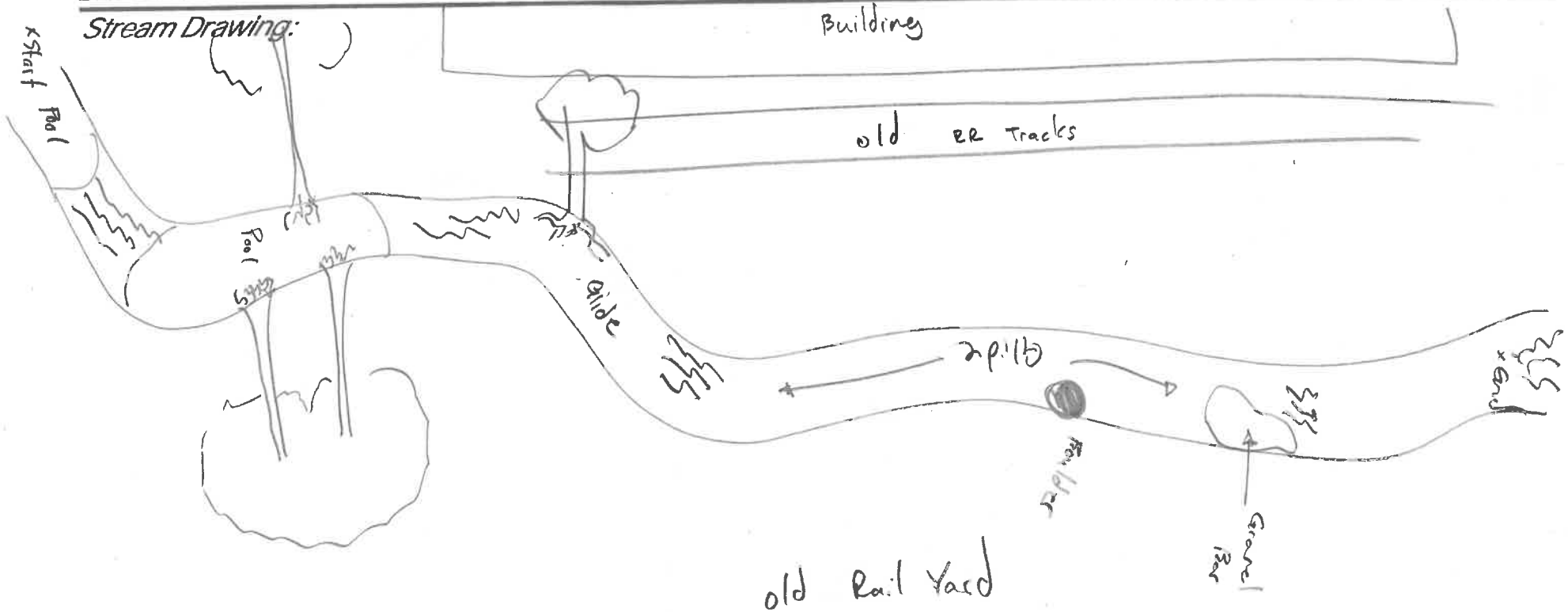
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



Ohio EPA — Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 59.5

Stream & Location: UT to Trabue Run @ RM 1.21 Ust Adlington Ln RM: 0.9 Date: 7/16/24

TRB05 Scorers Full Name & Affiliation: MAS -> MBI

River Code: 02-934-___-___ STORET #: _____ Lat./Long.: 39.99562 183.11665 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR/SLABS [10]	___	___	☐☐ HARDPAN [4]	1	___
☐☐ BOULDER [9]	4	___	☐☐ DETRITUS [3]	___	___
☐☒ COBBLE [8]	4	2	☐☐ MUCK [2]	___	___
☒☐ GRAVEL [7]	2	4	☐☐ SILT [2]	4	___
☐☐ SAND [6]	4	___	☐☐ ARTIFICIAL [0]	___	___
☐☐ BEDROCK [5]	___	___	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☒ 4 or more [2] ☐ 3 or less [0]

ORIGIN	QUALITY	
☐ LIMESTONE [1]	☒ HEAVY [-2]	
☒ TILLS [1]	☒ MODERATE [-1]	
☐ WETLANDS [0]	☐ NORMAL [0]	
☐ HARDPAN [0]	☐ FREE [1]	
☐ SANDSTONE [0]	SILT / EMBEDDEDNESS ☐ EXTENSIVE [-2]	
☐ RIP/RAP [0]	☐ MODERATE [-1]	
☐ LACUSTURINE [0]	☒ NORMAL [0]	
☐ SHALE [-1]	☐ NONE [1]	
☐ COAL FINES [-2]		

Comments

Substrate: 17 (Maximum 20)

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

0 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	AMOUNT (Check ONE (Or 2 & average))
1 OVERHANGING VEGETATION [1]	0 ROOTWADS [1]	1 AQUATIC MACROPHYTES [1]	☐ EXTENSIVE >75% [11]
1 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]	☒ MODERATE 25-75% [7]
1 ROOTMATS [1]			☒ SPARSE 5-<25% [3]
			☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 11

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☒ MODERATE [2]
☒ LOW [2]	☒ FAIR [3]	☒ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 10

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION (L / R)	RIPARIAN WIDTH (L / R)	FLOOD PLAIN QUALITY (L / R)
☒ ☒ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	☐ ☐ FOREST, SWAMP [3]
☐ ☒ MODERATE [2]	☐ ☐ MODERATE 10-50m [3]	☐ ☐ SHRUB OR OLD FIELD [2]
☐ ☐ HEAVY / SEVERE [1]	☐ ☒ NARROW 5-10m [2]	☐ ☐ RESIDENTIAL, PARK, NEW FIELD [1]
	☒ ☐ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]
	☒ ☐ NONE [0]	☐ ☐ OPEN PASTURE, ROWCROP [0]
		☐ ☐ CONSERVATION TILLAGE [1]
		☒ ☒ URBAN OR INDUSTRIAL [0]
		☐ ☐ MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 4

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (ONLY!))	CHANNEL WIDTH (Check ONE (Or 2 & average))	CURRENT VELOCITY (Check ALL that apply)
☐ > 1m [6]	☐ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1] ☒ SLOW [1]
☐ 0.7-<1m [4]	☒ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1] ☐ INTERSTITIAL [-1]
☒ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	☐ FAST [1] ☐ INTERMITTENT [-2]
☐ 0.2-<0.4m [1]		☒ MODERATE [1] ☐ EDDIES [1]
☐ < 0.2m [0]		Indicate for reach - pools and riffles.

Recreation Potential: Primary Contact / Secondary Contact (circle one and comment on back)

Comments

Pool / Current Maximum 12: 6

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☒ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☒ BEST AREAS 5-10cm [1]	☒ MAXIMUM < 50cm [1]	☒ MOD. STABLE (e.g., Large Gravel) [1]	☒ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 4.5

6] GRADIENT (31.5 ft/mi) ☐ VERY LOW - LOW [2-4] ☐ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (0.82 mi²)

%POOL: 2 %GLIDE: ___ %RUN: ___ %RIFFLE: ___

Gradient Maximum 10: 8

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st-sample pass-	2nd
☐ HIGH	☐
☐ UP	☐
☑ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☑ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

meters

CLARITY

1st --sample pass--	2nd
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

1st pass _____ cm

2nd _____ cm

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

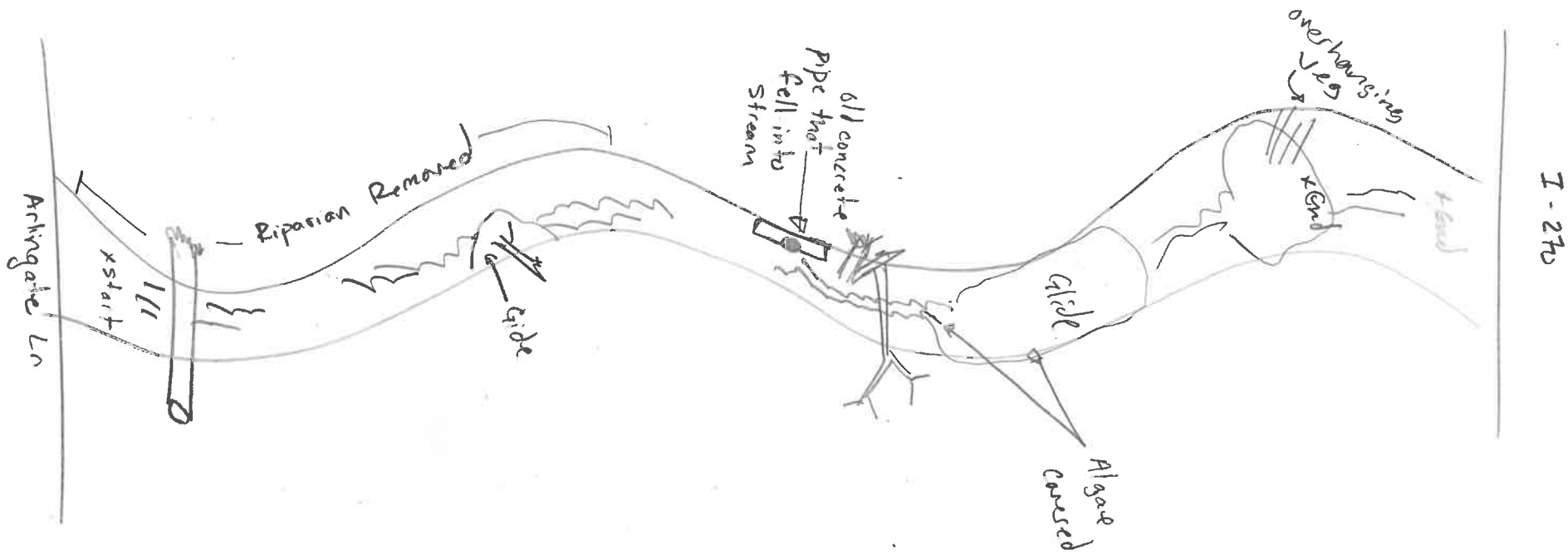
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASURMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



Ohio EPA — Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 69

Stream & Location: Robert Milliken Ditch Ust Westbelt Dr RM: 2.75 Date: 7/15/24

RMD03

Scorers Full Name & Affiliation: MAS -> MBJ

River Code: 02-937-___ STORET #: _____ Lat./Long.: 40.00829 183.12296 (NAD 83 - decimal) Office verified location ☐

1] SUBSTRATE Check *ONLY* Two substrate *TYPE BOXES*; estimate % or note every type present

Check ONE (*Or 2 & average*)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR/SLABS [10]			☐☐ HARDPAN [4]	X	
☐☐ BOULDER [9]	X	X	☐☐ DETRITUS [3]		
☐☒ COBBLE [8]	X	X	☐☐ MUCK [2]		
☒☐ GRAVEL [7]	X	X	☐☐ SILT [2]		
☐☐ SAND [6]			☐☐ ARTIFICIAL [0]		
☐☐ BEDROCK [5]					

(Score natural substrates; ignore sludge from point-sources)

NUMBER OF BEST TYPES: ☒ 4 or more [2] ☐ 3 or less [0]

ORIGIN	QUALITY	
☐ LIMESTONE [1]	☐ HEAVY [-2]	
☒ TILLS [1]	☒ MODERATE [-1]	
☐ WETLANDS [0]	☐ NORMAL [0]	
☐ HARDPAN [0]	☐ FREE [1]	
☐ SANDSTONE [0]	SILT ☐ EXTENSIVE [-2]	
☐ RIP/RAP [0]	EMBEDDEDNESS ☒ MODERATE [-1]	
☐ LACUSTURINE [0]	☐ NORMAL [0]	
☐ SHALE [-1]	☐ NONE [1]	
☐ COAL FINES [-2]		

Comments

Substrate: 16 (Maximum 20)

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	AMOUNT (Check ONE (*Or 2 & average*))
1 OVERHANGING VEGETATION [1]	2 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	☐ EXTENSIVE >75% [11]
1 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]	☒ MODERATE 25-75% [7]
3 ROOTMATS [1]			☐ SPARSE 5-<25% [3]
			☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 14

3] CHANNEL MORPHOLOGY Check ONE in each category (*Or 2 & average*)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☒ HIGH [3]
☒ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☒ LOW [2]	☒ FAIR [3]	☒ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 11.5

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for *EACH BANK* (*Or 2 per bank & average*)

River right looking downstream

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)
☒ ☒ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	☐ ☐ FOREST, SWAMP [3]
☐ ☐ MODERATE [2]	☐ ☒ MODERATE 10-50m [3]	☐ ☐ SHRUB OR OLD FIELD [2]
☐ ☐ HEAVY / SEVERE [1]	☒ ☐ NARROW 5-10m [2]	☐ ☐ RESIDENTIAL, PARK, NEW FIELD [1]
	☐ ☐ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]
	☐ ☐ NONE [0]	☐ ☐ OPEN PASTURE, ROWCROP [0]

☐ ☐	CONSERVATION TILLAGE [1]
☒ ☒	URBAN OR INDUSTRIAL [0]
☐ ☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 6.5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (*ONLY!*))	CHANNEL WIDTH (Check ONE (*Or 2 & average*))	CURRENT VELOCITY (Check ALL that apply)	
☐ > 1m [6]	☒ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1]	☒ SLOW [1]
☐ 0.7-<1m [4]	☐ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
☒ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	☐ FAST [1]	☐ INTERMITTENT [-2]
☐ 0.2-<0.4m [1]		☒ MODERATE [1]	☐ EDDIES [1]
☐ < 0.2m [0]		*Indicate for reach - pools and riffles.*	

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 6

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☒ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☒ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☐ BEST AREAS 5-10cm [1]	☒ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	☒ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 6

6] GRADIENT (21.7 ft/mi) ☐ VERY LOW - LOW [2-4] ☐ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (0.61 mi²)

%POOL: 2 %GLIDE: ____ %RUN: ____ %RIFFLE: ____

Gradient Maximum 10: 10

15
37
52

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☑ OTHER

STAGE

1st-sample pass-2nd

- ☐ HIGH ☐
- ☑ UP ☐
- ☑ NORMAL ☐
- ☐ LOW ☐
- ☐ DRY ☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☑ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

meters

CLARITY

1st --sample pass-- 2nd

- ☐ < 20 cm ☐
- ☐ 20-<40 cm ☐
- ☐ 40-70 cm ☐
- ☑ > 70 cm/ CTB ☐
- ☐ SECCHI DEPTH ☐

CANOPY

1st pass _____ cm

2nd _____ cm

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☑ <10%- CLOSED

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

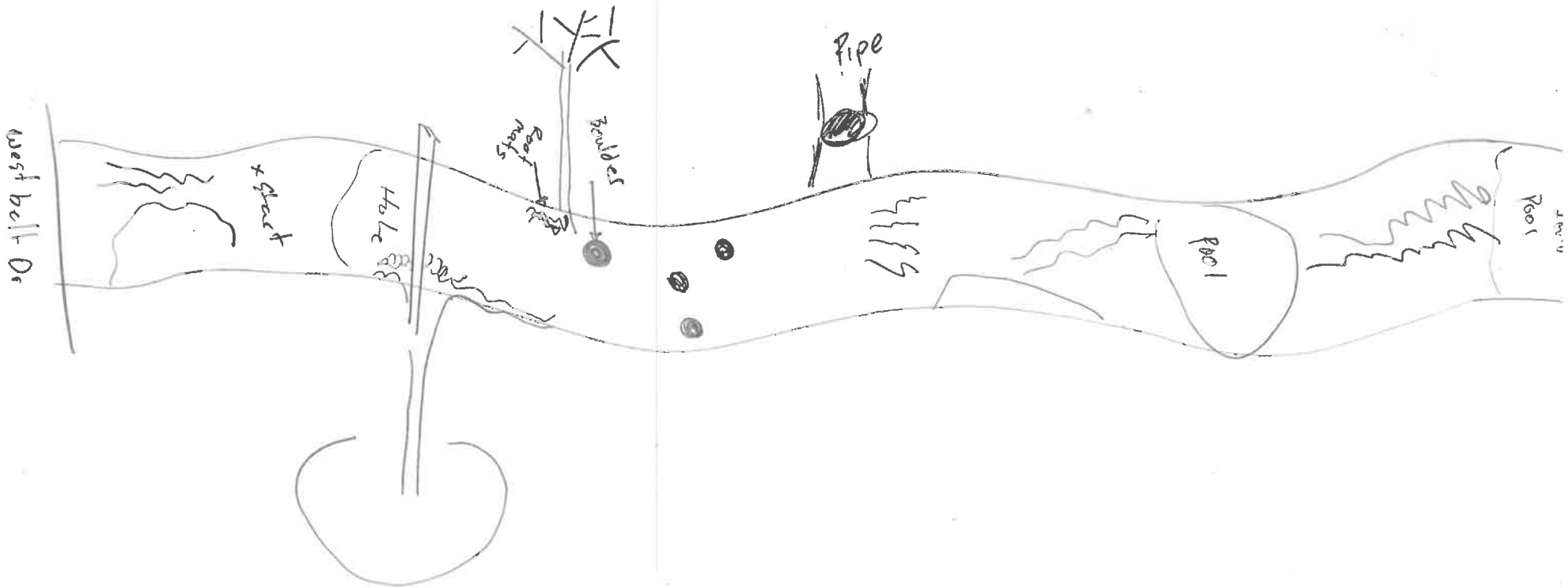
F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

Stream Drawing:



Ohio EPA — Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 61

Stream & Location: Robert Milikin Ditch Dof Roberts Rd RM: 1.59 Date: 7/15/24
RMD02 Scorers Full Name & Affiliation: MAS -> MBI
River Code: 02-937- STORET #: Lat./Long.: 40.00259 183.16619 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE
Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR/SLABS [10]			☐☐ HARDPAN [4]	X	
☐☐ BOULDER [9]	X		☐☐ DETRITUS [3]		
☐☒ COBBLE [8]	X	X	☐☐ MUCK [2]		
☒☐ GRAVEL [7]	X	X	☐☐ SILT [2]	X	
☐☐ SAND [6]	X		☐☐ ARTIFICIAL [0]		
☐☐ BEDROCK [5]					

(Score natural substrates; ignore sludge from point-sources)

NUMBER OF BEST TYPES: ☒ 4 or more [2] ☐ 3 or less [0]

ORIGIN (Check ONE (Or 2 & average)): ☐ LIMESTONE [1] ☒ TILLS [1] ☐ WETLANDS [0] ☐ HARDPAN [0] ☐ SANDSTONE [0] ☐ RIP/RAP [0] ☐ LACUSTURINE [0] ☐ SHALE [-1] ☐ COAL FINES [-2]

QUALITY: ☐ HEAVY [-2] ☐ MODERATE [-1] ☒ NORMAL [0] ☐ FREE [1]

EMBEDDEDNESS: SILT ☒ EXTENSIVE [-2] ☐ MODERATE [-1] ☐ NORMAL [0] ☐ NONE [1]

Substrate Maximum 20: 17

Comments: Embeddedness caused by algae, not silt

2] INSTREAM COVER
Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]
1 OVERHANGING VEGETATION [1]	1 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]
1 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]
1 ROOTMATS [1]		

AMOUNT (Check ONE (Or 2 & average)): ☐ EXTENSIVE >75% [11] ☒ MODERATE 25-75% [7] ☐ SPARSE 5-<25% [3] ☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 14

3] CHANNEL MORPHOLOGY
Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☒ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☒ LOW [2]	☒ FAIR [3]	☒ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 11

4] BANK EROSION AND RIPARIAN ZONE
Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION L	EROSION R	
☒	☒	NONE / LITTLE [3]
☐	☐	MODERATE [2]
☐	☐	HEAVY / SEVERE [1]

RIPARIAN WIDTH L	RIPARIAN WIDTH R	
☐	☐	WIDE > 50m [4]
☐	☐	MODERATE 10-50m [3]
☐	☐	NARROW 5-10m [2]
☐	☐	VERY NARROW < 5m [1]
☒	☒	NONE [0]

FLOOD PLAIN QUALITY L	FLOOD PLAIN QUALITY R	
☐	☐	FOREST, SWAMP [3]
☐	☐	SHRUB OR OLD FIELD [2]
☐	☐	RESIDENTIAL, PARK, NEW FIELD [1]
☐	☐	FENCED PASTURE [1]
☐	☐	OPEN PASTURE, ROWCROP [0]
☐	☐	CONSERVATION TILLAGE [1]
☒	☒	URBAN OR INDUSTRIAL [0]
☐	☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 3

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (ONLY)): ☐ > 1m [6] ☐ 0.7-<1m [4] ☒ 0.4-<0.7m [2] ☐ 0.2-<0.4m [1] ☐ < 0.2m [0]

CHANNEL WIDTH (Check ONE (Or 2 & average)): ☒ POOL WIDTH > RIFFLE WIDTH [2] ☐ POOL WIDTH = RIFFLE WIDTH [1] ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY (Check ALL that apply): ☐ TORRENTIAL [-1] ☐ VERY FAST [1] ☐ FAST [1] ☒ MODERATE [1] ☒ SLOW [1] ☐ INTERSTITIAL [-1] ☐ INTERMITTENT [-2] ☐ EDDIES [1]
Indicate for reach - pools and riffles.

Recreation Potential: Primary Contact / Secondary Contact (circle one and comment on back)

Comments

Pool / Current Maximum 12: 6

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH: ☒ BEST AREAS > 10cm [2] ☐ BEST AREAS 5-10cm [1] ☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH: ☐ MAXIMUM > 50cm [2] ☒ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE: ☒ STABLE (e.g., Cobble, Boulder) [2] ☐ MOD. STABLE (e.g., Large Gravel) [1] ☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS: ☐ NONE [2] ☒ LOW [1] ☐ MODERATE [0] ☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 6

6] GRADIENT (41.7 ft/mi) DRAINAGE AREA (1.03 mi²)

☐ VERY LOW - LOW [2-4] ☐ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

%POOL: 2 %GLIDE: %RUN: %RIFFLE:

Gradient Maximum 10: 4

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☒ OTHER

STAGE

1st-sample pass- 2nd	
☐ HIGH	☐
☒ UP	☐
☒ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☒ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

meters

CLARITY

1st --sample pass-- 2nd	
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☒ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

CANOPY

- ☒ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

1st pass _____ cm

2nd _____ cm

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

Dense mats of filamentous algae throughout site

B] AESTHETICS

- ☒ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

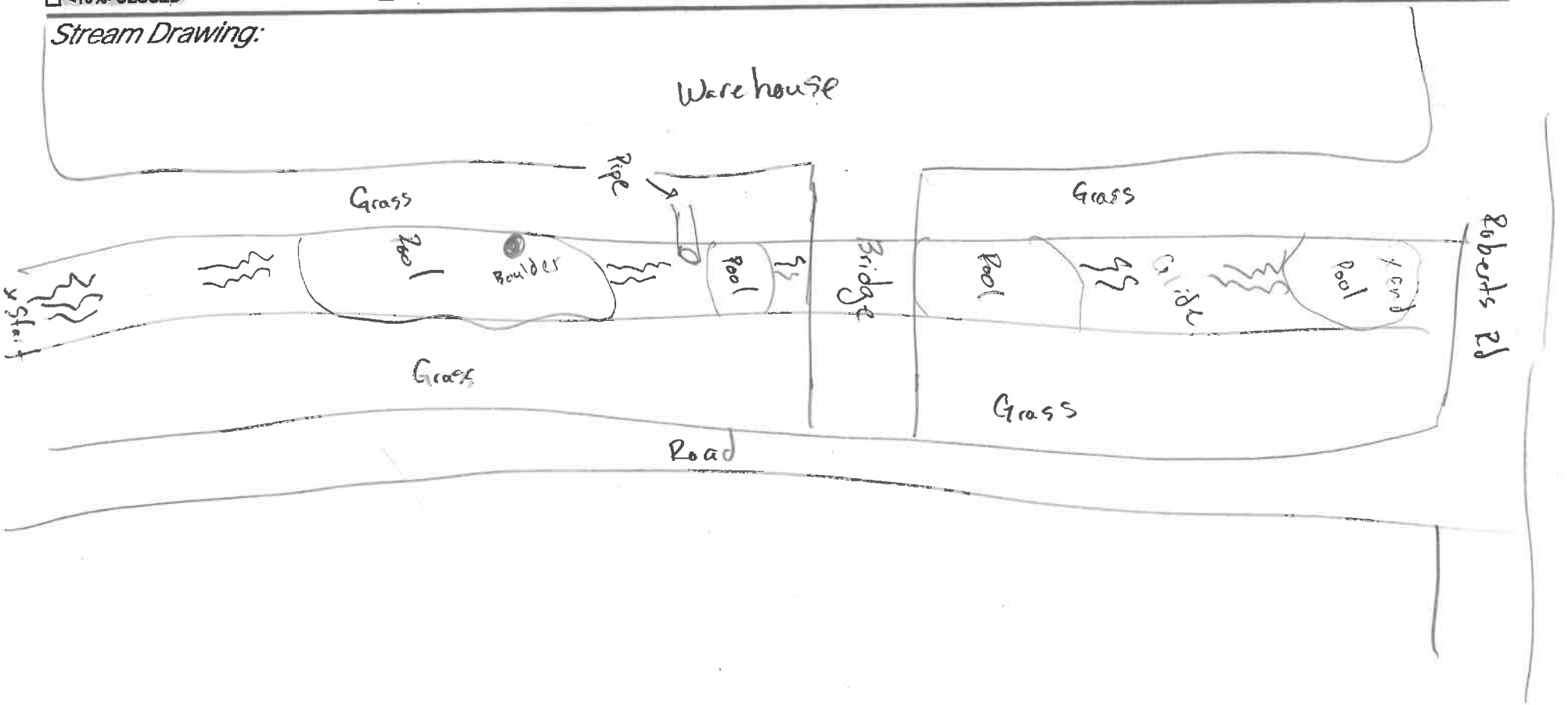
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 64.5

Stream & Location: Roberts Millikin Ditch Dst Millikin Falls RM: 0.39 Date: 7/15/24

RMD04

Scorers Full Name & Affiliation: MAS - MBI

River Code: 02-938- STORET #: Lat./Long.: 39.99883 / 83.08842 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR/SLABS [10]			☐ ☐ HARDPAN [4]		
☒ ☐ BOULDER [9]	x	x	☐ ☐ DETRITUS [3]		
☐ ☒ COBBLE [8]	x	x	☐ ☐ MUCK [2]		
☐ ☐ GRAVEL [7]	x	x	☐ ☐ SILT [2]		
☐ ☐ SAND [6]			☐ ☐ ARTIFICIAL [0]		
☐ ☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☐ 4 or more [2] ☒ 3 or less [0]

ORIGIN	QUALITY	
☐ LIMESTONE [1]	☐ HEAVY [-2]	
☒ TILLS [1]	☐ MODERATE [-1]	
☐ WETLANDS [0]	☐ NORMAL [0]	
☐ HARDPAN [0]	☒ FREE [1]	
☐ SANDSTONE [0]	☐ EXTENSIVE [-2]	
☒ RIP/RAP [0]	☐ MODERATE [-1]	
☐ LACUSTURINE [0]	☐ NORMAL [0]	
☐ SHALE [-1]	☒ NONE [1]	
☐ COAL FINES [-2]		

SILT / EMBEDDEDNESS

Substrate: 19.5 Maximum 20

Comments

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

0	UNDERCUT BANKS [1]	0	POOLS > 70cm [2]	2	OXBOWS, BACKWATERS [1]
1	OVERHANGING VEGETATION [1]	0	ROOTWADS [1]	0	AQUATIC MACROPHYTES [1]
1	SHALLOWS (IN SLOW WATER) [1]	3	BOULDERS [1]	0	LOGS OR WOODY DEBRIS [1]
0	ROOTMATS [1]				

AMOUNT (Check ONE (Or 2 & average))
☐ EXTENSIVE >75% [11]
☒ MODERATE 25-75% [7]
☐ SPARSE 5-<25% [3]
☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 11

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☒ HIGH [3]
☒ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☐ LOW [2]	☒ FAIR [3]	☒ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 12

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION L	EROSION R	RIPARIAN WIDTH L	RIPARIAN WIDTH R
☒	☒	NONE / LITTLE [3]	
☐	☐	MODERATE [2]	
☐	☐	HEAVY / SEVERE [1]	
☐	☐	WIDE > 50m [4]	
☒	☒	MODERATE 10-50m [3]	
☐	☐	NARROW 5-10m [2]	
☐	☐	VERY NARROW < 5m [1]	
☐	☐	NONE [0]	

FLOOD PLAIN QUALITY L	FLOOD PLAIN QUALITY R	
☐	☐	FOREST, SWAMP [3]
☐	☐	SHRUB OR OLD FIELD [2]
☒	☒	RESIDENTIAL, PARK, NEW FIELD [1]
☐	☐	FENCED PASTURE [1]
☐	☐	OPEN PASTURE, ROWCROP [0]
☐	☐	CONSERVATION TILLAGE [1]
☐	☐	URBAN OR INDUSTRIAL [0]
☐	☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 7

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (ONLY!))	CHANNEL WIDTH (Check ONE (Or 2 & average))	CURRENT VELOCITY (Check ALL that apply)	
☐ > 1m [6]	☐ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1]	☒ SLOW [1]
☐ 0.7-<1m [4]	☒ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
☐ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	☐ FAST [1]	☐ INTERMITTENT [-2]
☒ 0.2-<0.4m [1]		☒ MODERATE [1]	☐ EDDIES [1]
☐ < 0.2m [0]		Indicate for reach - pools and riffles.	

