Section 4

MITIGATION AND MONITORING PLAN

FOR THE
B.F. IRON AND METAL BARGE CLEANING AND REPAIR FACILITY PROJECT
HAVERHILL, LAWRENCE COUNTY, OHIO

Ohio River Watershed (HUC 05090103 010)
Project # 1233-3788

Prepared for:

ETA Engineering Consultants, PSC
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Prepared by:

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27 May 2011(revised 30 March 2012)

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1.0 Introduction

This conceptual mitigation plan was prepared for ETA Engineering Consultants, PSC (ETA) for impacts to waters of the U.S. as part of the B. F. Iron and Metal Barge Cleaning and Repair Facility at River Mile 334.1 on the right descending bank of the Ohio River near Ironton (Lawrence County), Ohio and Greenup County, Kentucky. This area of the Ohio River is known as the Greenup Pool.

1.1 Site Overview

The facility will be located on a terrace of the Ohio River and will occupy approximately 8.7 acres. Access to the facility will be along a road to be constructed from Gallia Pike to the facility - a distance of approximately 533 m (1,750 ft). The access road will be 6.1 m (20 ft) wide, although there will be areas of greater disturbance where there will be sections of cut and fill. Following is a description of the proposed project as presented in U.S. Army Corps of Engineers Public Notice Number 2006-00026-OHR which was issued March 21, 2008:

> The applicant proposes to place fill material into waters of the United States in association with the construction of a barge cleaning and repair facility. A slipway would be constructed to allow dry docking of barges for cleaning and repair. The barges would move along concrete slides and a hoisting winch system would provide the mechanism for obtaining barges from the river.
>
> Concrete runners would be constructed along 430 linear feet (lf) of the riverbank and would be utilized in removing barges from the river. No fill material would be placed below the ordinary high water elevation of 516.0 ft in association with this construction activity. The applicant proposes no fleeting or mooring of barges, as each barge would be hoisted onto land for cleaning and/or repair upon arrival. No more than two barges would be delivered at a time and would be maneuvered adjacent to the facility in preparation for hoisting. A dock would be constructed just upstream of the slipway and would be utilized to dry-dock barges for cleaning and/or repair. This dock would extend 75 lf riverward and would extend 320 lf along the riverbank. This structure would be constructed of sheet piling and would be backfilled with ODOT Type B riprap. A total of 3,700 cubic yards of fill material would be placed below the ordinary high water mark of the river in association with dock construction activities

The project is located in the following 11-digit hydrologic unit: Ohio River Watershed; Little Scioto River and other Ohio River tributaries (hydrologic# 05090103 010). Maps of the project site are contained in Appendix A.

1.2 Impact Summary

Tables 1 and 2 provide an itemized summary of the proposed wetland and stream impacts. The different impacts result from differing road alignments. The Preferred Design is a straighter, shorter road to the dry docks, but would result in impacts to wetlands as well as streams. The Minimal Degradation Alternative minimizes impacts by following an old roadway which is a longer distance, but which crosses Stream 1 at a

location where no wetlands exist. The Non-Degradation Alternative is a no-build alternative, as this dock is a water-dependent activity.

At this time, the permittee is requesting to build the Minimal Degradation Alternative.

1.2.1 Preferred Design

The preferred design includes a straight roadway to the proposed dry dock. See Figure 6 in Appendix I.

1.2.2 Minimal Degradation Design

The Minimal Degradation Alternative minimizes impacts by following an old roadway which is a longer distance, but which crosses Stream 1 at a location where no wetlands exist. See Figure 7 in Appendix I. Onsite mitigation for the Minimal Degradation Alternative is the same as what is proposed for the Preferred Design in Section 2.

1.2.3 Non- Degradation (No Build)

The Non-Degradation Alternative is a no-build alternative, as this dock is a water-dependent activity. No mitigation is proposed for the non-degradation alternative.

Table 1. Summary of Streams on Site and Proposed Fill Impacts

Stream ID	Flow Regime	QHEI Score	HHEI Score	Approx. Length (lf)	Impacts Preferred Design (lf)	Impacts Minimal Degradation (lf)	Impacts Non-Degradation (No Build) (lf)
S-1	Intermittent	45.5	--	3002	100	100	0
S-2	Ephemeral	--	16	252.8	0	0	0
S-3	Ephemeral	--	10	560.2	70	0	0
S-4	Ephemeral	--	11	60.5	0	0	0
S-5	Ephemeral	--	16.5	784.1	0	70	0
Ohio River	Perennial	44	--	1734	320*	320*	0
			Total	**6093.6**	**490**	**490**	**0**

*An additional 430 lf of riparian clearing will be conducted in upland areas only and is not included in this table.

Table 2. Summary of Wetlands on Site and Proposed Fill Impacts

Wetland ID	Cowardin Class	ORAM Score	ORAM Category	Size (ac)	Impacts Preferred Design (ac)	Impacts Minimal Degradation (ac)	Impacts Non-Degradation (No Build) (ac)
A	PEM/SS	48	2	0.03	0	0	0
B	PEM/AB	59	2	2.33	0.25	0	0
C	PFO/EM	44	Modified 2	0.03	0	0	0
D	PEM	29	1	0.01	0	0	0
E	PFO/EM	53	2	0.04	0	0	0
F	PEM/SS	23	1	0.03	0	0	0
Total				**2.47**	**0.25**	**0**	**0**

2.0 Mitigation Summary

2.1 Objectives

The proposed mitigation for the impacts to the Ohio River and tributary streams is the enhancement of approximately 490 lf of the Ohio River through plantings. Additionally, the mitigation will include the preservation of 2,333 lf of riparian buffer along Stream 1 and the Ohio River. This totals 2,823 lf, which is well above any required mitigation ratio for aquatic impacts.

Table 3. Proposed Mitigation

Stream Name	Type of Mitigation	LF
Ohio River	Buffer enhancement through planting	490
Ohio River	Preservation only	139
Stream 1	Preservation only	2,194
Total		2,823

Based on a March 2011 field visit, approximately 400 native trees with dbh greater than 6 inches are located along the existing 1,734 lf of Ohio River onsite. Most of these trees are located in a single row along the bank. Therefore, approximately 200 trees will be cleared to construct the dock and runners. The 490 lf of Ohio River will be enhanced by planting 200 native trees along a 50-ft riparian corridor and preserving it in perpetuity using a deed restriction, environmental covenant, or conservation easement. The same mitigation is proposed for the Preferred Design and Minimal Degradation Alternative.

2.2 Site Selection

Onsite mitigation was suggested by both Jim Spence of the USACE and Rose McLean of Ohio EPA as the most appropriate option. Therefore, no other sites were considered by the applicant. The onsite mitigation area has the advantage of being located in close proximity to the impacts on the Ohio River, and the tributary is one of the few wooded corridors remaining along that reach of the Ohio River.

2.3 Site Protection Instrument

The site will remain under the ownership of Mr. Fowler and will be preserved using a conservation easement. The Ohio Valley Conservation Coalition (OVCC), a nonprofit conservation organization, has indicated they would be willing to hold the easement. Standard conservation easement language was provided by OVCC and is attached in Appendix III.

2.4 Contact Information

Contact information is contained in the table below.

Table 4. Contact Information.

Type	Contact Information	Activity
Landowner/ Permittee	Mr. Bob Fowler, President B.F. Iron and Metal Inc. PO Box 1838 Ashland, KY 41105-1838 Phone: 606-928-6466 Fax: 606-928-6466 scrapmaster1@frontier.com	Landowner, Will complete tree plantings and seeding. Will be responsible for maintenance during initial five years
Engineering Consultant	Mr. Brian Horsley Project Manager / Civil Engineer ETA Engineering Consultants 5802 Brown Lane Catlettsburg, KY 41129 Phone: 606-739-6805 x227 office Fax: 606-739-4659 brian.horsley@eecpsc.com	Engineering design
Ecological Consultant	Michael Liptak, Ph.D. Senior Ecologist EnviroScience, Inc. 3781 Darrow Rd, Stow OH 44224 Phone:(330) 688-0111 Fax: (330) 688-3858 mliptak@enviroscienceinc.com	Mitigation plan preparation
Nonprofit Conservation Organization	Mr. Joel Wood, Director Ohio Valley Conservation Coalition 225 Broadway St. Jackson OH 45640 Phone: 740-710-9651 jwood@amfam.com	Conservation easement holder

2.5 Baseline Information

The Ohio River is highly modified in the impact area by hydrological modifications from the dams placed across it for boat traffic and by clearing of its riparian corridor for agriculture. Its QHEI score was 44. Stream 1 received a QHEI score of 44.5. QHEI and HHEI data sheets for all streams onsite are located in Appendix IV. Wetlands onsite were delineated by EnviroScience and summarized in its 2008 delineation report. During the March 2011 mitigation site visit, approximately 20 individuals of the state potentially threatened cork elm (*Ulmus thomasii*) were discovered onsite at the north edge of Wetland B at 38.568471848°N, 82.798289818°W. The proposed preservation area includes this population.

2.6 Determination of Credits

The impacts to the Ohio River primarily consist of placement of riprap and fill below the ordinary high water mark in a highly modified river with a very narrow riparian corridor with no canopy coverage. Approximately 200 trees will be cleared above the ordinary high water. Impacts to intermittent Stream 1 will consist of a culvert crossing along an existing dirt road. Impacts to ephemeral Stream 5 will consist of a culvert crossing through an existing farm field.

Stream Impacts to 320 lf of one bank of the Ohio River will be mitigated by enhancing the existing narrow riparian corridor along 490 lf of the Ohio River and preserving another 139 lf of existing wide riparian corridor. Impacts to 100 lf of intermittent Stream 1 and 70 lf of ephemeral Stream 2 will be mitigated by preservation of 2,194 lf of Stream 1 and its associated wetlands and riparian buffer. This provides adequate compensation for the unavoidable impacts to aquatic resources from the proposed drydock facility and road.

2.7 Mitigation Work Plan

Two hundred trees (1-gallon stock or greater in size) will be planted along the riparian corridor of the Ohio River in the location shown on Figure 9. A minimum of six tree species from the following list will be planted. The maximum percentage of any one species will be 25 percent.

Table 5. Native Tree Species Proposed for Planting

Scientific Name	Common Name
Populus deltoides	Cottonwood
Aesculus glabra	Ohio buckeye
Platanus occidentalis	Sycamore
Acer negundo	Box elder
Acer saccharinum	Silver maple
Acer rubrum	Red maple
Celtis occidentalis	Hackberry
Robinia pseudoacacia	Black locust
Rhus glabra	Smooth sumac
Juglans nigra	Black walnut
Quercus alba	White oak

Disturbed unvegetated areas within the enhancement area will be seeded at 15 lbs/ac with a native seed mix suitable for riparian areas, such as ERNMX-178 Riparian Buffer Mix (Appendix V) or similar native seed mix. Areas within the enhancement area that are already vegetated will be overseeded at a rate of 3 lbs/ac.

Trees will be planted in the enhancement area by Mr. Fowler. Trees will be staked to avoid blowing over and will be protected from herbivory by tree tubes or similar exclusion devices.

Metal conservation easement signs will be placed along the borders of the proposed conservation area by Mr. Fowler. The signs will be placed on metal poles and will contain the below language or similar.

CONSERVATION EASEMENT AREA.
NO CLEARING
NO DUMPING
NO FILLING
IF YOU HAVE QUESTIONS, CONTACT
OHIO VALLEY CONSERVATION COALITION AT _____
OHIO EPA AT _____
USACE AT _____
USACE PERMIT NO:_____
OEPA SWIMS NO:_____

Signs will be placed approximately 200 ft apart, or closer if required by site conditions.

2.8 Maintenance Plan

Trees will be inspected annually during the growing season for condition. If trees do not survive the initial 5 years, they will be replaced by Mr. Fowler. If seed does not provide suitable cover, areas will be reseeded by Mr. Fowler using the same seed mix.

3.0 Performance Standards

Performance standards will include the following:

1. Survival of 160 planted trees in the riparian enhancement at the end of the monitoring period (80% survival).
2. Total vegetative coverage of 75% or greater in the riparian enhancement area at the end of the monitoring period, including woody and herbaceous species.
3. The riparian enhancement area must exhibit no more than 10 percent bare ground at the end of the monitoring period.
4. The riparian enhancement area must contain no more than 5 percent relative cover of any invasive species as listed on Table 6.
5. Placement of a conservation easement on the riparian enhancement and riparian preservation areas.

If the site meets the performance standards at the end of three years of monitoring, the site may be released form further monitoring at the discretion of the agencies.

Table 6. Invasive Species

Common Name	Scientific Name
Autumn-olive	*Elaeagnus umbellata*
Buckthorn, glossy	*Rhamnus frangula*
Buckthorn, European or common	*Rhamnus cathartica*
Common reed grass	*Phragmites australis*
Garlic mustard	*Alliaria petiolata*
Honeysuckle, amur	*Lonicera maackii*
Honeysuckle, Japanese	*Lonicera japonica*
Honeysuckle, Morrow	*Lonicera morrowii*
Honeysuckle, Tatarian	*Lonicera tatarica*
Japanese knotweed	*Polygonum cuspidatum*
Multiflora rose	*Rosa multiflora*
Purple loosestrife	*Lythrum salicaria*
Reed canary grass	*Phalaris arundinacea*

4.0 Monitoring Requirements

Onsite mitigation project monitoring will be comprised of two forms: 1) annual construction update reports, and 2) assessment reports documenting the success of the plantings. A mitigation construction update report will be submitted to USACE and Ohio EPA at end of the first construction season by December 31 and by December 31 of each subsequent year (for the duration of construction activities). The construction update reports will document the following: status of fill activities by date and/or by anticipated start/completion dates.

Monitoring reports will be prepared in accordance with USACE's Regulatory Guidance Letter No. 08-03 "Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving the Creation, Restoration, and/or Enhancement of Aquatic Resources".

Assuming construction and tree planting activities will be completed in 2012, the first monitoring report will be submitted by December 31, 2013 to the Ohio EPA and USACE. The site visit and photographs will be completed in July of each monitoring year.

Post-construction monitoring is required by the regulatory agencies usually for duration of five years. However, if the performance standards have been met by the third year, permittee may request release from further requirements and monitoring. If all appropriate documentation is submitted and successful onsite restoration is determined, permittee will be released of further mitigation requirements.

Table 7. Monitoring and Reporting Activities and Timeline

Activity	Timeline
Conservation Easement Recorded	Within 60 days of permit issuance
Annual Construction Report	December 31 of each construction year until construction is complete
Planting and Seeding	Fall 2012 or Spring 2013
As-Built Report	December 31 of planting year
Site Photographs	July of each monitoring year
Vegetative cover estimate	July of each monitoring year
Plant survival	July of each monitoring year
Annual Report submitted to USACE and OEPA	December 31 of each monitoring year
Agency Site Visit	July of Year 4

5.0 Long-Term Management

The site will remain under the ownership of Mr. Fowler, but will be monitored in perpetuity by the Ohio Valley Conservation Coalition. Long-term management will consist of making sure that no parties violate the terms of the conservation easement by clearing or committing prohibited activities within the conservation easement area.

5.1 Adaptive Management Plan

The adaptive management plan will be in effect until the site is released from its monitoring requirements, and will consist of replanting trees if necessary, reseeding native seed mix, if necessary or treating invasive species with herbicide in the enhancement area only. Mr. Fowler will complete any necessary replanting or reseeding, and it is anticipated that herbicide application will be completed by Mr. Fowler or contracted through a commercial applicator.

5.2 Financial Assurances

As financial assurance, Mr. Fowler will place $3,000 in an escrow account to be used for mitigation plantings. This will cover the amount of money necessary to purchase the trees and seed.

7.0 References

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual.* Technical Report Y-87-1. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

EnviroScience, Inc. 2008. Wetlands and Other Waters Delineation Report, Approximately 52.9 acre Haverhill Site, Haverhill, Lawrence County, Ohio.

U.S. Army Corps of Engineers. 2008. Regulatory Guidance Letter No. 08-03: Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving the Creation, Restoration, and/or Enhancement of Aquatic Resources.

Appendix I

Figures

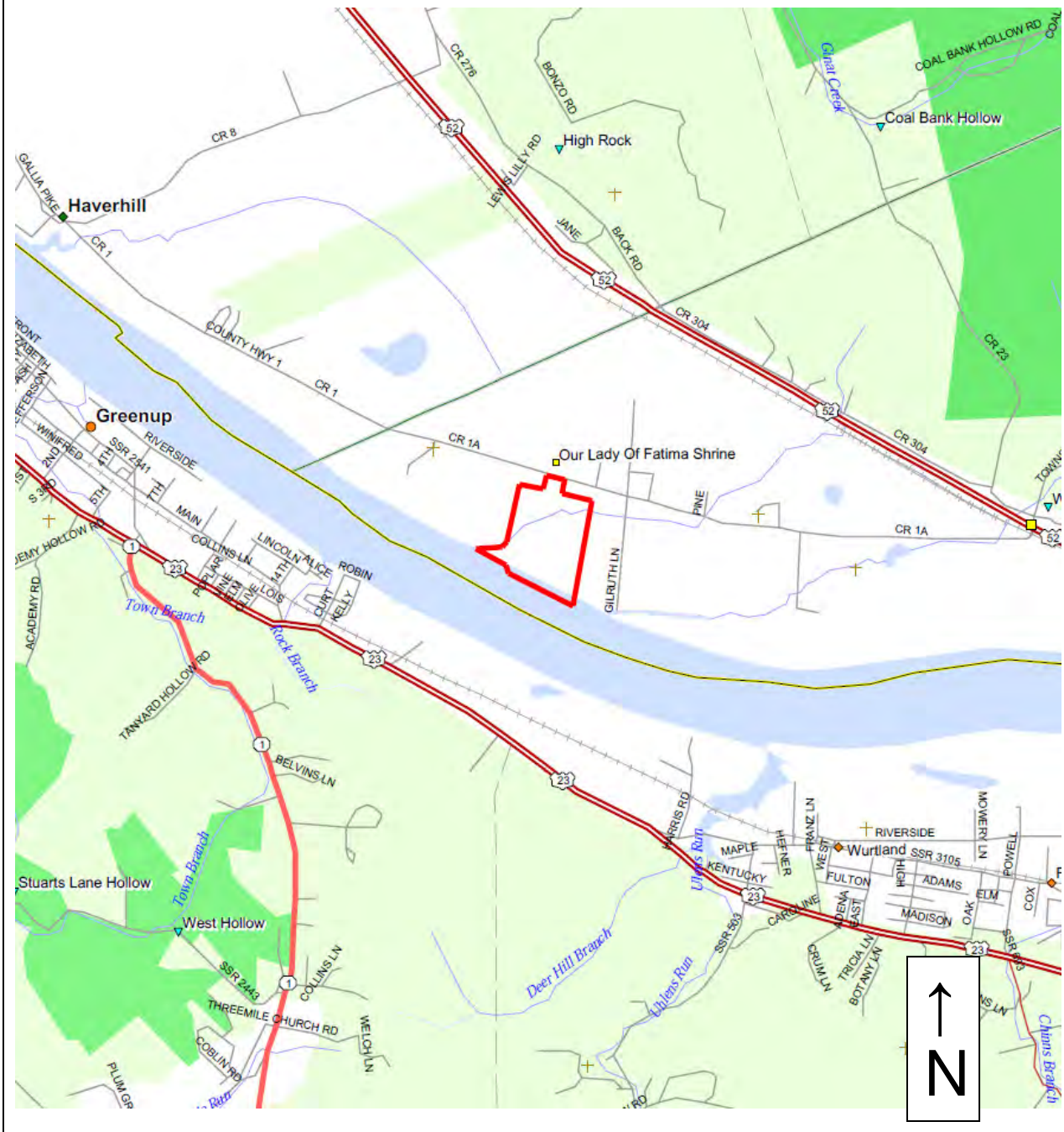

Figure 1. Road map showing location of site.

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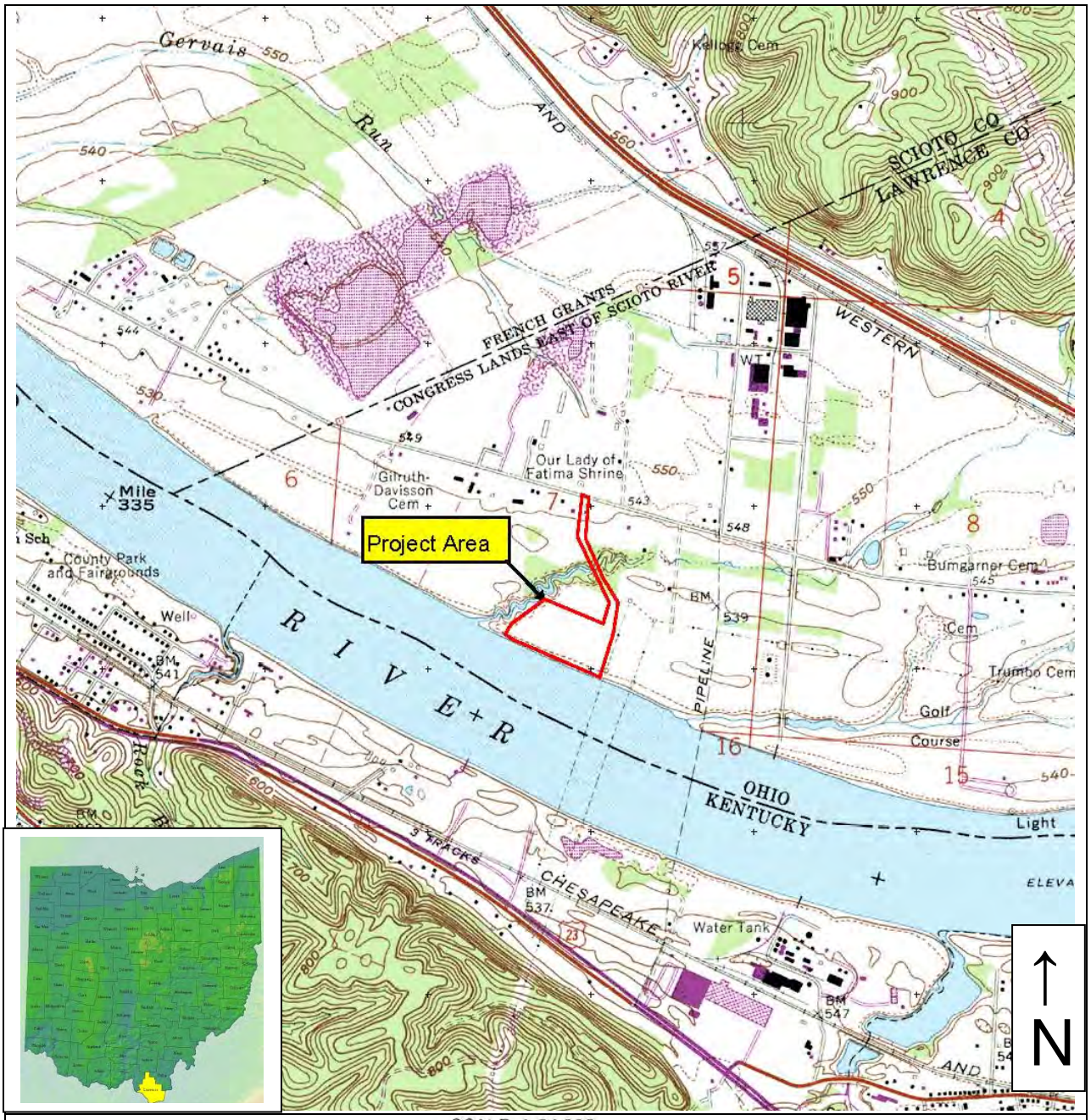

Figure 2. Portion of Greenup, KY-Ohio, 7.5-minute topographic quadrangle map showing location of project area.

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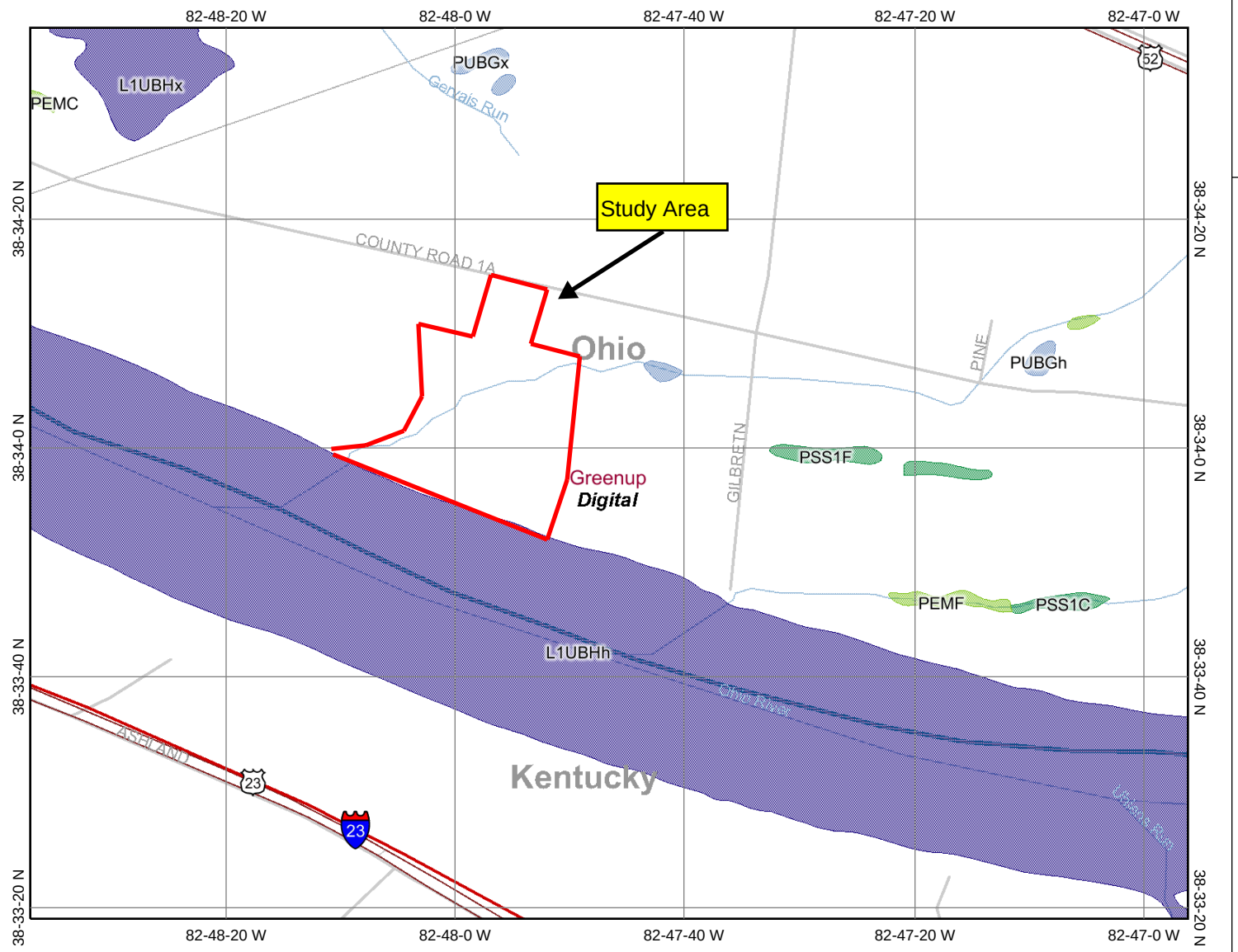
Figure 3. NWI Map of Site.



Map center: 38° 33' 58" N, 82° 47' 47" W

Legend

Ohio_wet_scan
- 0
- 1
- Out of range

Interstate
Major Roads
- Other Road
- Interstate
- State highway
- US highway

Roads
Cities
USGS Quad Index 24K
Lower 48 Wetland Polygons
- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

Lower 48 Available Wetland Data
- Non-Digital
- Digital
- No Data
- Scan

NHD Streams
Counties 100K
States 100K
South America
North America

Scale: 1:16,797

Figure 4. NRCS Soil Survey Map of Site

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:4,820 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:15,840.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lawrence County, Ohio
Survey Area Data: Version 7, Dec 10, 2007

Date(s) aerial images were photographed: 9/23/2004

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Lawrence County, Ohio (OH087)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
EkB	Elkinsville silt loam, 1 to 6 percent slopes	18.2	34.4%
EkE	Elkinsville silt loam, 15 to 40 percent slopes	15.3	28.9%
No	Nolin silt loam, occasionally flooded	1.7	3.2%
SaB	Sciotoville silt loam, 1 to 6 percent slopes	9.2	17.4%
ScB	Sciotoville silt loam, 1 to 8 percent slopes	1.0	1.8%
W	Water	3.2	6.1%
WeA	Weinbach silt loam, 0 to 2 percent slopes	2.9	5.5%
WmC2	Wheeling silt loam, 6 to 15 percent slopes, eroded	1.5	2.8%
Totals for Area of Interest		**52.9**	**100.0%**

Figure 5. Aerial Photograph of Site.

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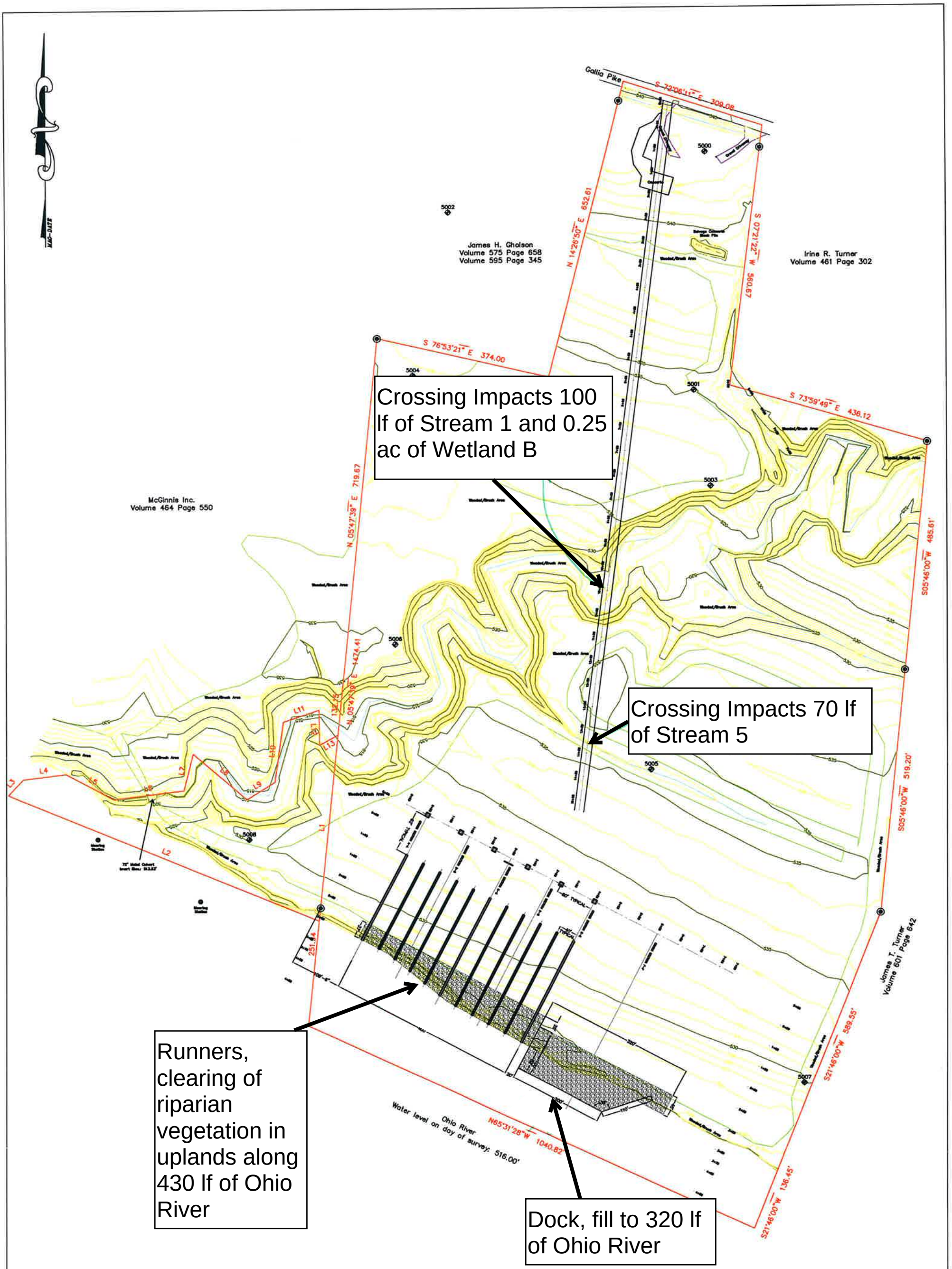


Figure 6. Preferred Design

Scale: 1"=200'

200' 400' 600'
100' 300' 500'

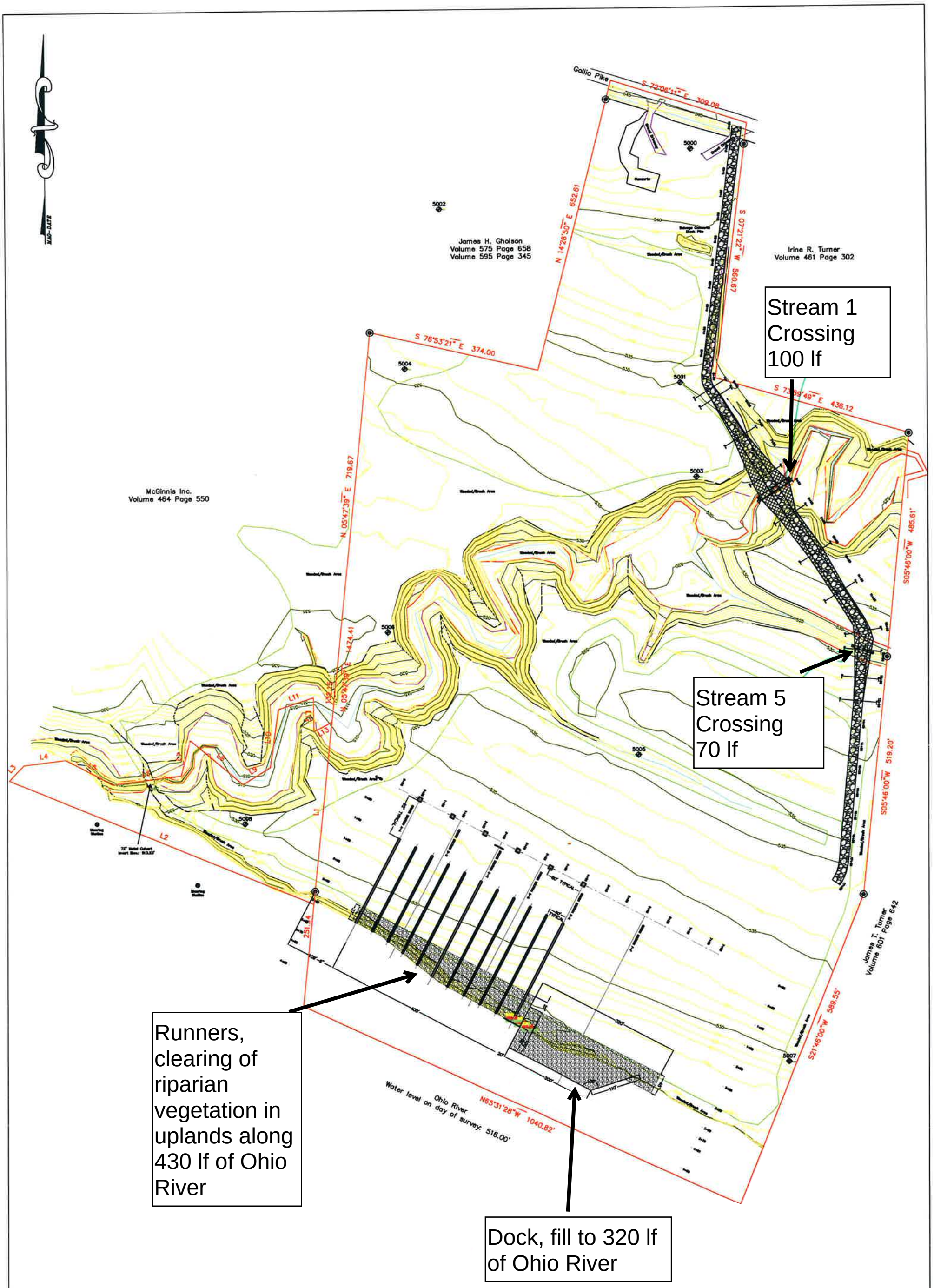


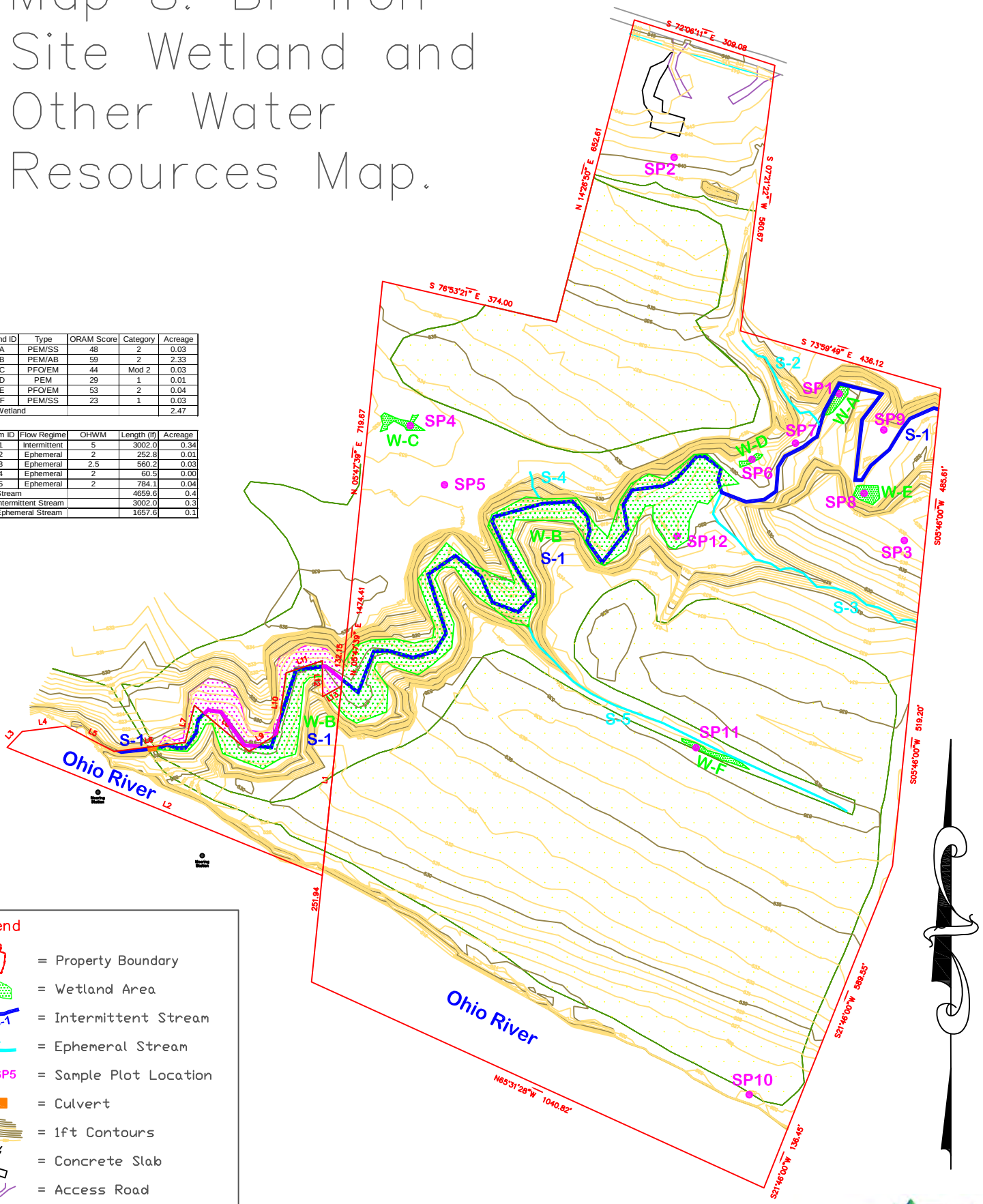
Figure 7. Minimal Degradation Alternative

Scale: 1"=200'

Map 8. BF Iron Site Wetland and Other Water Resources Map.