Recreation Potential: Primary Contact / Secondary Contact (circle one and comment on back)

Comments

Pool / Current Maximum 12: 4

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☒ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☒ STABLE (e.g., Cobble, Boulder) [2]	☒ NONE [2]
☐ BEST AREAS 5-10cm [1]	☒ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 7

6] GRADIENT (200 ft/mi) DRAINAGE AREA (2.9 mi²)

☐ VERY LOW - LOW [2-4]
☐ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: 2 %GLIDE: %RUN: %RIFFLE:

Gradient Maximum 10: 4

EPA 4520 06/16/06

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☒ OTHER

STAGE

1st-sample pass- 2nd

- ☐ HIGH ☐
- ☐ UP ☐
- ☒ NORMAL ☐
- ☐ LOW ☐
- ☐ DRY ☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☒ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

CLARITY

1st --sample pass-- 2nd

- ☐ < 20 cm ☐
- ☐ 20-<40 cm ☐
- ☐ 40-70 cm ☐
- ☒ > 70 cm/ CTB ☐
- ☐ SECCHI DEPTH ☐

meters

CANOPY

1st pass _____ cm

2nd _____ cm

- ☒ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

A Shortened site sandwiched between Milikin Falls and the modified downstream where a metal low-head was installed to divert water from the original channel to a series of falls leading to a retention pond. Old channel is now for stormwater overflow and otherwise dry

B] AESTHETICS

- ☒ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

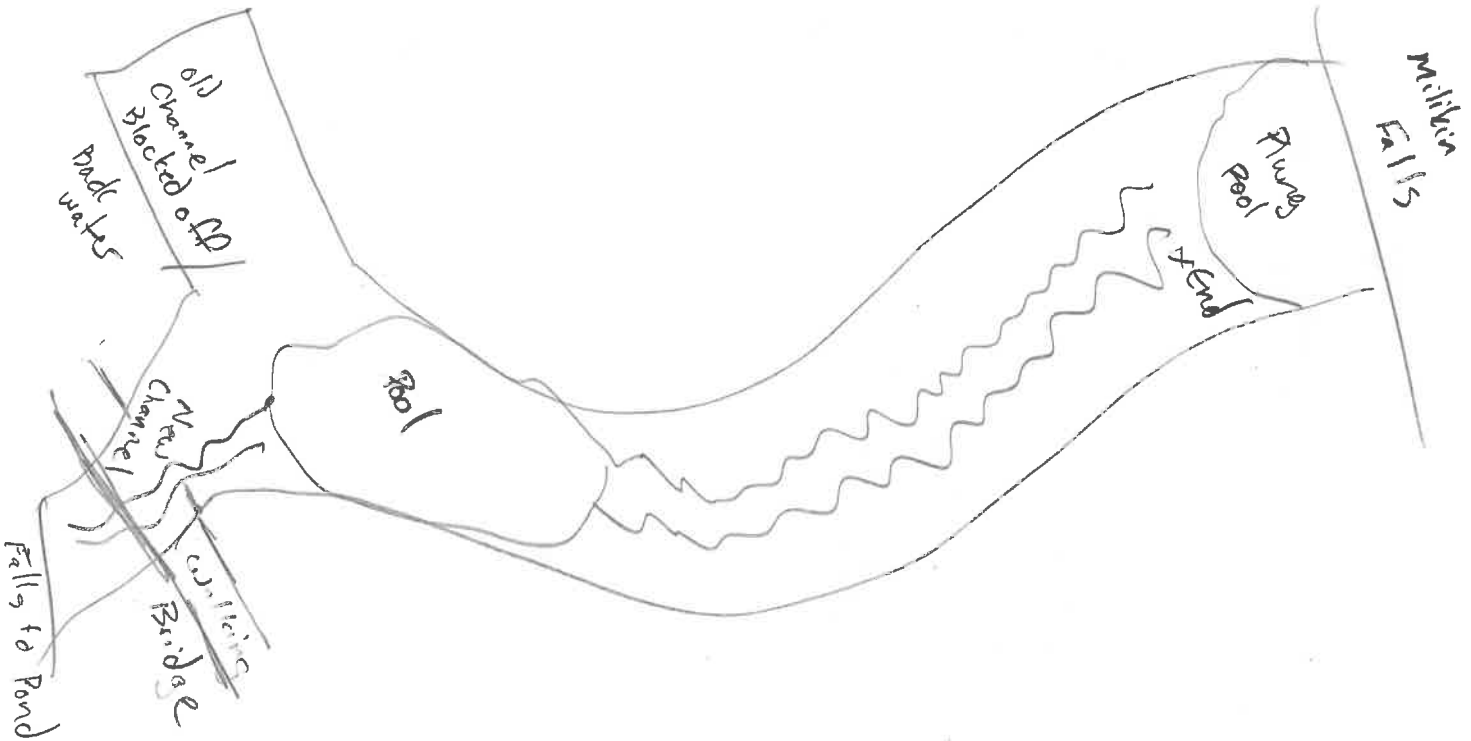
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 67.5

Stream & Location: Evans Run, DSt Scioto Pointe drive RM: 0.1 Date: 7/23/24

SCC01

Scorers Full Name & Affiliation: Corbin Rinkley, MBI

River Code: 02-939- STORET #: Lat./Long.: 39.9946 183.0741 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE

Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR/SLABS [10]			☐ ☐ HARDPAN [4]		
☐ ☐ BOULDER [9]	✓	✓	☐ ☐ DETRITUS [3]		
☑ ☐ COBBLE [8]	✓	✓	☐ ☐ MUCK [2]		
☐ ☑ GRAVEL [7]	✓	✓	☐ ☐ SILT [2]	✓	
☐ ☐ SAND [6]			☐ ☐ ARTIFICIAL [0]		
☐ ☐ BEDROCK [5]	✓	✓			

(Score natural substrates; ignore sludge from point-sources)

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

Check ONE (Or 2 & average)

ORIGIN	QUALITY	
☑ LIMESTONE [1]	☐ HEAVY [-2]	
☐ TILLS [1]	☐ MODERATE [-1]	
☐ WETLANDS [0]	SILT ☑ NORMAL [0]	
☐ HARDPAN [0]	☑ FREE [1]	
☐ SANDSTONE [0]	EMBEDDEDNESS ☐ EXTENSIVE [-2]	
☐ RIP/RAP [0]	☐ MODERATE [-1]	
☐ LACUSTURINE [0]	☑ NORMAL [0]	
☐ SHALE [-1]	☐ NONE [1]	
☐ COAL FINES [-2]		

Substrate: 18.5 Maximum 20

Comments

2] INSTREAM COVER

Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]
1 OVERHANGING VEGETATION [1]	0 ROOTWADS [1]	1 AQUATIC MACROPHYTES [1]
1 SHALLOWS (IN SLOW WATER) [1]	2 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]
1 ROOTMATS [1]		

AMOUNT (Check ONE (Or 2 & average))

☐ EXTENSIVE >75% [11]
☑ MODERATE 25-75% [7]
☐ SPARSE 5-<25% [3]
☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 14

3] CHANNEL MORPHOLOGY

Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☑ HIGH [3]
☐ MODERATE [3]	☑ GOOD [5]	☑ RECOVERED [4]	☐ MODERATE [2]
☑ LOW [2]	☐ FAIR [3]	☑ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 13.5

4] BANK EROSION AND RIPARIAN ZONE

Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

L	R	EROSION
☑	☑	NONE / LITTLE [3]
☐	☐	MODERATE [2]
☐	☐	HEAVY / SEVERE [1]

L	R	RIPARIAN WIDTH
☐	☐	WIDE > 50m [4]
☐	☐	MODERATE 10-50m [3]
☑	☑	NARROW 5-10m [2]
☑	☑	VERY NARROW < 5m [1]
☐	☐	NONE [0]

L	R	FLOOD PLAIN QUALITY
☐	☐	FOREST, SWAMP [3]
☐	☐	SHRUB OR OLD FIELD [2]
☑	☑	RESIDENTIAL, PARK, NEW FIELD [1]
☐	☐	FENCED PASTURE [1]
☐	☐	OPEN PASTURE, ROWCROP [0]

L	R	
☐	☐	CONSERVATION TILLAGE [1]
☐	☐	URBAN OR INDUSTRIAL [0]
☐	☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 5.5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (ONLY!))

☐ > 1m [6]
☐ 0.7-<1m [4]
☑ 0.4-<0.7m [2]
☐ 0.2-<0.4m [1]
☐ < 0.2m [0]

CHANNEL WIDTH (Check ONE (Or 2 & average))

☑ POOL WIDTH > RIFFLE WIDTH [2]
☐ POOL WIDTH = RIFFLE WIDTH [1]
☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY (Check ALL that apply)

☐ TORRENTIAL [-1]
☐ VERY FAST [1]
☑ FAST [1]
☑ MODERATE [1]
☑ SLOW [1]
☐ INTERSTITIAL [-1]
☐ INTERMITTENT [-2]
☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 7

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☑ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☑ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	☑ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 5

6] GRADIENT

GRADIENT (250 ft/mi) DRAINAGE AREA (1.39 mi²)

☐ VERY LOW - LOW [2-4]
☐ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: 2 %GLIDE: %RUN: %RIFFLE:

Gradient Maximum 10: 4

EPA 4520 06/16/06

210 = 10 / 0.04 = 250

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st-sample pass-	2nd
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☑ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

150 meters

CLARITY

1st --sample pass--	2nd
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

1st pass _____ cm

2nd _____ cm

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

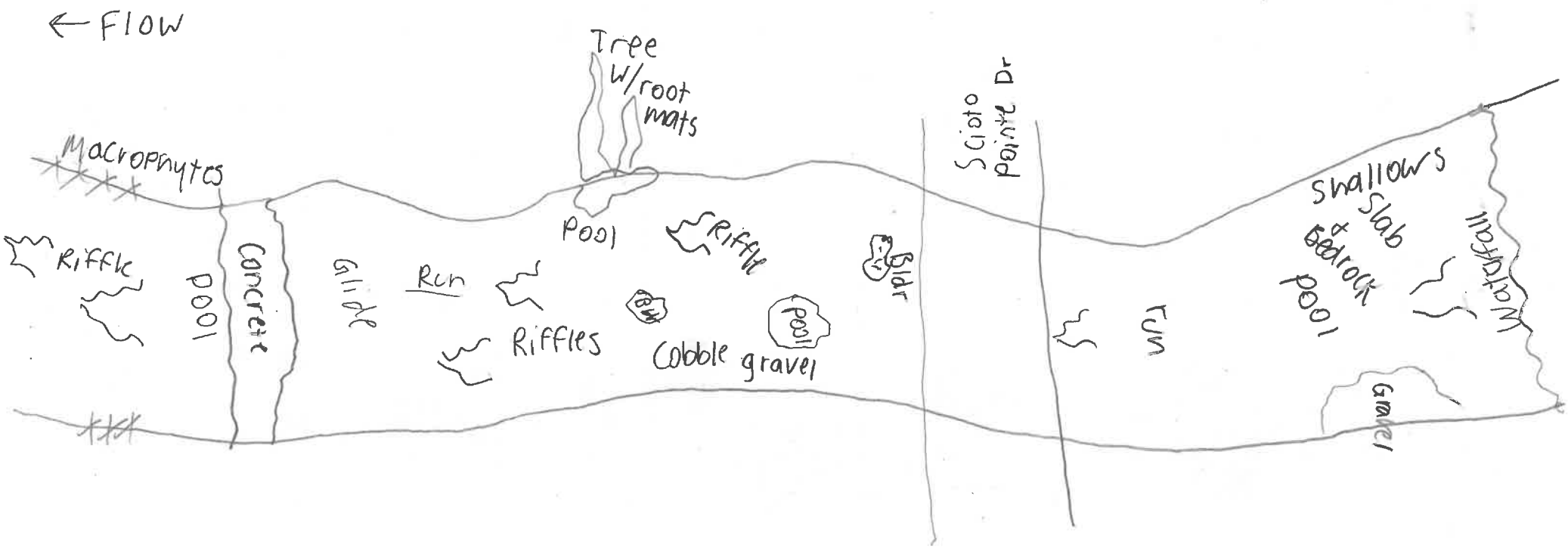
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



Ohio EPA — Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 49

Stream & Location: Kian Run @ High Street RM: 0.82 Date: 7/25/24

KR02

Scorers Full Name & Affiliation: Corbin Binkley, MRI

River Code: 02-197-___ STORET #: _____ Lat./Long.: 39.90955 82.99511 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR/SLABS [10]			☐ ☐ HARDPAN [4]		
☐ ☐ BOULDER [9]	✓	✓	☐ ☐ DETRITUS [3]	✓	✓
☐ ☐ COBBLE [8]	✓	✓	☐ ☐ MUCK [2]	✓	
☐ ☐ GRAVEL [7]	✓	✓	☑ ☐ SILT [2]	✓	✓
☐ ☑ SAND [6]	✓	✓	☐ ☐ ARTIFICIAL [0]		
☐ ☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

ORIGIN		QUALITY	
☐ LIMESTONE [1]	SILT	☐ HEAVY [-2]	Substrate
☑ TILLS [1]		☑ MODERATE [-1]	9
☐ WETLANDS [0]		☐ NORMAL [0]	
☐ HARDPAN [0]	EMBEDDEDNESS	☐ FREE [1]	
☐ SANDSTONE [0]		☐ EXTENSIVE [-2]	Maximum 20
☐ RIP/RAP [0]		☑ MODERATE [-1]	
☐ LACUSTURINE [0]		☐ NORMAL [0]	
☐ SHALE [-1]		☐ NONE [1]	
☐ COAL FINES [-2]			

Comments: Very Silty

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]
1 OVERHANGING VEGETATION [1]	2 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]
2 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	3 LOGS OR WOODY DEBRIS [1]
1 ROOTMATS [1]		

AMOUNT Check ONE (Or 2 & average)

☐ EXTENSIVE >75% [11]
☑ MODERATE 25-75% [7]
☐ SPARSE 5-<25% [3]
☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 14

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☑ MODERATE [2]
☑ LOW [2]	☐ FAIR [3]	☑ RECOVERING [3]	☑ LOW [1]
☐ NONE [1]	☑ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 7.5

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION L	EROSION R	RIPARIAN WIDTH L	RIPARIAN WIDTH R
☐	☐	☐	☐ WIDE > 50m [4]
☐	☐ NONE / LITTLE [3]	☐	☑ MODERATE 10-50m [3]
☑	☑ MODERATE [2]	☑	☐ NARROW 5-10m [2]
☐	☐ HEAVY / SEVERE [1]	☐	☐ VERY NARROW < 5m [1]
		☐	☐ NONE [0]

FLOOD PLAIN QUALITY L	FLOOD PLAIN QUALITY R
☐	☐ FOREST, SWAMP [3]
☐	☐ SHRUB OR OLD FIELD [2]
☑	☑ RESIDENTIAL, PARK, NEW FIELD [1]
☐	☐ FENCED PASTURE [1]
☐	☐ OPEN PASTURE, ROWCROP [0]

L	R	
☐	☐	CONSERVATION TILLAGE [1]
☐	☐	URBAN OR INDUSTRIAL [0]
☐	☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 5.5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check ONE (ONLY!)

☐ > 1m [6]
☐ 0.7-<1m [4]
☑ 0.4-<0.7m [2]
☐ 0.2-<0.4m [1]
☐ < 0.2m [0]

CHANNEL WIDTH Check ONE (Or 2 & average)

☑ POOL WIDTH > RIFFLE WIDTH [2]
☐ POOL WIDTH = RIFFLE WIDTH [1]
☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply

☐ TORRENTIAL [-1]
☐ VERY FAST [1]
☐ FAST [1]
☐ MODERATE [1]
☑ SLOW [1]
☐ INTERSTITIAL [-1]
☐ INTERMITTENT [-2]
☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 5

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☑ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☑ BEST AREAS < 5cm [metric=0]		☑ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☑ MODERATE [0]
			☑ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 0

6] GRADIENT (11.78 ft/mi) DRAINAGE AREA (1.36 mi²)

☐ VERY LOW - LOW [2-4]
☐ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: 2 %GLIDE: ____ %RUN: ____ %RIFFLE: ____

Gradient Maximum 10: 8

EPA 4520 06/16/06

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass-	2nd
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CLARITY

1st --sample pass--	2nd
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

1st pass _____ cm

2nd _____ cm

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

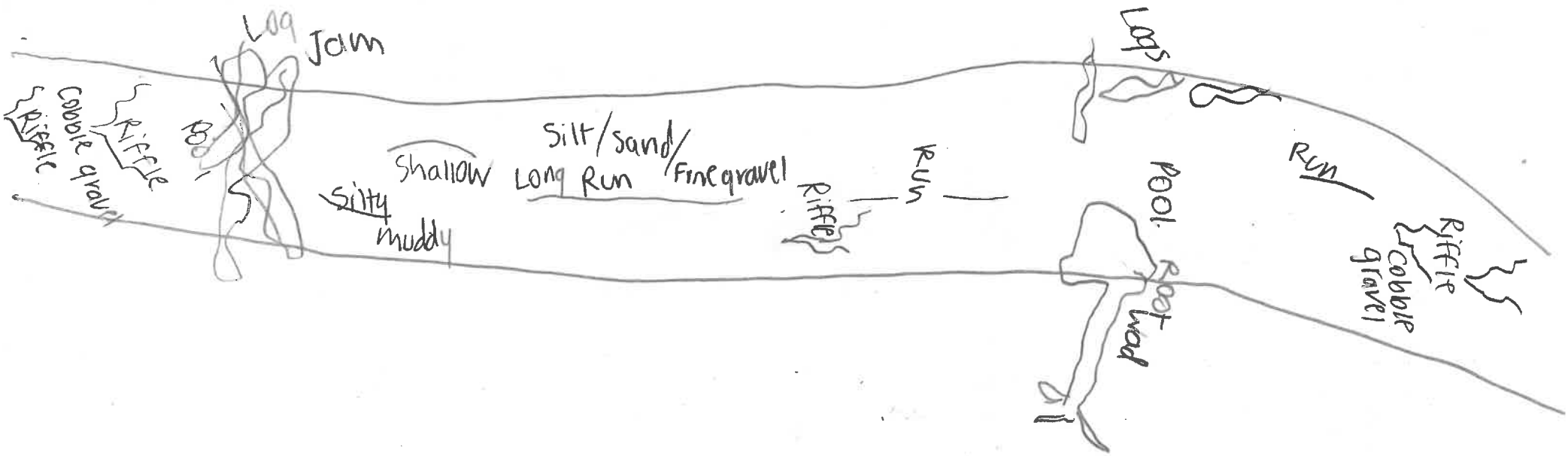
F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:

← Flow



Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 49

Stream & Location: Kian Run @ Mouth to Scioto river RM: 0.05 Date: 7/25/24

KR01

Scorers Full Name & Affiliation: Corbin Binkley

River Code: 02-197-___ STORET #: _____ Lat./Long.: 39.90233 183.00092 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE

Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR/SLABS [10]			☐☐ HARDPAN [4]	✓	
☐☐ BOULDER [9]	✓		☐☐ DETRITUS [3]	✓	
☐☐ COBBLE [8]	✓	✓	☐☐ MUCK [2]	✓	
☐☐ GRAVEL [7]	✓	✓	☑☐ SILT [2]	✓	
☐☑ SAND [6]	✓	✓	☐☐ ARTIFICIAL [0]		
☐☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

ORIGIN: ☐ LIMESTONE [1] ☑ TILLS [1] ☐ WETLANDS [0] ☐ HARDPAN [0] ☐ SANDSTONE [0] ☐ RIP/RAP [0] ☐ LACUSTURINE [0] ☐ SHALE [-1] ☐ COAL FINES [-2]

QUALITY: ☑ HEAVY [-2] ☐ MODERATE [-1] ☐ NORMAL [0] ☐ FREE [1]

SILT / EMBEDDEDNESS: ☑ EXTENSIVE [-2] ☐ MODERATE [-1] ☐ NORMAL [0] ☐ NONE [1]

Substrate Maximum 20: 7

Comments: VERY Silty & Sandy

2] INSTREAM COVER

Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

2	UNDERCUT BANKS [1]	2	POOLS > 70cm [2]	0	OXBOWS, BACKWATERS [1]
0	OVERHANGING VEGETATION [1]	2	ROOTWADS [1]	0	AQUATIC MACROPHYTES [1]
1	SHALLOWS (IN SLOW WATER) [1]	1	BOULDERS [1]	3	LOGS OR WOODY DEBRIS [1]
2	ROOTMATS [1]				

AMOUNT (Check ONE (Or 2 & average)): ☐ EXTENSIVE >75% [11] ☑ MODERATE 25-75% [7] ☐ SPARSE 5-<25% [3] ☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 15

3] CHANNEL MORPHOLOGY

Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☑ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☑ LOW [1]
☐ NONE [1]	☑ POOR [1]	☑ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 4.5

4] BANK EROSION AND RIPARIAN ZONE

Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION L	EROSION R	RIPARIAN WIDTH L	RIPARIAN WIDTH R
☐ NONE / LITTLE [3]	☐ NONE / LITTLE [3]	☐ WIDE > 50m [4]	☑ WIDE > 50m [4]
☐ MODERATE [2]	☐ MODERATE [2]	☑ MODERATE 10-50m [3]	☑ MODERATE 10-50m [3]
☑ HEAVY / SEVERE [1]	☑ HEAVY / SEVERE [1]	☐ NARROW 5-10m [2]	☐ NARROW 5-10m [2]
		☐ VERY NARROW < 5m [1]	☐ VERY NARROW < 5m [1]
		☐ NONE [0]	☐ NONE [0]

FLOOD PLAIN QUALITY L	FLOOD PLAIN QUALITY R
☐ FOREST, SWAMP [3]	☐ CONSERVATION TILLAGE [1]
☐ SHRUB OR OLD FIELD [2]	☑ URBAN OR INDUSTRIAL [0]
☑ RESIDENTIAL, PARK, NEW FIELD [1]	☐ MINING / CONSTRUCTION [0]
☐ FENCED PASTURE [1]	
☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 5.5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (ONLY!)): ☐ > 1m [6] ☑ 0.7-<1m [4] ☐ 0.4-<0.7m [2] ☐ 0.2-<0.4m [1] ☐ < 0.2m [0]