Wetland ID	Type	ORAM Score	Category	Acreage
W-A	PEM/SS	48	2	0.03
W-B	PEM/AB	59	2	2.33
W-C	PFO/EM	44	Mod 2	0.03
W-D	PEM	29	1	0.01
W-E	PFO/EM	53	2	0.04
W-F	PEM/SS	23	1	0.03
Total Wetland				2.47

Stream ID	Flow Regime	OHWM	Length (lf)	Acreage
S-1	Intermittent	5	3002.0	0.34
S-2	Ephemeral	2	252.8	0.01
S-3	Ephemeral	2.5	560.2	0.03
S-4	Ephemeral	2	60.5	0.00
S-5	Ephemeral	2	784.1	0.04
Total Stream			4659.6	0.4
Total Intermittent Stream			3002.0	0.3
Total Ephemeral Stream			1657.6	0.1



Legend

- = Property Boundary
- W-A = Wetland Area
- S-1 = Intermittent Stream
- S-4 = Ephemeral Stream
- SP5 = Sample Plot Location
- = Culvert
- = 1ft Contours
- = Concrete Slab
- = Access Road
- = Tree/Brushline
- = Agricultural Field

300 0 200 400

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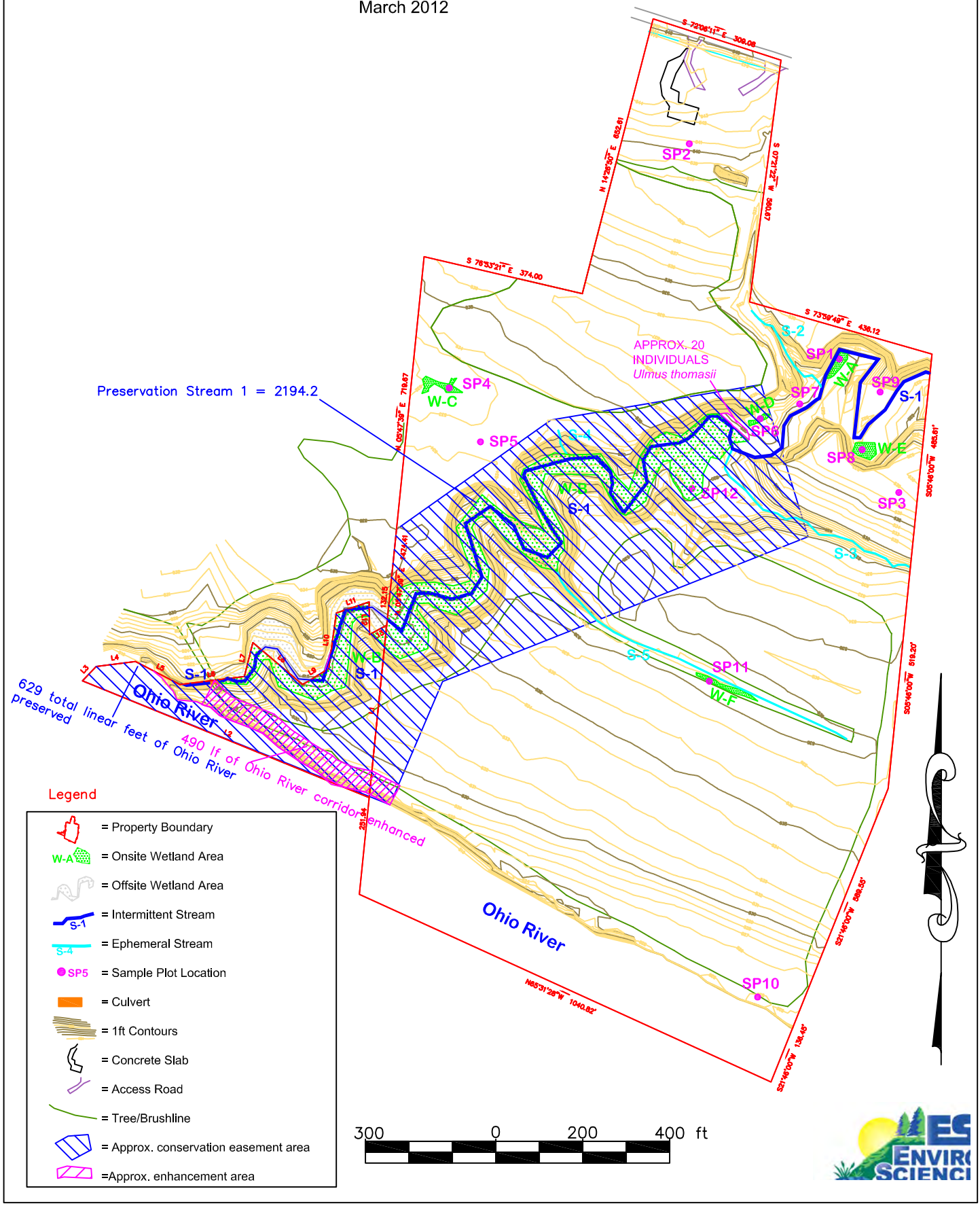
November 2008

Figure 9. BF Iron Mitigation Area Map

March 2012



Appendix II

Wetland Delineation Report

Appendix III

QHEI and HHEI Forms

OhioEPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 45.5

Stream & Location: Haverhill, OH 51 **RM:** ___.__ **Date:** 07/20/11

Unnamed tributary to Ohio River **Scorers Full Name & Affiliation:** A. Cayka / EnviroScience

River Code: ___-___-___ **STORET #:** _____ **Lat./ Long.:** (NAD 83 - decimal °) __.____ / 8__.____ 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]		10
☐☐ BOULDER [9]			☐☐ DETRITUS [3]		20
☐☐ COBBLE [8]			☒☐ MUCK [2]		45
☐☐ GRAVEL [7]			☒☐ SILT [2]		20
☐☐ SAND [6]		5	☐☐ 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
- ☐ 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 0 *Maximum 20*

Comments
no riffles Spring Creek Same substrate

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

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

Cover Maximum 20 14

Comments
1

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]	

Channel Maximum 20 12.5

Comments
3.5 2 1

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.

Riparian Maximum 10 10

Comments
3 4 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)

Pool / Current Maximum 12 5

Comments
1 2 1

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]

Riffle / Run Maximum 8 0

Comments
6 1 6

6] GRADIENT
(3 ft/mi)

DRAINAGE AREA (1.59 mi²)

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

%POOL: 50 %GLIDE: 50

%RUN: ____ %RIFFLE: ____

Gradient Maximum 10 4

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	☐

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.

Stream is spring fed

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	3.5 feet
$\bar{x}$ depth	10 inch
max. depth	2.4
$\bar{x}$ 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: 44

Stream & Location: Haverhill, OH Ohio River **RM:** 334. **Date:** 07/20/11

Scorers Full Name & Affiliation: D. Czyske / EnviroScience

River Code: ___-___-___ **STORET #:** _____ **Lat./ Long.:** (NAD 83 - decimal °) ___.____ / 8__.____ 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]	5	____
☐☐ COBBLE [8]	____	____	☒☐ MUCK [2]	30	____
☐☐ GRAVEL [7]	10	____	☐☐ SILT [2]	20	____
☒☐ SAND [6]	35	____	☐☐ 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
- ☐ LIMESTONE [1]
- ☒ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ☒ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

.5 SILT

EMBEDDEDNESS

QUALITY
- ☒ HEAVY [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ FREE [1]
- ☐ EXTENSIVE [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ NONE [1]

Comments

Substrate 6.5 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.

- ____ UNDERCUT BANKS [1]
- 1 OVERHANGING VEGETATION [1]
- 2 SHALLOWS (IN SLOW WATER) [1]
- ____ ROOTMATS [1]
- 3 POOLS > 70cm [2]
- 1 ROOTWADS [1]
- ____ BOULDERS [1]
- ____ OXBOWS, BACKWATERS [1]
- 2 AQUATIC MACROPHYTES [1]
- 3 LOGS OR WOODY DEBRIS [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
- ☐ HIGH [4]
- ☐ MODERATE [3]
- ☐ LOW [2]
- ☒ NONE [1]

DEVELOPMENT
- ☐ EXCELLENT [7]
- ☐ GOOD [5]
- ☐ FAIR [3]
- ☒ POOR [1]

CHANNELIZATION
- ☐ NONE [6]
- ☐ RECOVERED [4]
- ☒ RECOVERING [3]
- ☐ RECENT OR NO RECOVERY [1]

STABILITY
- ☐ HIGH [3]
- ☒ MODERATE [2]
- ☒ LOW [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 R)
- ☐☐ NONE / LITTLE [3]
- ☒☒ MODERATE [2]
- ☐☐ HEAVY / SEVERE [1]

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

FLOOD PLAIN QUALITY (L 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 2 2

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 6 2 1

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
- ☐ 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 No Riffles

Riffle / Run Maximum 8: 0

6] GRADIENT (4) ft/mi)
DRAINAGE AREA (mi²)
- ☒ VERY LOW - LOW [2-4]
- ☐ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

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

Gradient Maximum 10: 6

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

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

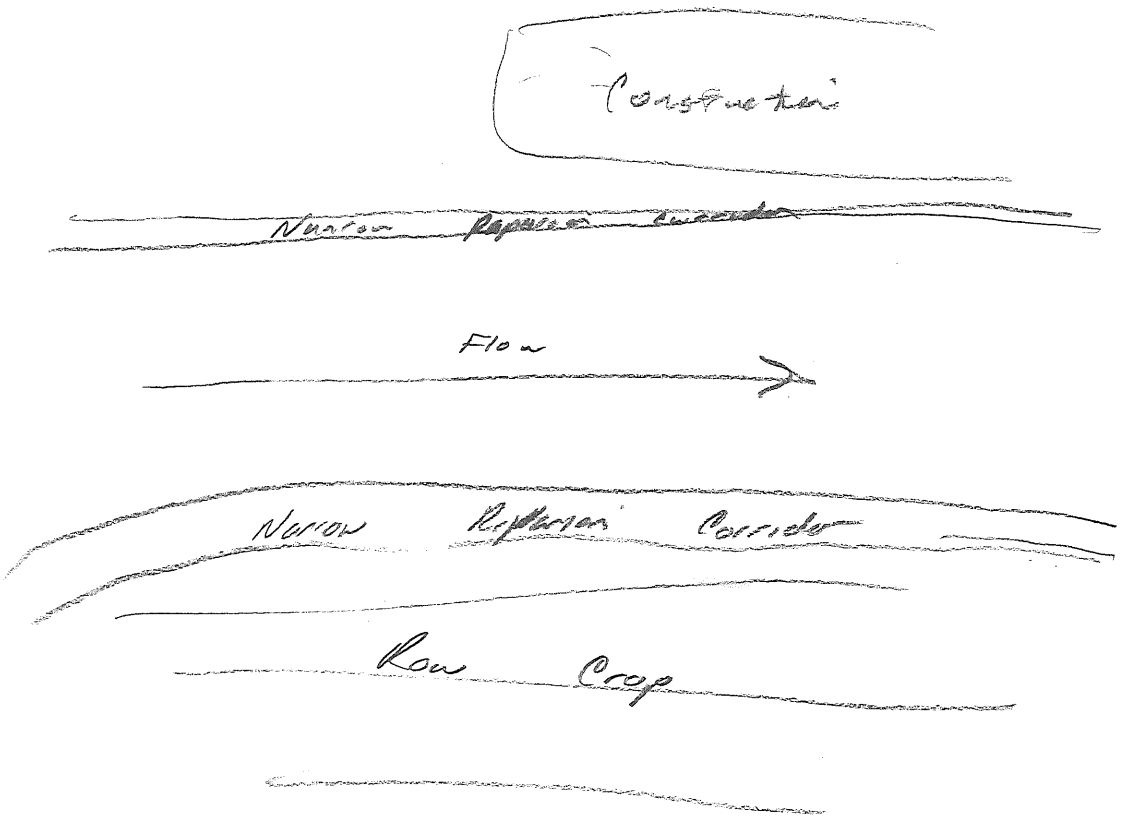
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN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



S2

OhioEPA Primary Headwater Habitat Evaluation Form

HHEI Score (sum of metrics 1, 2, 3) : 16

SITE NAME/LOCATION Haverhill, OH Ohio River

SITE NUMBER S2 RIVER BASIN OH. River DRAINAGE AREA (mi²) <1 mi²

LENGTH OF STREAM REACH (ft) 200 LAT. _____ LONG. _____ RIVER CODE _____ RIVER MILE _____

DATE 7-20-11 SCORER D. Czayka COMMENTS Stream head dry

NOTE: Complete All Items On This Form - Refer to "Field Evaluation Manual for Ohio's PHWH Streams" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☐ RECOVERED ☒ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type of substrate present. Check *ONLY* two predominant substrate *TYPE* boxes (Max of 40). 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]		☐	LEAF PACK/WOODY DEBRIS [3 pts]	10%
☐	BEDROCK [16 pt]		☐	FINE DETRITUS [3 pts]	
☐	COBBLE (65-256 mm) [12 pts]		☒	CLAY or HARDPAN [0 pt]	50%
☐	GRAVEL (2-64 mm) [9 pts]		☐	MUCK [0 pts]	
☒	SAND (<2 mm) [6 pts]	30%	☐	ARTIFICIAL [3 pts]	5%

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock _____ (A) 6

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES:

(B) 5 **TOTAL NUMBER OF SUBSTRATE TYPES:**

HHEI Metric Points

Substrate Max = 40

11

A + B

2. Maximum Pool Depth ***(Measure the maximum pool depth within the 61 meter (200 ft)*** 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 [5 pts]
☐	> 10 - 22.5 cm [25 pts]	☒	NO WATER OR MOIST CHANNEL [0 pts]

COMMENTS Stream channel dry **MAXIMUM POOL DEPTH (centimeters):** 0

Pool Depth Max = 30

0

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 _____ **AVERAGE BANKFULL WIDTH (meters)** 5

Bankfull Width Max=30

5

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY ☆NOTE: River Left (L) and Right (R) as looking downstream☆

RIPARIAN WIDTH L	R	(Per Bank)	FLOODPLAIN QUALITY L	R	(Most Predominant per Bank)	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: Ohio River Distance from Evaluated Stream .47mi

☐ 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: Greenup NRCS Soil Map Page: _____ NRCS Soil Map Stream Order _____

County: Lawrence Township / City: Hamilton / Haverhill

MISCELLANEOUS

Base Flow Conditions? (Y/N): N Date of last precipitation: 7/19/11 Quantity: _____

Photograph Information: two Photographs one upstream, one downstream

Elevated Turbidity? (Y/N): N Canopy (% open): 10%

Were samples collected for water chemistry? (Y/N): N (Note lab sample no. or id. and attach results) Lab Number: _____

Field Measures: Temp (°C) _____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (µmhos/cm) _____

Is the sampling reach representative of the stream (Y/N) N If not, please explain: Stream Channel dry

Additional comments/description of pollution impacts: _____

BIOTIC EVALUATION

Performed? (Y/N): N (If Yes, Record all observations. Voucher collections optional. NOTE: all voucher samples must be labeled with the site ID number. Include appropriate field data sheets from the Primary Headwater Habitat Assessment Manual)

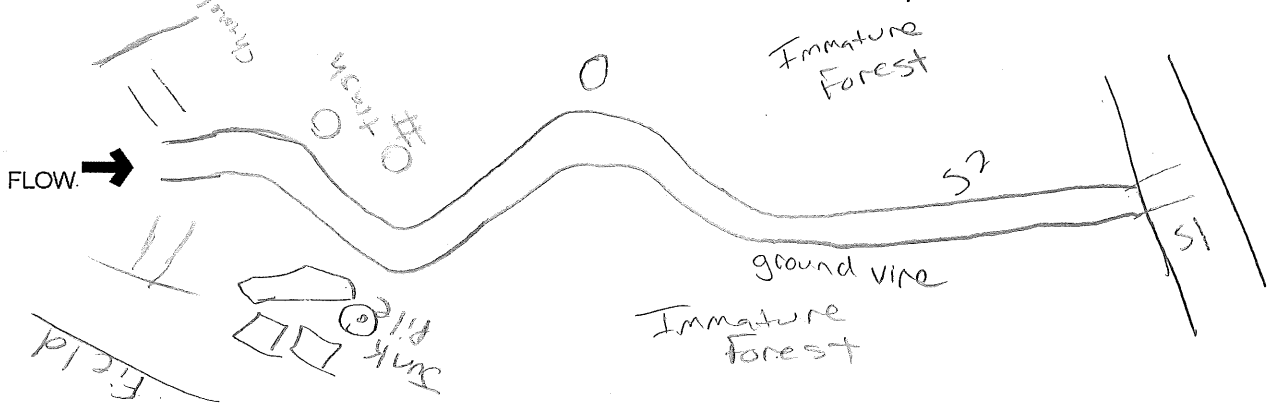
Fish Observed? (Y/N) N Voucher? (Y/N) N Salamanders Observed? (Y/N) N Voucher? (Y/N) N

Frogs or Tadpoles Observed? (Y/N) N Voucher? (Y/N) N Aquatic Macroinvertebrates Observed? (Y/N) N Voucher? (Y/N) N

Comments Regarding Biology: Stream channel dry Searched for salamanders

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



OhioEPA Primary Headwater Habitat Evaluation Form

HHEI Score (sum of metrics 1, 2, 3) : 10

SITE NAME/LOCATION Haverhill, OH Ohio River

SITE NUMBER _____ RIVER BASIN Ohio River DRAINAGE AREA (mi²) 21 mi²

LENGTH OF STREAM REACH (ft) _____ LAT. _____ LONG. _____ RIVER CODE _____ RIVER MILE _____

DATE 07/20/11 SCORER D.CzayKa COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Field Evaluation Manual for Ohio's PHWH Streams" for Instructions

STREAM CHANNEL MODIFICATIONS: ☒ NONE / NATURAL CHANNEL ☐ RECOVERED ☐ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type of substrate present. Check *ONLY* two predominant substrate *TYPE* boxes (Max of 40). 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]	_____	☐☐	LEAF PACK/WOODY DEBRIS [3 pts]	_____
☐☐	BEDROCK [16 pt]	_____	☐☐	FINE DETRITUS [3 pts]	10%
☐☐	COBBLE (65-256 mm) [12 pts]	_____	☐☐	CLAY or HARDPAN [0 pt]	25%
☐☐	GRAVEL (2-64 mm) [9 pts]	_____	☒☒	MUCK [0 pts]	50%
☐☐	SAND (<2 mm) [6 pts]	5%	☐☐	ARTIFICIAL [3 pts]	_____

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock _____ (A) [ ]

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES:

TOTAL NUMBER OF SUBSTRATE TYPES: (B) 5

HHEI Metric Points

Substrate Max = 40: 5

A + B

2. Maximum Pool Depth ***(Measure the maximum pool depth within the 61 meter (200 ft)*** 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 [5 pts]
- ☒ NO WATER OR MOIST CHANNEL [0 pts]

COMMENTS Dry channel MAXIMUM POOL DEPTH (centimeters): 0

Pool Depth Max = 30: 0

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): 5

Bankfull Width Max=30: 5

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)

June 20, 2008 Revision

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: Ohio River Distance from Evaluated Stream .43

☐ 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: Green up NRCS Soil Map Page: _____ NRCS Soil Map Stream Order _____

County: Lawrence Township / City: Hamilton / Haverhill

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 7/19 Quantity: 0

Photograph Information: Up + Down

Elevated Turbidity? (Y/N): N Canopy (% open): 10%

Were samples collected for water chemistry? (Y/N): N (Note lab sample no. or id. and attach results) Lab Number: —

Field Measures: Temp (°C) — Dissolved Oxygen (mg/l) — pH (S.U.) — Conductivity (µmhos/cm) —

Is the sampling reach representative of the stream (Y/N)_____ If not, please explain: Stream channel Dry

Additional comments/description of pollution impacts: _____

BIOTIC EVALUATION

Performed? (Y/N): N (If Yes, Record all observations. Voucher collections optional. NOTE: all voucher samples must be labeled with the site ID number. Include appropriate field data sheets from the Primary Headwater Habitat Assessment Manual)

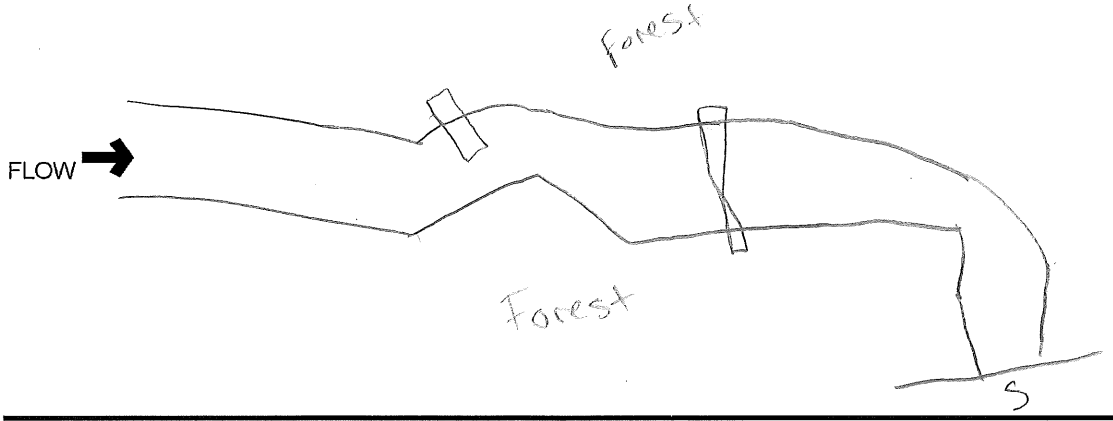
Fish Observed? (Y/N) N Voucher? (Y/N) N Salamanders Observed? (Y/N) N Voucher? (Y/N) N

Frogs or Tadpoles Observed? (Y/N) N Voucher? (Y/N) N Aquatic Macroinvertebrates Observed? (Y/N) N Voucher? (Y/N) N

Comments Regarding Biology: Channel dry

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



S4

OhioEPA Primary Headwater Habitat Evaluation Form

HHEI Score (sum of metrics 1, 2, 3) : 11

SITE NAME/LOCATION Haverhill, OH Ohio River

SITE NUMBER S4 RIVER BASIN Ohio River DRAINAGE AREA (mi²) < 1 mi²

LENGTH OF STREAM REACH (ft) 200 LAT. _____ LONG. _____ RIVER CODE _____ RIVER MILE _____

DATE 7/20/11 SCORER D. Czarka COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Field Evaluation Manual for Ohio's PHWH Streams" for Instructions

STREAM CHANNEL MODIFICATIONS: ☒ NONE / NATURAL CHANNEL ☒ RECOVERED ☐ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type of substrate present. Check *ONLY* two predominant substrate *TYPE* boxes (Max of 40). 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]	_____	☒☐	LEAF PACK/WOODY DEBRIS [3 pts]	30%
☐☐	BEDROCK [16 pt]	_____	☐☐	FINE DETRITUS [3 pts]	_____
☐☐	COBBLE (65-256 mm) [12 pts]	_____	☐☐	CLAY or HARDPAN [0 pt]	20%
☐☐	GRAVEL (2-64 mm) [9 pts]	_____	☒☐	MUCK [0 pts]	50%
☐☐	SAND (<2 mm) [6 pts]	_____	☐☐	ARTIFICIAL [3 pts]	_____

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock _____ (A) 3 (B) 3

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: **TOTAL NUMBER OF SUBSTRATE TYPES:**

HHEI Metric Points

Substrate Max = 40: 6

A + B

2. Maximum Pool Depth ***(Measure the maximum pool depth within the 61 meter (200 ft)*** 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 [5 pts]
☐	> 10 - 22.5 cm [25 pts]	☒	NO WATER OR MOIST CHANNEL [0 pts]