CHANNEL WIDTH (Check ONE (Or 2 & average)): ☑ POOL WIDTH > RIFFLE WIDTH [2] ☐ POOL WIDTH = RIFFLE WIDTH [1] ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY (Check ALL that apply): ☐ TORRENTIAL [-1] ☑ SLOW [1] ☐ VERY FAST [1] ☐ INTERSTITIAL [-1] ☐ FAST [1] ☐ INTERMITTENT [-2] ☐ MODERATE [1] ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential: Primary Contact / Secondary Contact (circle one and comment on back)

Comments

Pool / Current Maximum 12: 7

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☑ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☐ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☑ BEST AREAS < 5cm [metric=0]		☑ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0] ☑ EXTENSIVE [-1]

Comments: Mostly POOL + run, Minimal riffle Presence

Riffle / Run Maximum 8: 0

6] GRADIENT (11.76 ft/mi)

DRAINAGE AREA (9.44 mi²)

☐ VERY LOW - LOW [2-4] ☐ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

%POOL: 2 %GLIDE: %RUN: %RIFFLE:

Gradient Maximum 10: 10

EPA 4520 06/16/06

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☑ L. LINE
- ☐ OTHER

STAGE

1st -sample pass-	2nd
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☑ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

150 meters

CLARITY

1st --sample pass--	2nd
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☒ 10%-<30%
- ☐ <10%- CLOSED

1st pass _____ cm

2nd _____ cm

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

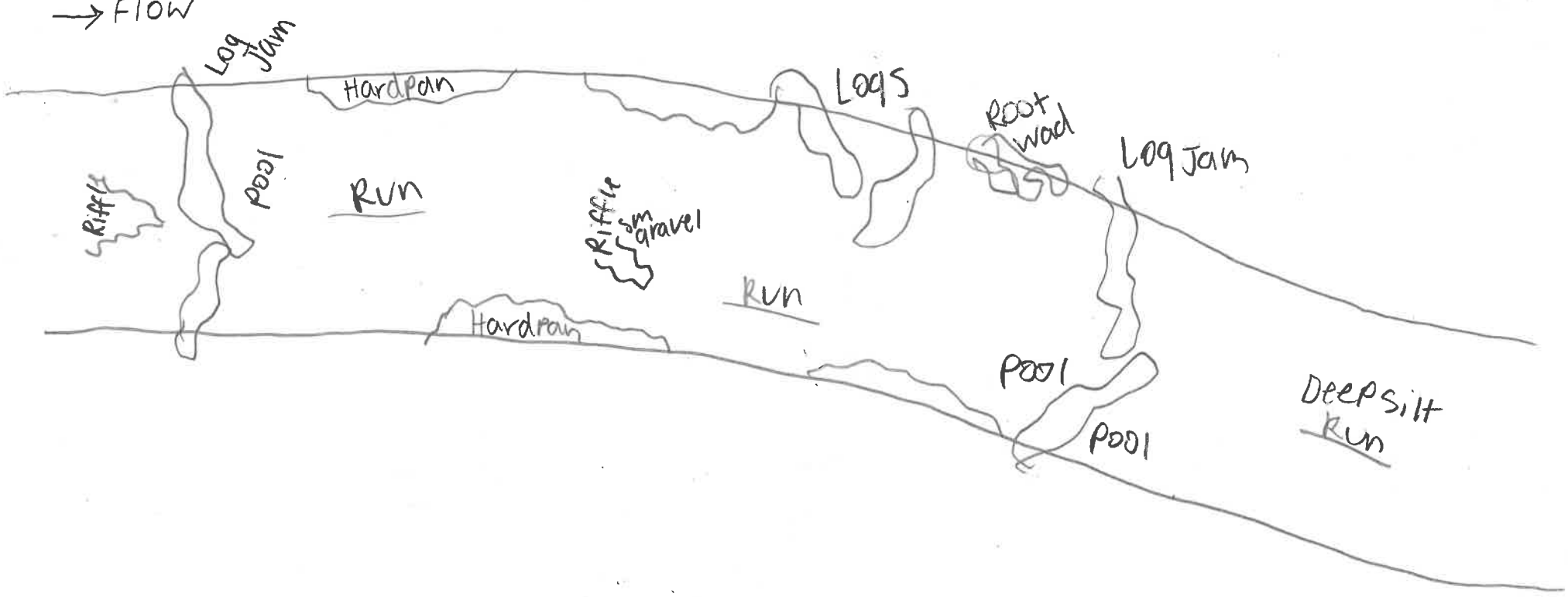
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20./ TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



APPENDIX D-3: 2024 PHWH Worksheets

Appendix D-1. Primary Headwater Aquatic Life Use information for the ColsDOSD23 Study area in 2024.

Site ID	RM	Year	River	Location:
RMD02	**1.50**	**2024**	(02937) Roberts Millikin Ditch Subwatershed (Sci	Off Roberts Road

HHEI Info: HHEI Score: ***77.0*** Substrate: **27.0** Pool: **20.0** Bankfull **30.0** Channel: ***Recovered*** Flow: ***Flowing***

QHEI Info: QHEI Score: Substrate: Pool: Max Z.: Channel Flow:

Drainage Size: **1.03** Riffle: Ripar: Cover: PHW Class:**WWH**

FISH Info: IBI Score: **34** Species: **5.0** Sensitive Sp.: **0.0** % Pioneer: **97.46** Headwater Sp. **0.00**

MACRO Info: ICI Score: QUAL EPT: **3** Coldwater Taxa.: **0** Intols: Sens. **0** Toler: V. Tol.

Salamanders: Adults: Larvae: Alternate Site ID:

BARB03	**2.70**	**2024**	(02932) Barbee Ditch (Tributary To Scioto River	Wilson Road

HHEI Info: HHEI Score: ***87.0*** Substrate: **27.0** Pool: **30.0** Bankfull **30.0** Channel: ***Recovering*** Flow: ***Flowing***

QHEI Info: QHEI Score: Substrate: Pool: Max Z.: Channel Flow:

Drainage Size: **0.90** Riffle: Ripar: Cover: PHW Class:**PHW2**

FISH Info: IBI Score: **34** Species: **2.0** Sensitive Sp.: **0.0** % Pioneer: **100.0** Headwater Sp. **0.00**

MACRO Info: ICI Score: QUAL EPT: **3** Coldwater Taxa.: **0** Intols: Sens. **0** Toler: V. Tol.

Salamanders: Adults: Larvae: Alternate Site ID:

TRB03	**2.20**	**2024**	(02266) Trabue Run (Tributary to Barbee Ditch @	Dst Dividend Drive

HHEI Info: HHEI Score: ***74.0*** Substrate: **29.0** Pool: **20.0** Bankfull **25.0** Channel: ***Recovered*** Flow: ***Flowing***

QHEI Info: QHEI Score: Substrate: Pool: Max Z.: Channel Flow:

Drainage Size: **0.63** Riffle: Ripar: Cover: PHW Class:**WWH**

FISH Info: IBI Score: **34** Species: **5.0** Sensitive Sp.: **0.0** % Pioneer: **85.83** Headwater Sp. **0.00**

MACRO Info: ICI Score: QUAL EPT: **6** Coldwater Taxa.: **0** Intols: Sens. **1** Toler: V. Tol.

Salamanders: Adults: Larvae: Alternate Site ID:

TRB02	**1.05**	**2024**	(02266) Trabue Run (Tributary to Barbee Ditch @	Trabue Rd

HHEI Info: HHEI Score: ***79.0*** Substrate: **29.0** Pool: **20.0** Bankfull **30.0** Channel: ***Recovered*** Flow: ***Flowing***

QHEI Info: QHEI Score: Substrate: Pool: Max Z.: Channel Flow:

Drainage Size: **2.60** Riffle: Ripar: Cover: PHW Class:**WWH**

FISH Info: IBI Score: **34** Species: **6.0** Sensitive Sp.: **0.0** % Pioneer: **72.54** Headwater Sp. **1.00**

MACRO Info: ICI Score: QUAL EPT: **8** Coldwater Taxa.: **0** Intols: Sens. **3** Toler: V. Tol.

Salamanders: Adults: Larvae: Alternate Site ID:

Appendix D1. Primary Headwater Aquatic Life Use information for the ColsDOSD23 Study area in 2024.

Site ID	RM	Year	River	Location:
TRB01	**0.13**	**2024**	(02266) Trabue Run (Tributary to Barbee Ditch @	Hague Ave

HHEI Info: HHEI Score: ***76.0*** Substrate: **26.0** Pool: **20.0** Bankfull **30.0** Channel: ***Recovering*** Flow: ***Flowing***

QHEI Info: QHEI Score: Substrate: Pool: Max Z.: Channel Flow:

Drainage Size: **3.00** Riffle: Ripar: Cover: PHW Class:**WWH**

FISH Info: IBI Score: **34** Species: **11.0** Sensitive Sp.: **2.0** % Pioneer: **54.55** Headwater Sp. **1.00**

MACRO Info: ICI Score: QUAL EPT: **7** Coldwater Taxa.: **0** Intols: Sens. **5** Toler: V. Tol.

Salamanders: Adults: Larvae: Alternate Site ID:

Site ID	RM	Year	River	Location:
TRB05	**0.85**	**2024**	(02934) Unnamed Tributary to Trabue Run @RM 1.2	Wilson Road (ust. Gold Course)

HHEI Info: HHEI Score: ***86.0*** Substrate: **26.0** Pool: **30.0** Bankfull **30.0** Channel: ***Recovering*** Flow: ***Flowing***

QHEI Info: QHEI Score: Substrate: Pool: Max Z.: Channel Flow:

Drainage Size: **0.82** Riffle: Ripar: Cover: PHW Class:**PHW2**

FISH Info: IBI Score: **34** Species: **5.0** Sensitive Sp.: **0.0** % Pioneer: **62.68** Headwater Sp. **0.00**

MACRO Info: ICI Score: QUAL EPT: **6** Coldwater Taxa.: **0** Intols: Sens. **1** Toler: V. Tol.

Salamanders: Adults: Larvae: Alternate Site ID:

Site ID	RM	Year	River	Location:
TRB04	**0.22**	**2024**	(02933) Unnamed Tributary to Trabue Run @RM 2.7	Behind Westbelt historic Ohio EPA site

HHEI Info: HHEI Score: ***77.0*** Substrate: **27.0** Pool: **30.0** Bankfull **20.0** Channel: ***Recovered*** Flow: ***Flowing***

QHEI Info: QHEI Score: ***54.0*** Substrate: **9.5** Pool: **5.0** Max Z.: **40-70 cm** Channel **11.0** Flow: ***Flowing***

Drainage Size: **0.22** Riffle: **4.5** Ripar: **4.0** Cover: **12.0** PHW Class:**PHW2**

FISH Info: IBI Score: **34** Species: **3.0** Sensitive Sp.: **0.0** % Pioneer: **90.32** Headwater Sp. **0.00**

MACRO Info: ICI Score: QUAL EPT: **5** Coldwater Taxa.: **0** Intols: Sens. **1** Toler: V. Tol.

Salamanders: Adults: Larvae: Alternate Site ID:

Site ID	RM	Year	River	Location:
BARB04	**0.43**	**2024**	(02935) Unnamed Tributary to Barbee Ditch @ RM 1	Wilson Road

HHEI Info: HHEI Score: ***89.0*** Substrate: **34.0** Pool: **30.0** Bankfull **25.0** Channel: ***Recovered*** Flow: ***Flowing***

QHEI Info: QHEI Score: ***58.5*** Substrate: **17.5** Pool: **4.0** Max Z.: **20-40 cm** Channel **11.0** Flow: ***Flowing***

Drainage Size: **0.95** Riffle: **4.0** Ripar: **3.0** Cover: **15.0** PHW Class:**PHW2**

FISH Info: IBI Score: **34** Species: **4.0** Sensitive Sp.: **0.0** % Pioneer: **71.70** Headwater Sp. **0.00**

MACRO Info: ICI Score: QUAL EPT: **0** Coldwater Taxa.: **0** Intols: Sens. **0** Toler: V. Tol.

Salamanders: Adults: Larvae: Alternate Site ID:

Appendix D1. Primary Headwater Aquatic Life Use information for the ColsDOSD23 Study area in 2024.

Site ID	RM	Year	River	Location:
DRY02	**2.61**	**2024**	(02095) Dry Run (Scioto R. @134.43)	Drive off of Hague Ave

HHEI Info: HHEI Score: ***89.0*** Substrate: **29.0** Pool: **30.0** Bankfull **30.0** Channel: ***Recovered*** Flow: ***Flowing***

QHEI Info: QHEI Score: Substrate: Pool: Max Z.: Channel Flow:

Drainage Size: **0.75** Riffle: Ripar: Cover: PHW Class:**WWH**

FISH Info: IBI Score: **34** Species: **5.0** Sensitive Sp.: **0.0** % Pioneer: **84.42** Headwater Sp. **2.00**

MACRO Info: ICI Score: QUAL EPT: **8** Coldwater Taxa.: **2** Intols: Sens. **2** Toler: V. Tol.

Salamanders: Adults: Larvae: Alternate Site ID:

DRY09	**2.45**	**2024**	(02930) Unnamed Tributary to Dry Run@RM 1.61	Site of Old USGS Gauge, Back of Parking Lot

HHEI Info: HHEI Score: ***83.0*** Substrate: **23.0** Pool: **30.0** Bankfull **30.0** Channel: ***Recovered*** Flow: ***Flowing***

QHEI Info: QHEI Score: Substrate: Pool: Max Z.: Channel Flow:

Drainage Size: **1.28** Riffle: Ripar: Cover: PHW Class:**PHW2**

FISH Info: IBI Score: **34** Species: **2.0** Sensitive Sp.: **0.0** % Pioneer: **100.0** Headwater Sp. **0.00**

MACRO Info: ICI Score: QUAL EPT: **3** Coldwater Taxa.: **0** Intols: Sens. **0** Toler: V. Tol.

Salamanders: Adults: Larvae: Alternate Site ID:

DRY04	**0.14**	**2024**	(02930) Unnamed Tributary to Dry Run@RM 1.61	Valley View Drive

HHEI Info: HHEI Score: ***83.0*** Substrate: **23.0** Pool: **30.0** Bankfull **30.0** Channel: ***Recovered*** Flow: ***Flowing***

QHEI Info: QHEI Score: Substrate: Pool: Max Z.: Channel Flow:

Drainage Size: **3.43** Riffle: Ripar: Cover: PHW Class:**WWH**

FISH Info: IBI Score: **34** Species: **6.0** Sensitive Sp.: **0.0** % Pioneer: **76.11** Headwater Sp. **2.00**

MACRO Info: ICI Score: QUAL EPT: **6** Coldwater Taxa.: **0** Intols: Sens. **2** Toler: V. Tol.

Salamanders: Adults: Larvae: Alternate Site ID:

DRY07	**1.74**	**2024**	(02931) Unnamed Tributary to Dry Run @ RM 2.61	Phillipi Road

HHEI Info: HHEI Score: ***68.0*** Substrate: **23.0** Pool: **20.0** Bankfull **25.0** Channel: ***Recovered*** Flow: ***Flowing***

QHEI Info: QHEI Score: ***56.5*** Substrate: **16.5** Pool: **5.0** Max Z.: Channel **5.5** Flow: ***Interst.***

Drainage Size: **1.37** Riffle: **2.5** Ripar: **3.0** Cover: **14.0** PHW Class:**PHW2**

FISH Info: IBI Score: **34** Species: **5.0** Sensitive Sp.: **0.0** % Pioneer: **75.36** Headwater Sp. **0.00**

MACRO Info: ICI Score: QUAL EPT: **5** Coldwater Taxa.: **0** Intols: Sens. **2** Toler: V. Tol.

Salamanders: Adults: Larvae: Alternate Site ID:

Appendix D1. Primary Headwater Aquatic Life Use information for the ColsDOSD23 Study area in 2024.

Site ID	RM	Year	River	Location:
DRY06	**0.34**	**2024**	(02931) Unnamed Tributary to Dry Run @ RM 2.61	Drive off Fisher Road

HHEI Info: HHEI Score: ***79.0*** Substrate: **29.0** Pool: **25.0** Bankfull **25.0** Channel: ***Recovered*** Flow: ***Flowing***

QHEI Info: QHEI Score: Substrate: Pool: Max Z.: Channel Flow:

Drainage Size: **2.15** Riffle: Ripar: Cover: PHW Class:**WWH**

FISH Info: IBI Score: **34** Species: **7.0** Sensitive Sp.: **0.0** % Pioneer: **63.66** Headwater Sp. **1.00**

MACRO Info: ICI Score: QUAL EPT: **10** Coldwater Taxa.: **0** Intols: Sens. **4** Toler: V. Tol.

Salamanders: Adults: Larvae: Alternate Site ID:

Site ID	RM	Year	River	Location:
SCC01	**0.10**	**2024**	(02939) Evans Run (Scioto R. @136.97)	Scioto Point Dr.

HHEI Info: HHEI Score: ***85.0*** Substrate: **35.0** Pool: **20.0** Bankfull **30.0** Channel: ***Recovering*** Flow: ***Flowing***

QHEI Info: QHEI Score: ***67.5*** Substrate: **18.5** Pool: **7.0** Max Z.: **40-70 cm** Channel **13.5** Flow: ***Flowing***

Drainage Size: **1.39** Riffle: **5.0** Ripar: **5.5** Cover: **14.0** PHW Class:**PHW2**

FISH Info: IBI Score: **34** Species: **7.0** Sensitive Sp.: **0.0** % Pioneer: **84.29** Headwater Sp. **0.00**

MACRO Info: ICI Score: QUAL EPT: **0** Coldwater Taxa.: **0** Intols: Sens. **0** Toler: V. Tol.

Salamanders: Adults: Larvae: Alternate Site ID:

Site ID	RM	Year	River	Location:
KR02	**0.80**	**2024**	(02197) Kian Run (Scioto R. @126.5)	High Street

HHEI Info: HHEI Score: ***67.0*** Substrate: **17.0** Pool: **20.0** Bankfull **30.0** Channel: ***Recovered*** Flow: ***Flowing***

QHEI Info: QHEI Score: Substrate: Pool: Max Z.: Channel Flow:

Drainage Size: **1.36** Riffle: Ripar: Cover: PHW Class:**MWH_C**

FISH Info: IBI Score: **34** Species: **4.0** Sensitive Sp.: **0.0** % Pioneer: **99.45** Headwater Sp. **1.00**

MACRO Info: ICI Score: QUAL EPT: **2** Coldwater Taxa.: **0** Intols: Sens. **0** Toler: V. Tol.

Salamanders: Adults: Larvae: Alternate Site ID:

Site ID	RM	Year	River	Location:
KR01	**0.05**	**2024**	(02197) Kian Run (Scioto R. @126.5)	Access from Scioto

HHEI Info: HHEI Score: ***73.0*** Substrate: **23.0** Pool: **20.0** Bankfull **30.0** Channel: ***Recovered*** Flow: ***Flowing***

QHEI Info: QHEI Score: ***49.0*** Substrate: **7.0** Pool: **7.0** Max Z.: **70-100 cm** Channel **4.5** Flow: ***Flowing***

Drainage Size: **9.44** Riffle: **0.0** Ripar: **5.5** Cover: **15.0** PHW Class:**MWH_C**

FISH Info: IBI Score: **34** Species: **8.0** Sensitive Sp.: **2.0** % Pioneer: **81.42** Headwater Sp. **0.00**

MACRO Info: ICI Score: QUAL EPT: **0** Coldwater Taxa.: **0** Intols: Sens. **0** Toler: V. Tol.

Salamanders: Adults: Larvae: Alternate Site ID:

APPENDIX D-4: 2024 HHEI Field Sheets

Headwater Habitat Evaluation Index Field Form

HHEI Score (sum of metrics 1+2+3) 92

SITE NAME/LOCATION Dry Run

SITE NUMBER DRY02 RIVER BASIN 02 RIVER CODE 02-095 DRAINAGE AREA (m²) 0.75

LENGTH OF STREAM REACH (ft) 200 LAT 39.97244 LONG -83.08279 RIVER MILE 2.61

DATE 7/18/2024 SCORER AJS COMMENTS

NOTE: Complete All Items On This Form - Refer to "Headwater Habitat Evaluation Index Field Manual" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☐ RECOVERED ☑ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type present). Check *ONLY* two predominant substrate *TYPE* boxes. (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B

TYPE		PERCENT	TYPE		PERCENT
☐	BLDR SLABS [16 pts]		☐	SILT [3 pt]	2
☐	BOULDER (>256 mm) [16 pts]	15	☐	LEAF PACK/WOODY DEBRIS [3 pts]	1
☐	BEDROCK [16 pts]	05	☐	FINE DETRITUS [3 pts]	1
☑	COBBLE (65-256 mm) [12 pts]	30	☐	CLAY or HARDPAN [0 pt]	1
☑	GRAVEL (2-64 mm) [9 pts]	25	☐	MUCK [0 pts]	
☐	SAND (<2 mm) [6 pts]	10	☐	ARTIFICIAL [3 pts]	0.5

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 53.5 (A) 21 (B) 11

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: TOTAL NUMBER OF SUBSTRATE TYPES:

HHEI Metric Points — Substrate Max = 40: 32 — A + B

2. Maximum Pool Depth (*Measure the maximum pool depth within the 61 meter (200 feet)* evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

- ☐ > 30 centimeters [20 pts]
- ☑ > 22.5 - 30 cm [30 pts]
- ☐ > 10 - 22.5 cm [25 pts]
- ☐ 5 cm - 10 cm [15 pts]
- ☐ < 5 cm - [5pts]
- ☐ NO WATER OR MOIST CHANNEL [0pts]

COMMENTS 10 inches MAXIMUM POOL DEPTH (centimeters) 25.4

Pool Depth Max = 30: 30

3. BANK FULL WIDTH (Measured as the average of 3 - 4 measurements) (Check *ONLY* one box):

- ☑ > 4.0 meters (> 13') [30 pts]
- ☐ > 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]
- ☐ > 1.5 m - 3.0 m (> 4' 8" - 9' 7") [20 pts]
- ☐ > 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
- ☐ ≤ 1.0 m (≤ 3' 3") [5 pts]

COMMENTS 6.3, 5.7, 6.2 AVERAGE BANKFULL WIDTH (meters) 6.06

Bankfull Width Max=30: 30

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY * NOTE: River Left (L) and Right (R) as looking downstream*

RIPARIAN WIDTH (Per Bank)

L	R	
☑	☐	Wide >10m
☐	☑	Moderate 5-10m
☐	☐	Narrow <5m
☐	☐	None

FLOODPLAIN QUALITY (Most Predominant per Bank)

L	R				
☑	☐	Mature Forest, Wetland	☐	☐	Conservation Tillage
☐	☑	Immature Forest, Shrub or Old Field	☐	☐	Urban or Industrial
☐	☐	Residential, Park, New Field	☐	☐	Open Pasture, Row Crop
☐	☐	Fenced Pasture	☐	☐	Mining or Construction

COMMENTS

FLOW REGIME (*At Time of Evaluation*) (Check *ONLY* one box):

- ☑ Stream Flowing
- ☐ Subsurface flow with isolated pools (interstitial)
- ☐ Moist Channel, isolated pools, no flow (intermittent)
- ☐ Dry channel, no water (ephemeral)

COMMENTS

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check ONLY one box):

☑ None	☐ 1.0	☐ 2.0	☐ 3.0
☐ 0.5	☐ 1.5	☐ 2.5	☐ >3

STREAM GRADIENT ESTIMATE

☐ Flat (0.5 ft/100 ft) ☑ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? ☐ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI form)

DOWNSTREAM DESIGNATED USE(S)

☑ WWH Name: _____ Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION.

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order: _____

County: _____ Township/City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 07/18/24 Quantity: ~0.5 inch

Photo-documentation Notes: ✓

Elevated Turbidity? (Y/N): N Canopy (% open): 25

Were samples collected for water chemistry? (Y/N): Y Lab Sample # or ID (attach results): _____

Field Measures: Temp (°C) _____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (umhos/cm) _____

Is the sampling reach representative of the stream (Y/N) Y If not, explain: _____

Additional comments/description of pollution impacts: _____

BIOLOGICAL OBSERVATIONS

(Record all observations below)

Fish Observed? (Y/N) N Species observed (if known): _____

Frogs or Tadpoles Observed? (Y/N) N Species observed (if known): _____

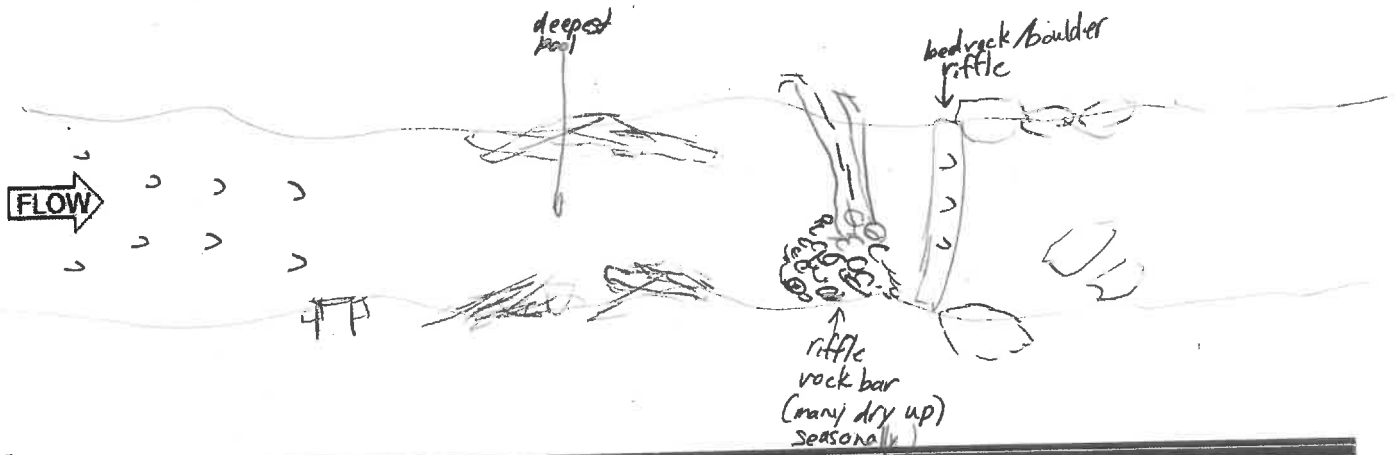
Salamanders Observed? (Y/N) N Species observed (if known): _____

Aquatic Macroinvertebrates Observed? (Y/N) Y Species observed (if known): see ICI sheet

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed)

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location



Headwater Habitat Evaluation Index Field Form

HHEI Score (sum of metrics 1+2+3) 83

SITE NAME/LOCATION Trib to Dry Run at RM 1.61 / Site of Old USGS Gauge

SITE NUMBER DRY09 RIVER BASIN _____ RIVER CODE 02-930 DRAINAGE AREA (mi²) 1.28

LENGTH OF STREAM REACH (ft) 200 LAT 39.95625 LONG -83.10755 RIVER MILE ~~2.40~~ 2.45

DATE 7/18/24 SCORER AJS COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Headwater Habitat Evaluation Index Field Manual" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☐ RECOVERED ☑ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type present). Check *ONLY* two predominant substrate *TYPE* boxes. (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B

TYPE		PERCENT	TYPE		PERCENT
☐	BLDR SLABS [16 pts]	5	☐	SILT [3 pt]	1
☐	BOULDER (>256 mm) [16 pts]	5	☐	LEAF PACK/WOODY DEBRIS [3 pts]	1
☐	BEDROCK [16 pts]		☐	FINE DETRITUS [3 pts]	
☐	COBBLE (65-256 mm) [12 pts]	16	☐	CLAY or HARDPAN [0 pt]	
☑	GRAVEL (2-64 mm) [9 pts]	20	☐	MUCK [0 pts]	
☑	SAND (<2 mm) [6 pts]	50	☐	ARTIFICIAL [3 pts]	2

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 86

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: (A) 15 TOTAL NUMBER OF SUBSTRATE TYPES: (B) 8

HHEI Metric Points Substrate Max = 40: 23 (A + B)

2. Maximum Pool Depth (*Measure the maximum pool depth within the 61 meter (200 feet)* evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

- ☐ > 30 centimeters [20 pts]
- ☑ > 22.5 - 30 cm [30 pts]
- ☐ > 10 - 22.5 cm [25 pts]
- ☐ 5 cm - 10 cm [15 pts]
- ☐ < 5 cm - [5pts]
- ☐ NO WATER OR MOIST CHANNEL [0pts]

COMMENTS 24 MAXIMUM POOL DEPTH (centimeters): 24

Pool Depth Max = 30: 30

3. BANK FULL WIDTH (Measuredas the average of 3 - 4 measurements) (Check *ONLY* one box):

- ☑ > 4.0 meters (> 13') [30 pts]
- ☐ > 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]
- ☐ > 1.5 m - 3.0 m (> 4' 8" - 9' 7") [20 pts]
- ☐ > 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
- ☐ ≤ 1.0 m (≤ 3' 3") [5 pts]

COMMENTS 4.6, 6, 5.6 AVERAGE BANKFULL WIDTH (meters): 5.4

Bankfull Width Max=30: 30

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY * NOTE: River Left (L) and Right (R) as looking downstream*

RIPARIAN WIDTH (Per Bank) L	R	FLOODPLAIN QUALITY (Most Predominant per Bank) L	R	L	R
☐	☐ Wide >10m	☐	☐ Mature Forest, Wetland	☐	☐ Conservation Tillage
☐	☐ Moderate 5-10m	☐	☐ Immature Forest, Shrub or Old Field	☑	☑ Urban or Industrial
☑	☑ Narrow <5m	☐	☐ Residential, Park, New Field	☐	☐ Open Pasture, Row Crop
☐	☐ None	☐	☐ Fenced Pasture	☐	☐ Mining or Construction

COMMENTS _____

FLOW REGIME (*At Time of Evaluation*) (Check *ONLY* one box):

- ☑ Stream Flowing
- ☐ Subsurface flow with isolated pools (interstitial)
- ☐ Moist Channel, isolated pools, no flow (intermittent)
- ☐ Dry channel, no water (ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check ONLY one box):

☑ None	☐ 1.0	☐ 2.0	☐ 3.0
☐ 0.5	☐ 1.5	☐ 2.5	☐ >3

STREAM GRADIENT ESTIMATE

☑ Flat (0.5 ft/100 ft) ☐ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? ☑ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI form)

DOWNSTREAM DESIGNATED USE(S)

☑ WWH Name: Dry Run Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION.

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order: _____

County: _____ Township/City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 07/17/24 Quantity: ~0.5 inches

Photo-documentation Notes: ✓

Elevated Turbidity? (Y/N): N Canopy (% open): 10

Were samples collected for water chemistry? (Y/N): Y Lab Sample # or ID (attach results): _____

Field Measures: Temp (°C) _____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (umhos/cm) _____

Is the sampling reach representative of the stream (Y/N) Y If not, explain: _____

Additional comments/description of pollution impacts: trash all through-out the stream

BIOLOGICAL OBSERVATIONS

(Record all observations below)

Fish Observed? (Y/N) Y Species observed (if known): _____

Frogs or Tadpoles Observed? (Y/N) Y Species observed (if known): _____

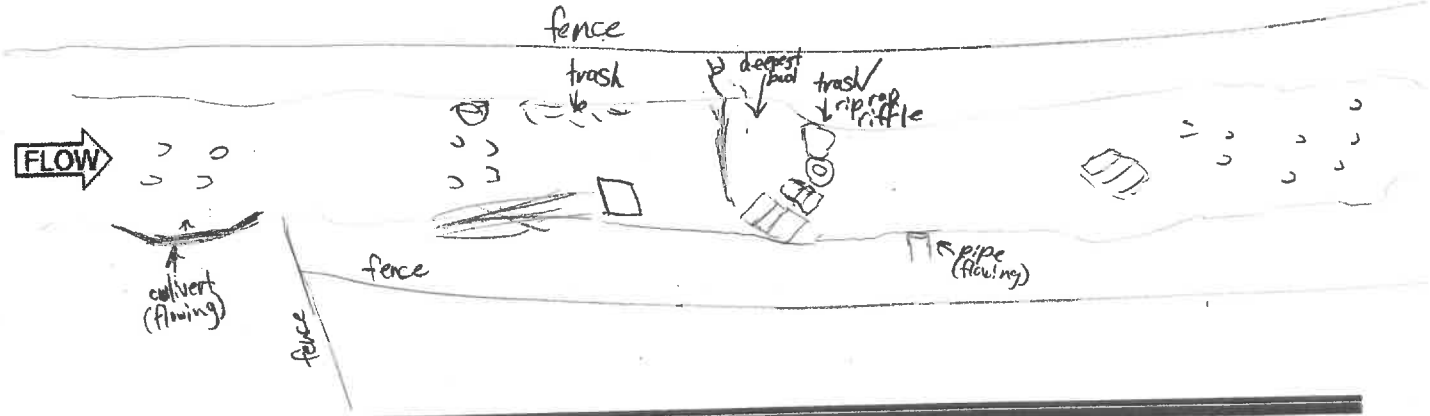
Salamanders Observed? (Y/N) _____ Species observed (if known): _____

Aquatic Macroinvertebrates Observed? (Y/N) Y Species observed (if known): see ICI sheet

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed)

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location



Headwater Habitat Evaluation Index Field Form

HHEI Score (sum of metrics 1+2+3) 83

SITE NAME/LOCATION Trib to Dry Run/Valley View Drive
SITE NUMBER DRY04 RIVER BASIN _____ RIVER CODE 02-930 DRAINAGE AREA (m²) ~~2.10~~ 3.43
LENGTH OF STREAM REACH (ft) 200 LAT 39.96307 LONG -83.07227 RIVER MILE ~~0.10~~ 0.14
DATE 07/03/24 SCORER AJS COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Headwater Habitat Evaluation Index Field Manual" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☐ RECOVERED ☑ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type present). Check *ONLY* two predominant substrate *TYPE* boxes. (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B

TYPE		PERCENT	TYPE		PERCENT
☐☐	BLDR SLABS [16 pts]	1	☐☐	SILT [3 pt]	1
☐☐	BOULDER (>256 mm) [16 pts]	2	☐☐	LEAF PACK/WOODY DEBRIS [3 pts]	1
☐☐	BEDROCK [16 pts]		☐☐	FINE DETRITUS [3 pts]	
☐☐	COBBLE (65-256 mm) [12 pts]	12	☐☐	CLAY or HARDPAN [0 pt]	
☑☐	GRAVEL (2-64 mm) [9 pts]	15	☐☐	MUCK [0 pts]	
☑☐	SAND (<2 mm) [6 pts]	60	☐☐	ARTIFICIAL [3 pts]	8

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 15 (A) 15

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: 15

(B) TOTAL NUMBER OF SUBSTRATE TYPES: 8

HHEI Metric Points
Substrate Max = 40: 23
A + B

2. Maximum Pool Depth (*Measure the maximum pool depth within the 61 meter (200 feet)* evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

- ☐ > 30 centimeters [20 pts]
- ☑ > 22.5 - 30 cm [30 pts]
- ☐ > 10 - 22.5 cm [25 pts]
- ☐ 5 cm - 10 cm [15 pts]
- ☐ < 5 cm [5pts]
- ☐ NO WATER OR MOIST CHANNEL [0pts]

COMMENTS 9 MAXIMUM POOL DEPTH (centimeters): 23

Pool Depth Max = 30: 30

3. BANK FULL WIDTH (Measured as the average of 3 - 4 measurements) (Check *ONLY* one box):

- ☑ > 4.0 meters (> 13') [30 pts]
- ☐ > 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]
- ☐ > 1.5 m - 3.0 m (> 4' 8" - 9' 7") [20 pts]
- ☐ > 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
- ☐ ≤ 1.0 m (≤ 3' 3") [5 pts]

COMMENTS 6.10, 6.7, 8.5 AVERAGE BANKFULL WIDTH (meters): 7.1

Bankfull Width Max=30: 30

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY * NOTE: River Left (L) and Right (R) as looking downstream *

RIPARIAN WIDTH (Per Bank) L	R	FLOODPLAIN QUALITY (Most Predominant per Bank) L	R	L	R
☐	☐ Wide >10m	☐	☐ Mature Forest, Wetland	☐	☐ Conservation Tillage
☐	☑ Moderate 5-10m	☑	☑ Immature Forest, Shrub or Old Field	☐	☐ Urban or Industrial
☑	☐ Narrow <5m	☐	☐ Residential, Park, New Field	☐	☐ Open Pasture, Row Crop
☐	☐ None	☐	☐ Fenced Pasture	☐	☐ Mining or Construction

COMMENTS _____

FLOW REGIME (*At Time of Evaluation*) (Check *ONLY* one box):

- ☑ Stream Flowing
- ☐ Subsurface flow with isolated pools (interstitial)
- ☐ Moist Channel, isolated pools, no flow (intermittent)
- ☐ Dry channel, no water (ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check ONLY one box):

☑ None	☐ 1.0	☐ 2.0	☐ 3.0
☐ 0.5	☐ 1.5	☐ 2.5	☐ >3

STREAM GRADIENT ESTIMATE

☑ Flat (0.5 ft/100 ft) ☐ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? ☑ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI form)

DOWNSTREAM DESIGNATED USE(S)

☑ WWH Name: Dry Run Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION.

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order: _____

County: Franklin Township/City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 6/29/24 Quantity: >0.5 inch

Photo-documentation Notes: ✓

Elevated Turbidity? (Y/N): N Canopy (% open): 15

Were samples collected for water chemistry? (Y/N): Y Lab Sample # or ID (attach results): _____

Field Measures: Temp (°C) _____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (umhos/cm) _____

Is the sampling reach representative of the stream (Y/N) Y If not, explain: _____

Additional comments/description of pollution impacts: lots of trash, CSO smell

BIOLOGICAL OBSERVATIONS

(Record all observations below)

Fish Observed? (Y/N) Y Species observed (if known): _____

Frogs or Tadpoles Observed? (Y/N) N Species observed (if known): _____

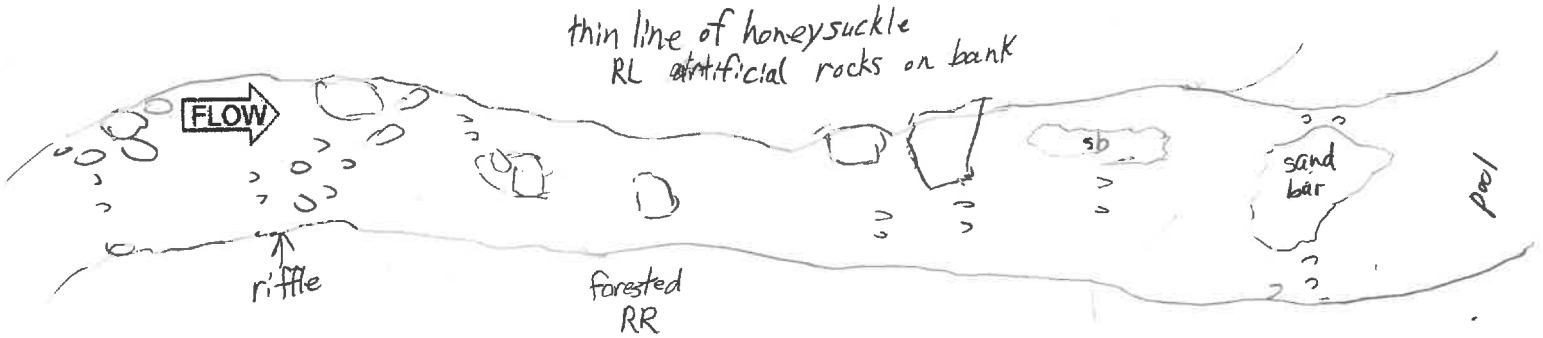
Salamanders Observed? (Y/N) N Species observed (if known): _____

Aquatic Macroinvertebrates Observed? (Y/N) Y Species observed (if known): See dual Sheet

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed)

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location



Headwater Habitat Evaluation Index Field Form

HHEI Score (sum of metrics 1+2+3) 72

SITE NAME/LOCATION DRY07 / Trib to Dry Run at RM 2.61

SITE NUMBER _____ RIVER BASIN _____ RIVER CODE 02-931 DRAINAGE AREA (mi²) ~~1.60~~ 1.37

LENGTH OF STREAM REACH (ft) 200 LAT 39.96561 LONG -83.11163 RIVER MILE ~~1.70~~ 1.74

DATE 7/15/24 SCORER AJS COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Headwater Habitat Evaluation Index Field Manual" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☐ RECOVERED ☑ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type present). Check *ONLY* two predominant substrate *TYPE* boxes. (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B

TYPE		PERCENT	TYPE		PERCENT
☐	BLDR SLABS [16 pts]	9	☐	SILT [3 pt]	8
☐	BOULDER (>256 mm) [16 pts]	5	☐	LEAF PACK/WOODY DEBRIS [3 pts]	1
☐	BEDROCK [16 pts]		☐	FINE DETRITUS [3 pts]	
☐	COBBLE (65-256 mm) [12 pts]	8	☐	CLAY or HARDPAN [0 pt]	5
☑	GRAVEL (2-64 mm) [9 pts]	50	☐	MUCK [0 pts]	1
☑	SAND (<2 mm) [6 pts]	12	☐	ARTIFICIAL [3 pts]	

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 73 (A) 15 (B) 9

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: 15 TOTAL NUMBER OF SUBSTRATE TYPES: 9

HHEI Metric Points Substrate Max = 40: 24 A + B

2. Maximum Pool Depth (*Measure the maximum pool depth within the 61 meter (200 feet)* evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

- ☑ > 30 centimeters [20 pts]
- ☐ > 22.5 - 30 cm [30 pts]
- ☐ > 10 - 22.5 cm [25 pts]
- ☐ 5 cm - 10 cm [15 pts]
- ☐ < 5 cm [5pts]
- ☐ NO WATER OR MOIST CHANNEL [0pts]

COMMENTS 9.5in, 14in MAXIMUM POOL DEPTH (centimeters): 35.5

Pool Depth Max = 30: 20

3. BANK FULL WIDTH (Measured as the average of 3 - 4 measurements) (Check *ONLY* one box):

- ☐ > 4.0 meters (> 13') [30 pts]
- ☑ > 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]
- ☐ > 1.5 m - 3.0 m (> 4' 8" - 9' 7") [20 pts]
- ☐ > 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
- ☐ ≤ 1.0 m (≤ 3' 3") [5 pts]

COMMENTS 3, 3.3, 3.6 AVERAGE BANKFULL WIDTH (meters): 3.3

Bankfull Width Max=30: 25

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY * NOTE: River Left (L) and Right (R) as looking downstream*

RIPARIAN WIDTH (Per Bank) L	R	FLOODPLAIN QUALITY (Most Predominant per Bank) L	R	L	R
☐	☐ Wide >10m	☐	☐ Mature Forest, Wetland	☐	☐ Conservation Tillage
☐	☐ Moderate 5-10m	☐	☐ Immature Forest, Shrub or Old Field	☐	☐ Urban or Industrial
☑	☑ Narrow <5m	☑	☑ Residential, Park, New Field	☐	☐ Open Pasture, Row Crop
☐	☐ None	☐	☐ Fenced Pasture	☐	☐ Mining or Construction

COMMENTS _____

FLOW REGIME (*At Time of Evaluation*) (Check *ONLY* one box):

- ☑ Stream Flowing
- ☐ Subsurface flow with isolated pools (interstitial)
- ☐ Moist Channel, isolated pools, no flow (intermittent)
- ☐ Dry channel, no water (ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check ONLY one box):

☐ None	☑ 1.0	☐ 2.0	☐ 3.0
☐ 0.5	☐ 1.5	☐ 2.5	☐ >3

STREAM GRADIENT ESTIMATE

☑ Flat (0.5 ft/100 ft) ☐ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? ☑ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI form)

DOWNSTREAM DESIGNATED USE(S)

☑ WWH Name: Dry Run Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION.

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order: _____

County: _____ Township/City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 07/14/24 Quantity: >0.02 inches

Photo-documentation Notes: ✓

Elevated Turbidity? (Y/N): N Canopy (% open): 100

Were samples collected for water chemistry? (Y/N): Y Lab Sample # or ID (attach results): _____

Field Measures: Temp (°C) _____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (umhos/cm) _____

Is the sampling reach representative of the stream (Y/N) ____ If not, explain: _____

Additional comments/description of pollution impacts: _____

BIOLOGICAL OBSERVATIONS

(Record all observations below)

Fish Observed? (Y/N) Y Species observed (if known): shiner

Frogs or Tadpoles Observed? (Y/N) Y Species observed (if known): _____

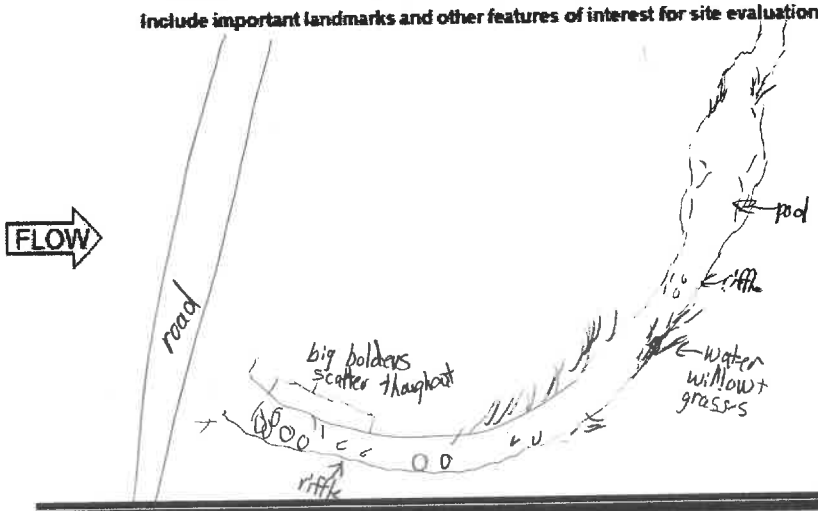
Salamanders Observed? (Y/N) N Species observed (if known): _____

Aquatic Macroinvertebrates Observed? (Y/N) Y Species observed (if known): see ICI sheet

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed)

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location



Headwater Habitat Evaluation Index Field Form

HHEI Score (sum of metrics 1+2+3) 80

SITE NAME/LOCATION Trib to Dry Run at RM 2.61 / off Fisher Rd.

SITE NUMBER DRY06 RIVER BASIN _____ RIVER CODE 02-931 DRAINAGE AREA (mi²) ~~4.3~~ 2.15

LENGTH OF STREAM REACH (ft) 200ft. LAT 39.96981 LONG -83.08793 RIVER MILE 0.34

DATE 7/03/24 SCORER AJS COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Headwater Habitat Evaluation Index Field Manual" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☐ RECOVERED ☑ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type present). Check *ONLY* two predominant substrate *TYPE* boxes. (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B

TYPE		PERCENT	TYPE		PERCENT
☐	BLDR SLABS [16 pts]		☐	SLT [3 pt]	10
☐	BOULDER (>256 mm) [16 pts]	3	☐	LEAF PACK/WOODY DEBRIS [3 pts]	1
☐	BEDROCK [16 pts]		☐	FINE DETRITUS [3 pts]	1
☑	COBBLE (65-256 mm) [12 pts]	20	☐	CLAY or HARDPAN [0 pt]	
☑	GRAVEL (2-64 mm) [9 pts]	50	☐	MUCK [0 pts]	1
☐	SAND (<2 mm) [6 pts]	10	☐	ARTIFICIAL [3 pts]	1

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 27 (A) 21 (B) 8

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: 21 TOTAL NUMBER OF SUBSTRATE TYPES: 8

HHEI Metric Points Substrate Max = 40: 30 A + B

2. Maximum Pool Depth (*Measure the maximum pool depth within the 61 meter (200 feet)* evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

- ☐ > 30 centimeters [20 pts]
- ☐ > 22.5 - 30 cm [30 pts]
- ☑ > 10 - 22.5 cm [25 pts]
- ☐ 5 cm - 10 cm [15 pts]
- ☐ < 5 cm [5pts]
- ☐ NO WATER OR MOIST CHANNEL [0pts]

COMMENTS 8 inches MAXIMUM POOL DEPTH (centimeters): 20

Pool Depth Max = 30: 25

3. BANK FULL WIDTH (Measured as the average of 3 - 4 measurements) (Check *ONLY* one box):

- ☐ > 4.0 meters (> 13') [30 pts]
- ☑ > 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]
- ☐ > 1.5 m - 3.0 m (> 4' 8" - 9' 7") [20 pts]
- ☐ > 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
- ☐ ≤ 1.0 m (≤ 3' 3") [5 pts]

COMMENTS 4.3, 3.6, 2.7 AVERAGE BANKFULL WIDTH (meters): 3.5

Bankfull Width Max=30: 25

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY * NOTE: River Left (L) and Right (R) as looking downstream*

RIPARIAN WIDTH (Per Bank) L	R		FLOODPLAIN QUALITY (Most Predominant per Bank) L	R		L	R	
☐	☐	Wide >10m	☐	☐	Mature Forest, Wetland	☐	☐	Conservation Tillage
☑	☐	Moderate 5-10m	☑	☐	Immature Forest, Shrub or Old Field	☐	☐	Urban or Industrial
☐	☑	Narrow <5m	☐	☑	Residential, Park, New Field	☐	☐	Open Pasture, Row Crop
☐	☐	None	☐	☐	Fenced Pasture	☐	☐	Mining or Construction

COMMENTS _____

FLOW REGIME (*At Time of Evaluation*) (Check *ONLY* one box):

- ☑ Stream Flowing
- ☐ Subsurface flow with isolated pools (interstitial)
- ☐ Moist Channel, isolated pools, no flow (intermittent)
- ☐ Dry channel, no water (ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check ONLY one box):

☑ None	☐ 1.0	☐ 2.0	☐ 3.0
☐ 0.5	☐ 1.5	☐ 2.5	☐ >3

STREAM GRADIENT ESTIMATE

☑ Flat (0.5 ft/100 ft) ☐ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? ☑ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI form)

DOWNSTREAM DESIGNATED USE(S)

☑ WWH Name: Dry Run Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION.