COMMENTS Stream Channel dry **MAXIMUM POOL DEPTH (centimeters):** 0

Pool Depth Max = 30: 0

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 _____ **AVERAGE BANKFULL WIDTH (meters)** 5

Bankfull Width Max=30: 5

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	☒	☐	☐	Conservation Tillage
☐	☐	Moderate 5-10m	☐	☐	☐	Urban or Industrial
☐	☐	Narrow <5m	☐	☐	☐	Open Pasture, Row Crop
☐	☐	None	☐	☐	☐	Mining or Construction

Mature Forest, Wetland; Immature Forest, Shrub or Old Field; Residential, Park, New Field; Fenced Pasture

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)

June 20, 2008 Revision

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: Ohio River Distance from Evaluated Stream 0.29mi

☐ 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: Greenup NRCS Soil Map Page: _____ NRCS Soil Map Stream Order _____

County: Lawrence Township / City: Hamilton / Haverhill

MISCELLANEOUS

Base Flow Conditions? (Y/N): N Date of last precipitation: 7/19/11 Quantity: _____

Photograph Information: one upstream and downstream

Elevated Turbidity? (Y/N): N Canopy (% open): 5%

Were samples collected for water chemistry? (Y/N): N (Note lab sample no. or id. and attach results) Lab Number: —

Field Measures: Temp (°C) — Dissolved Oxygen (mg/l) — pH (S.U.) — Conductivity (µmhos/cm) —

Is the sampling reach representative of the stream (Y/N) N If not, please explain: Stream channel dry

Additional comments/description of pollution impacts: _____

BIOTIC EVALUATION

Performed? (Y/N): N (If Yes, Record all observations. Voucher collections optional. NOTE: all voucher samples must be labeled with the site ID number. Include appropriate field data sheets from the Primary Headwater Habitat Assessment Manual)

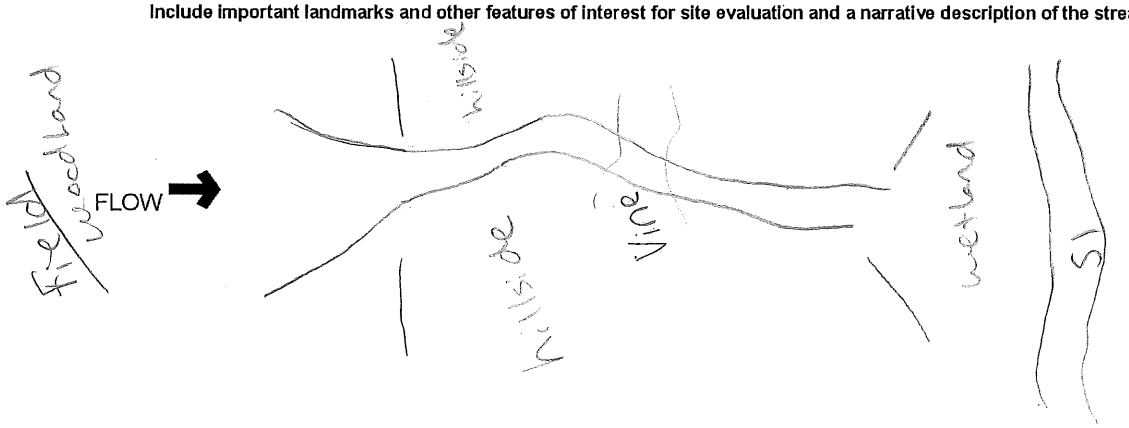
Fish Observed? (Y/N) N Voucher? (Y/N) N Salamanders Observed? (Y/N) N Voucher? (Y/N) N

Frogs or Tadpoles Observed? (Y/N) N Voucher? (Y/N) N Aquatic Macroinvertebrates Observed? (Y/N) N Voucher? (Y/N) N

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



OhioEPA Primary Headwater Habitat Evaluation Form

HHEI Score (sum of metrics 1, 2, 3) : 16.5

SITE NAME/LOCATION Thurhill, OH

SITE NUMBER 55 RIVER BASIN Ohio River DRAINAGE AREA (mi²) < 1 m²

LENGTH OF STREAM REACH (ft) 200 LAT. _____ LONG. _____ RIVER CODE _____ RIVER MILE _____

DATE 7-20-11 SCORER D. Czyrka COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Field Evaluation Manual for Ohio's PHWH Streams" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☒ RECOVERED ☐ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type of substrate present. Check *ONLY* two predominant substrate *TYPE* boxes (Max of 40). 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]	_____	☐☐	LEAF PACK/WOODY DEBRIS [3 pts]	10%
☐☐	BEDROCK [16 pt]	_____	☐☒	FINE DETRITUS [3 pts]	20%
☐☐	COBBLE (65-256 mm) [12 pts]	_____	☐☐	CLAY or HARDPAN [0 pt]	15%
☐☐	GRAVEL (2-64 mm) [9 pts]	_____	☒☐	MUCK [0 pts]	35%
☐☐	SAND (<2 mm) [6 pts]	_____	☐☐	ARTIFICIAL [3 pts]	5%

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock _____ (A) 3

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES:

TOTAL NUMBER OF SUBSTRATE TYPES: (B) 6

HHEI Metric Points

Substrate Max = 40: 9

A + B

2. Maximum Pool Depth ***(Measure the maximum pool depth within the 61 meter (200 ft)*** 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 [5 pts]
☐	> 10 - 22.5 cm [25 pts]	☒	NO WATER OR MOIST CHANNEL [0 pts]

COMMENTS most of stream dry fill wetland **MAXIMUM POOL DEPTH (centimeters):** 2.5

Pool Depth Max = 30: 2.5

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 _____ **AVERAGE BANKFULL WIDTH (meters)** 5

Bankfull Width Max=30: 5

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY ☆NOTE: River Left (L) and Right (R) as looking downstream☆

RIPARIAN WIDTH L	R	(Per Bank)	FLOODPLAIN QUALITY L	R	(Most Predominant per Bank)	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 Narrowing as it goes upstream

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: Ohio River Distance from Evaluated Stream 2.9 miles

☐ 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: Greenup NRCS Soil Map Page: _____ NRCS Soil Map Stream Order _____

County: Lawrence Township / City: Hamilton / Haverhill

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 7-19-11 Quantity: _____

Photograph Information: one photograph upstream and downstream

Elevated Turbidity? (Y/N): N Canopy (% open): 5%

Were samples collected for water chemistry? (Y/N): N (Note lab sample no. or id. and attach results) Lab Number: _____

Field Measures: Temp (°C) _____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (µmhos/cm) _____

Is the sampling reach representative of the stream (Y/N) N If not, please explain: stream channel is dry

Additional comments/description of pollution impacts: _____

BIOTIC EVALUATION

Performed? (Y/N): N (If Yes, Record all observations. Voucher collections optional. NOTE: all voucher samples must be labeled with the site ID number. Include appropriate field data sheets from the Primary Headwater Habitat Assessment Manual)

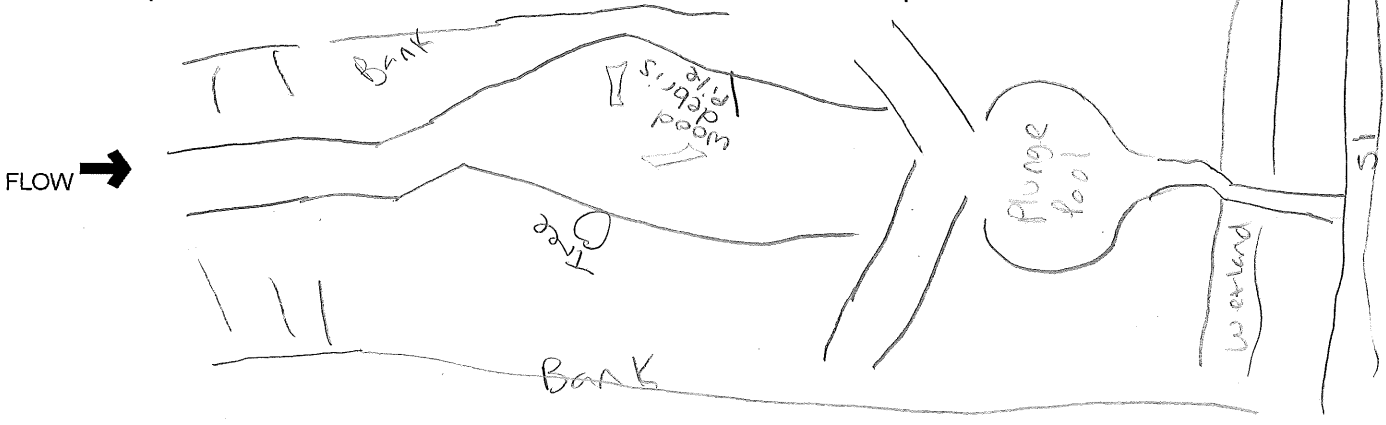
Fish Observed? (Y/N) N Voucher? (Y/N) N Salamanders Observed? (Y/N) N Voucher? (Y/N) N

Frogs or Tadpoles Observed? (Y/N) N Voucher? (Y/N) N Aquatic Macroinvertebrates Observed? (Y/N) N Voucher? (Y/N) N

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 IV

Sample Conservation Easement Language

GRANT OF CONSERVATION EASEMENT

This grant of a Conservation Easement, made by _____, an _____ (hereinafter referred to as the "**Grantor**") to the _____, an Ohio nonprofit, whose mailing address is _____ (hereinafter referred to as the "**Grantee**").

Witnesseth:

WHEREAS, Grantor is the owner in fee simple of certain real property situated in _____, Ohio, consisting of approximately ___ acres and legally described in Exhibits A, and depicted in Exhibit B, attached hereto and made a part hereof (which real property is hereinafter referred to as the "Protected Property"); and

WHEREAS, the Protected Property has value as a scenic, natural, aquatic and aesthetic resource in its present state as a natural, scenic, wetlands and riparian area, constituting a natural habitat for plants and wildlife; and

WHEREAS, the Grantor and Grantee recognize the aforesaid scenic, natural, aquatic, and open space values of the Protected Property in its present state, and have, by the conveyance and acceptance of a Conservation Easement, respectively, the common purpose of conserving the aforesaid values of the Protected Property, and preventing the use or development of the Protected Property for any purpose or in any manner that would conflict with the maintenance of the Protected Property in its natural, scenic, open and wetlands condition, as suitable habitat for wild flora and fauna of all types; and

WHEREAS, it is the intent of the Grantor to use the Protected Property as a natural park/preserve for conservation purposes; and

WHEREAS, Grantor intends to and does convey to the Grantee the right to preserve and protect the conservation values of the Protected Property in perpetuity and to prevent or remedy subsequent activities or uses that are inconsistent with the terms of this Conservation Easement; and

WHEREAS, The purpose of this Conservation Easement is to assure that the Protected Property will be retained and forever preserved in its natural condition, as a habitat for plants and wildlife; and

WHEREAS, Grantor and Grantee intend that this Conservation Easement shall be a "conservation easement" as defined in Section 5301.67 of the Ohio Revised Code; and

WHEREAS, Grantee is willing to accept this Conservation Easement, subject to the reservations and to the terms and conditions and obligations set out herein and imposed hereby;

NOW, THEREFORE, for and in consideration of the premises and the foregoing recitations, and $ _____ paid by _____ and other good and valuable consideration in hand paid, and in consideration of the mutual promises, covenants, terms, conditions, and restrictions hereinafter set forth, the Grantor does hereby grant, give, and convey unto the Grantee, its successors and assigns, forever and in perpetuity, a Conservation Easement of the nature and character and to the extent hereinafter set forth, in, upon, and over the Protected Property, for the purposes of preserving, protecting, and maintaining the Protected Property as a natural, scenic, open and wetlands resource and as habitat for plants and wildlife.

THE TERMS, CONDITIONS, AND RESTRICTIONS OF THE CONSERVATION EASEMENT ARE AS HEREINAFTER SET FORTH:

I. Grantor's Rights and Responsibilities:

Grantor agrees as follows:

1. The Protected Property shall remain in its natural condition. There shall be no alteration of the natural water courses, streams, gorges, marshes or other water bodies or activities or uses detrimental to water purity on the Conservation Easement except as may be necessary and agreed to, in writing, in advance of the activity, by _____ in order to prevent or halt soil erosion, soil slippage, and damage from erosion or other restoration activities.

2. Except as otherwise herein provided, the Protected Property shall be managed in a manner consistent with its preservation as a natural, scenic, open and wetlands resource. Each and every other activity or construction that might endanger the natural or scenic state of the Protected Property is forbidden, unless such activity is required to protect human health. Without limiting the generality of the foregoing, it is Grantor's intent that this Conservation Easement is to prohibit commercial or residential use of the Protected Property.

3. No buildings or other structures, including, but not limited to, billboards or advertising of any kind, camping accommodations, mobile homes, and fences, shall be hereafter erected or placed on the Protected Property.

4. There shall be no dumping of soil, trash, ashes, garbage, waste, or other unsightly or offensive material, nor any placement of underground storage tanks, on or in the Protected Property, and no changing of its topography through the placing of soil or other substance or material such as land fill or dredging spoils.

5. There shall be no fillings, excavations, mining, drilling, or other changes in the general topography, except as allowed herein, of the land on the Protected Property in any manner excepting that caused by the forces of nature. Without limiting the foregoing, there shall be no drilling for oil or gas or similar substances on the property. There shall be no fill, excavation, dredging, mining, drilling or removal of soil, clay, sand, gravel, rock, minerals or other inorganic and natural organic materials.

6. The Grantor reserves the right to maintain and repair existing telephone, electric, water, wells, or other utility lines or mains needed to provide for the needs of the Grantor, Grantor's successors or assigns. The area needed to repair said facility shall be the minimum necessary to accomplish the task as agreed upon in writing by the Grantors and Grantee. Upon completion, the area shall be restored to its previous state or as near as practical.

7. There shall be no manipulation or alteration of natural water courses, lake shores, marshes, or other water bodies unless such activities are conducted to improve water quality or aquatic habitat.

8. There shall be no removal or destruction of native growth in the open and wooded areas or disturbance or change in the natural habitat except in accordance with good husbandry practices and enhancement of wildlife habitats. There shall be no removal, destruction, or cutting of trees, shrubs, or other vegetation on the Conservation Easement except as may be necessary for:

A. The control or prevention of imminent hazard, disease or fire to restore natural

habitat areas to promote native vegetation;

B. The removal and clearing of diseased, dying, damaged, destroyed or fallen trees, shrubs, or other vegetation; and

C. The elimination and removal of grapevines, poison ivy, invasive species and other toxic and undesirable growth.

9. No advertising of any kind or nature shall be located on the Conservation Easement except for:

A. Signs marking the boundaries as part of a Conservation Easement in favor of the Grantee. The Grantee shall have the right to post or clearly mark the boundaries of said easement in compliance with the Grantee's policies; and

B. If passive public recreation amenities are developed, such as a nature trail or boardwalk, interpretive signage along such amenities or recognizing the granting sources that provided funds for such amenities.

10. The Grantor expressly reserves for itself, its personal representatives, heirs, successors, and assigns, the right to continue the use of the Protected Property for all purposes consistent with this Conservation Easement. Nothing contained in this Conservation Easement shall give or grant to the public a right to enter upon the Protected Property or any portion thereof where no such right existed in the public immediately prior to the execution of this Conservation Easement.

11. The Grantor reserves for itself, its personal representatives, heirs, successors, and assigns, the right to construct a nature trail and boardwalk at the Grantor's discretion. If constructed, these are to be installed with minimal impact to the environment and wetlands.

12. The Grantor reserves for itself, its personal representatives, heirs, successors, and assigns, the right to construct stream and wetland enhancement and/or restoration projects that prevent soil erosion, result in improved stream water quality, and enhance wildlife habitat.

II. Present Conveyance of Real Property Interest

This Conservation Easement constitutes a real property interest immediately vested in the Grantee.

III. Future Conveyances by Grantor

The Grantor agrees that the terms, conditions, restrictions, and purposes of this Conservation Easement will be incorporated by reference in any subsequent deed, or other legal instrument, by which Grantor divests itself of either the fee simple title to, or of its possessory interest in, the Protected Property.

IV. Amendments of This Grant

This Grant may be amended only with the written consent of the Grantee and Grantor.

V. Extinguishment in Case of Impossibility

If the circumstances arise in the future that render the purposes of this Conservation Easement impossible to accomplish, this Conservation Easement can only be terminated or extinguished, whether in whole or in part, by judicial proceedings in a court of competent jurisdiction, and the amount of the compensation to which the Grantee shall be entitled from any sale, exchange, or involuntary conversion of all or any portion of the Protected Property, pursuant to such proceedings, subsequent to such termination or extinguishment, shall be established, unless otherwise provided by Ohio law at the time, as provided below with respect to the division of condemnation proceeds. The Grantee shall use any such proceeds in a manner consistent with the purposes of this Conservation Easement.

VI. Right of Inspection

The Grantee, or its duly authorized representative, or its heirs, may enter the Protected Property at reasonable times to monitor compliance with this Conservation Easement.

VII. Grantee's Rights and Remedies

In order to accomplish the purposes of this Conservation Easement, the following rights and remedies are conveyed to the Grantee so that it may: (1) preserve and protect the conservation values of the Protected Property, (2) prevent any activity on or use of the Protected Property which is inconsistent with the purposes of this Conservation Easement, and (3) require the restoration of any areas of the Protected Property that may be damaged by any unauthorized activity or use.

A. Notice of Violation Corrective Action: If the Grantee determines that a violation of the terms of this Conservation Easement has occurred or is threatened, the Grantee shall give written notice to the Grantor of such violation and demand corrective action sufficient to cure the violation and, where the violation involves injury to the conservation values of the Protected Property resulting from any use or activity inconsistent with the purpose of this Conservation Easement, to restore the portion of the Protected Property so injured to its prior condition in accordance with a plan approved in writing by the Grantee.

B. Injunctive Relief: If Grantor fails to cure the violation within thirty (30) days after receipt of notice thereof from the Grantee, or under circumstances where the violation cannot reasonably be cured within a thirty (30) day period, fails to begin curing such violation within the thirty (30) day period, or fail to continue diligently to cure such violation until finally cured, the Grantee may bring an action at law or in equity in a court of competent jurisdiction to enforce the terms of this Conservation Easement, to enjoin the violation, *ex parte* if necessary, by temporary or permanent injunction, and to require the restoration of the Protected Property in the condition that existed prior to any such injury.

C. Damages: The Grantee shall be entitled to recover damages for violation of the terms of this Conservation Easement or injury to any conservation values protected by this Conservation Easement, including, without limitation, damages for the loss of any scenic, aesthetic, or environmental values. Without limiting Grantor's liability therefor, Grantee, in its sole discretion, may apply any damages recovered to the cost of undertaking any corrective action on the Protected Property.

D. Forbearance: Forbearance by Grantee to exercise its rights under this Conservation Easement in the event of any breach of any of its terms shall not be deemed or construed to be a waiver by the Grantee of such term or of any subsequent breach of the same. No delay or omission by the Grantee in the exercise of any right or remedy shall be construed as a waiver.

E. Right to Post Signs: Grantee shall have the right to post one or more signs on the Protected Property which indicate that it is burdened by a conservation easement in favor of Grantee.

VIII. Payment of Taxes and Special Assessments:

The Grantor or the Grantor's personal representatives, heirs, successors and assigns shall pay all taxes and special assessments validly assessed and levied against the Protected Property and shall bear all costs of maintenance, insurance and any liabilities related to ownership of the Protected Property.

IX. Transfer by Grantee

The Grantee shall have the right to transfer this perpetual Conservation Easement to any organization which is eligible to hold a Conservation Easement under the laws of the State of Ohio that agrees to the terms, conditions, restrictions, and purposes of this Conservation Easement.

X. Recording and Deed Reference:

This Conservation Easement will be filed and recorded with the Summit County Recorders Office by the Grantee at the expense of the Grantee. The Grantor agrees that the terms, conditions, restrictions, and purposes of this Conservation Easement will either be referred to or inserted in any subsequent deed, or other transfer instrument, by which the Grantor transfers title or possessor interest in the Protected Property. Furthermore, Grantor agrees that if a new plat plan is being done for the property, the Conservation Easement will be referred to on the registered plat plan.

XI. Grantor's Continuing Obligation

Grantor's continuing obligations hereunder shall cease upon transfer of the Grantor's entire interest in the property, provided however, that Grantor shall remain personally liable to Grantee for any breach of the warranties, representation, covenants, and/or promises contained herein occurring or existing prior to the date of such transfer.

XII. Miscellaneous:

A. **Ohio Law to Govern.** The laws of the State of Ohio shall govern this Conservation Easement agreement. If any provision herein is found to be invalid, the remainder of the provisions of this Conservation Easement shall not be affected thereby. This instrument sets forth the entire agreement of the parties and supersedes all prior discussions, negotiations, undertakings or agreements relating to the grant of this Conservation Easement.

B. **Counterparts.** The parties may execute this Conservation Easement Agreement in one or more counterparts which shall, in the aggregate, be signed by both parties; each counterpart shall be deemed an original instrument with respect to the party who signed it. In the event of any disparity between counterparts, the counterpart recorded by Grantee shall be controlling.

C. **Nature of Easement.** Without limiting any other provision of this Conservation Easement, Grantor and Grantee agree and intend that the Easement granted and accepted hereby constitute a "conservation easement" as that term is used in Section 5301.67 through 5301.70 of the Ohio Revised Code and that the Conservation Easement granted hereby shall be entitled to all the benefits of such sections.

TO HAVE AND HOLD unto the Grantee, its successors and assigns forever. The covenants agreed to and the terms, obligations, conditions, restrictions, and purposes imposed as aforesaid, shall be binding upon and inure to the benefit of the parties and their heirs, personal representatives, grantees, successors and assigns, and all other successors in interest, and shall continue as a servitude running in perpetuity with the above-described land.

The rest of this page left intentionally blank

By: _____

Name: _____

Its: _____

STATE OF OHIO)
) ss:
COUNTY OF _____)

The foregoing instrument was acknowledged before me this _____ day of _____, 20__, by _____, the _____ of _____.

_____
Notary Public
My commission expires: _____

_____
an Ohio nonprofit corporation

By: _____

Its: Executive Director

STATE OF OHIO)
) ss:
COUNTY OF _____)

The foregoing instrument was acknowledged before me this _____ day of _____, 20__, by _____, the Executive Director of _____, an Ohio nonprofit corporation, for and on behalf of the corporation.

_____
Notary Public
My commission expires: _____

EXHIBIT A

LEGAL DESCRIPTION OF PROTECTED PROPERTY

EXHIBIT B

MAP OF PROTECTED PROPERTY

Appendix V

Native Seed Mix

Riparian Buffer Mix

ERNMX #	ERNMX-178
Cost Per Pound	$31.50
Seeding Rate	20 lb per acre, or 1/2 lb per 1,000 sq ft
Mix Type	Riparian Sites
Species List (click for details)	15% Deertongue, 'Tioga' (Panicum clandestinum (Dichanthelium c.), 'Tioga') 10% Fox Sedge, PA Ecotype (Carex vulpinoidea, PA Ecotype) 8% Virginia Wildrye, PA Ecotype (Elymus virginicus, PA Ecotype) 8% Little Bluestem, 'Itasca', MN Ecotype (Schizachyrium scoparium, 'Itasca', MN Ecotype) 8% Riverbank Wildrye, PA Ecotype (Elymus riparius, PA Ecotype) 7% Indiangrass, 'Southlow'-MI Ecotype (Sorghastrum nutans, 'Southlow'-MI Ecotype) 6% Silky Dogwood, PA Ecotype (Cornus amomum, PA Ecotype) 6% Partridge Pea, PA Ecotype (Chamaecrista fasciculata (Cassia f.), PA Ecotype) 5% Big Bluestem, 'Niagara' (Andropogon gerardii, 'Niagara') 4% Switchgrass, 'Shelter' (Panicum virgatum, 'Shelter') 3% Blue Vervain, PA Ecotype (Verbena hastata, PA Ecotype) 2% Boneset, PA Ecotype (Eupatorium perfoliatum, PA Ecotype) 2% Blue 0 Indigo, Southern WV Ecotype (Baptisia australis, Southern WV Ecotype) 2% Autumn Bentgrass, PA Ecotype (Agrostis perennans, PA Ecotype) 2% Soft Rush (Juncus effusus) 2% Arrowwood, PA Ecotype (Viburnum dentatum, PA Ecotype) 2% Giant Ironweed, PA Ecotype (Vernonia gigantea (V. altissima), PA Ecotype) 2% Blackeyed Susan, Coastal Plain NC Ecotype (Rudbeckia hirta, Coastal Plain NC Ecotype) 2% Oxeye Sunflower, PA Ecotype (Heliopsis helianthoides, PA Ecotype) 1% Joe Pye Weed, PA Ecotype (Eupatorium fistulosum, PA Ecotype) 1% Common Sneezeweed, Northern VA Ecotype (Helenium autumnale, Northern VA Ecotype) 1% Wild Bergamot (Monarda fistulosa) 1% Great Blue Lobelia, PA Ecotype (Lobelia siphilitica, PA Ecotype) Total: 100%

Section 5

FRESHWATER MUSSEL AND EASTERN SPADEFOOT TOAD SURVEYS OF OHIO RIVER MILE ~334.1, RDB NEAR IRONTON, LAWRENCE COUNTY, OHIO

***Presented to*:**

B.F. Iron & Metal
PO Box 1838
Ashland, KY 41105-1838

And

ETA Engineering and Consulting
5802 Brown Lane
Catlettsburg, KY 41129

Prepared by:

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ES Project # 2571

July 26, 2008

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ACKNOWLEDGEMENTS

B.F. Iron and Metal (BFIM) provided funding for this study through its representative, ETA Engineering and Consulting (ETA). Mr. Brian Horsley was the project manager for ETA. Mr. Gregory Zimmerman was the field manager for EnviroScience, Inc. (ES). Mr. Daniel Lakamp (ES) was the dive supervisor and Mr. Josh Rowland (ES) the dive safety officer and a diver. Mr. Mike Hanway (ES) was the primary diver for the field study. Mr. Zimmerman (ES) authored this report and constructed the maps. Mr. Jeff Davis performed the Eastern spadefoot toad habitat survey as a consulting scientist under contract with ES.

INTRODUCTION

ETA Engineering and Consulting (ETA) has been contracted by B.F. Iron & Metal (BFIM) to permit and design for the construction of a barge cleaning and repair facility at river mile 334.1 on the right descending bank of the Ohio River near Ironton (Lawrence County), Ohio and Greenup County, Kentucky. This area of the Ohio River is known as the Greenup Pool. Indirect and direct impacts from the project construction and barge fleeting may include river disturbance, sedimentation, scouring, and/or changes in local water conditions and biota.

Because the construction of the facility may alter or disturb the riverbank, riverbed and/or existing flow patterns in the Ohio River, the USFWS and the Ohio Department of Natural Resources (ODNR) requested that a freshwater mussel survey (Unionidae) and Eastern Spadefoot Toad (*Scaphiopus holbrookii*) surveys be completed as part of the permit review process.

Freshwater Mussels

This project could directly or indirectly affect freshwater mussels (Family: Unionidae) inhabiting the riverbed near the project site. Freshwater mussel resources in the Ohio River, and throughout North America, have declined in the last century due to factors such as impoundment, channelization, sedimentation, pollution, commercial harvesting, and invasive species (Fuller, 1974; Aldridge *et al.*, 1987; Taylor, 1989; Bogan, 1993; Williams *et al.*, 1992, 1993; Ricciardi *et al.*, 1998, Box and Mossa, 1999; Vaughn *et al.*, 1999; Watters, 2000). Due to recent population declines, many freshwater mussel resources are protected at the state and federal levels.

In the last several decades, evidence of 54 unionid species has been collected in the upper Ohio River, including 45 species that were found either live or freshly dead (ESI, 2000). Of the 54 recent mussel species, two are considered extinct (*Epioblasma flexuosa* and *E. t. torulosa*), seven others are listed as federally endangered (*Cyprogenia stegaria*,

Lampsilis abrupta, *Obovaria retusa*, *Plethobasus cicatricosus*, *Plethobasus cooperianus*, *Pleurobema clava*, and *Pleurobema plenum*; USFWS, 2005), one is a federal candidate for listing (*Plethobasus cyphyus*), and numerous others are also listed as rare by the bordering states. Only three of the above federally endangered or candidate species (*C. stegaria*, *L. abrupta*, and *P. cyphyus*) have been found alive in the upper Ohio River in recent decades. Although it is unlikely these species are present within the project area, a mussel survey should be completed to assess the mussel resources in the project area.

Eastern Spadefoot Toad

The Eastern spadefoot toad (*Scaphiopus holbrookii*) is listed as state endangered within Ohio. A habitat survey for the eastern spadefoot toad was completed by Mr. Jeff Davis, a ODNR-approved consulting scientist under contract with ES. The results of the habitat survey are included separately as Attachment C.

The objectives of this study were to 1) determine the presence/absence of federally and state endangered and other unionid species in the project area (including a buffer zone), and 2) characterize the unionid species composition, relative abundance, distribution, and habitat within the project area and buffer zone, and 3), determine the likelihood of the Eastern spadefoot toad existing within the project area through a habitat survey. This information will be used by the U.S. Fish and Wildlife Service and the Ohio Department of Natural Resources to determine if and how the project may affect unionid resources as well as the Eastern spadefoot Toad, and their habitat.

METHODS

Mussel Survey

Surveying methods followed a protocol developed by the Ohio River Valley Ecosystem (ORVE) Mollusk Subgroup entitled "Draft Protocol for Mussel Surveys in the Ohio River Where Dredging/Disposal/Development Activity is Proposed" (Appendix A). The study area was approximately 652m long and 100m wide (extending riverward from the Ohio bank). A site map showing the general project area is provided in Figure 1.

The ORVE protocol calls for a semi-quantitative (sampling of the substrate surface within a known area) sampling approach. A total of nine transects were established perpendicular to the bank at 100m intervals. Each transect extended 100m from the bank riverward and was divided into 10m sections. Each 10m section was considered a separate sample, for a total of 110 samples. Within each 10m section, a diver visually and physically (disturbing the substrate surface by hand) searched a one meter-wide path of the substrate along the transect and collected all mussels (live and dead) into a mesh bag. The target search time for each transect was approximately one hour.

Collection bags were returned to the boat so mussels could be processed by an agency approved malacologist. All live mussels were identified, counted, measured (length in mm), and sexed (sexually dimorphic species only). All dead shells were identified and scored as either fresh dead (lustrous nacre, dead <1yr), weathered dead (dull or chalky nacre, dead one to many years), or subfossil (heavily weathered and fragmented, dead many years to many decades) and noted as present. Live mussels were kept in ambient river water before and after processing. During processing, mussels were kept cool and moist and were not held out of the water more than 5-10min. All live mussels were returned to the area where they were collected.

The presence and abundance of zebra mussels (*Dreissena polymormpha*) were noted and recorded as percent coverage of a 0.25m^2 every 10m. Relative substrate composition (Wentworth Scale) was also estimated by the diver every 10m and reported via two-way diver/tender communications. Depth was measured every 10m using a pneumatic depth gauge attached to the diver. Global Positioning Coordinates (GPS) coordinates of each transect endpoint and spot dive were recorded so that an accurate map of the study area, including habitat and mussel distribution, could be constructed using ArcGIS (v.9.1) software. Digital images of protected species and site reference points were taken (Appendix B). Dead shells of each common species were retained as vouchers and will be sent to the Ohio State Museum of Biological Diversity (Columbus, OH) and/or resource agencies that granted permission to collect and handle the mussel resources.

Quality Control

Several measures of quality control were implemented to ensure thorough mussel collection and accurate habitat assessment by divers. Initially, an EnviroScience malacologist conducted an orientation with the divers on proper search methods and habitat assessment. Also, four 5min timed searches were completed in-between transects to confirm the results of the transect surveys.

Live unionids and site reference points were photo documented with a digital camera. Several voucher shells were taken and will be deposited at the Ohio State Museum of Biological Diversity and/or resource agencies that grant permission to collect and handle mussel resources.

RESULTS

Mussel Habitat

Mussel habitat within the project area was found to be poor. In general, the river depths were relatively deep (30ft) beginning a few meters from the bank and the hard substrates (mud and clay) were covered in a thick (6in to 2ft) layer of fine silt. River flow on the bottom as observed by the diver was very low (<0.2ft/s) Substrate conditions varied somewhat with distance from the bank along transects and longitudinally (upstream to downstream) within the study area, however most of the substrate types appeared to be poor habitat for endangered mussels. Depth typically reached 27ft by the midpoint (*e.g.*, 50m) on most transects, and depths increased riverward. The maximum depth observed was 30ft.

Zebra mussels (*Dreissena polymorpha*) were present in the study area but only in small concentrations. Zebra mussels were found alive on the only freshwater mussel collected. Zebra mussels measured approximately 14mm in length (longest axis). On this single unionid, only a moderate portion (~15%) of the shell on the ventral-posterior edge was covered by zebra mussels.

Unionid Mussel Survey Results

Only one live unionid, a pink heelsplitter (*Potamilus alatus*) was collected during the survey, immediately downstream of the direct impact area on Transect 7, between 10m and 20m from the Ohio bank (Figure 1). This species has no special federal or state status and is one of the most common species within the upper Ohio River in predominately mud and clay habitats. No dead or relic unionid shell material was observed.

Osprey (Pandion haliaetus) Observations

During the mussel survey an Osprey (*Pandion haliaetus*) was observed nesting and actively feeding young on one of the barge pilings near the center of the project area

(Appendix B). Because the Osprey is protected under state and federal regulations, certain precautions may be necessary during construction. These precautions may include delaying construction until the Osprey chicks leave the nest. ES can work with ETA to contact the USFWS and ODNR directly to determine the necessary avoidance or mitigation measures to receive project construction approval.

Eastern Spadefoot Toad Habitat Survey Results

The Eastern Spadefoot Toad Habitat Survey Report is provided separately in Attachment C. Based on a survey of the property, suitable habitat for the state endangered Eastern spadefoot was limited to poor and additional presence / absence surveys were not recommended.

CONCLUSIONS

Mussel Resources

Based on the results of the mussel survey, the project area does not contain a mussel concentration that should warrant mitigation for development. Mussel habitat within the study area was found to be poor, and only one live mussel was found downstream from the direct impact area. Due to the relatively deep nature of the project area (30ft nearly to the river bank), extensive dredging and disturbance of the river bottom will probably not be necessary to allow for barge access to the proposed facility.

Eastern Spadefoot Toad Habitat

The habitat survey ranked the subject site as providing low quality Eastern Spadefoot habitat. A standard survey to determine their status at the site was not recommended as a follow up to the habitat survey.

Osprey Nesting Site

The ODNR and USFWS should be contacted to determine the appropriate avoidance or mitigation measures necessary for the Osprey nesting area identified at the site.

LITERATURE CITED

Aldridge, D. W., B. S. Payne, and A. C. Miller. 1987. The effects of intermittent exposure to suspended solids and turbulence on three species of freshwater mussels. *Environmental Pollution* 45:17-28.

Bogan, A. E. 1993. Freshwater bivalve extinctions (Mollusca: Unionoida): a search for causes. *American Zoologist* 33:599-609.

Box, J. B. and J. Mossa. 1999. Sediment, land use, and freshwater mussels: Prospects and problems. *Journal of the North American Benthological Society* 18:99-117.

Ecological Specialists, Inc. (ESI). 2000. *Final Report: Freshwater Mussels (Bivalvia: Unionidae) of the Upper Ohio River.* Prepared for the Mussel Mitigation Trust Fun Committee and U.S. Fish and Wildlife Service. 99pp + appendices.

EnviroScience, Inc. 2005. Unionid Mussel Survey of Ohio River Miles 242.0-243.4 Near American Electric Power's Mountaineer Plant. Final Report to AEP. 10pp + appendices.

Fuller, S. L. H. 1974. Clams and mussels (Mollusca: Bivalvia). Pages 215-274 *in* Hart, C. W., Jr. and S. L. H. Fuller. *Pollution ecology of freshwater invertebrates.* Academic Press New York. 387pp.

Ricciardi, A., R. J. Neves, and J. B. Rasmussen. 1998. Impending extinctions of North American freshwater mussels (Unionoida) following the zebra mussel (*Dreissena polymorpha*) invasion. *Journal of Animal Ecology* 67:613-619.

Taylor, R. W. 1989. Changes in freshwater mussel populations of the Ohio River: 1,000 bp to recent times. *Ohio Journal of Science* 89(5):188-191.

United States Fish and Wildlife Service. 2005. The Endangered Species Program website. http://endangered.fws.gov .

Vaughn, C. C. and C. M. Taylor. 1999. Impoundments and the decline of freshwater mussels: a case study of an extinction gradient. *Conservation Biology* 13(4):912-920.

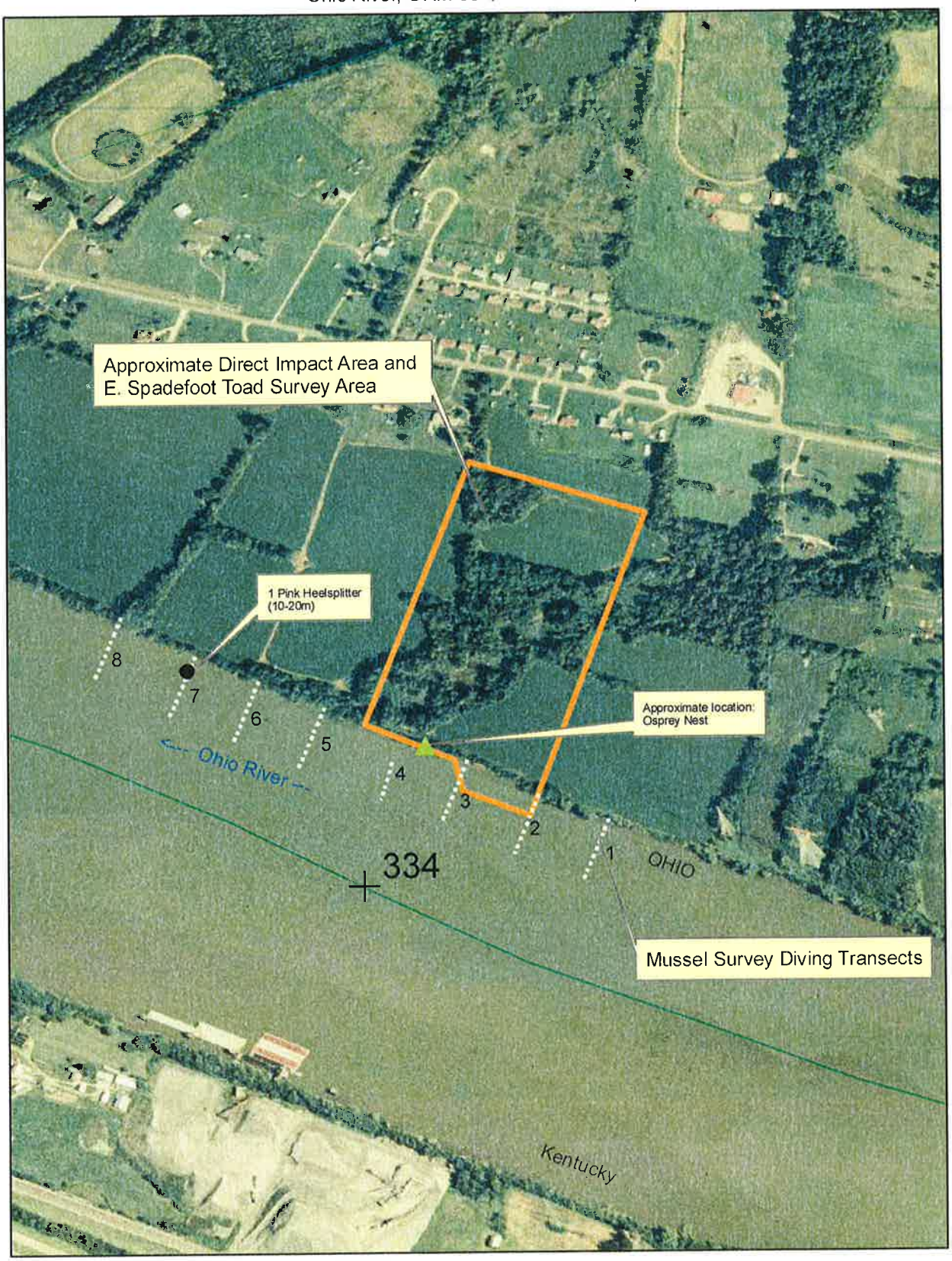
Watters, G. T. 2000. Freshwater mussels and water quality: a review of the effects of hydrologic and instream habitat alterations. Proceedings of the First Freshwater Mollusk Conservation Society Symposium, 1999, pp 261-274. Ohio Biological Survey.

Williams, J. D., S. L. H. Fuller, and R. Grace. 1992. Effects of impoundments on freshwater mussels (Mollusca: Bivalvia: Unionidae) in the main channel of the Black Warrior and Tombigbee Rivers in Western Alabama. *Bulletin Alabama Museum of Natural History* 13:1-10.

Williams, J. D., M. L. Warren, Jr., K. S. Cummings, J. L. Harris, and R. J. Neves. 1993. Conservation status of freshwater mussels of the United States and Canada. *Fisheries* 18:6-22.

FIGURES

Figure 1.
Mussel and Toad Survey Area and Results;
Ohio River, ORM 334.1 near Haverhill, OH



EnviroScience, Inc.
888-866-8540

APPENDICES

Appendix A

Draft Protocol for Mussel Surveys in the Ohio River Where Dredging/Disposal/Development Activity is Proposed (Ohio River Valley Ecosystem Mollusk Subgroup [April 2004]).

Draft Protocol for Mussel Surveys in the Ohio River
Where Dredging/Disposal/Development Activity Is Proposed
Ohio River Valley Ecosystem Mollusk Subgroup (clarified April 2004)

Introduction: This protocol provides some basic mussel survey methodology and guidance for a more consistent approach to conducting mussel surveys throughout most of the Ohio River. It is a qualitative diving survey technique to be applied to areas proposed for dredging and/or spoil disposal. The protocol is driven by the goals of the survey. It is not the best@ survey technique for all possible purposes, but it is suitable for an area where the goal is to identify mussel concentrations and then avoid them. This level of survey effort is not sufficient to prove the absence of a listed species. It is not quantitative and will not tell you how many mussels are present, or the true relative abundance or density of the community. The collaborators on this protocol development concur that such a detailed level of information is not necessary if the goal is merely to avoid mussel concentration areas. It assumes that surface searching, with a little digging by hand, will not uncover all the mussels which are present in the substrate.