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order: _____

County: Franklin Township/City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 06/29/24 Quantity: >0.5 inch

Photo-documentation Notes: ✓

Elevated Turbidity? (Y/N): N Canopy (% open): 50

Were samples collected for water chemistry? (Y/N): Y Lab Sample # or ID (attach results): _____

Field Measures: Temp (°C) 21.5 Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (umhos/cm) _____

Is the sampling reach representative of the stream (Y/N) ____ If not, explain: _____

Additional comments/description of pollution impacts: _____

BIOLOGICAL OBSERVATIONS

(Record all observations below)

Fish Observed? (Y/N) Y Species observed (if known): _____

Frogs or Tadpoles Observed? (Y/N) Y Species observed (if known): Tadpoles

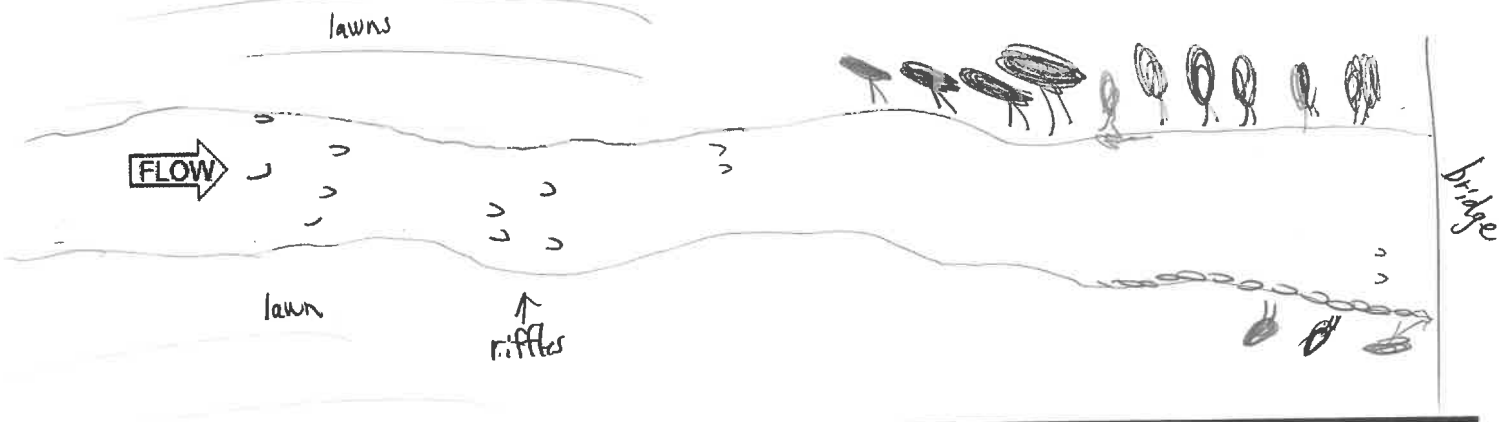
Salamanders Observed? (Y/N) N Species observed (if known): _____

Aquatic Macroinvertebrates Observed? (Y/N) Y Species observed (if known): see QHEI sheet

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed)

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location



Headwater Habitat Evaluation Index Field Form

HHEI Score (sum of metrics 1+2+3) 87

SITE NAME/LOCATION Barbee Ditch Trib to Scioto River at RM 135.75

SITE NUMBER BARB03 RIVER BASIN _____ RIVER CODE 02-932 DRAINAGE AREA (mi²) ~~1.2~~ 0.9

LENGTH OF STREAM REACH (ft) 200 LAT 39.98556 LONG 83.11589 RIVER MILE 2.70

DATE 6/28/21 SCORER AJS COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Headwater Habitat Evaluation Index Field Manual" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☑ RECOVERED ☐ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type present). Check *ONLY* two predominant substrate *TYPE* boxes. (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B

TYPE		PERCENT	TYPE		PERCENT
☐	BLDR SLABS [16 pts]		☐	SILT [3 pt]	5
☐	BOULDER (>256 mm) [16 pts]	10	☐	LEAF PACK/WOODY DEBRIS [3 pts]	1
☐	BEDROCK [16 pts]		☐	FINE DETRITUS [3 pts]	
☑	COBBLE (65-256 mm) [12 pts]	30	☐	CLAY or HARDPAN [0 pt]	
☑	GRAVEL (2-64 mm) [9 pts]	40	☐	MUCK [0 pts]	
☐	SAND (<2 mm) [6 pts]	5	☐	ARTIFICIAL [3 pts]	

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 49 (A) 21

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES:

(B) TOTAL NUMBER OF SUBSTRATE TYPES: 6

HHEI Metric Points

Substrate Max = 40: 27

A + B

2. Maximum Pool Depth (*Measure the maximum pool depth within the 61 meter (200 feet)* evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

- ☐ > 30 centimeters [20 pts]
- ☑ > 22.5 - 30 cm [30 pts]
- ☐ > 10 - 22.5 cm [25 pts]
- ☐ 5 cm - 10 cm [15 pts]
- ☐ < 5 cm [5pts]
- ☐ NO WATER OR MOIST CHANNEL [0pts]

COMMENTS _____ MAXIMUM POOL DEPTH (centimeters): 23

Pool Depth Max = 30: 30

3. BANK FULL WIDTH (Measured as the average of 3 - 4 measurements) (Check *ONLY* one box):

- ☑ > 4.0 meters (> 13') [30 pts]
- ☐ > 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]
- ☐ > 1.5 m - 3.0 m (> 4' 8" - 9' 7") [20 pts]
- ☐ > 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
- ☐ ≤ 1.0 m (≤ 3' 3") [5 pts]

COMMENTS 6.5, 3.2, 3.5 AVERAGE BANKFULL WIDTH (meters): 13.2

Bankfull Width Max=30: 30

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY * NOTE: River Left (L) and Right (R) as looking downstream *

RIPARIAN WIDTH (Per Bank)

L	R	
☐	☐	Wide >10m
☑	☑	Moderate 5-10m
☐	☐	Narrow <5m
☐	☐	None

FLOODPLAIN QUALITY (Most Predominant per Bank)

L	R		L	R	
☐	☐	Mature Forest, Wetland	☐	☐	Conservation Tillage
☑	☑	Immature Forest, Shrub or Old Field	☐	☐	Urban or Industrial
☐	☐	Residential, Park, New Field	☐	☐	Open Pasture, Row Crop
☐	☐	Fenced Pasture	☐	☐	Mining or Construction

COMMENTS _____

FLOW REGIME (*At Time of Evaluation*) (Check *ONLY* one box):

- ☑ Stream Flowing
- ☐ Subsurface flow with isolated pools (interstitial)
- ☐ Moist Channel, isolated pools, no flow (intermittent)
- ☐ Dry channel, no water (ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check ONLY one box):

☐ None	☐ 1.0	☐ 2.0	☐ 3.0
☑ 0.5	☐ 1.5	☐ 2.5	☐ >3

STREAM GRADIENT ESTIMATE

☑ Flat (0.5 ft/100 ft) ☐ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? ☑ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI form)

DOWNSTREAM DESIGNATED USE(S)

☑ WWH Name: Scioto River Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION.

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order: _____

County: _____ Township/City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 08/25/24 Quantity: ~1 inch

Photo-documentation Notes: ✓

Elevated Turbidity? (Y/N): N Canopy (% open): 10

Were samples collected for water chemistry? (Y/N): Y Lab Sample # or ID (attach results): _____

Field Measures: Temp (°C) _____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (umhos/cm) _____

Is the sampling reach representative of the stream (Y/N) ____ If not, explain: _____

Additional comments/description of pollution impacts: _____

BIOLOGICAL OBSERVATIONS

(Record all observations below)

Fish Observed? (Y/N) Y Species observed (if known): _____

Frogs or Tadpoles Observed? (Y/N) N Species observed (if known): _____

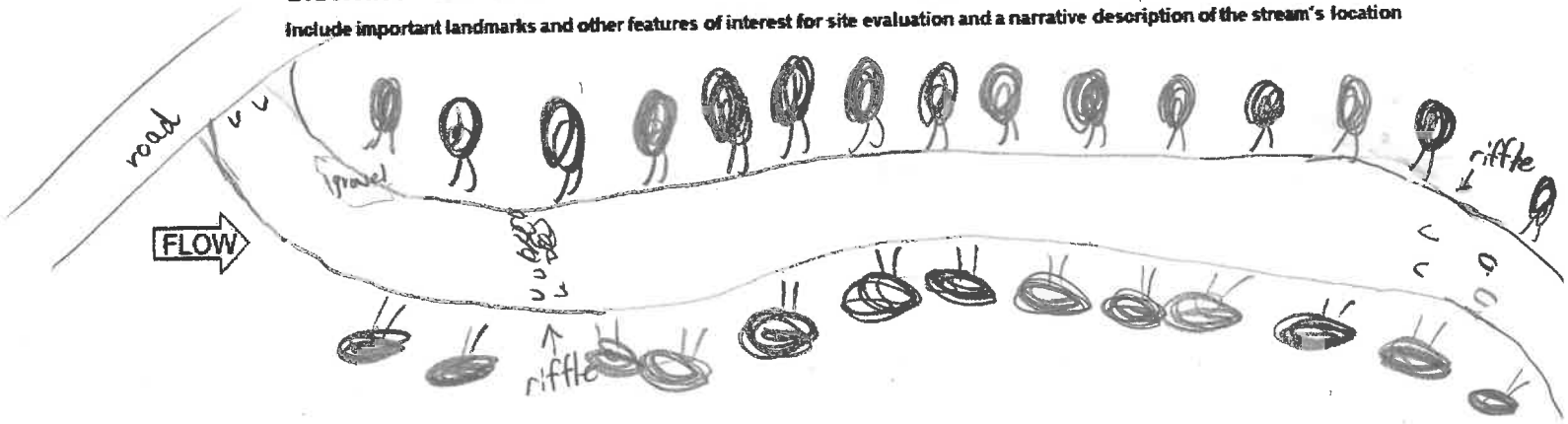
Salamanders Observed? (Y/N) N Species observed (if known): _____

Aquatic Macroinvertebrates Observed? (Y/N) Y Species observed (if known): See Qual sheet

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed)

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location



Headwater Habitat Evaluation Index Field Form

HHEI Score (sum of metrics 1+2+3) 89

SITE NAME/LOCATION BARB04 / Trib to Barbee Ditch @ RM 1.87

SITE NUMBER BARB04 RIVER BASIN _____ RIVER CODE 02-935 DRAINAGE AREA (m²) ~~1.8~~ 0.95

LENGTH OF STREAM REACH (ft) 200 LAT 39.97906 LONG -83.10127 start RIVER MILE ~~0.45~~ 0.43

DATE 07/16/24 SCORER AJS COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Headwater Habitat Evaluation Index Field Manual" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☐ RECOVERED ☑ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type present). Check *ONLY* two predominant substrate *TYPE* boxes. (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B

TYPE		PERCENT	TYPE		PERCENT
☐	BLDR SLABS [16 pts]		☐	SILT [3 pt]	
☑	BOULDER (>256 mm) [16 pts]	25	☐	LEAF PACK/WOODY DEBRIS [3 pts]	0.5
☐	BEDROCK [16 pts]		☐	FINE DETRITUS [3 pts]	
☑	COBBLE (65-256 mm) [12 pts]	34.5	☐	CLAY or HARDPAN [0 pt]	10
☐	GRAVEL (2-64 mm) [9 pts]	15	☐	MUCK [0 pts]	
☐	SAND (<2 mm) [6 pts]	15	☐	ARTIFICIAL [3 pts]	

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 59.5 (A)

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: 28 (B) TOTAL NUMBER OF SUBSTRATE TYPES: 6

HHEI Metric Points — Substrate Max = 40: 34 — A + B

2. Maximum Pool Depth ***(Measure the maximum pool depth within the 61 meter (200 feet)*** evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

☐	> 30 centimeters [20 pts]	☐	5 cm - 10 cm [15 pts]
☑	> 22.5 - 30 cm [30 pts]	☐	< 5 cm [5pts]
☐	> 10 - 22.5 cm [25 pts]	☐	NO WATER OR MOIST CHANNEL [0pts]

COMMENTS _____ MAXIMUM POOL DEPTH (centimeters): 25.4

Pool Depth Max = 30: 30

3. BANK FULL WIDTH (Measured as the average of 3 - 4 measurements) (Check *ONLY* one box):

☐	> 4.0 meters (> 13') [30 pts]	☐	> 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
☑	> 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]	☐	≤ 1.0 m (≤ 3' 3") [5 pts]
☐	> 1.5 m - 3.0 m (> 4' 8" - 9' 7") [20 pts]		

COMMENTS 3.6, 3.4 AVERAGE BANKFULL WIDTH (meters): 3.6

Bankfull Width Max=30: 25

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY * NOTE: River Left (L) and Right (R) as looking downstream*

RIPARIAN WIDTH (Per Bank) L	R		FLOODPLAIN QUALITY (Most Predominant per Bank) L	R		L	R	
☐	☐	Wide >10m	☐	☐	Mature Forest, Wetland	☐	☐	Conservation Tillage
☐	☐	Moderate 5-10m	☐	☐	Immature Forest, Shrub or Old Field	☐	☐	Urban or Industrial
☑	☑	Narrow <5m	☑	☑	Residential, Park, New Field	☐	☐	Open Pasture, Row Crop
☐	☐	None	☐	☐	Fenced Pasture	☐	☐	Mining or Construction

COMMENTS _____

FLOW REGIME *(At Time of Evaluation)* (Check *ONLY* one box):

☑	Stream Flowing	☐	Moist Channel, isolated pools, no flow (intermittent)
☐	Subsurface flow with isolated pools (interstitial)	☐	Dry channel, no water (ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check ONLY one box):

☑	None	☐	1.0	☐	2.0	☐	3.0
☐	0.5	☐	1.5	☐	2.5	☐	>3

STREAM GRADIENT ESTIMATE

☑ Flat (0.5 ft/100 ft) ☐ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? ☑ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI form)

DOWNSTREAM DESIGNATED USE(S)

☑ WWH Name: Barbee Creek Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION.

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order: _____

County: _____ Township/City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 07/15/24 Quantity: 0.02 inches

Photo-documentation Notes: _____

Elevated Turbidity? (Y/N): N Canopy (% open): 5

Were samples collected for water chemistry? (Y/N): Y Lab Sample # or ID (attach results): _____

Field Measures: Temp (°C) _____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (umhos/cm) _____

Is the sampling reach representative of the stream (Y/N) Y If not, explain: _____

Additional comments/description of pollution impacts: _____

BIOLOGICAL OBSERVATIONS

(Record all observations below)

Fish Observed? (Y/N) Y Species observed (if known): _____

Frogs or Tadpoles Observed? (Y/N) N Species observed (if known): _____

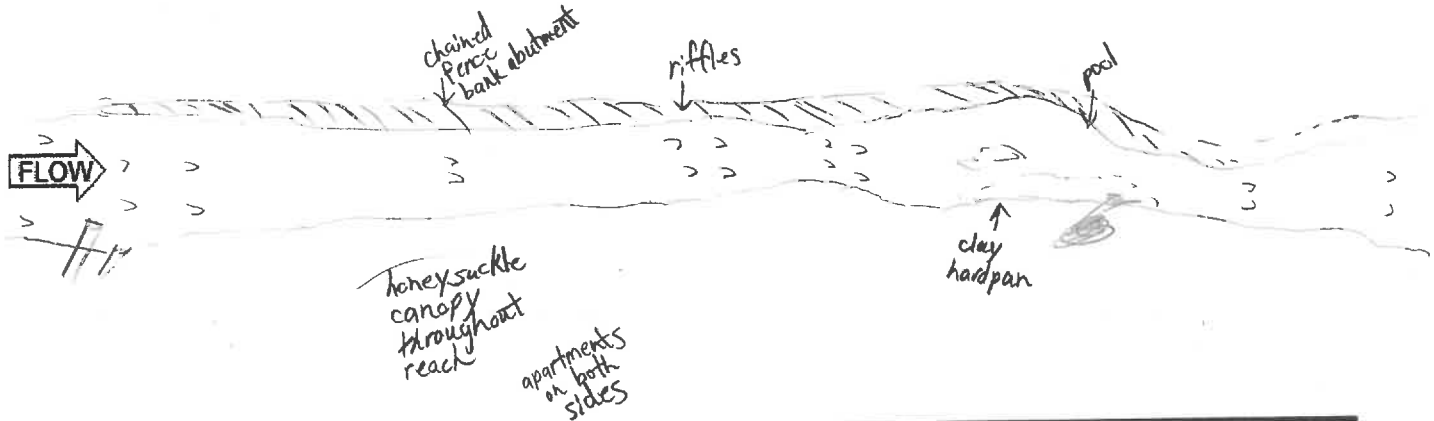
Salamanders Observed? (Y/N) N Species observed (if known): _____

Aquatic Macroinvertebrates Observed? (Y/N) Y Species observed (if known): see ICI sheet

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed)

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location



Headwater Habitat Evaluation Index Field Form

HHEI Score (sum of metrics 1+2+3) 85

SITE NAME/LOCATION Trabue Run (Trib to Barbee Ditch @ RM 1.39)

SITE NUMBER TRB03 RIVER BASIN _____ RIVER CODE 02-266 DRAINAGE AREA (mi²) ~~0.5~~ 0.63

LENGTH OF STREAM REACH (ft) 200 LAT 39.99094 LONG -83.12100 RIVER MILE 2.20

DATE 07/02/24 SCORER AJS COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Headwater Habitat Evaluation Index Field Manual" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☐ RECOVERED ☑ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type present). Check *ONLY* two predominant substrate *TYPE* boxes. (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B

TYPE		PERCENT	TYPE		PERCENT
☐☐	BLDR SLABS [16 pts]		☐☐	SLT [3 pt]	2
☐☐	BOULDER (>256 mm) [16 pts]	2	☐☐	LEAF PACK/WOODY DEBRIS [3 pts]	1
☐☐	BEDROCK [16 pts]		☐☐	FINE DETRITUS [3 pts]	1
☐☐	COBBLE (65-256 mm) [12 pts]	25	☐☐	CLAY or HARDPAN [0 pt]	10
☐☐	GRAVEL (2-64 mm) [9 pts]	25	☐☐	MUCK [0 pts]	5
☐☐	SAND (<2 mm) [6 pts]	10	☐☐	ARTIFICIAL [3 pts]	

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 27 (A) 21 (B) 9

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: 21 TOTAL NUMBER OF SUBSTRATE TYPES: 9

HHEI Metric Points

Substrate Max = 40: 30

A + B

2. Maximum Pool Depth (*Measure the maximum pool depth within the 61 meter (200 feet)* evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

- ☐ > 30 centimeters [20 pts]
- ☑ > 22.5 - 30 cm [30 pts]
- ☐ > 10 - 22.5 cm [25 pts]
- ☐ 5 cm - 10 cm [15 pts]
- ☐ < 5 cm [5pts]
- ☐ NO WATER OR MOIST CHANNEL [0pts]

COMMENTS NA MAXIMUM POOL DEPTH (centimeters): 30

Pool Depth Max = 30: 30

3. BANK FULL WIDTH (Measured as the average of 3 - 4 measurements) (Check *ONLY* one box):

- ☐ > 4.0 meters (> 13') [30 pts]
- ☑ > 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]
- ☐ > 1.5 m - 3.0 m (> 4' 8" - 9' 7") [20 pts]
- ☐ > 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
- ☐ ≤ 1.0 m (≤ 3' 3") [5 pts]

COMMENTS 3.6, 2.4, 3.7 AVERAGE BANKFULL WIDTH (meters): 3.23

Bankfull Width Max=30: 25

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY * NOTE: River Left (L) and Right (R) as looking downstream*

RIPARIAN WIDTH (Per Bank) L	R	FLOODPLAIN QUALITY (Most Predominant per Bank) L	R	L	R
☐	☐ Wide >10m	☐	☐ Mature Forest, Wetland	☐	☐ Conservation Tillage
☐	☐ Moderate 5-10m	☑	☑ Immature Forest, Shrub or Old Field	☐	☐ Urban or Industrial
☑	☑ Narrow <5m	☐	☐ Residential, Park, New Field	☐	☐ Open Pasture, Row Crop
☐	☐ None	☐	☐ Fenced Pasture	☐	☐ Mining or Construction

COMMENTS _____

FLOW REGIME (*At Time of Evaluation*) (Check *ONLY* one box):

- ☑ Stream Flowing
- ☐ Subsurface flow with isolated pools (interstitial)
- ☐ Moist Channel, isolated pools, no flow (intermittent)
- ☐ Dry channel, no water (ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check ONLY one box):

☑ None	☐ 1.0	☐ 2.0	☐ 3.0
☐ 0.5	☐ 1.5	☐ 2.5	☐ >3

STREAM GRADIENT ESTIMATE

☑ Flat (0.5 ft/100 ft) ☐ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? ☐ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI form)

DOWNSTREAM DESIGNATED USE(S)

☑ WWH Name: Barbee Ditch Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION.

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order: _____

County: _____ Township/City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): _____ Date of last precipitation: 6/29/24 Quantity: >0.5 inches

Photo-documentation Notes: _____

Elevated Turbidity? (Y/N): Y Canopy (% open): 30

Were samples collected for water chemistry? (Y/N): Y Lab Sample # or ID (attach results): _____

Field Measures: Temp (°C) _____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (umhos/cm) _____

Is the sampling reach representative of the stream (Y/N) Y If not, explain: _____

Additional comments/description of pollution impacts: trash, possible runoff pollution

BIOLOGICAL OBSERVATIONS

(Record all observations below)

Fish Observed? (Y/N) N Species observed (if known): _____

Frogs or Tadpoles Observed? (Y/N) Y Species observed (if known): _____

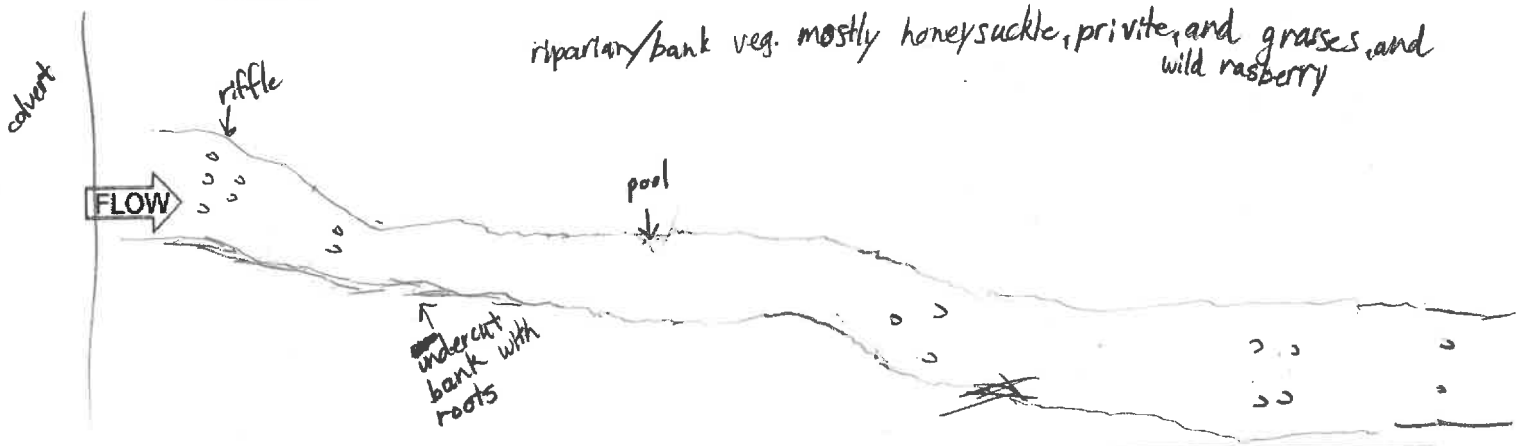
Salamanders Observed? (Y/N) N Species observed (if known): _____

Aquatic Macroinvertebrates Observed? (Y/N) Y Species observed (if known): See Qual Sheet

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed)

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location



Headwater Habitat Evaluation Index Field Form

HHEI Score (sum of metrics 1+2+3) 81

SITE NAME/LOCATION Trabue Run (Trib to Barbee Ditch @ RM 1.39

SITE NUMBER TRB02 RIVER BASIN _____ RIVER CODE 03-266 DRAINAGE AREA (mi²) ~~1.00~~ 2.6

LENGTH OF STREAM REACH (ft) 200 LAT 39.98986 LONG -83.10019 RIVER MILE ~~1.10~~ 1.05

DATE 07/02/24 SCORER AJS COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Headwater Habitat Evaluation Index Field Manual" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☐ RECOVERED ☑ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type present). Check *ONLY* two predominant substrate *TYPE* boxes. (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B

TYPE		PERCENT	TYPE		PERCENT
☐☐	BLDR SLABS [16 pts]	5	☐☐	SILT [3 pt]	5
☐☐	BOULDER (>256 mm) [16 pts]	5	☐☐	LEAF PACK/WOODY DEBRIS [3 pts]	2
☐☐	BEDROCK [16 pts]		☐☐	FINE DETRITUS [3 pts]	1
☐☐	COBBLE (65-256 mm) [12 pts]	30	☐☐	CLAY or HARDPAN [0 pt]	
☐☐	GRAVEL (2-64 mm) [9 pts]	40	☐☐	MUCK [0 pts]	1
☐☐	SAND (<2 mm) [6 pts]	10	☐☐	ARTIFICIAL [3 pts]	1

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 40 (A)

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: 21

(B) TOTAL NUMBER OF SUBSTRATE TYPES: 10

HHEI Metric Points

Substrate Max = 40

31

A + B

2. Maximum Pool Depth (***Measure the maximum pool depth within the 61 meter (200 feet)*** evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

- ☑ > 30 centimeters [20 pts]
- ☐ > 22.5 - 30 cm [30 pts]
- ☐ > 10 - 22.5 cm [25 pts]
- ☐ 5 cm - 10 cm [15 pts]
- ☐ < 5 cm [5pts]
- ☐ NO WATER OR MOIST CHANNEL [0pts]

COMMENTS _____ MAXIMUM POOL DEPTH (centimeters): 60

Pool Depth Max = 30

20

3. BANK FULL WIDTH (Measured as the average of 3 - 4 measurements) (Check *ONLY* one box):

- ☑ > 4.0 meters (> 13') [30 pts]
- ☐ > 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]
- ☐ > 1.5 m - 3.0 m (> 4' 8" - 9' 7") [20 pts]
- ☐ > 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
- ☐ ≤ 1.0 m (≤ 3' 3") [5 pts]

COMMENTS 6.5, 8.4, 6.3 AVERAGE BANKFULL WIDTH (meters): 7.1

Bankfull Width Max=30

30

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY * NOTE: River Left (L) and Right (R) as looking downstream*

RIPARIAN WIDTH (Per Bank)

L	R	
☐	☐	Wide >10m
☑	☑	Moderate 5-10m
☐	☐	Narrow <5m
☐	☐	None

FLOODPLAIN QUALITY (Most Predominant per Bank)

L	R		L	R	
☐	☐	Mature Forest, Wetland	☐	☐	Conservation Tillage
☑	☑	Immature Forest, Shrub or Old Field	☐	☐	Urban or Industrial
☐	☐	Residential, Park, New Field	☐	☐	Open Pasture, Row Crop
☐	☐	Fenced Pasture	☐	☐	Mining or Construction

COMMENTS _____

FLOW REGIME *(At Time of Evaluation)* (Check *ONLY* one box):

- ☑ Stream Flowing
- ☐ Subsurface flow with isolated pools (interstitial)
- ☐ Moist Channel, isolated pools, no flow (intermittent)
- ☐ Dry channel, no water (ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check ONLY one box):

☑ None	☐ 1.0	☐ 2.0	☐ 3.0
☐ 0.5	☐ 1.5	☐ 2.5	☐ >3

STREAM GRADIENT ESTIMATE

☑ Flat (0.5 ft/100 ft) ☐ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? ☑ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI form)

DOWNSTREAM DESIGNATED USE(S)

☑ WWH Name: Barbee Ditch Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION.