This protocol is a >work in progress= and does not address in detail all issues and concerns related to dredging/disposal/development activities. It is not yet "officially" approved and endorsed by any federal or state agency, but rather represents the best professional judgment of mollusk experts in the ecosystem. It needs to be adequately field tested to determine if the standards and guidelines presented herein are sufficient to protect the mussel resource and corresponding riverine habitat; therefore, it is subject to change or modification if testing indicates such action is appropriate. After sufficient testing and review is completed, it may be submitted for official agency approval.

This protocol has been utilized by consultants for the Corps maintenance dredging program since 2002, and The Ohio River Valley Ecosystem Team (ORVET) Mollusk Group anticipates further testing this protocol during the summer of 2004. This may provide opportunities to work together with those entities involved in dredging/disposal/development activities, to further develop and fine tune this protocol.

Background: The origin and concept of this protocol arose out of the need to develop standards and guidance in advance of surveys for year 2002; the requirement in the various state Water Quality certifications that mussel surveys must have approved protocols ahead of time; and the application for commercial sand and gravel dredging for many miles of the Ohio River during the fall of 2001 and at recurring intervals (e.g., every five years). Various representatives of state, federal, university and private organizations participated in a conference call during October 2001 to construct an approach and create a protocol. Information gleaned from that conference call was used to construct a protocol which was subsequently reviewed and discussed at the ORVET Mollusk Group in November 2001. A draft protocol was then distributed for review and comment. During a meeting to discuss anticipated dredging activities in the Ohio River, held in Frankfort, Kentucky in February 2002, there was additional discussion regarding this draft protocol, and the need to clarify portions of the protocol and address additional concerns, especially from the Corps, regarding the protocols potential impact on their navigation dredging activities. Additional comments along with notes from a meeting to discuss the protocol on March 5th, 2002 in Frankfort, Kentucky, have resulted in this latest version of the draft protocol, revised for clarification purposes in April 2004.

Goals:

1. To protect sections of a river which support federally listed mussel species and/or a mussel concentration from the impacts of any dredging/disposal/development activities. For the purposes of this protocol, a mussel concentration is one live animal per square meter. The presence of one live or fresh dead federally listed species will also constitute a mussel concentration requiring protection (for further details, see **Sampling approach**).

2. Arrive at a scientifically sound protocol to identify areas of unionid mussel concentrations, determine if live or fresh dead federally listed mussels are present within the proposed activity area, and identify areas that may support federally listed species.

3. Incorporate this protocol into the Scope of Work (SOW) for those conducting mussel surveys in big rivers where any dredging/disposal/development activity is proposed.

Application of this protocol: Although much of this protocol addresses dredging/disposal activities, it may be adapted for use on other types of projects on the river (such as development of loading facilities etc.). The applicant/action agency should coordinate with state and federal agencies prior to conducting any surveys in order to determine what modifications to the protocol are appropriate. **Note**: Survey data collected on a specific site will be considered valid for five years from the date the survey was conducted.

Location: For Ohio River investigations, this protocol is considered most appropriate for river reaches **downstream of Willow Island Lock and Dam**. Although portions of this protocol (e.g., sampling technique) may be applicable upstream of Willow Island Lock and Dam, any upstream activities will, at this time, need to be addressed on a case-by-case basis with appropriate state and federal agency representatives. The Atrigger@ for a mussel concentration area will likely need to be adjusted in the upper Ohio River, since that area is in a recovery/re-colonization phase.

Notification: Survey plans should be provided to appropriate state and federal officials at least two weeks prior to the time the actual survey will occur. Appropriate state and federal officials will be notified at least one week prior to the time the actual survey will occur. In addition, state and federal agencies should be given at least 30 days to review survey results prior to the anticipated start of the dredging/disposal/development activity.

Survey period: Mussel surveys may only be conducted from **May 1 to October 31.** Any survey work outside this period will be done only under extenuating circumstances, and with separate approval obtained from the appropriate state and federal agencies prior to conducting the work, and possibly a different protocol.

Visibility requirements: Since this is a qualitative surface survey relying primarily on visual cues, minimum visibility is **one-half meter** (approx. 20 inches), with or without lights, at depth of the survey. This distance is approximately the length of one side of a quarter meter square sampling frame. When recording visibility along with other data, quantify the actual visibility rather than just note that it met the minimum requirement. Recording this information will help determine if the one-half meter minimum distance should be modified in the future. If suitable visibility is not present at the intended time of the survey, then the survey must be re-scheduled, or a different protocol employed in consultation with the appropriate state and federal agencies. (e.g., more extensive quantitative surveys with excavations may be required).

Standard data to be collected: A standard data sheet form to include the following information will be provided: **Required data** will include persons collecting information, diver(s) and mussel identifier, surface weather conditions, air and water temperature, visibility (see aforementioned visibility requirements), collecting time, river location, GPS coordinates of ends of dive transects, substrate information (use Wentworth size scale to determine percent silt, sand, gravel, cobble, boulder, bedrock, scoured substrate, etc.), relative compaction of the sand and gravel substrate, an estimate of the percent zebra mussel coverage of the substrate, and identification of mussels, both live and dead, to species. A voucher specimen of a species of mussel observed dead will be provided to the appropriate state and/or federal agency representative. A photograph of any live federally listed mussel observed will be provided to the appropriate state and/or federal representative. A photograph of live state listed species, if not previously vouchered, will be provided to the appropriate state representative. **Optional data** will include the presence/absence of live snails, the size range of mussels (to help determine recruitment), photograph of state listed species, and other information the collector deems worthy to include.

Buffer zones: Once a mussel concentration is identified, the following buffer zones apply - 1500 feet upstream, 500 feet downstream, and 500 feet adjacent to the limits of a federally listed mussel and/or mussel concentration, to the area of any dredging and/or disposal activity, except as noted in the following section concerning channel maintenance navigation dredging.

Note: There are additional buffer zone requirements regarding the distance from shore commercial sand and/or gravel dredging is allowed. Contact the appropriate state agency for their current regulations.

If **navigation dredging** will occur less than 500 feet from a mussel concentration, then the following will apply:

X The applicant/action agency will consult with the appropriate state and federal agency representatives to determine what level of mussel survey effort is to be conducted prior to dredging activity. It is very likely the state and/or federal agency representative will require additional search effort, especially to determine if federally listed mussels are present, in addition to survey effort already described under the **Sampling approach** portion of this protocol.

X Bathymetric monitoring of the site will occur prior to, immediately after, and one year after the dredging activity. This information will be provided to the appropriate state and federal agency representative within two weeks after each phase of bathymetric monitoring occurs. After the post one year bathymetric monitoring is conducted, the applicant/action agency will consult with the appropriate state and federal agency representative, to determine if additional bathymetric monitoring will be required.

Sampling approach: Transects shall be established throughout the proposed site perpendicular to the river, spaced no farther than 100 meters apart and using a minimum of three transects, and spanning (length and width wise) the proposed dredge area and buffer zones. Each transect will be sub-divided into 10 meter segments. Along each transect, divers shall visually search an area one meter wide for mussels. A visual search includes moving cobble and woody debris, hand sweeping away silt and small detritus, and disturbing/probing the upper one to two inches of substrate in order to better view the mussels which may be there. A minimum of five minutes of visual searching will be expended in each segment in which mussels and/or suitable mussel habitat is present. Mussels observed along the transect will be recorded as occurring in a particular segment. In each 10 meter segment mussels observed will be bagged and brought to the surface for further processing and positive identification, unless the appropriate state and federal agency representative both agree to permit some mussel identification to occur at the survey depth. However, any species which may resemble a federally listed species must be brought to the surface for positive identification. Appropriate information describing the habitat conditions along each transect, such as depositional areas, silt, mud, detritus, hard-pan sand, and scoured areas where mussels cannot burrow, etc., shall be recorded for each 10 meter segment. If no mussels are observed in two adjacent transects, with at least one of the transects containing apparent suitable mussel habitat, then a dive search of a minimum of 10 minutes in length will occur between the two transects in the area of suitable mussel habitat. If any live and/or fresh dead mussels are found between the two transects during the search dives, then an additional transect will be placed there and a search conducted as previously described.

The agreed-upon threshold of a mussel concentration is one animal per square meter, but not all mussels present are visible at the substrate surface. For the purposes of this protocol, only 50% are assumed visible. Consequently, an observed density of 0.5 animals per square meter would indicate an actual density of at least 1 animal per square meter.

Therefore, if five or more live mussels are observed within any 10 square meter segment of the transect (i.e., the observed density is greater than or equal to one-half mussel per square meter), and/or if a federally listed mussel is present, then the appropriate buffer zones will be established around that segment within which dredging and/or disposal activity will not occur.

Note: If there is a desire to conduct a mussel survey in a different manner than as described above or under different environmental conditions, then it will need to be handled on a case-by-case basis with the appropriate state and federal representatives.

Appendix B

Digital images recorded at the Project Site (Ohio River Mile 334.1), July 2008.

Photo1: EnviroScience dive vessel (E. O. Wilson) and dive team at the Greenup Boat Launch in Ironton, Ohio.

Photo2: View of the upstream portion of the project area. Note power lines.

Photo 3: View of dive team setting transect lines, just downstream from existing barge fleeting area and direct impact area.

Photo 4: View of the active Osprey nest on barge fleeting pier.

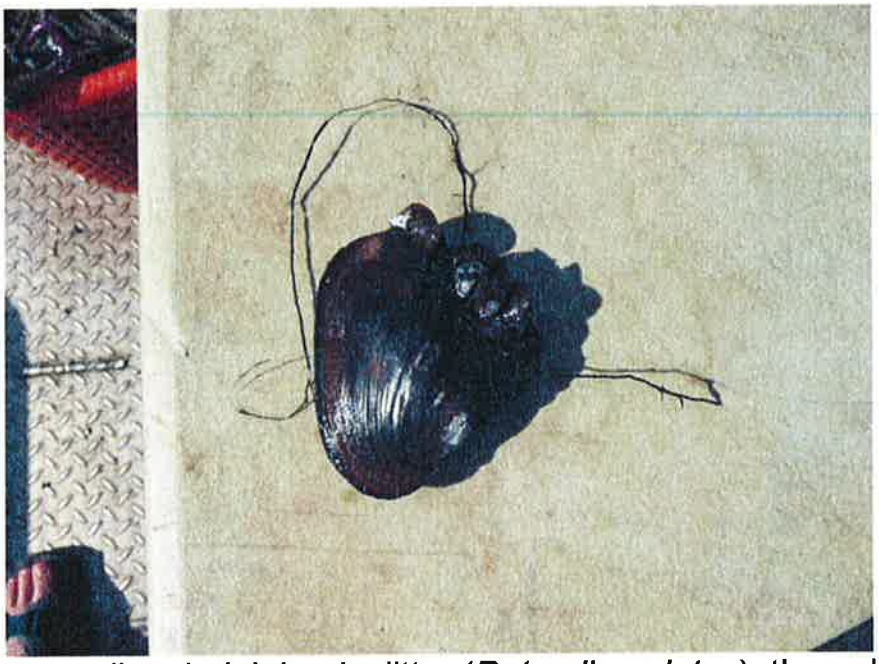


Photo 5: A non listed pink heelsplitter (*Potamilus alatus*); the only mussel detected within the survey area. Note the attached live exotic zebra mussels.

Appendix C

Final Report: Eastern Spadefoot (*Scaphiopus holbrookii*) Habitat Survey at a proposed barge cleaning and repair facility at Ohio River Mile 334.1 in Hamilton Township, Lawrence County, Ohio

Final Report: Eastern Spadefoot (*Scaphiopus holbrookii*) Habitat Survey at a proposed barge cleaning and repair facility at Ohio River Mile 334.1 in Hamilton Township, Lawrence County, Ohio

Submitted to:

EnviroScience, Inc.
6751 A-1 Taylor Road
Blacklick, Ohio 43004

Submitted by: Jeffrey G. Davis, Ohio Division of Wildlife Approved *S. holbrookii* Surveyor

Jeffrey G. Davis
625 Crescent Road
Hamilton, Ohio 45013

July 16 2008

1.0 INTRODUCTION

1.1 Purpose

This report presents the findings of an Eastern Spadefoot (*Scaphiopus holbrookii*) habitat evaluation performed at a site where a proposal has been made to construct a barge cleaning and repair facility on the Ohio River at River Mile 334.1 in Hamilton Township, Lawrence County.

1.2 Site Description

The approximate center of the subject site is located in Lawrence County, Hamilton Township, Ohio in the Ohio River floodplain at 38°34'2.24"N, 82°48'6.55"W in the Greenup, Kentucky - Ohio USGS 7.5 Minute Series Topographic Quadrangle. Elevations range from approximately 530 feet along the shore of the Ohio River to a 540 feet above mean sea level (Figures 1 and 2). There is a wooded stream valley that runs diagonally from northeast to southwest at the site. The soils in the valley are mucky and poorly drained. This valley appears to be frequently inundated by Ohio River floodwaters. The predominant upland soils at the subject site consist of several deposits of Silt Loam (Figure 3).

1.3 Eastern Spadefoot Life History

The Eastern Spadefoot (Figure 4), a toad-like member of the family Pelobatidae, was first collected and reported in Ohio by Geier (1945). The following description of the species and its natural history is after Davis and Menze (2002). Adults attain a length of 570 mm. The back is usually brown and the belly is white or pale gray. A pair of curved tan or yellow lines extends from behind each eye and down the back forming an hourglass pattern. The Spadefoot's sides are sparsely covered with small warts that are usually orange in color. A pair of indistinct paratoid glands is located behind the eyes. The eyes bulge significantly and unlike those of any other anuran that occurs in Ohio, their pupils are vertically elliptical (Figure 5). A sickle-shaped, sharp, black tubercle, usually called the spade, is located on each heel. It enables the Spadefoot to burrow vertically and backwards into the soil. This spade on the foot is the namesake of the species (Figure 6).

Several environmental components determine whether or not Eastern Spadefoots might inhabit an area. The soil must be sandy or loose loam that is sufficiently friable to enable them to burrow (Figure 7). In Ohio Spadefoots may inhabit open woods but they are most frequently associated with fields where the canopy is open or along the edges of woodlands. There must also be hydric soils capable of holding pools of water for several weeks within 1000 meters of burrowing sites. These serve as the Spadefoots' breeding sites.

Mating occurs between late March and August in Ohio. The earliest recorded date for reproduction in Ohio was 28 March 2008 in Scioto County. Adults move from their

burrows to temporary pools to breed after torrential thunderstorms associated with significant drops in atmospheric pressure bring flooding rainfall. Breeding sites in Ohio can be small puddles in river valley fields and yards to large flooded agricultural fields (Figures 8 and 9). Permanent water is rarely used. The males' advertisement call can be described as a harsh "whar" that has been likened to the call of nestling crows. Amplexus is inguinal and the eggs are laid in double bands about twelve inches long and draped over submerged vegetation (Figure 10). The tadpoles are voracious feeders (Figure 11). They eat algae, plankton, drowned earthworms, and as their temporary pools begin to dry they may become cannibalistic. While other Ohio species of frogs and toads require eight weeks to three years to metamorphose, Eastern Spadefoots may metamorphose in as few as two or three weeks. Reproduction can be repeated several times in a season but during dry years it may not take place at all.

Eastern Spadefoots spend most of their time burrowed into sandy soils. They do not venture far from their burrows except to reproduce. On rainy nights they may leave them to forage on a variety of small invertebrates, especially insects. They typically return to the same burrow. If the weather is dry, Spadefoots ambush passing insects from the mouth of their burrow. In Ohio Eastern Spadefoots are restricted to the Hocking, Muskingum, Ohio, and Tuscarawas River valleys. There is one record from 1957 in Pike County in the Scioto River drainage. The distribution of the Eastern Spadefoot in Ohio is illustrated in Figure 12.

2.0 METHODS

2.1 Site Reconnaissance

On 15 July 2008 the subject site was visited and the reconnaissance portion of the habitat evaluation was conducted. The perimeter of the agricultural fields, which were planted in soy beans, were walked as were swales across the fields that were devoid of plants. These bare spots were apparently flooded during the planting season or if flooding occurred afterward, the seedlings died while inundated. The margins of the woodlots were also examined and I investigated the ravine that bisects the area from northeast to southwest. Likewise observations were made at varying intervals along the Ohio River shoreline.

During the habitat evaluation, I looked for a variety of primary indicators of Eastern Spadefoot habitat. Four indicators were evaluated at the subject site. These included....

1. the presence of suitable breeding sites on or within 1000 meters of the subject site.
2. the presence of an open canopy or open woodland habitat.
3. ground cover that can support sufficient Spadefoot forage (insects and their larvae and other small invertebrate animals).
4. the presence of friable soils (either sand or loam) at the subject site.

A fifth element in evaluating habitat is the historical presence of the species in the vicinity of the subject site which is explained in section 2.2 below.

2.2 Museum and Literature Searches

A review of the literature and a search for museum specimens was conducted to determine the history of Eastern Spadefoot distribution in the vicinity of the subject site. Because river floodplains serve as migration corridors for this species, the search included historical records for Eastern Spadefoots in Lawrence County and its neighboring counties in the Ohio River valley and the valleys of its tributaries.

2.3 Habitat Quality Ranking

The results of the site reconnaissance survey are combined with the literature and museum searches to assess the suitability of the subject site as Eastern Spadefoot habitat. If potential Eastern Spadefoot habitat (habitat ranked moderate or high quality) is present on site, a Presence - Absence Survey is recommended to determine the Eastern Spadefoot's status there.

Eastern Spadefoot habitat quality is ranked by the number of habitat indicators present and the history of known populations in the vicinity of the subject site. Also considered in the evaluation are any anecdotal records (word of mouth but no conclusive evidence is available), and information from herpetologists familiar with the species and the region. Finally, consideration is given based on what is known about the herpetological community in the county. If herpetologists have made significant efforts historically to document the amphibians and reptiles in the county, one can assume an increased probability that most species that occur in it will have been found; the Eastern Spadefoot being among them.

It is very important to understand that due to the Eastern Spadefoot's unpredictable breeding season, fossorial habits, and short larval period it can be easily overlooked. This must be taken into consideration when Spadefoot habitat assessments are being conducted.

The habitat is determined to be of **high quality** if all five indicators are present. Four of five indicators rank the habitat to be of **moderate quality**, three indicators rank the habitat as **low quality**, and zero to two indicators rank the site as **unsuitable** for Eastern Spadefoots.

3.0 FINDINGS

3.1 Museum Records and Literature Search

Records accumulated from every museum and university collection known to hold Ohio specimens were examined. The museum search provided records of Eastern Spadefoots from Perry and Fayette Townships in Lawrence County and from Porter Township in neighboring Scioto County. Those from Perry Township were first collected in 1946 and more recently in 2001. All specimens from Fayette Township were collected in 2001 and those in Scioto County, Green Township were collected in 2008. Findings from the museum search are summarized in Table 1.

A report of Eastern Spadefoots from Lawrence County are also present in the literature. Green (1948) discovered populations in 1946 in Lawrence County between Burlington and Ironton. He stated, "There was scarcely a spot between South Point and Ironton where one was out of range of their calls." In his paper, Green makes no mention of looking for Eastern Spadefoots farther downstream from Ironton where the subject site is located.

Lawrence County, Ohio is included in the range of 58 Ohio amphibian and reptile species. Eighty-one percent (47 species) of these have been confirmed by herpetologists and voucher specimens exist in museums or they are reported in the literature. These are represented by 15 frog and toad species, 15 salamander species, two lizard species, ten snake species and five turtle species (Davis and Menze, 2000; Davis and Mennze, 2002; Pfingsten and Matson, 2003; Wynn and, 2006). This supports that Lawrence County's herpetofauna is well documented. Wynn and Moody only report four turtle species from Lawrence County, but one unreported species, the Redear Slider (*Trachemys scripta*) was photographed in the Ohio River at the subject site on 15 July 2008.

3.2 Subject Site Habitat Quality

The entire subject site is located in the floodplain of the Ohio River. With the exception of the valley walls of the stream that bisects the site from northeast to southwest, the land is without significant relief. Much of it is planted in row crops, specifically soybeans (Figure 13). The remainder is under a canopy of second growth trees and shrubs (Figure 14). The ground under much of the woodlots at the site is covered with a horticultural variety of Winter Creeper (*Euonymus fortunei*).

In Ohio, Eastern Spadefoots often inhabit the sandy terraces deposited on the inside bends of rivers. The sand terraces associated with the river bend on which the subject site is located are northeast of State Route 52 more than one kilometer away. Very limited sandy soil was found at the subject site and it was immediately adjacent to the Ohio River. Nearly all of the soil at the subject site was hard packed and not sufficiently friable for Eastern Spadefoots to burrow into. Patches of bare soil in soy bean fields suggest that temporary pools do form in them during periods of significant rainfall. However, they were small and probably would not hold water long enough to support tadpoles through metamorphosis (Figure 15).

Sweeps with an insect net at the subject site produced a diversity of Dipterans, Coleopterans, Lepidopterans, and Hemipterans, among others. There were also numerous other small arthropods present that could serve as forage for Eastern Spadefoots.

Two Anuran species, the American Toad (An*axyrus americanus*) and the Green Frog (*Lithobates clamitans*) were collected at the site. The latter uses permanent bodies of water for breeding while in addition to those, the former also may seek out temporary pools in which to breed.

An evaluation of habitat quality indicators are summarized in Table 2.

4.0 RECOMMENDATIONS

The present habitat survey ranks the subject site as providing **low quality Eastern Spadefoot habitat** based on the findings reviewed below. **A standard survey** to determine their status at the site **is not recommended** as a follow up to the habitat survey.