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order: _____

County: _____ Township/City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 6/29/24 Quantity: >0.5 inch

Photo-documentation Notes: ✓

Elevated Turbidity? (Y/N): N Canopy (% open): 50

Were samples collected for water chemistry? (Y/N): Y Lab Sample # or ID (attach results): _____

Field Measures: Temp (°C) _____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (umhos/cm) _____

Is the sampling reach representative of the stream (Y/N) N if not, explain: a bridge is in part of the reach

Additional comments/description of pollution impacts: _____

BIOLOGICAL OBSERVATIONS

(Record all observations below)

Fish Observed? (Y/N) Y Species observed (if known): _____

Frogs or Tadpoles Observed? (Y/N) _____ Species observed (if known): _____

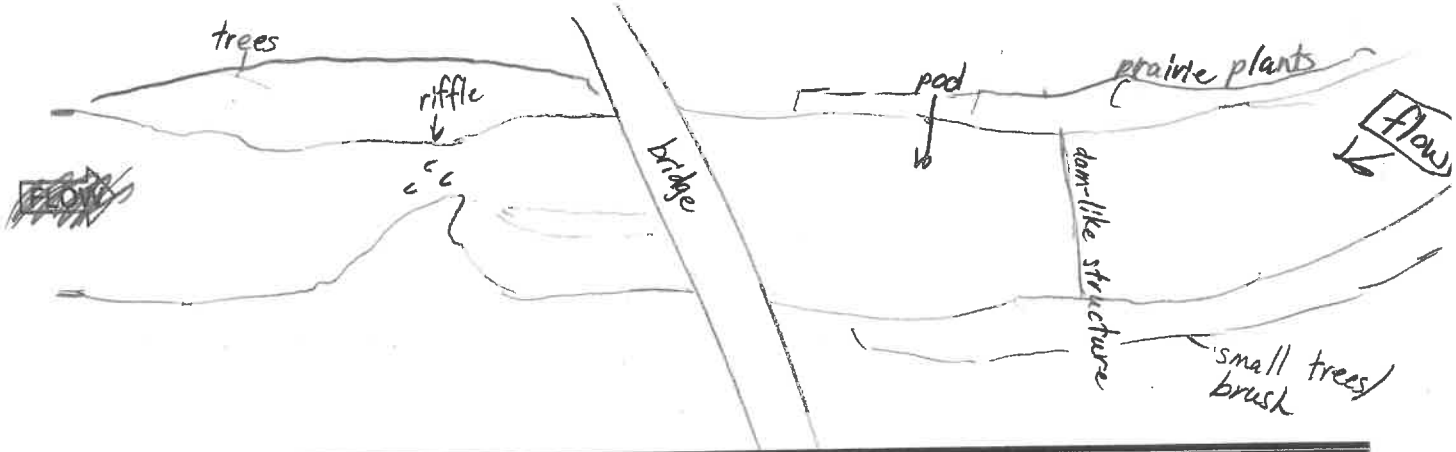
Salamanders Observed? (Y/N) _____ Species observed (if known): _____

Aquatic Macroinvertebrates Observed? (Y/N) Y Species observed (if known): see qual sheet

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed)

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location



Headwater Habitat Evaluation Index Field Form

HHEI Score (sum of metrics 1+2+3) 76

SITE NAME/LOCATION Trabue Run Trib to Barbee Ditch @ RM 1.39

SITE NUMBER TRB01 RIVER BASIN _____ RIVER CODE 02-266 DRAINAGE AREA (mi²) ~~1.46~~ 3.0

LENGTH OF STREAM REACH (ft) 200 LAT 39.98416 LONG -83.08815 RIVER MILE 0.13

DATE 07/16/24 SCORER ATS COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Headwater Habitat Evaluation Index Field Manual" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☑ RECOVERED ☐ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type present). Check *ONLY* two predominant substrate *TYPE* boxes. (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B

TYPE		PERCENT	TYPE		PERCENT
☐ ☐	BLDR SLABS [16 pts]	5	☐ ☐	SILT [3 pt]	3
☐ ☐	BOULDER (>256 mm) [16 pts]	5	☐ ☐	LEAF PACK/WOODY DEBRIS [3 pts]	1
☐ ☐	BEDROCK [16 pts]		☐ ☐	FINE DETRITUS [3 pts]	1
☐ ☐	COBBLE (65-256 mm) [12 pts]	10	☐ ☐	CLAY or HARDPAN [0 pt]	
☐ ☐	GRAVEL (2-64 mm) [9 pts]	5	☐ ☐	MUCK [0 pts]	
☑ ☐	SAND (<2 mm) [6 pts]	70	☐ ☐	ARTIFICIAL [3 pts]	

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 20 (A) 18

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: 18 TOTAL NUMBER OF SUBSTRATE TYPES: (B) 8

HHEI Metric Points Substrate Max = 40: 26 (A + B)

2. Maximum Pool Depth (*Measure the maximum pool depth within the 61 meter (200 feet)* evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

- ☑ > 30 centimeters [20 pts]
- ☐ > 22.5 - 30 cm [30 pts]
- ☐ > 10 - 22.5 cm [25 pts]
- ☐ 5 cm - 10 cm [15 pts]
- ☐ < 5 cm [5pts]
- ☐ NO WATER OR MOIST CHANNEL [0pts]

COMMENTS _____ MAXIMUM POOL DEPTH (centimeters): 55.8

Pool Depth Max = 30: 20

3. BANK FULL WIDTH (Measured as the average of 3 - 4 measurements) (Check *ONLY* one box):

- ☑ > 4.0 meters (> 13') [30 pts]
- ☐ > 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]
- ☐ > 1.5 m - 3.0 m (> 4' 8" - 9' 7") [20 pts]
- ☐ > 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
- ☐ ≤ 1.0 m (≤ 3' 3") [5 pts]

COMMENTS 6.2, 6.6, 6.9 AVERAGE BANKFULL WIDTH (meters): 6.56

Bankfull Width Max=30: 30

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY * NOTE: River Left (L) and Right (R) as looking downstream*

RIPARIAN WIDTH (Per Bank)

L	R	
☑	☐	Wide >10m
☐	☐	Moderate 5-10m
☐	☑	Narrow <5m
☐	☐	None

FLOODPLAIN QUALITY (Most Predominant per Bank)

L	R		L	R	
☑	☐	Mature Forest, Wetland	☐	☐	Conservation Tillage
☐	☑	Immature Forest, Shrub or Old Field	☐	☐	Urban or Industrial
☐	☐	Residential, Park, New Field	☐	☐	Open Pasture, Row Crop
☐	☐	Fenced Pasture	☐	☐	Mining or Construction

COMMENTS _____

FLOW REGIME (*At Time of Evaluation*) (Check *ONLY* one box):

- ☑ Stream Flowing
- ☐ Subsurface flow with isolated pools (interstitial)
- ☐ Moist Channel, isolated pools, no flow (intermittent)
- ☐ Dry channel, no water (ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check ONLY one box):

☐ None	☑ 1.0	☐ 2.0	☐ 3.0
☐ 0.5	☑ 1.5	☐ 2.5	☐ >3

STREAM GRADIENT ESTIMATE

☑ Flat (0.5 ft/100 ft) ☐ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? ☑ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI form)

DOWNSTREAM DESIGNATED USE(S)

☐ WWH Name: Barbee Ditch Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION.

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order: _____

County: _____ Township/City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 07/16/24 Quantity: ~0.02 inch

Photo-documentation Notes: ✓

Elevated Turbidity? (Y/N): Y Canopy (% open): 50

Were samples collected for water chemistry? (Y/N): Y Lab Sample # or ID (attach results): _____

Field Measures: Temp (°C) _____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (umhos/cm) _____

Is the sampling reach representative of the stream (Y/N) Y If not, explain: _____

Additional comments/description of pollution impacts: _____

BIOLOGICAL OBSERVATIONS

(Record all observations below)

Fish Observed? (Y/N) Y Species observed (if known): Johnny darter

Frogs or Tadpoles Observed? (Y/N) N Species observed (if known): _____

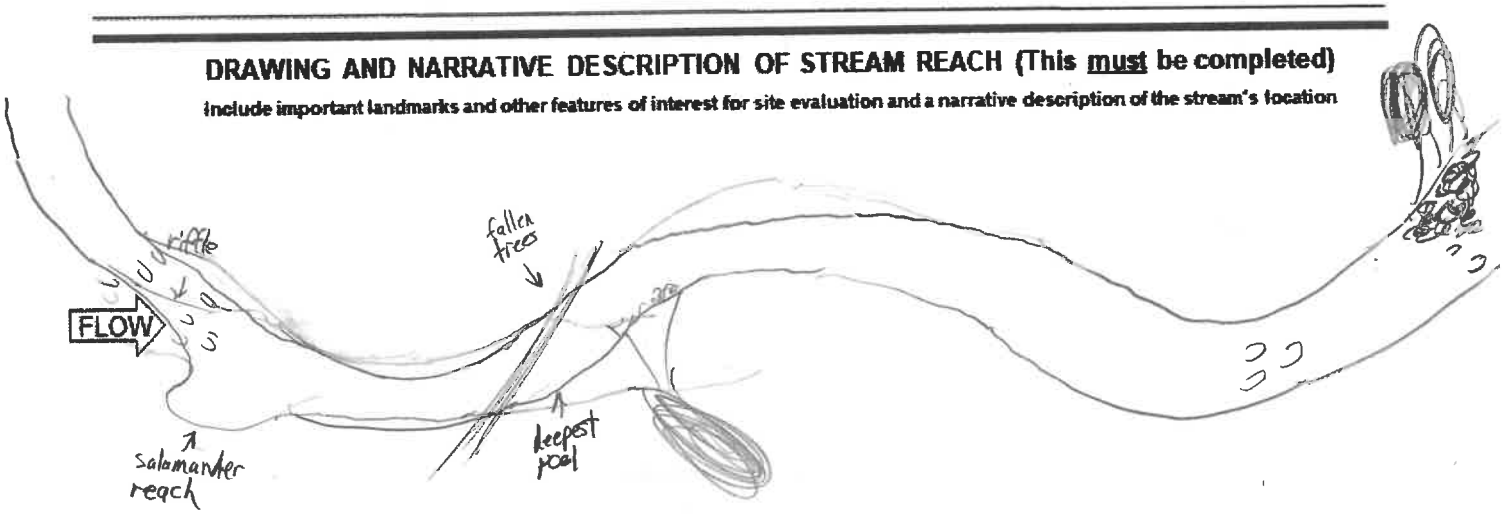
Salamanders Observed? (Y/N) N Species observed (if known): _____

Aquatic Macroinvertebrates Observed? (Y/N) Y Species observed (if known): See ICI

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed)

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location



Headwater Habitat Evaluation Index Field Form

HHEI Score (sum of metrics 1+2+3) 81

SITE NAME/LOCATION UT to Trabue Run at RM 2.7 Behind Westbelt historic Ohio EPA site
SITE NUMBER TRB04 RIVER BASIN _____ RIVER CODE 02-933 DRAINAGE AREA (mi²) ~~0.1~~ 0.04
LENGTH OF STREAM REACH (ft) 200 LAT 39.98788 LONG -83.12704 RIVER MILE ~~0.3~~ 0.22
DATE 07/02/24 SCORER AJS COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Headwater Habitat Evaluation Index Field Manual" for instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☐ RECOVERED ☑ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type present). Check *ONLY* two predominant substrate *TYPE* boxes. (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B

TYPE		PERCENT	TYPE		PERCENT
☐	BLDR SLABS [16 pts]		☐	SILT [3 pt]	10
☐	BOULDER (>256 mm) [16 pts]	5	☐	LEAF PACK/WOODY DEBRIS [3 pts]	
☐	BEDROCK [16 pts]		☐	FINE DETRITUS [3 pts]	
☑	COBBLE (65-256 mm) [12 pts]	30	☐	CLAY or HARDPAN [0 pt]	5
☑	GRAVEL (2-64 mm) [9 pts]	45	☐	MUCK [0 pts]	1
☐	SAND (<2 mm) [6 pts]	~~5~~	☐	ARTIFICIAL [3 pts]	

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 35 (A) **SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES:** 21 (B) **TOTAL NUMBER OF SUBSTRATE TYPES:** 6

HHEI Metric Points
Substrate Max = 40
27
A + B

2. Maximum Pool Depth ***(Measure the maximum pool depth within the 61 meter (200 feet)*** evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

☐	> 30 centimeters [20 pts]	☐	5 cm - 10 cm [15 pts]
☑	> 22.5 - 30 cm [30 pts]	☐	< 5 cm [5pts]
☐	> 10 - 22.5 cm [25 pts]	☐	NO WATER OR MOIST CHANNEL [0pts]

COMMENTS 11 **MAXIMUM POOL DEPTH (centimeters):** 28

Pool Depth Max = 30
30

3. BANK FULL WIDTH (Measured as the average of 3 - 4 measurements) (Check *ONLY* one box):

☐	> 4.0 meters (> 13') [30 pts]	☐	> 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
☑	> 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]	☐	≤ 1.0 m (≤ 3' 3") [5 pts]
☐	> 1.5 m - 3.0 m (> 4' 8" - 9' 7") [20 pts]		

COMMENTS 3.10, 2.5, 2.4 **AVERAGE BANKFULL WIDTH (meters):** 2.6

Bankfull Width Max=30
25

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY * NOTE: River Left (L) and Right (R) as looking downstream*

RIPARIAN WIDTH (Per Bank) L	R		FLOODPLAIN QUALITY (Most Predominant per Bank) L	R		L	R	
☐	☐	Wide >10m	☐	☐	Mature Forest, Wetland	☐	☐	Conservation Tillage
☐	☐	Moderate 5-10m	☐	☐	Immature Forest, Shrub or Old Field	☑	☑	Urban or Industrial
☑	☑	Narrow <5m	☐	☐	Residential, Park, New Field	☐	☐	Open Pasture, Row Crop
☐	☐	None	☐	☐	Fenced Pasture	☐	☐	Mining or Construction

COMMENTS _____

FLOW REGIME *(At Time of Evaluation)* (Check *ONLY* one box):

☑	Stream Flowing	☐	Moist Channel, isolated pools, no flow (intermittent)
☐	Subsurface flow with isolated pools (interstitial)	☐	Dry channel, no water (ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check ONLY one box):

☑	None	☐	1.0	☐	2.0	☐	3.0
☐	0.5	☐	1.5	☐	2.5	☐	>3

STREAM GRADIENT ESTIMATE

☑ Flat (0.5 ft/100 ft) ☐ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? ☑ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI form)

DOWNSTREAM DESIGNATED USE(S)

☑ WWH Name: Trabue Run Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION.

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order: _____

County: _____ Township/City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 6/29/24 Quantity: < 0.5 inches

Photo-documentation Notes: ✓

Elevated Turbidity? (Y/N): N Canopy (% open): 40

Were samples collected for water chemistry? (Y/N): Y Lab Sample # or ID (attach results): _____

Field Measures: Temp (°C) _____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (umhos/cm) _____

Is the sampling reach representative of the stream (Y/N) Y If not, explain: _____

Additional comments/description of pollution impacts: _____

BIOLOGICAL OBSERVATIONS

(Record all observations below)

Fish Observed? (Y/N) N Species observed (if known): _____

Frogs or Tadpoles Observed? (Y/N) N Species observed (if known): _____

Salamanders Observed? (Y/N) N Species observed (if known): _____

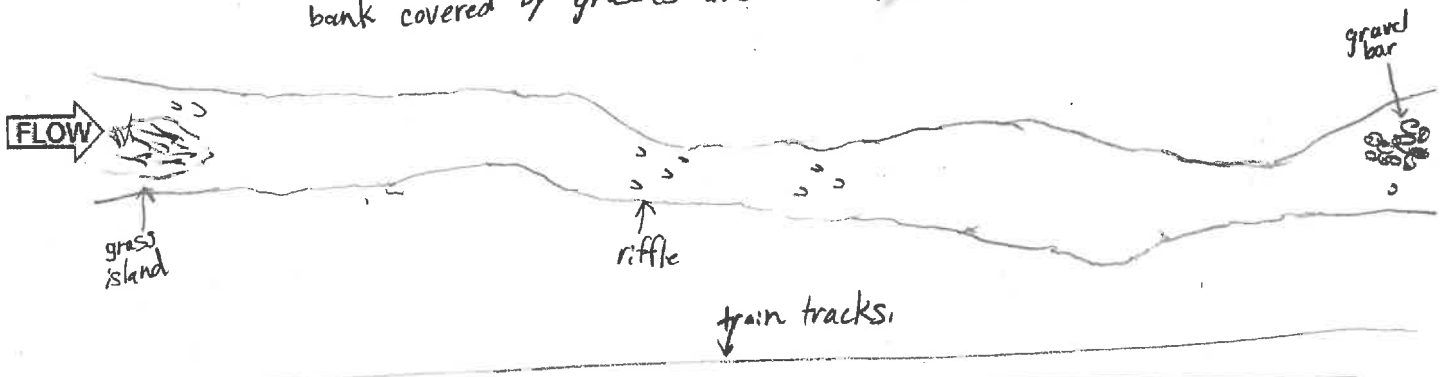
Aquatic Macroinvertebrates Observed? (Y/N) Y Species observed (if known): _____

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed)

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location

bank covered by grasses and bushes/small trees



Headwater Habitat Evaluation Index Field Form

HHEI Score (sum of metrics 1+2+3) 87

SITE NAME/LOCATION UT to Trabue Run at RM 1.21

SITE NUMBER TRB05 RIVER BASIN _____ RIVER CODE 02-934 DRAINAGE AREA (m²) ~~0.50~~ 0.82

LENGTH OF STREAM REACH (ft) 200 LAT 39.99561 LONG -83.11658 end RIVER MILE ~~0.60~~ 0.85

DATE 07/18/24 SCORER AJS COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Headwater Habitat Evaluation Index Field Manual" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☑ RECOVERED ☐ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type present). Check *ONLY* two predominant substrate *TYPE* boxes. (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B

TYPE		PERCENT	TYPE		PERCENT
☐	BLDR SLABS [18 pts]		☐	SILT [3 pt]	2
☐	BOULDER (>256 mm) [16 pts]	9	☐	LEAF PACK/WOODY DEBRIS [3 pts]	1
☐	BEDROCK [16 pts]		☐	FINE DETRITUS [3 pts]	1
☑	COBBLE (65-256 mm) [12 pts]	30	☐	CLAY or HARDPAN [0 pt]	1
☐	GRAVEL (2-64 mm) [9 pts]	23	☐	MUCK [0 pts]	1
☑	SAND (<2 mm) [6 pts]	27	☐	ARTIFICIAL [3 pts]	

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 58

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: (A) 18 TOTAL NUMBER OF SUBSTRATE TYPES: (B) 9

HHEI Metric Points — Substrate Max = 40: 27 (A + B)

2. Maximum Pool Depth (*Measure the maximum pool depth within the 61 meter (200 feet)* evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

- ☐ > 30 centimeters [20 pts]
- ☑ > 22.5 - 30 cm [30 pts]
- ☐ > 10 - 22.5 cm [25 pts]
- ☐ 5 cm - 10 cm [15 pts]
- ☐ < 5 cm [5pts]
- ☐ NO WATER OR MOIST CHANNEL [0pts]

COMMENTS 10 MAXIMUM POOL DEPTH (centimeters): 25.4

Pool Depth Max = 30: 30

3. BANK FULL WIDTH (Measuredas the average of 3 - 4 measurements) (Check *ONLY* one box):

- ☑ > 4.0 meters (> 13') [30 pts]
- ☐ > 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]
- ☐ > 1.5 m - 3.0 m (> 4' 6" - 9' 7") [20 pts]
- ☐ > 1.0 m - 1.5 m (> 3' 3" - 4' 6") [15 pts]
- ☐ ≤ 1.0 m (≤ 3' 3") [5 pts]

COMMENTS 4.4, 5.5, 4.4 AVERAGE BANKFULL WIDTH (meters): 4.76

Bankfull Width Max=30: 30

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY * NOTE: River Left (L) and Right (R) as looking downstream*

RIPARIAN WIDTH (Per Bank) L	R	FLOODPLAIN QUALITY (Most Predominant per Bank) L	R	L	R
☐	☐ Wide >10m	☐	☐ Mature Forest, Wetland	☐	☐ Conservation Tillage
☐	☐ Moderate 5-10m	☐	☐ Immature Forest, Shrub or Old Field	☑	☑ Urban or Industrial
☑	☑ Narrow <5m	☐	☐ Residential, Park, New Field	☐	☐ Open Pasture, Row Crop
☐	☐ None	☐	☐ Fenced Pasture	☐	☐ Mining or Construction

COMMENTS _____

FLOW REGIME (*At Time of Evaluation*) (Check *ONLY* one box):

- ☑ Stream Flowing
- ☐ Subsurface flow with isolated pools (interstitial)
- ☐ Moist Channel, isolated pools, no flow (intermittent)
- ☐ Dry channel, no water (ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check ONLY one box):

☑ None	☐ 1.0	☐ 2.0	☐ 3.0
☐ 0.5	☐ 1.5	☐ 2.5	☐ >3

STREAM GRADIENT ESTIMATE

☐ Flat (0.5 ft/100 ft) ☑ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? ☑ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI form)

DOWNSTREAM DESIGNATED USE(S)

☑ WWH Name: Trabue Run Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION.

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order: _____

County: _____ Township/City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 07/18/24 Quantity: ~0.5 inch

Photo-documentation Notes: _____

Elevated Turbidity? (Y/N): N Canopy (% open): 90

Were samples collected for water chemistry? (Y/N): Y Lab Sample # or ID (attach results): _____

Field Measures: Temp (°C) _____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (umhos/cm) _____

Is the sampling reach representative of the stream (Y/N) Y If not, explain: _____

Additional comments/description of pollution impacts: _____

BIOLOGICAL OBSERVATIONS

(Record all observations below)

Fish Observed? (Y/N) Y Species observed (if known): Creek Cub

Frogs or Tadpoles Observed? (Y/N) Y Species observed (if known): _____

Salamanders Observed? (Y/N) N Species observed (if known): _____

Aquatic Macroinvertebrates Observed? (Y/N) Y Species observed (if known): see ICI sheet

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed)

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location

Headwater Habitat Evaluation Index Field Form

HHEI Score (sum of metrics 1+2+3) 69

SITE NAME/LOCATION Roberts Millikin DHch / Ust. I-270 ; Ust Westbel Drive

SITE NUMBER RMD03 RIVER BASIN _____ RIVER CODE 02-937 DRAINAGE AREA (mi²) ~~1.20~~ 0.61

LENGTH OF STREAM REACH (ft) 200 LAT 40.00551 LONG -83.12521 RIVER MILE ~~0.65~~ 1.80

DATE 7/01/24 SCORER AJS COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Headwater Habitat Evaluation Index Field Manual" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☑ RECOVERED ☐ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type present). Check *ONLY two* predominant substrate *TYPE* boxes. (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B

TYPE		PERCENT	TYPE		PERCENT
☐	BLDR SLABS [16 pts]	3	☐	SILT [3 pt]	2
☐	BOULDER (>256 mm) [16 pts]	4	☐	LEAF PACK/WOODY DEBRIS [3 pts]	
☐	BEDROCK [16 pts]		☐	FINE DETRITUS [3 pts]	1
☑	COBBLE (65-256 mm) [12 pts]	33	☐	CLAY or HARDPAN [0 pt]	7
☑	GRAVEL (2-64 mm) [9 pts]	40	☐	MUCK [0 pts]	
☐	SAND (<2 mm) [6 pts]	10	☐	ARTIFICIAL [3 pts]	

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 40 (A) 21

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: 21

(B) TOTAL NUMBER OF SUBSTRATE TYPES: 8

HHEI Metric Points

Substrate Max = 40: 29

A + B

2. Maximum Pool Depth ***(Measure the maximum pool depth within the 61 meter (200 feet)*** evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

- ☑ > 30 centimeters [20 pts]
- ☐ > 22.5 - 30 cm [30 pts]
- ☐ > 10 - 22.5 cm [25 pts]
- ☐ 5 cm - 10 cm [15 pts]
- ☐ < 5 cm [5pts]
- ☐ NO WATER OR MOIST CHANNEL [0pts]

COMMENTS 2ft. 6in MAXIMUM POOL DEPTH (centimeters): 76

Pool Depth Max = 30: 20

3. BANK FULL WIDTH (Measured as the average of 3 - 4 measurements) (Check *ONLY* one box):

- ☐ > 4.0 meters (> 13') [30 pts]
- ☐ > 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]
- ☑ > 1.5 m - 3.0 m (> 4' 8" - 9' 7") [20 pts]
- ☐ > 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
- ☐ ≤ 1.0 m (≤ 3' 3") [5 pts]

COMMENTS 3.5, 3, 1.9 AVERAGE BANKFULL WIDTH (meters): 2.8

Bankfull Width Max=30: 20

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY * NOTE: River Left (L) and Right (R) as looking downstream*

RIPARIAN WIDTH (Per Bank) L	R	FLOODPLAIN QUALITY (Most Predominant per Bank) L	R		L	R	
☐	☐	Wide >10m	☐	☐	Mature Forest, Wetland	☐	☐	Conservation Tillage
☑	☑	Moderate 5-10m	☑	☑	Immature Forest, Shrub or Old Field	☐	☐	Urban or Industrial
☐	☐	Narrow <5m	☐	☐	Residential, Park, New Field	☐	☐	Open Pasture, Row Crop
☐	☐	None	☐	☐	Fenced Pasture	☐	☐	Mining or Construction

COMMENTS _____

FLOW REGIME *(At Time of Evaluation)* (Check *ONLY* one box):

- ☑ Stream Flowing
- ☐ Subsurface flow with isolated pools (interstitial)
- ☐ Moist Channel, isolated pools, no flow (intermittent)
- ☐ Dry channel, no water (ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check ONLY one box):

☐ None	☑ 1.0	☐ 2.0	☐ 3.0
☐ 0.5	☐ 1.5	☐ 2.5	☐ >3

STREAM GRADIENT ESTIMATE

☐ Flat (0.5 ft/100 ft) ☑ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? ☑ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI form)

DOWNSTREAM DESIGNATED USE(S)

☑ WWH Name: Scioto River Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION.