LITERATURE CITED

Davis, J.G. and S.A. Menze. 2000. Ohio Frog and Toad Atlas. Ohio Biological Survey. Miscellaneous Contributions Number 6.

Davis, J.G. and S.A. Menze. 2002. In Ohio's Backyard: Frogs and Toads. Ohio Biological Survey.

Gier, H.T. 1945. The Spadefoot Toad in Ohio. Copeia. 1945 (1): 50.

Green BN. 1948. The Spade-foot Toad, Scaphiopus h. holbrookii, breeding in southern Ohio. Copeia 1948(1):65.

Pfingsten, R.A. and T.O. Matson. 2003. Ohio Salamander Atlas. Ohio Biological Survey. Miscellaneous Contributions Number 9.

Wynn, D. and S.A. Moody. 2006. The Ohio Turtle, Snake and Lizard Atlas. Ohio Biological Survey. Ohio Biological Survey Miscellaneous Contributions Number 10. iv + 81 p.

Figures

Figure 1. Aerial view of the subject site (provided by EnviroScience, Inc.).

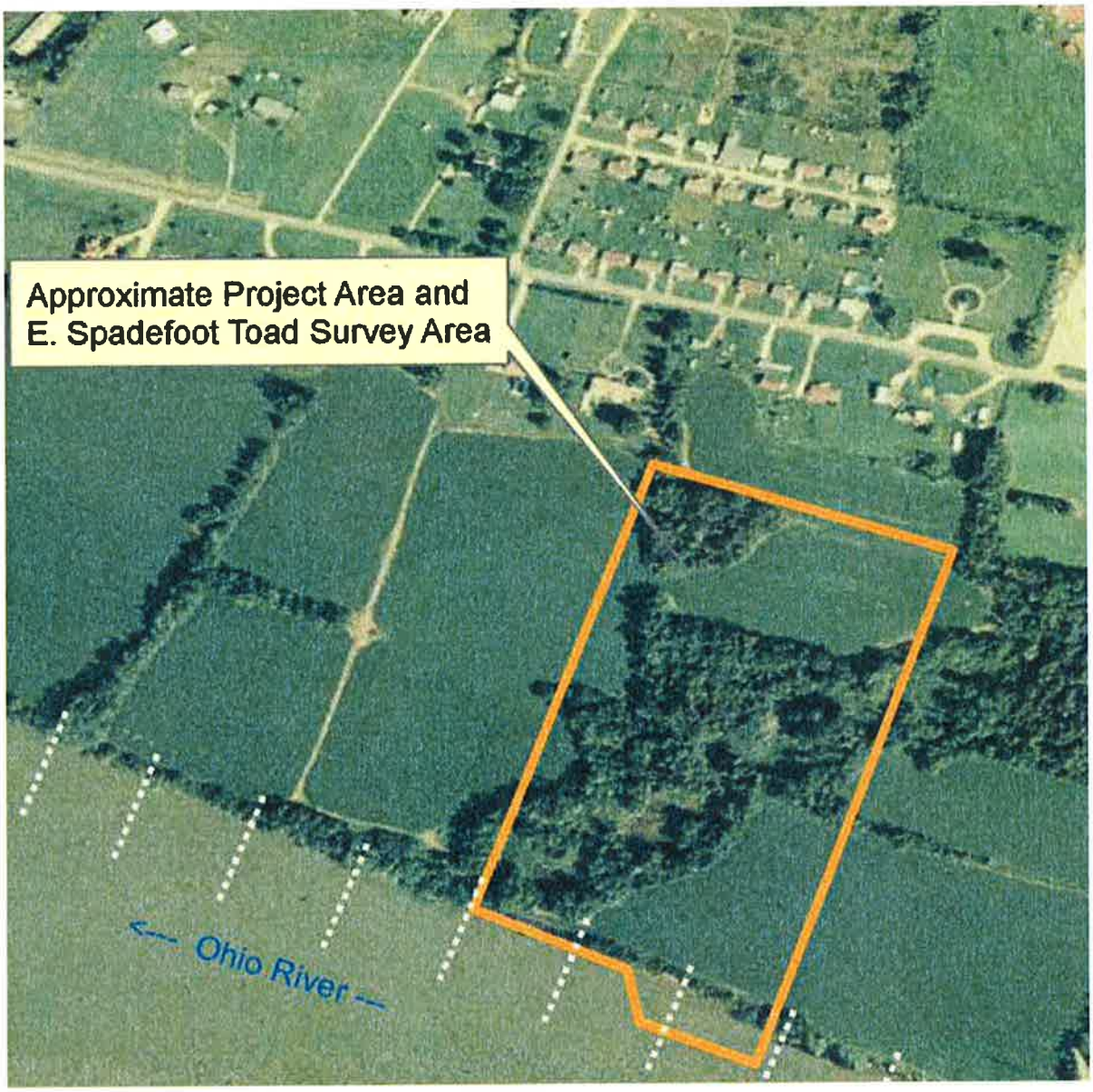
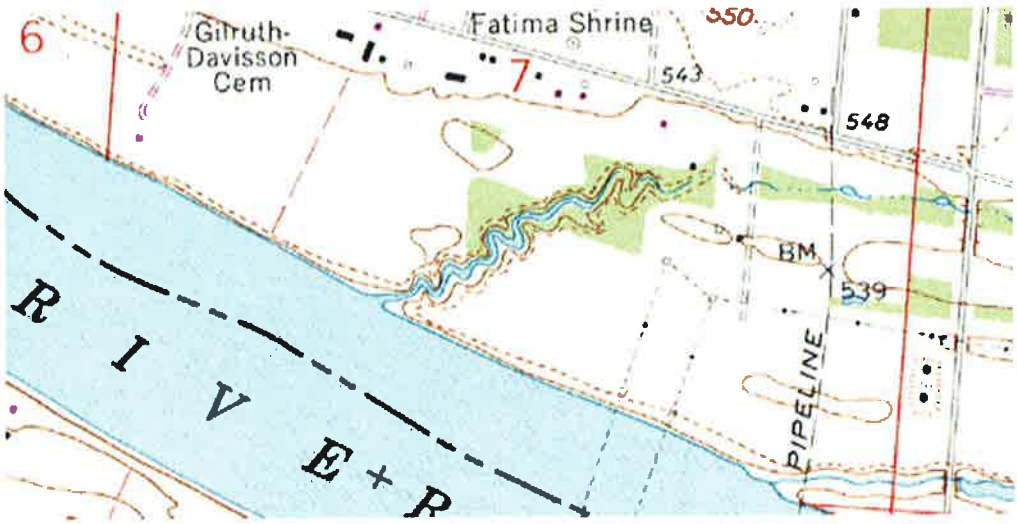


Figure 2. The approximate center of the subject site is located in Lawrence County, Hamilton Township, Ohio in the Ohio River floodplain at 38°34'2.24"N, 82°48'6.55"W in the Greenup, Kentucky - Ohio USGS 7.5 Minute Series Topographic Quadrangle.



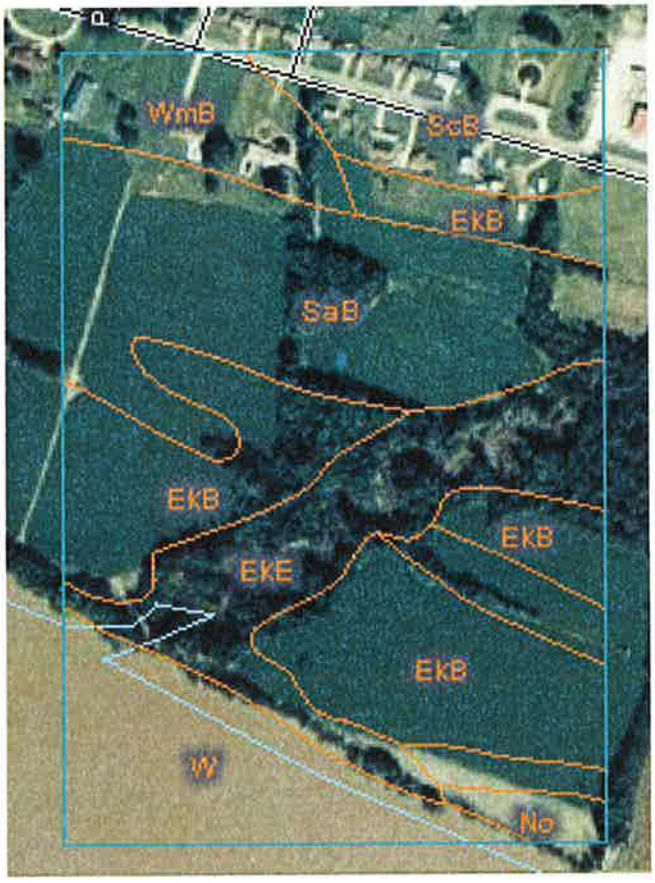


Figure 3. Predominant soils at the subject site are Elkinsville Silt Loams (EkE and EkB) and Sciotoville Silt Loams (SaB). Other soils at the site are also Silt Loams. Wheeling Silt Loams and (WmB) and Nolin Silt Loams (No) are also present at the site.

Map produced at: (http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx).

Figure 4. Eastern Spadefoot, *Scaphiopus holbrookii.*

Figure 5. Eastern Spadefoots are the only Ohio anurans to have vertically elliptical pupils.

Figure 6. The hard, black "spade" on the Eastern Spadefoot's heel is used to dig into soft soil.

Figure 7. In Ohio, Eastern Spadefoots usually inhabit sand terraces on the inside bends of rivers. The sandy or loamy soil must be loose enough that they can burrow into it.

Figure 8. This Eastern Spadefoot breeding pool in Washington County, Ohio. is a puddle in a horse pasture. The tree line in the background borders the Muskingum River.

Figure 9. This Eastern Spadefoot breeding pool in Meigs County, Ohio. is in a flooded corn field. The hills in the background are on the south side of the Ohio River.

Figure 10. Eastern Spadefoot eggs are laid in double bands about 35 cm long and 2 cm wide. These are draped over vegetation in temporary pools.

Figure 11. Spadefoot tadpoles often move in huge schools and are voracious feeders. In addition to filtering plankton they consume algae, dead earthworms, and other tadpoles. This school in Coshocton County is eating its way through an algae mat.

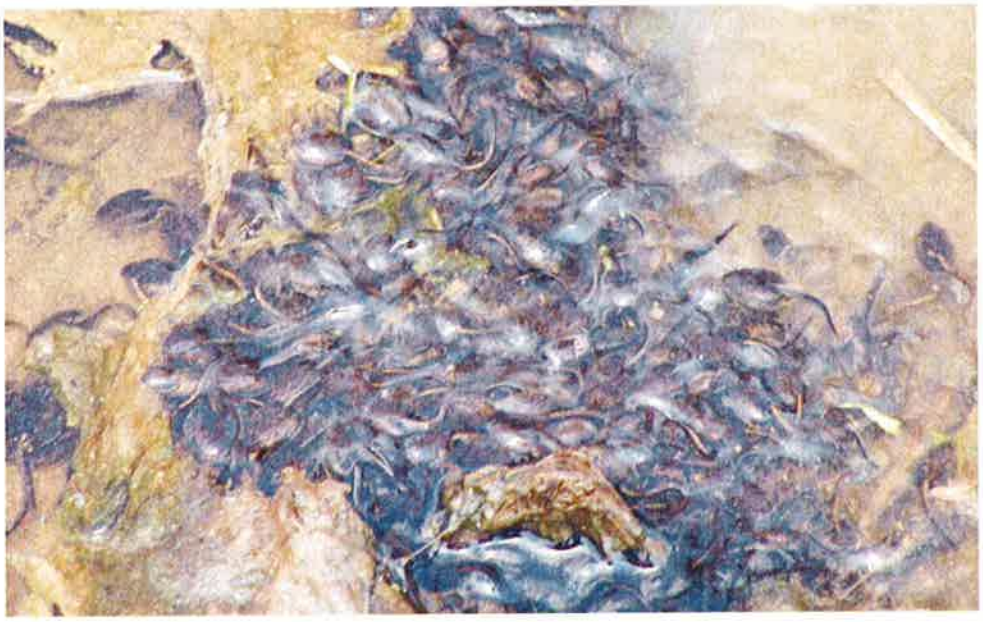


Figure 12. Distribution of the Eastern Spadefoot in Ohio.

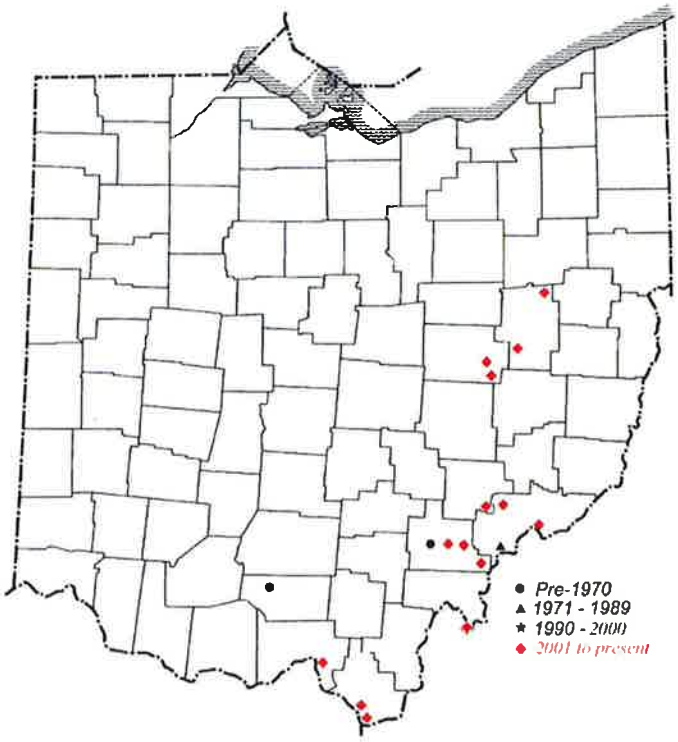


Figure 13. Nearly all of the open canopy habitat at the subject site is planted in Soy Beans.

Figure 14. Most of the area at the subject site that has a closed canopy has soils that are not sufficiently friable for Eastern Spadefoots to burrow into.

Figure 15. Bare spots in Soy Bean fields suggest that water forms temporary pools. Such pools are used by Eastern Spadefoots as breeding sites. None at that subject site appeared to be large enough to hold water sufficiently long to allow for tadpole development before they dry.

Tables

Table 1. Museum records for the Eastern Spadefoot, *Scaphiopus holbrookii*, in Lawrence and Scioto Counties, Ohio and neighboring counties.

County	Township	Locality	Latitude	Longitude	Museum No.	Date
Lawrence	Fayette	South Point	38° 25' 3.9"N	82° 35' 3.8"W	CMC 7920	25 May 2001
Lawrence	Fayette	South Point	38° 25.038'N	82° 34.993"W	CMC (????)	03 June 2001
Lawrence	Perry	Sheridan	38.46588°N	82.60196°W	UMMZ 142701.1- 4	02 June 1946
Lawrence	Perry	Sheridan	38.46588°N	82.60196°W	UMMZ 122604.1- 4	02 June 1946
Lawrence	Perry	South Point	38° 25' 52.1"N	82° 35' 9.4"W	CMC 9219-27	11 June 2001
Scioto	Porter	Sand Hill	38.69527°N	82.85141°W	CMC 11056-57	28 Mar 2008

CMC – Cincinnati Museum Center **UMMZ** – University of Michigan Museum of Zoology

Table 2. Summarization of habitat indicators for the Eastern Spadefoot at the proposed construction site of the AMP – Ohio, Inc. of a base load electric generating plant in Letart Township in Meigs County, Ohio. Three of five indicators are present at the subject site ranking it as **low quality habitat** for Eastern Spadefoots.

Indicator	Present	Comments
Breeding site/s within 1000 m of subject site.	**No**	There was evidence that temporary pools form in some of the agricultural fields, but all appeared too small to maintain water sufficiently long for tadpole emergence.
Open canopy or slightly closed canopy is present	**Yes**	Open canopy was abundant but it was planted in row crops. The floor of the slightly closed canopy areas was covered with dense ground cover.
Friable soils, either sand or loam, are present	**No**	The only sand found on site was immediately adjacent to the Ohio River. Silty loams at the site were hard packed and not friable.
Ground cover provides habitat for insects and other invertebrates for Eastern Spadefoot forage.	**Yes**	A diversity of insects, larvae, and other small arthropods were abundant.
Museum and/or Literature Search provides evidence that Eastern Spadefoots have been found in the vicinity of the subject site.	**Yes**	Voucher specimens from both Lawrence and Scioto Counties are accessioned into the collections at the University of Michigan Museum of Zoology and the Cincinnati Museum Center
Knowledge of the local herpetofauna based on museum records and the available literature.	**n/a**	The herpetofauna of Lawrence County, Ohio is well understood. Eighty-one percent of the species whose ranges include the county have been documented within its borders.

Section 6

Ohio EPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 45.5

Stream & Location: Hawksville, OH 51 **RM:** ___.___ **Date:** 07/20/11

Unnamed tributary to Ohio River **Scorers Full Name & Affiliation:** A. Gupta / EnviroScience

River Code: ___-___-___ **STORET #:** _____ **Lat./ Long.:** (NAD 83 - decimal °) 38.____ 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]	___	10
☐☐ BOULDER [9]	___	___	☐☐ DETRITUS [3]	___	20
☐☐ COBBLE [8]	___	___	☒☐ MUCK [2]	___	10
☐☐ GRAVEL [7]	___	___	☒☐ SILT [2]	___	20
☐☐ SAND [6]	___	5	☐☐ 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
- ☐ 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 0 *Maximum 20*

Comments
no riffles Spring Creek Same substrate

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

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

Cover 14 *Maximum 20*

Comments

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

SINUOSITY
- ☒ HIGH [4]
- ☒ MODERATE [3]
- ☐ LOW [2]
- ☐ NONE [1]

DEVELOPMENT
- ☐ EXCELLENT [7]
- ☐ GOOD [5]
- ☒ FAIR [3]
- ☒ POOR [1]

CHANNELIZATION
- ☒ NONE [6]
- ☐ RECOVERED [4]
- ☐ RECOVERING [3]
- ☐ RECENT OR NO RECOVERY [1]

STABILITY
- ☐ HIGH [3]
- ☐ MODERATE [2]
- ☒ LOW [1]

Channel 12.5 *Maximum 20*

Comments 3.5 2

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)
- ☒☒ NONE / LITTLE [3]
- ☐☐ MODERATE [2]
- ☐☐ HEAVY / SEVERE [1]

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

FLOOD PLAIN QUALITY (L / 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.

Riparian 10 *Maximum 10*

Comments

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)

Pool / Current 5 *Maximum 12*

Comments

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: ☐ 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
Check ONE (*Or 2 & average*)
- ☐ 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]

Riffle / Run 0 *Maximum 8*

Comments

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

DRAINAGE AREA (1.59 mi²)

%POOL: 50 %GLIDE: 50 %RUN: ___ %RIFFLE: ___

Gradient 4 *Maximum 10*

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	☐

1st _____ 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.

Stream is spring fed

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

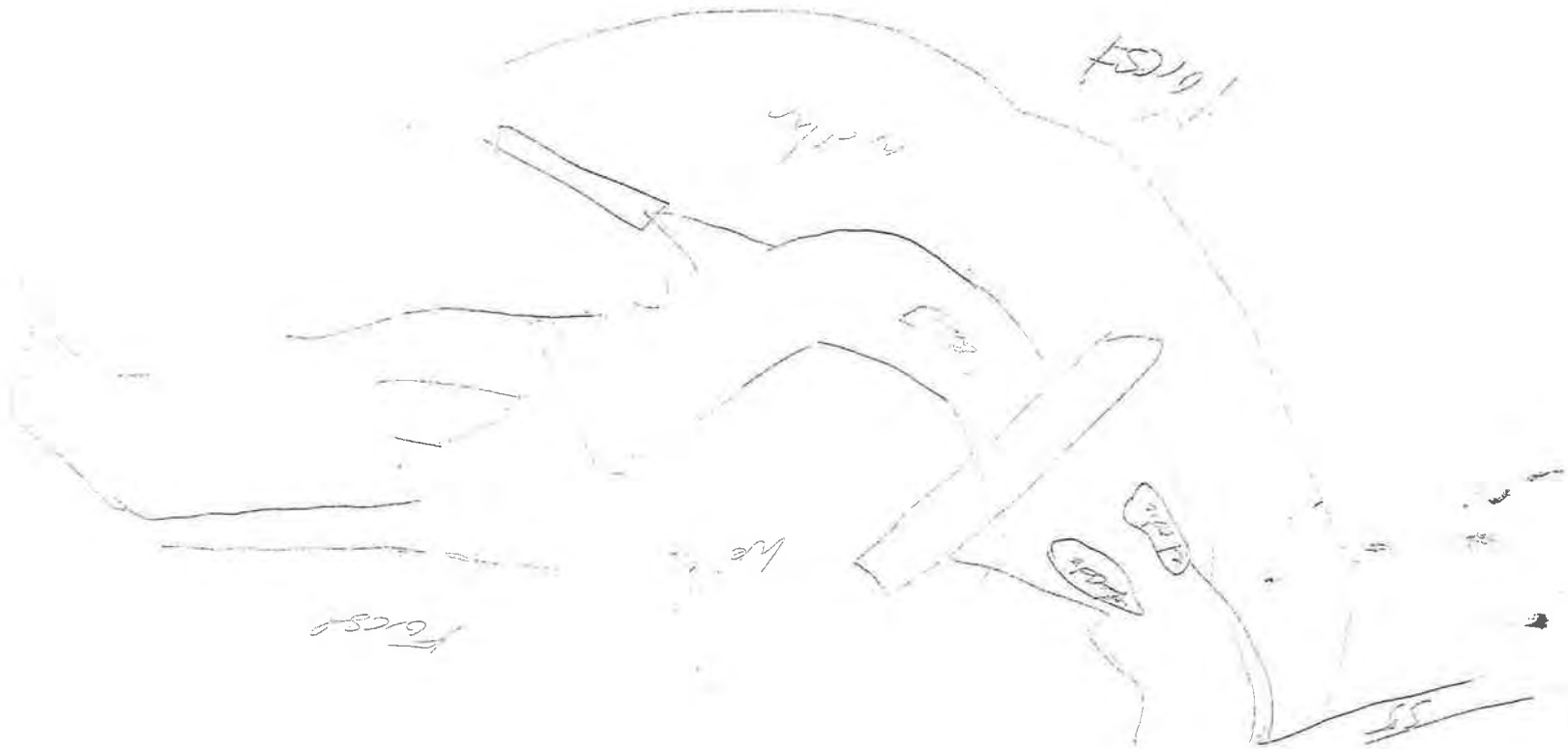
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN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

F] MEASUREMENTS

x̄ width	3.5 ft
x̄ depth	
max. depth	
x̄ bankfull width	
bankfull x̄ depth	
W/D ratio	
bankfull max. depth	
floodprone x^2 width	
entrench. ratio	

Legacy Tree:

Stream Drawing:



OhioEPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 44

Stream & Location: Haverhill, OH Ohio River **RM:** 334. **Date:** 07/20/11

Scorers Full Name & Affiliation: D. Czyzbe / EnviroScience

River Code: ___ - ___ - ___ **STORET #:** ___ **Lat./ Long.:** (NAD 83 - decimal °) 38 . ___ 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]	5	___
☐☐ COBBLE [8]	___	___	☒☐ MUCK [2]	90	___
☐☐ GRAVEL [7]	10	___	☐☐ SILT [2]	20	___
☒☐ SAND [6]	35	___	☐☐ 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]	1.5 SILT	☐ MODERATE [-1]	Substrate
☐ WETLANDS [0]		☐ NORMAL [0]	6.5
☐ 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

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.