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order: _____

County: _____ Township/City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 08/29/24 Quantity: >0.5 inches

Photo-documentation Notes: ✓

Elevated Turbidity? (Y/N): N Canopy (% open): 20%

Were samples collected for water chemistry? (Y/N): Y Lab Sample # or ID (attach results): _____

Field Measures: Temp (°C) 19.5 Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (umhos/cm) _____

Is the sampling reach representative of the stream (Y/N) Y If not, explain: _____

Additional comments/description of pollution impacts: trash

BIOLOGICAL OBSERVATIONS

(Record all observations below)

Fish Observed? (Y/N) Y Species observed (if known): _____

Frogs or Tadpoles Observed? (Y/N) N Species observed (if known): _____

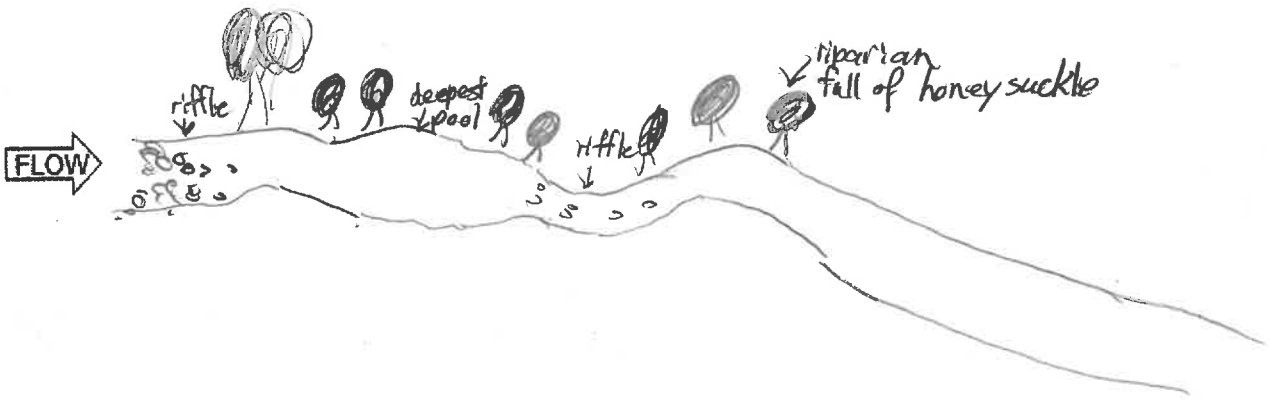
Salamanders Observed? (Y/N) N Species observed (if known): _____

Aquatic Macroinvertebrates Observed? (Y/N) Y Species observed (if known): see dual sheet

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed)

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location



Headwater Habitat Evaluation Index Field Form

Ohio Environmental Protection Agency

HHEI Score (sum of metrics 1+2+3) 77

SITE NAME/LOCATION Roberts Millikin Ditch / Roberts Road

SITE NUMBER RM002 RIVER BASIN _____ RIVER CODE 02-937 DRAINAGE AREA (mi²) ~~1.20~~ 1.03

LENGTH OF STREAM REACH (ft) 200 LAT 40.00212 LONG -83.10551 RIVER MILE 1.50

DATE 7/01/24 SCORER AJS COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Headwater Habitat Evaluation Index Field Manual" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☐ RECOVERED ☑ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type present). Check *ONLY* two predominant substrate *TYPE* boxes. (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B

TYPE		PERCENT	TYPE		PERCENT
☐☐	BLDR SLABS [16 pts]		☐☐	SLT [3 pt]	2
☐☐	BOULDER (>256 mm) [16 pts]	10	☐☐	LEAF PACK/WOODY DEBRIS [3 pts]	
☐☐	BEDROCK [16 pts]		☐☐	FINE DETRITUS [3 pts]	1
☐☐	COBBLE (65-256 mm) [12 pts]	37	☐☐	CLAY or HARDPAN [0 pt]	
☐☐	GRAVEL (2-64 mm) [9 pts]	35	☐☐	MUCK [0 pts]	
☐☐	SAND (<2 mm) [6 pts]	15	☐☐	ARTIFICIAL [3 pts]	

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 48 (A) 21

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: 21

(B) 6 TOTAL NUMBER OF SUBSTRATE TYPES: 6

HHEI Metric Points

Substrate Max = 40

27

A + B

2. Maximum Pool Depth (*Measure the maximum pool depth within the 61 meter (200 feet)* evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

- ☑ > 30 centimeters [20 pts]
- ☐ > 22.5 - 30 cm [30 pts]
- ☐ > 10 - 22.5 cm [25 pts]
- ☐ 5 cm - 10 cm [15 pts]
- ☐ < 5 cm [5pts]
- ☐ NO WATER OR MOIST CHANNEL [0pts]

COMMENTS 14:h MAXIMUM POOL DEPTH (centimeters): 36

Pool Depth Max = 30

20

3. BANK FULL WIDTH (Measuredas the average of 3 - 4 measurements) (Check *ONLY* one box):

- ☑ > 4.0 meters (> 13') [30 pts]
- ☐ > 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]
- ☐ > 1.5 m - 3.0 m (> 4' 8" - 9' 7") [20 pts]
- ☐ > 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
- ☐ ≤ 1.0 m (≤ 3' 3") [5 pts]

COMMENTS 10.4, 2.5, 2.8 AVERAGE BANKFULL WIDTH (meters): 5.2

Bankfull Width Max=30

30

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY * NOTE: River Left (L) and Right (R) as looking downstream*

RIPARIAN WIDTH (Per Bank) L	R		FLOODPLAIN QUALITY (Most Predominant per Bank) L	R		L	R	
☐	☐	Wide >10m	☐	☐	Mature Forest, Wetland	☐	☐	Conservation Tillage
☑	☑	Moderate 5-10m	☑	☑	Immature Forest, Shrub or Old Field	☐	☐	Urban or Industrial
☐	☐	Narrow <5m	☐	☐	Residential, Park, New Field	☐	☐	Open Pasture, Row Crop
☐	☐	None	☐	☐	Fenced Pasture	☐	☐	Mining or Construction

COMMENTS _____

FLOW REGIME (*At Time of Evaluation*) (Check *ONLY* one box):

- ☑ Stream Flowing
- ☐ Subsurface flow with isolated pools (interstitial)
- ☐ Moist Channel, isolated pools, no flow (intermittent)
- ☐ Dry channel, no water (ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check ONLY one box):

☑ None	☐ 1.0	☐ 2.0	☐ 3.0
☐ 0.5	☐ 1.5	☐ 2.5	☐ >3

STREAM GRADIENT ESTIMATE

☑ Flat (0.5 ft/100 ft) ☐ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? ☑ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI form)

DOWNSTREAM DESIGNATED USE(S)

☑ WWH Name: Scioto River Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION.

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order: _____

County: Franklin Township/City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 6/29/24 Quantity: >0.5 inches

Photo-documentation Notes: _____

Elevated Turbidity? (Y/N): N Canopy (% open): 8

Were samples collected for water chemistry? (Y/N): Y Lab Sample # or ID (attach results): _____

Field Measures: Temp (°C) _____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (umhos/cm) _____

Is the sampling reach representative of the stream (Y/N) Y If not, explain: _____

Additional comments/description of pollution impacts: _____

BIOLOGICAL OBSERVATIONS

(Record all observations below)

Fish Observed? (Y/N) Y Species observed (if known): _____

Frogs or Tadpoles Observed? (Y/N) N Species observed (if known): _____

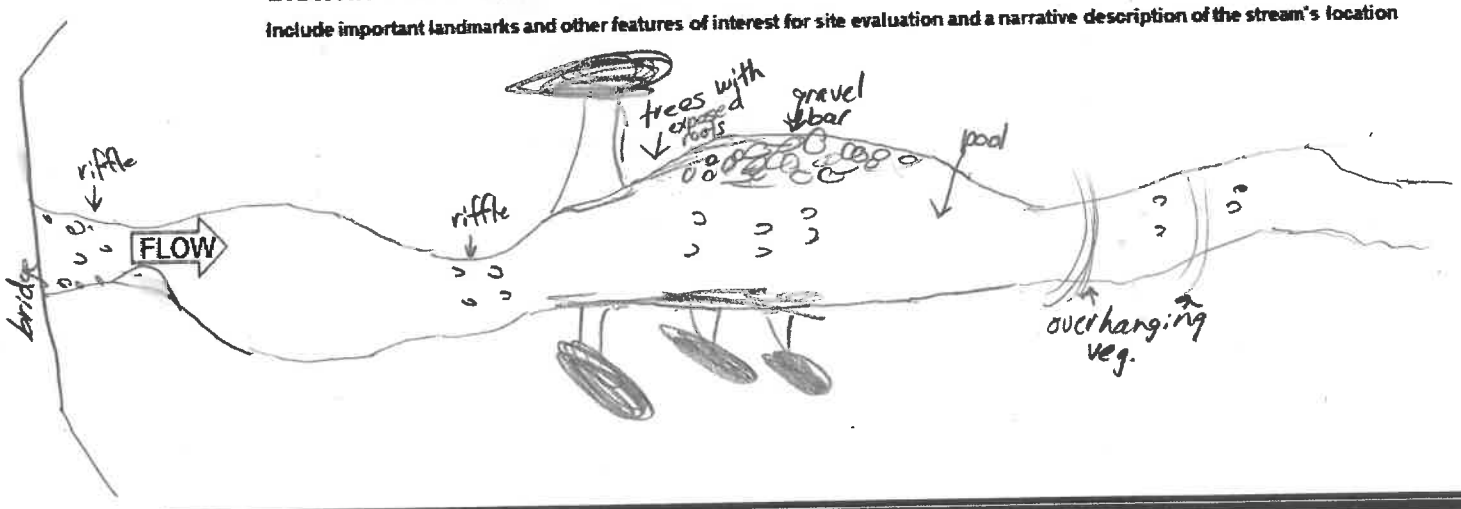
Salamanders Observed? (Y/N) N Species observed (if known): _____

Aquatic Macroinvertebrates Observed? (Y/N) Y Species observed (if known): See Qual Sheet

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed)

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location



Headwater Habitat Evaluation Index Field Form

HHEI Score (sum of metrics 1+2+3) 88

SITE NAME/LOCATION Roberts Millikin Ditch

SITE NUMBER RMD04 RIVER BASIN _____ RIVER CODE 02-938 DRAINAGE AREA (mi²) 2.90

LENGTH OF STREAM REACH (ft) 200Ft LAT 39.9987822 LONG -83.0890866 RIVER MILE ~~0.30~~ 0.5

DATE 6/28/24 SCORER AJS COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Headwater Habitat Evaluation Index Field Manual" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☐ RECOVERED ☑ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type present). Check *ONLY* two predominant substrate *TYPE* boxes. (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B

TYPE		PERCENT	TYPE		PERCENT
☐	BLDR SLABS [16 pts]	0.5	☐	SILT [3 pt]	0.5
☐	BOULDER (>256 mm) [16 pts]	3.5	☐	LEAF PACK/WOODY DEBRIS [3 pts]	0.5
☐	BEDROCK [16 pts]	0	☐	FINE DETRITUS [3 pts]	0
☑	COBBLE (65-256 mm) [12 pts]	35	☐	CLAY or HARDPAN [0 pt]	0
☑	GRAVEL (2-64 mm) [9 pts]	40	☐	MUCK [0 pts]	0
☐	SAND (<2 mm) [6 pts]	20	☐	ARTIFICIAL [3 pts]	0

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 40 (A)

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: 21

(B) TOTAL NUMBER OF SUBSTRATE TYPES: 7

HHEI Metric Points

Substrate Max = 40

28

A + B

2. Maximum Pool Depth (***Measure the maximum pool depth within the 61 meter (200 feet)*** evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

- ☑ > 30 centimeters [20 pts]
- ☐ > 22.5 - 30 cm [30 pts]
- ☐ > 10 - 22.5 cm [25 pts]
- ☐ 5 cm - 10 cm [15 pts]
- ☐ < 5 cm [5pts]
- ☐ NO WATER OR MOIST CHANNEL [0pts]

COMMENTS _____ MAXIMUM POOL DEPTH (centimeters): 29

Pool Depth Max = 30

30

3. BANK FULL WIDTH (Measured as the average of 3 - 4 measurements) (Check *ONLY* one box):

- ☑ > 4.0 meters (> 13') [30 pts]
- ☐ > 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]
- ☐ > 1.5 m - 3.0 m (> 4' 8" - 9' 7") [20 pts]
- ☐ > 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
- ☐ ≤ 1.0 m (≤ 3' 3") [5 pts]

COMMENTS _____ AVERAGE BANKFULL WIDTH (meters): 58

Bankfull Width Max=30

30

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY * NOTE: River Left (L) and Right (R) as looking downstream*

RIPARIAN WIDTH (Per Bank) L	R		FLOODPLAIN QUALITY (Most Predominant per Bank) L	R		L	R	
☑	☑	Wide >10m	☐	☐	Mature Forest, Wetland	☐	☐	Conservation Tillage
☐	☐	Moderate 5-10m	☑	☑	Immature Forest, Shrub or Old Field	☐	☐	Urban or Industrial
☐	☐	Narrow <5m	☐	☐	Residential, Park, New Field	☐	☐	Open Pasture, Row Crop
☐	☐	None	☐	☐	Fenced Pasture	☐	☐	Mining or Construction

COMMENTS _____

FLOW REGIME *(At Time of Evaluation)* (Check *ONLY* one box):

- ☑ Stream Flowing
- ☐ Subsurface flow with isolated pools (interstitial)
- ☐ Moist Channel, isolated pools, no flow (intermittent)
- ☐ Dry channel, no water (ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check ONLY one box):

- ☑ None
- ☐ 0.5
- ☐ 1.0
- ☐ 1.5
- ☐ 2.0
- ☐ 2.5
- ☐ 3.0
- ☐ >3

STREAM GRADIENT ESTIMATE

☐ Flat (0.5 ft/100 ft) ☑ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

22 5 90
R
42

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? ☐ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI form)

DOWNSTREAM DESIGNATED USE(S)

☑ WWH Name: Scioto River Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION.

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order: _____

County: _____ Township/City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 06/25/24 Quantity: ~1 inch

Photo-documentation Notes: _____

Elevated Turbidity? (Y/N): Y Canopy (% open): 50

Were samples collected for water chemistry? (Y/N): Y Lab Sample # or ID (attach results): _____

Field Measures: Temp (°C) 18.5 Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (umhos/cm) _____

Is the sampling reach representative of the stream (Y/N) ____ If not, explain: _____

Additional comments/description of pollution impacts: _____

BIOLOGICAL OBSERVATIONS

(Record all observations below)

Fish Observed? (Y/N) Y Species observed (if known): _____

Frogs or Tadpoles Observed? (Y/N) N Species observed (if known): _____

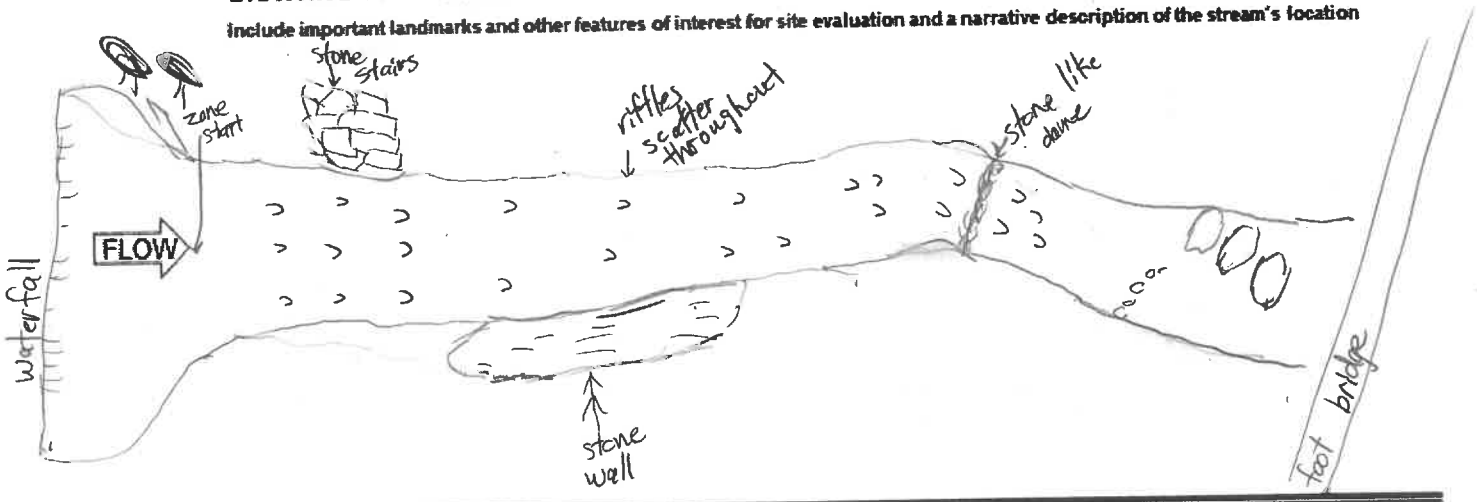
Salamanders Observed? (Y/N) N Species observed (if known): _____

Aquatic Macroinvertebrates Observed? (Y/N) Y Species observed (if known): Beatidae, Crayfly, Flatworms, etc.

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed)

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location



Headwater Habitat Evaluation Index Field Form

HHEI Score (sum of metrics 1+2+3) 85

SITE NAME/LOCATION Scioto CC Creek @ RM 136.97 to Scioto (Evans Run)
SITE NUMBER SCC01 RIVER BASIN Scioto RIVER CODE 02-939 DRAINAGE AREA (mi²) ~~1.70~~ 1.39
LENGTH OF STREAM REACH (ft) 200 LAT 39.99533 LONG -83.01922 RIVER MILE ~~0.20~~ 0.10
DATE 6/28/24 SCORER AJS COMMENTS

NOTE: Complete All Items On This Form - Refer to "Headwater Habitat Evaluation Index Field Manual" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☑ RECOVERED ☐ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type present). Check *ONLY* two predominant substrate *TYPE* boxes. (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B

TYPE		PERCENT	TYPE		PERCENT
☐	BLDR SLABS [16 pts]	20	☐	SILT [3 pt]	0.5
☑	BOULDER (>256 mm) [16 pts]	30	☐	LEAF PACK/WOODY DEBRIS [3 pts]	
☐	BEDROCK [16 pts]	5	☐	FINE DETRITUS [3 pts]	
☑	COBBLE (65-256 mm) [12 pts]	30	☐	CLAY or HARDPAN [0 pt]	
☐	GRAVEL (2-64 mm) [9 pts]	10	☐	MUCK [0 pts]	
☐	SAND (<2 mm) [6 pts]	4.5	☐	ARTIFICIAL [3 pts]	

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 85 (A) **SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES:** 28 (B) **TOTAL NUMBER OF SUBSTRATE TYPES:** 7

HHEI Metric Points — Substrate Max = 40: 35 — A + B

2. Maximum Pool Depth (***Measure the maximum pool depth within the 61 meter (200 feet)*** evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

- ☑ > 30 centimeters [20 pts]
- ☐ > 22.5 - 30 cm [30 pts]
- ☐ > 10 - 22.5 cm [25 pts]
- ☐ 5 cm - 10 cm [15 pts]
- ☐ < 5 cm [5pts]
- ☐ NO WATER OR MOIST CHANNEL [0pts]

COMMENTS MAXIMUM POOL DEPTH (centimeters): 39

Pool Depth Max = 30: 20

3. BANK FULL WIDTH (Measured as the average of 3 - 4 measurements) (Check *ONLY* one box):

- ☑ > 4.0 meters (> 13') [30 pts]
- ☐ > 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]
- ☐ > 1.5 m - 3.0 m (> 4' 8" - 9' 7") [20 pts]
- ☐ > 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
- ☐ ≤ 1.0 m (≤ 3' 3") [5 pts]

COMMENTS 6.5, 7.8, 6.8 AVERAGE BANKFULL WIDTH (meters): 7

Bankfull Width Max=30: 30

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY * NOTE: River Left (L) and Right (R) as looking downstream*

RIPARIAN WIDTH (Per Bank) L	R	FLOODPLAIN QUALITY (Most Predominant per Bank) L	R	L	R
☐	☐ Wide >10m	☐	☐ Mature Forest, Wetland	☐	☐ Conservation Tillage
☐	☐ Moderate 5-10m	☑	☑ Immature Forest, Shrub or Old Field	☐	☐ Urban or Industrial
☑	☑ Narrow <5m	☐	☐ Residential, Park, New Field	☐	☐ Open Pasture, Row Crop
☐	☐ None	☐	☐ Fenced Pasture	☐	☐ Mining or Construction

COMMENTS

FLOW REGIME *(At Time of Evaluation)* (Check *ONLY* one box):

- ☑ Stream Flowing
- ☐ Subsurface flow with isolated pools (interstitial)
- ☐ Moist Channel, isolated pools, no flow (intermittent)
- ☐ Dry channel, no water (ephemeral)

COMMENTS

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check ONLY one box):

☐ None	☑ 1.0	☐ 2.0	☐ 3.0
☐ 0.5	☐ 1.5	☐ 2.5	☐ >3

STREAM GRADIENT ESTIMATE

☐ Flat (0.5 ft/100 ft) ☑ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? ☑ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI form)

DOWNSTREAM DESIGNATED USE(S)

☑ WWH Name: Scioto River Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION.

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order: _____

County: _____ Township/City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 06/25/24 Quantity: ~1 inch

Photo-documentation Notes: ✓

Elevated Turbidity? (Y/N): N Canopy (% open): 25%

Were samples collected for water chemistry? (Y/N): Y Lab Sample # or ID (attach results): _____

Field Measures: Temp (°C) _____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (umhos/cm) _____

Is the sampling reach representative of the stream (Y/N) ____ If not, explain: _____

Additional comments/description of pollution impacts: _____

BIOLOGICAL OBSERVATIONS

(Record all observations below)

Fish Observed? (Y/N) N Species observed (if known): _____

Frogs or Tadpoles Observed? (Y/N) Y Species observed (if known): Frog

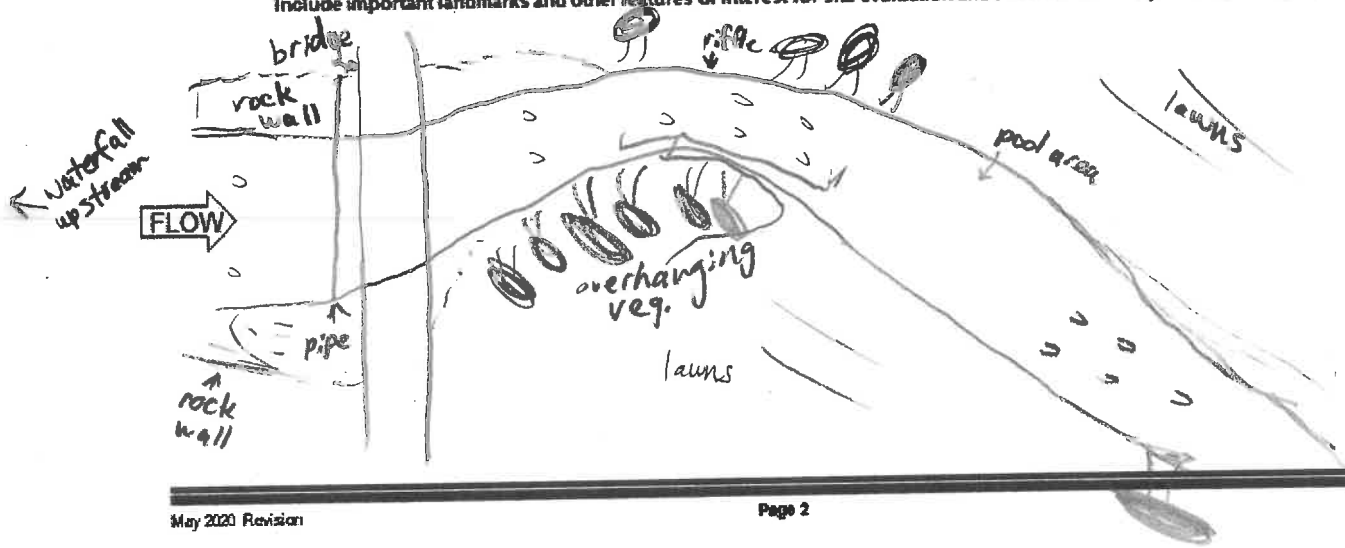
Salamanders Observed? (Y/N) _____ Species observed (if known): _____

Aquatic Macroinvertebrates Observed? (Y/N) Y Species observed (if known): see Qual sheet

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed)

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location



Headwater Habitat Evaluation Index Field Form

HHEI Score (sum of metrics 1+2+3) 68

SITE NAME/LOCATION Kian Run/High Street
SITE NUMBER KR02 RIVER BASIN _____ RIVER CODE 02-197 DRAINAGE AREA (mi²) ~~1.00~~ 1.36
LENGTH OF STREAM REACH (ft) 200 LAT 39.90955 LONG -82.99504 RIVER MILE 0.80
DATE 7/18/24 SCORER AJS COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Headwater Habitat Evaluation Index Field Manual" for instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☐ RECOVERED ☑ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type present). Check *ONLY* two predominant substrate *TYPE* boxes. (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B

TYPE		PERCENT	TYPE		PERCENT
☐	BLDR SLABS [16 pts]		☐	SILT [3 pt]	40
☐	BOULDER (>256 mm) [16 pts]	3	☐	LEAF PACK/WOODY DEBRIS [3 pts]	2
☐	BEDROCK [16 pts]		☐	FINE DETRITUS [3 pts]	1
☐	COBBLE (65-256 mm) [12 pts]	10	☐	CLAY or HARDPAN [0 pt]	
☐	GRAVEL (2-64 mm) [9 pts]	10	☐	MUCK [0 pts]	3
☐	SAND (<2 mm) [6 pts]	30	☐	ARTIFICIAL [3 pts]	1

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 13 (A)

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: 9 TOTAL NUMBER OF SUBSTRATE TYPES: (B) 9

HHEI Metric Points Substrate Max = 40: 18 (A + B)

2. Maximum Pool Depth (*Measure the maximum pool depth within the 61 meter (200 feet)* evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

- ☑ > 30 centimeters [20 pts]
- ☐ > 22.5 - 30 cm [30 pts]
- ☐ > 10 - 22.5 cm [25 pts]
- ☐ 5 cm - 10 cm [15 pts]
- ☐ < 5 cm [5pts]
- ☐ NO WATER OR MOIST CHANNEL [0pts]

COMMENTS 17in MAXIMUM POOL DEPTH (centimeters): 43.1

Pool Depth Max = 30: 20

3. BANK FULL WIDTH (Measured as the average of 3 - 4 measurements) (Check *ONLY* one box):

- ☑ > 4.0 meters (> 13') [30 pts]
- ☐ > 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]
- ☐ > 1.5 m - 3.0 m (> 4' 6" - 9' 7") [20 pts]
- ☐ > 1.0 m - 1.5 m (> 3' 3" - 4' 6") [15 pts]
- ☐ ≤ 1.0 m (≤ 3' 3") [5 pts]

COMMENTS 4.7, 5.2, 4.5 AVERAGE BANKFULL WIDTH (meters): 4.8

Bankfull Width Max=30: 30

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY * NOTE: River Left (L) and Right (R) as looking downstream*

RIPARIAN WIDTH (Per Bank)

L	R	
☑	☑	Wide >10m
☐	☐	Moderate 5-10m
☐	☐	Narrow <5m
☐	☐	None

FLOODPLAIN QUALITY (Most Predominant per Bank)

L	R		L	R	
☐	☐	Mature Forest, Wetland	☐	☐	Conservation Tillage
☑	☑	Immature Forest, Shrub or Old Field	☐	☐	Urban or Industrial
☐	☐	Residential, Park, New Field	☐	☐	Open Pasture, Row Crop
☐	☐	Fenced Pasture	☐	☐	Mining or Construction

COMMENTS _____

FLOW REGIME (*At Time of Evaluation*) (Check *ONLY* one box):

- ☑ Stream Flowing
- ☐ Subsurface flow with isolated pools (interstitial)
- ☐ Moist Channel, isolated pools, no flow (intermittent)
- ☐ Dry channel, no water (ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check ONLY one box):

☑ None	☐ 1.0	☐ 2.0	☐ 3.0
☐ 0.5	☐ 1.5	☐ 2.5	☐ >3

STREAM GRADIENT ESTIMATE

☑ Flat (0.5 ft/100 ft) ☐ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? ☑ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI form)

DOWNSTREAM DESIGNATED USE(S)

☑ WWH Name: Scioto River Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION.

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order: _____

County: _____ Township/City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 07/18/24 Quantity: ~0.5 inches

Photo-documentation Notes: ✓

Elevated Turbidity? (Y/N): Y Canopy (% open): 10

Were samples collected for water chemistry? (Y/N): Y Lab Sample # or ID (attach results): _____

Field Measures: Temp (°C) _____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (umhos/cm) _____

Is the sampling reach representative of the stream (Y/N) Y If not, explain: _____

Additional comments/description of pollution impacts: trash

BIOLOGICAL OBSERVATIONS

(Record all observations below)

Fish Observed? (Y/N) Y Species observed (if known): Creek Chub

Frogs or Tadpoles Observed? (Y/N) Y Species observed (if known): _____

Salamanders Observed? (Y/N) N Species observed (if known): _____

Aquatic Macroinvertebrates Observed? (Y/N) Y Species observed (if known): see ICI sheet

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed)

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location

Headwater Habitat Evaluation Index Field Form

HHEI Score (sum of metrics 1+2+3) 74

SITE NAME/LOCATION Kian Run

SITE NUMBER KR01 RIVER BASIN _____ RIVER CODE 02-197 DRAINAGE AREA (mi²) ~~1.85~~ 9.44

LENGTH OF STREAM REACH (ft) 200 LAT 39.90254 LONG -83.00124 RIVER MILE ~~0.18~~ 0.05

DATE 07/17/24 SCORER AJS COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Headwater Habitat Evaluation Index Field Manual" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☐ RECOVERED ☑ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type present). Check *ONLY* two predominant substrate *TYPE* boxes. (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B

TYPE		PERCENT	TYPE		PERCENT
☐	BLDR SLABS [16 pts]		☑	SILT [3 pt]	75
☐	BOULDER (>256 mm) [16 pts]	1	☐	LEAF PACK/WOODY DEBRIS [3 pts]	2
☐	BEDROCK [16 pts]		☐	FINE DETRITUS [3 pts]	1
☑	COBBLE (65-256 mm) [12 pts]	6	☐	CLAY or HARDPAN [0 pt]	5
☐	GRAVEL (2-64 mm) [9 pts]	5	☐	MUCK [0 pts]	5
☐	SAND (<2 mm) [6 pts]	1	☐	ARTIFICIAL [3 pts]	

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 7 (A) **SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES:** 15 (B) **TOTAL NUMBER OF SUBSTRATE TYPES:** 8

HHEI Metric Points — Substrate Max = 40: 24 — A + B

2. Maximum Pool Depth (*Measure the maximum pool depth within the 61 meter (200 feet)* evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

- ☑ > 30 centimeters [20 pts]
- ☐ > 22.5 - 30 cm [30 pts]
- ☐ > 10 - 22.5 cm [25 pts]
- ☐ 5 cm - 10 cm [15 pts]
- ☐ < 5 cm [5pts]
- ☐ NO WATER OR MOIST CHANNEL [0pts]

COMMENTS _____ **MAXIMUM POOL DEPTH (centimeters):** 91.4

Pool Depth Max = 30: 20

3. BANK FULL WIDTH (Measured as the average of 3 - 4 measurements) (Check *ONLY* one box):

- ☑ > 4.0 meters (> 13') [30 pts]
- ☐ > 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]
- ☐ > 1.5 m - 3.0 m (> 4' 8" - 9' 7") [20 pts]
- ☐ > 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
- ☐ ≤ 1.0 m (≤ 3' 3") [5 pts]

COMMENTS C.2, 6.4, 6.8 **AVERAGE BANKFULL WIDTH (meters):** 6.46

Bankfull Width Max=30: 30

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY * NOTE: River Left (L) and Right (R) as looking downstream *

RIPARIAN WIDTH (Per Bank) L	R		FLOODPLAIN QUALITY (Most Predominant per Bank) L	R		L	R	
☑	☑	Wide >10m	☑	☑	Mature Forest, Wetland	☐	☐	Conservation Tillage
☐	☐	Moderate 5-10m	☐	☐	Immature Forest, Shrub or Old Field	☐	☐	Urban or Industrial
☐	☐	Narrow <5m	☐	☐	Residential, Park, New Field	☐	☐	Open Pasture, Row Crop
☐	☐	None	☐	☐	Fenced Pasture	☐	☐	Mining or Construction

COMMENTS _____

FLOW REGIME (*At Time of Evaluation*) (Check *ONLY* one box):

- ☑ Stream Flowing
- ☐ Subsurface flow with isolated pools (interstitial)
- ☐ Moist Channel, isolated pools, no flow (intermittent)
- ☐ Dry channel, no water (ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check ONLY one box):

☐ None	☐ 1.0	☐ 2.0	☐ 3.0
☑ 0.5	☐ 1.5	☐ 2.5	☐ >3

STREAM GRADIENT ESTIMATE

☑ Flat (0.5 ft/100 ft) ☐ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? ☑ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI form)

DOWNSTREAM DESIGNATED USE(S)

☑ WWH Name: Sciota River Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION.

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order: _____

County: _____ Township/City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 07/15/24 Quantity: >0.02 inches

Photo-documentation Notes: ✓

Elevated Turbidity? (Y/N): Y Canopy (% open): 25

Were samples collected for water chemistry? (Y/N): Y Lab Sample # or ID (attach results): _____

Field Measures: Temp (°C) 20.1 Dissolved Oxygen (mg/l) 5.71 pH (S.U.) 7.79 Conductivity (umhos/cm) 1040

Is the sampling reach representative of the stream (Y/N) Y If not, explain: _____

Additional comments/description of pollution impacts: _____

BIOLOGICAL OBSERVATIONS

(Record all observations below)

Fish Observed? (Y/N) N Species observed (if known): _____

Frogs or Tadpoles Observed? (Y/N) Y Species observed (if known): _____

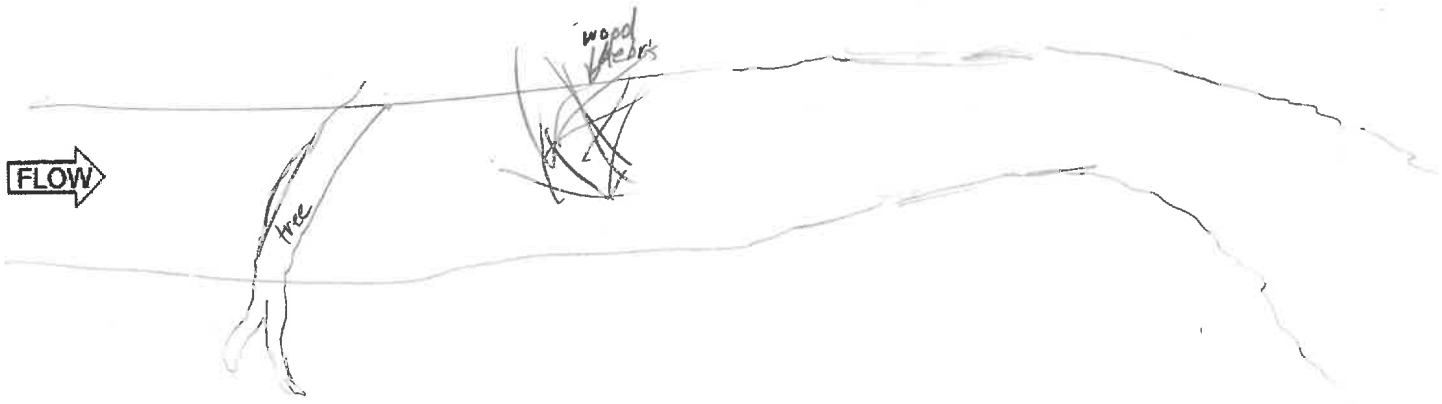
Salamanders Observed? (Y/N) N Species observed (if known): _____

Aquatic Macroinvertebrates Observed? (Y/N) Y Species observed (if known): see ICI sheet

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed)

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location



Appendix E: Ohio EPA Stream Nutrient Assessment Procedure (SNAP) Matrix and Flow Chart

<table>
<tr><th colspan="5">Proposed Stream Nutrient Assessment Procedure (SNAP; Ohio EPA 2015b)</th></tr>
<tr><th>STEP 1</th><th>STEP 2</th><th>STEP 3</th><th colspan="2">STEP 4</th></tr>
<tr><th>Biological Criteria</th><th>Diel D.O. Swing [2]</th><th>Benthic Chlorophyll [3]</th><th colspan="2">Preliminary Assessment: Trophic Condition Status of Evaluated Segment or Waterbody</th></tr>
<tr><td rowspan="4">All indices attaining or in non-significant departure[1]</td><td rowspan="2">Normal or low swings (≤6.5 mg/l)</td><td>Low to moderate (≤320 mg/m^2)</td><td colspan="2">Attaining use / Not threatened</td></tr>
<tr><td>High (>320 mg/m^2)</td><td rowspan="2">Attaining use, but may be threatened</td><td rowspan="2">See Flow Chart A</td></tr>
<tr><td rowspan="2">Wide swings (>6.5 mg/l)</td><td>Low (≤182 mg/m^2)</td></tr>
<tr><td>Moderate to high (>182 mg/m^2)</td></tr>
<tr><td rowspan="4">Non-attaining (one or more indices below nonsignificant departure)</td><td rowspan="2">Normal or low swings (≤6.5 mg/l)</td><td>Low to moderate (≤320 mg/m^2)</td><td>Impaired, but cause(s) other than nutrients</td><td>See Flow Chart B</td></tr>
<tr><td>High (>320 mg/m^2)</td><td rowspan="2">Impaired; likely nutrients over-enrichment</td><td rowspan="3">See Flow Chart C</td></tr>
<tr><td rowspan="2">Wide swings (>6.5 mg/l)</td><td>Low (≤182 mg/m^2)</td></tr>
<tr><td>Moderate to high (>182 mg/m^2)</td><td>Impaired; Nutrients over-enrichment</td></tr>
</table>

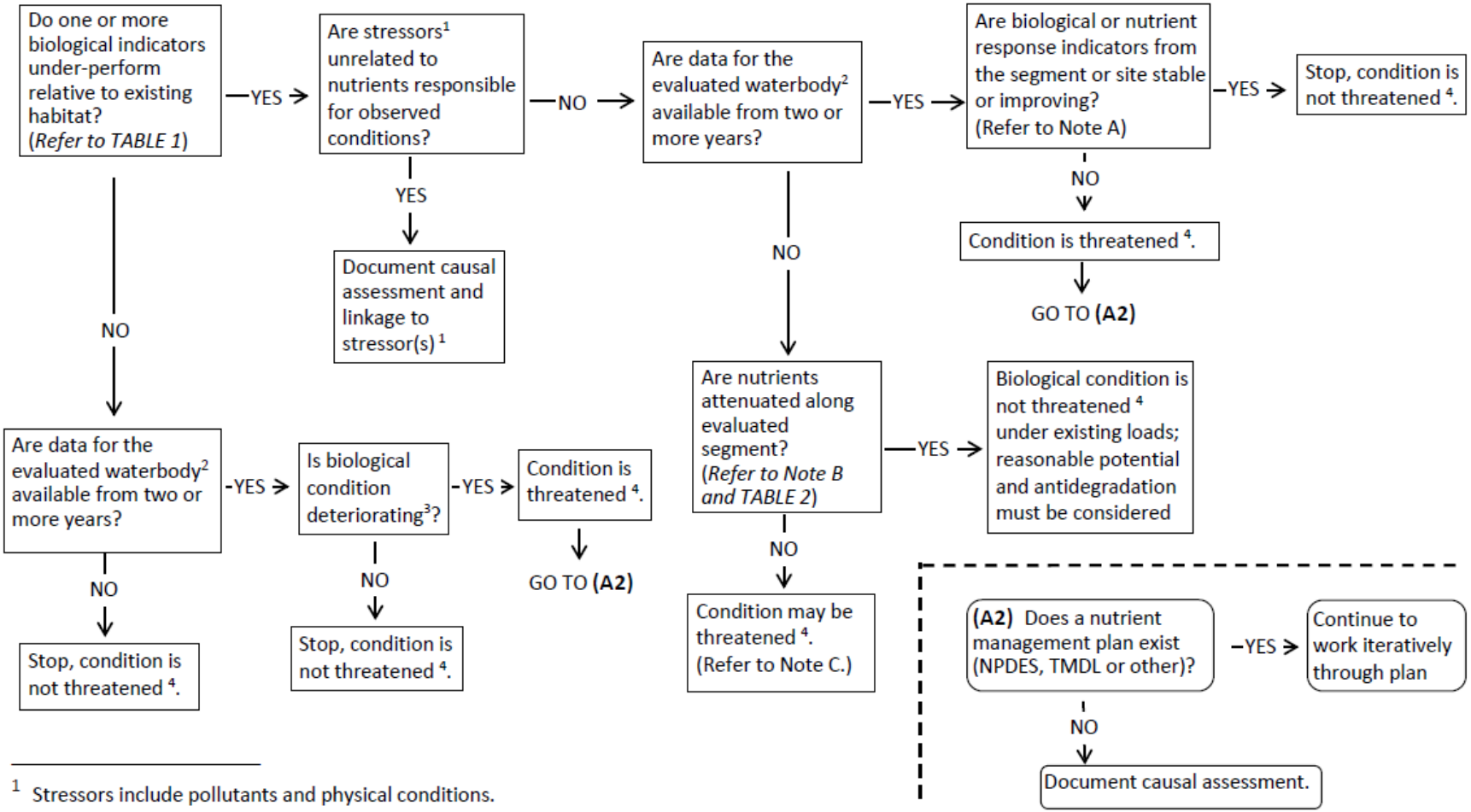
[1] Non-significant departure from biocriteria values accounts for background variability in measurements for biological indices. In accordance with "Biological Criteria for the Protection of Aquatic Life: Volume II: Users Manual for Biological Field Assessment of Ohio Surface Waters", Ohio EPA (1987, updated 2015b), non-significant departure is 4 points for IBI and ICI, and 0.5 point for MIwb.

[2] Threshold value for 24-hour DO swing based upon a change point of 6.5 mg/l between DO swing and minimum DO. "Low to normal" DO swing is ≤6.5 mg/l. "Wide" DO swing is >6.5 mg/l. Data used for analysis from Technical Support Document for Nutrient Water Quality Standards for Ohio Rivers and Streams, Ohio EPA (2011).

[3] Threshold values for benthic chlorophyll a are based upon change points between benthic chlorophyll a and DO swings or Invertebrate Community Index (ICI). "Low" chlorophyll a is ≤182 mg/m2. "Moderate" chlorophyll a is >182 and ≤320 mg/m2. "High" chlorophyll a is >320 mg/m2. Data used for analysis from Technical Support Document for Nutrient Water Quality Standards for Ohio Rivers and Streams, Ohio EPA (2011).

FLOW CHART A. – DECISION TREE FOR DETERMINING WHEN BIOLOGICALLY ATTAINING CONDITION STATUS IS THREATENED BY NUTRIENTS

For application when biological criteria are attaining, but one or both nutrient response indicators (DO swing or benthic chlorophyll) are elevated.



[1] Stressors include pollutants and physical conditions.

[2] The geographic scope or length of evaluated stream segments are defined in approved study plans.

[3] For a given location, a decrease of 5 or more IBI or ICI points, or 0.6 or more MIWb points between sampling years represents a significant change. Trends for waterbodies are formally evaluated in Biological and Water Quality Technical Support Documents.

[4] As recommended by US EPA in its integrated reporting guidance (*Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act*), "threatened" waters are currently attaining WQSs but are expected to not meet WQSs by the next listing cycle (every two years). For example, a declining trend may indicate threatened status, whereas a stable or improving trend would not.

Appendix F: Columbus Department of Water and Power Sewer Features Class Descriptions

COLUMBUS WATER & POWER

Sewer Feature Class Descriptions

CWP-GIS

SOP Number: GISS_1017		
Effective: 4/25/2013	**Updated:** 6/08/2023	**Reviewed:** 6/08/2023
Additional References, Attachments:		

Purpose: This document provides a general description of the feature classes within the DOSD GIS Enterprise Database. Feature classes that are not currently used have not been described.

- Blind Connect
  - A connection point between sewer mains without an above-ground access structure.
- Bulkhead
  - A plug installed on a sewer main.
  - Typically used during abandonments or at the upstream end of a line between project construction phases.
- Clean Out
  - A small feature at the upstream end of some lines that provides limited maintenance access to the sewer main.
- Customer Cleanout
  - Point feature representing a sewer customer location with a link to the utility billing system
- Customer Lateral
  - Line feature representing sewer laterals.
  - Contains a link to the utility billing system
  - Part of relationship class to the Sewer Permit table
- Customer Tap
  - Point feature representing service taps along main line sewers.
- Flap Gate
  - A device used to restrict the flow of water to one direction, similar to a check valve.
  - These are often installed where storm pipes drain to a water body.
  - They are also associated with designed sewer reliefs (DSRs).
  - Can be installed at the end of a pipe or inline.
  - Does not split a sewer main, but is represented 5’ upstream of the location along the protected sewer main.
- Flow Regulator
  - A key component of the collection system built to control the amount of liquid passed to downstream pipes.
  - Is also able to divert water to different downstream pipes depending on water elevation within the structure.

- Inlet
    - A structure that allows surface water to drain into the storm collection system.
    - Curb Inlet, Catch Basin, Lone, Stand Pipe, Riser Pipe, Trench Drain
- Main
    - Sewer pipe that transports stormwater and wastewater to outfalls or the treatment plant.
    - Gravity, Force, Siphon
- Main Change
    - A point that represents a change in the physical or non-physical structure of a sewer main.
    - Contract, Slope, Diameter, Material
- Manhole
    - A structure providing maintenance access to the collection system.
- Open Channel
    - A feature on the surface that directs storm water to a desired location.
    - Can be a concrete or earthen channel.
- Pipe End
    - A feature that signifies the end of a pipe. May be the upstream or downstream end of the line.
    - Plain, Headwall, Roof Drain, Unknown Line Upstream or Downstream.
- Pump Station
    - A key component of the collection system that lifts water from one elevation to a higher elevation.
    - Typically associated with force mains downstream of the station.
- Structure
    - This feature is used to represent structures that cannot be classified into the other primary feature types.
    - Includes a wide variety of features including multiple types of chambers and vaults, water quality control structures, shafts, valves, energy dissipation structures.
- Treatment Plant
    - Facilities that receive untreated sanitary and combined flows.
- DSR (Designed Sewer Relief)
    - Points with the sanitary/combined collection system where sewage is diverted to relief pipes, and ultimately an outfall, during periods of heavy precipitation pump failures, or other maintenance issues.
- CSO_SSO (Combined Sewer Overflow, Sanitary Sewer Overflow)
    - Outfalls downstream of DSR locations.
- CPH_DOSD_HSTS (Home Sewage Treatment Systems)
    - Locations of homes or businesses that treat their sanitary waste with aerators, septic systems, leach fields, waste hauling, etc.

- Project Dry Basement Valves
    - Locations of homes where a device has been installed to prevent water in basement (WIB) events.
- EPM_PowerCleaning
    - Sewer mains that require regular cleaning to remove debris, fats, oils, grease all of which can cause overflows or water in basements.
    - Segments in this layer are part of current WAM EPM benchmark work orders.
- Sanitary Sewershed
    - Polygons that define sanitary/combined pipe draining basins.
    - Similar to a watershed, but defined by pipes, not by surface drainage characteristics.
- SSES Study Area
    - Polygons defining the boundary of SSES project (I&I, IR)
- FCSWCD Data Points
    - GPS points captured by Franklin County Soil and Water Conservation District during field verification of the Stream Resource Geodatabase.
    - Each point has a photograph associated with it.
- Flow Meters
    - Devices installed in the collection system that measure flow depth and/or velocity.
- Maintenance Area
    - Areas where SMOC is responsible for maintenance of sanitary sewers.
- Contract Service Area
    - Areas where CWP has been contracted to accept sanitary flow from suburban or township entities.
- Sewer Main Historic ID
    - Lines that preserve old sewer main IDs when lines are split by new features.
    - Stores the historic id, and the current id.
    - This layer is populated by the DOSD GIS Asset ID tool but can also be modified manually in cases where the Asset ID tool is insufficient for proper tracking.
    - Currently used by the SCREAM CCTV integration.
- Rain Gauge
    - Location of rain gauges installed in Central Ohio.
- FPA
    - Facility Planning Area
- Pretreatment Industrial Customer
    - Customers subject to SRMS Pretreatment regulations
- Pretreatment Industrial Inspection Manhole
    - Manholes accessed by SRMS to monitor effluent from pretreatment customers
- Pretreatment Industrial Lateral Representation
    - Sewer lateral for pretreatment customers
- Atlas Grid

  - 5000’ x 4000’ grid system used for atlas map creation and asset id prefixes
- Suburban Sanitary Lines
  - Sanitary sewer mains obtained from suburban entities up
  - Last updated mid 2000’s
- Suburban Sanitary Manholes
  - Sanitary sewer manholes obtained from suburban entities
  - Last updated mid 2000’s
- BMP_and_GI
  - Represents stormwater quality and/or quantity control features
- BMP_and_GI_Facility_Extent
  - Polygon representations of select BMP_and_GI types
  - Examples include pervious pavement, detention basins, bioretention basins etc.
- SCPZ Mitigation
  - Stream Corridor Protection Zones
  - Areas defined by the Stormwater Drainage Manual to allow natural movement of streams, sufficient area for flood conveyance, protect water quality, and prevent erosion
  - Shown in GIS based on what is shown on plan drawings
- DOSD Odor Complaint
  - Represents odor complaints received by the Division of Sewerage and Drainage

Change Log:

1) 6/7/2017:
   a. Eliminated Sand Catch
   b. Renamed HSTS layer
   c. Added Sewer Customer layers
   d. Added Pretreatment Layers
   e. Added Facility Planning Area
2) 6/8/2017:
   a. Edited for clarity
3) 3/13/2019
   a. Added descriptions for suburban sanitary features, BMP related features, and Atlas Grid
4) 6/1/2021
   a. Added SCPZ Mitigation and DOSD Odor Complaint layers
5) 6/8/2023
   a. Removed Outfall and Sluice Gate descriptions, as they are no longer in the database.