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

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] ☒ 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 6 2 1

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 No Riffles

Riffle / Run Maximum 8: 0

6] GRADIENT (2/) ft/mi)
DRAINAGE AREA (mi²)

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

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

Gradient Maximum 10: 6

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

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

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

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

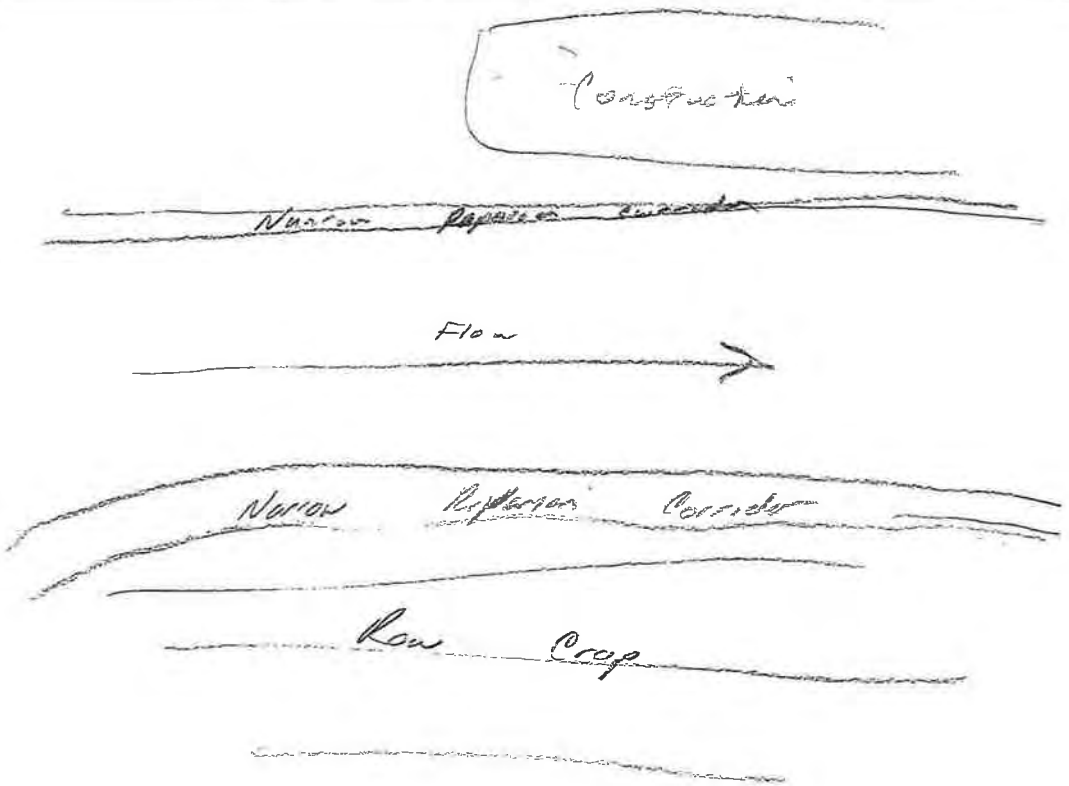
E] ISSUES

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:



S2

OhioEPA Primary Headwater Habitat Evaluation Form

HHEI Score (sum of metrics 1, 2, 3) : 16

SITE NAME/LOCATION Haverhill, OH Ohio River

SITE NUMBER S2 RIVER BASIN OH. River DRAINAGE AREA (mi²) 4.1 mi²

LENGTH OF STREAM REACH (ft) 200 LAT. _____ LONG. _____ RIVER CODE _____ RIVER MILE _____

DATE 7-2014 SCORER D. Czayka COMMENTS Stream head dry

NOTE: Complete All Items On This Form - Refer to "Field Evaluation Manual for Ohio's PHWH Streams" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☐ RECOVERED ☒ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type of substrate present. Check *ONLY* two predominant substrate *TYPE* boxes (Max of 40). 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]		☐	LEAF PACK/WOODY DEBRIS [3 pts]	10%
☐	BEDROCK [16 pt]		☐	FINE DETRITUS [3 pts]	
☐	COBBLE (65-256 mm) [12 pts]		☒	CLAY or HARDPAN [0 pt]	50%
☐	GRAVEL (2-64 mm) [9 pts]		☐	MUCK [0 pts]	
☒	SAND (<2 mm) [6 pts]	30%	☐	ARTIFICIAL [3 pts]	5%

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock _____ (A) 6 (B) 5

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: TOTAL NUMBER OF SUBSTRATE TYPES:

HHEI Metric Points

Substrate Max = 40: 11

A + B

2. Maximum Pool Depth ***(Measure the maximum pool depth within the 61 meter (200 ft)*** 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 [5 pts]
- ☒ NO WATER OR MOIST CHANNEL [0 pts]

COMMENTS Stream channel dry MAXIMUM POOL DEPTH (centimeters): 0

Pool Depth Max = 30: 0

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): 5

Bankfull Width Max=30: 5

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY ☆NOTE: River Left (L) and Right (R) as looking downstream☆

RIPARIAN WIDTH L	R	(Per Bank)	FLOODPLAIN QUALITY L	R	(Most Predominant per Bank)	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: Ohio River Distance from Evaluated Stream .47mi

☐ 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: Greenup NRCS Soil Map Page: _____ NRCS Soil Map Stream Order _____

County: Lawrence Township / City: Hamilton / Haverhill

MISCELLANEOUS

Base Flow Conditions? (Y/N): N Date of last precipitation: 7/19/11 Quantity: _____

Photograph Information: two Photographs one upstream, one downstream

Elevated Turbidity? (Y/N): N Canopy (% open): 10%

Were samples collected for water chemistry? (Y/N): N (Note lab sample no. or Id. and attach results) Lab Number: _____

Field Measures: Temp (°C) _____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (µmhos/cm) _____

Is the sampling reach representative of the stream (Y/N) N If not, please explain: Channel dry

Additional comments/description of pollution impacts: _____

BIOTIC EVALUATION

Performed? (Y/N): N (If Yes, Record all observations. Voucher collections optional. NOTE: all voucher samples must be labeled with the site ID number. Include appropriate field data sheets from the Primary Headwater Habitat Assessment Manual)

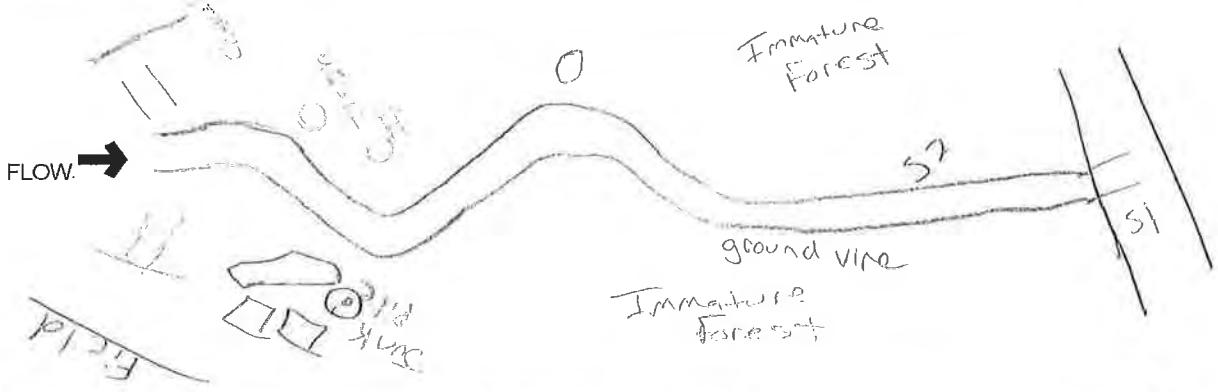
Fish Observed? (Y/N) N Voucher? (Y/N) N Salamanders Observed? (Y/N) N Voucher? (Y/N) N

Frogs or Tadpoles Observed? (Y/N) N Voucher? (Y/N) N Aquatic Macroinvertebrates Observed? (Y/N) N Voucher? (Y/N) N

Comments Regarding Biology: Stream channel dry Searched for salamanders

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



OhioEPA Primary Headwater Habitat Evaluation Form

HHEI Score (sum of metrics 1, 2, 3) : 10

SITE NAME/LOCATION Haverhill, OH Ohio River

SITE NUMBER _____ RIVER BASIN Ohio River DRAINAGE AREA (mi²) 2 1mi²

LENGTH OF STREAM REACH (ft) _____ LAT. _____ LONG. _____ RIVER CODE _____ RIVER MILE _____

DATE 07/20/11 SCORER D.Czayka COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Field Evaluation Manual for Ohio's PHWH Streams" for Instructions

STREAM CHANNEL MODIFICATIONS: ☒ NONE / NATURAL CHANNEL ☐ RECOVERED ☐ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type of substrate present. Check *ONLY* two predominant substrate *TYPE* boxes (Max of 40). 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]		☐	LEAF PACK/WOODY DEBRIS [3 pts]	
☐	BEDROCK [16 pt]		☐	FINE DETRITUS [3 pts]	10%
☐	COBBLE (65-256 mm) [12 pts]		☐	CLAY or HARDPAN [0 pt]	25%
☐	GRAVEL (2-64 mm) [9 pts]		☒ ☒	MUCK [0 pts]	50%
☐	SAND (<2 mm) [6 pts]	5%	☐	ARTIFICIAL [3 pts]	

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock _____ (A) ☐

(B) 5

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: **TOTAL NUMBER OF SUBSTRATE TYPES:**

HHEI Metric Points

Substrate Max = 40

5

A + B

2. Maximum Pool Depth ***(Measure the maximum pool depth within the 61 meter (200 ft)*** 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 [5 pts]
- ☒ NO WATER OR MOIST CHANNEL [0 pts]

COMMENTS Dry channel **MAXIMUM POOL DEPTH (centimeters):** 0

Pool Depth Max = 30

0

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' 8") [15 pts]
- ☒ ≤ 1.0 m (≤ 3' 3") [5 pts]

COMMENTS _____ **AVERAGE BANKFULL WIDTH (meters)** 5

Bankfull Width Max=30

5

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)

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: Ohio River Distance from Evaluated Stream .43

☐ 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: Green Up NRCS Soil Map Page: _____ NRCS Soil Map Stream Order _____

County: Lawrence Township / City: Hamilton / Hawkins

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 7/19 Quantity: 0

Photograph Information: UP + Down

Elevated Turbidity? (Y/N): N Canopy (% open): 10%

Were samples collected for water chemistry? (Y/N): N (Note lab sample no. or Id. and attach results) Lab Number: —

Field Measures: Temp (°C) — Dissolved Oxygen (mg/l) — pH (S.U.) — Conductivity (µmhos/cm) —

Is the sampling reach representative of the stream (Y/N) _____ If not, please explain: Stream channel Dry

Additional comments/description of pollution impacts: _____

BIOTIC EVALUATION

Performed? (Y/N): N (If Yes, Record all observations. Voucher collections optional. NOTE: all voucher samples must be labeled with the site ID number. Include appropriate field data sheets from the Primary Headwater Habitat Assessment Manual)

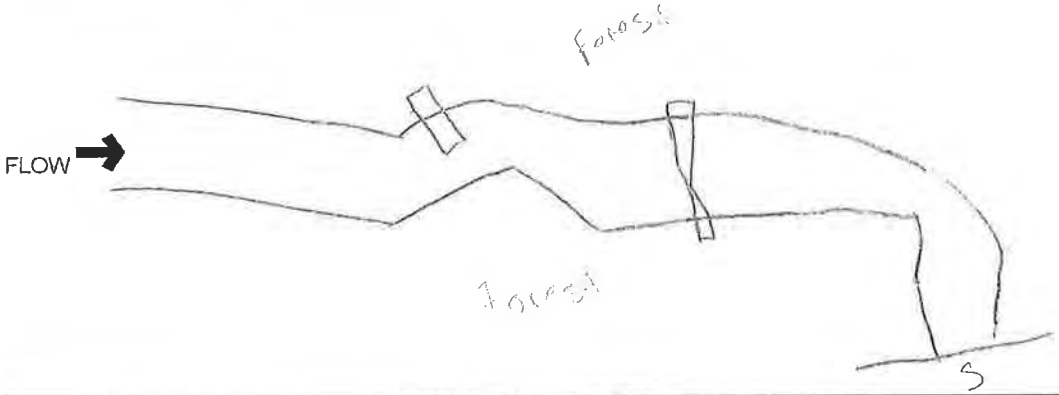
Fish Observed? (Y/N) N Voucher? (Y/N) N Salamanders Observed? (Y/N) N Voucher? (Y/N) N

Frogs or Tadpoles Observed? (Y/N) N Voucher? (Y/N) N Aquatic Macroinvertebrates Observed? (Y/N) N Voucher? (Y/N) N

Comments Regarding Biology: Channel dry

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



OhioEPA Primary Headwater Habitat Evaluation Form

HHEI Score (sum of metrics 1, 2, 3) : 11

SITE NAME/LOCATION Haverhill, OH Ohio River

SITE NUMBER S4 RIVER BASIN Ohio River DRAINAGE AREA (mi²) 4 lm²

LENGTH OF STREAM REACH (ft) 200 LAT. _____ LONG. _____ RIVER CODE _____ RIVER MILE _____

DATE 7/20/11 SCORER D. Czerka COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Field Evaluation Manual for Ohio's PHWH Streams" for Instructions

STREAM CHANNEL MODIFICATIONS: ☒ NONE / NATURAL CHANNEL ☒ RECOVERED ☐ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type of substrate present. Check *ONLY* two predominant substrate *TYPE* boxes (Max of 40). 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]	_____	☒☐	LEAF PACK/WOODY DEBRIS [3 pts]	30%
☐☐	BEDROCK [16 pt]	_____	☐☐	FINE DETRITUS [3 pts]	
☐☐	COBBLE (65-256 mm) [12 pts]	_____	☐☐	CLAY or HARDPAN [0 pt]	20%
☐☐	GRAVEL (2-64 mm) [9 pts]	_____	☒☐	MUCK [0 pts]	50%
☐☐	SAND (<2 mm) [6 pts]	_____	☐☐	ARTIFICIAL [3 pts]	_____

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock _____ (A) 3 (B) 3

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: **TOTAL NUMBER OF SUBSTRATE TYPES:**

HHEI Metric Points

Substrate Max = 40: 6

A + B

2. Maximum Pool Depth ***(Measure the maximum pool depth within the 61 meter (200 ft)*** 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 [5 pts]
- ☒ NO WATER OR MOIST CHANNEL [0 pts]

COMMENTS Stream Channel dry **MAXIMUM POOL DEPTH (centimeters):** 0

Pool Depth Max = 30: 0

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)** 5

Bankfull Width Max=30: 5

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY ☆NOTE: River Left (L) and Right (R) as looking downstream☆

RIPARIAN WIDTH L	R	(Per Bank)	FLOODPLAIN QUALITY L	R	(Most Predominant per Bank)	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)

June 20, 2008 Revision

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: Ohio River Distance from Evaluated Stream 0.29mi

☐ 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: Greenup NRCS Soil Map Page: _____ NRCS Soil Map Stream Order _____

County: Lawrence Township / City: Hamilton / Haverhill

MISCELLANEOUS

Base Flow Conditions? (Y/N): N Date of last precipitation: 7/19/11 Quantity: _____

Photograph Information: one upstream and downstream

Elevated Turbidity? (Y/N): N Canopy (% open): 5%

Were samples collected for water chemistry? (Y/N): N (Note lab sample no. or id. and attach results) Lab Number: —

Field Measures: Temp (°C) — Dissolved Oxygen (mg/l) — pH (S.U.) — Conductivity (µmhos/cm) —

Is the sampling reach representative of the stream (Y/N) N If not, please explain: Stream channel thin

Additional comments/description of pollution impacts: _____

BIOTIC EVALUATION

Performed? (Y/N): N (If Yes, Record all observations. Voucher collections optional. NOTE: all voucher samples must be labeled with the site ID number. Include appropriate field data sheets from the Primary Headwater Habitat Assessment Manual)

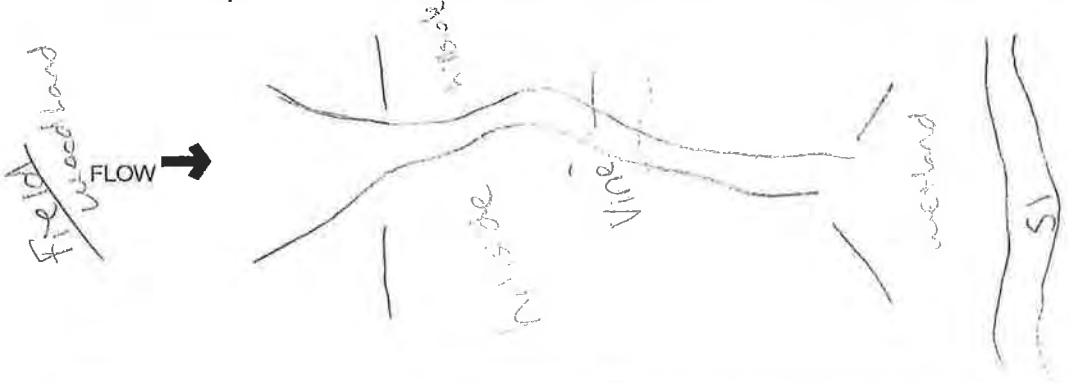
Fish Observed? (Y/N) N Voucher? (Y/N) N Salamanders Observed? (Y/N) N Voucher? (Y/N) N

Frogs or Tadpoles Observed? (Y/N) N Voucher? (Y/N) N Aquatic Macroinvertebrates Observed? (Y/N) N Voucher? (Y/N) N

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



OhioEPA Primary Headwater Habitat Evaluation Form

HHEI Score (sum of metrics 1, 2, 3) : 16.5

SITE NAME/LOCATION Haverhill, OH

SITE NUMBER 55 RIVER BASIN Ohio River DRAINAGE AREA (mi²) 2.1 m²

LENGTH OF STREAM REACH (ft) 200 LAT. _____ LONG. _____ RIVER CODE _____ RIVER MILE _____

DATE 7-20-11 SCORER D. Cuyler COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Field Evaluation Manual for Ohio's PHWH Streams" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☒ RECOVERED ☐ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type of substrate present. Check *ONLY* two predominant substrate *TYPE* boxes (Max of 40). 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]		☐	LEAF PACK/WOODY DEBRIS [3 pts]	10%
☐	BEDROCK [16 pt]		☒	FINE DETRITUS [3 pts]	20%
☐	COBBLE (65-256 mm) [12 pts]		☐	CLAY or HARDPAN [0 pt]	15%
☐	GRAVEL (2-64 mm) [9 pts]		☒	MUCK [0 pts]	35%
☐	SAND (<2 mm) [6 pts]		☐	ARTIFICIAL [3 pts]	5%

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock _____ (A) 3

(B) 6

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: **TOTAL NUMBER OF SUBSTRATE TYPES:**

HHEI Metric Points

Substrate Max = 40: 9

A + B

2. Maximum Pool Depth ***(Measure the maximum pool depth within the 61 meter (200 ft)*** 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 [5 pts]
- ☒ NO WATER OR MOIST CHANNEL [0 pts]

COMMENTS most of stream dry till wet+land **MAXIMUM POOL DEPTH (centimeters):** 2.5

Pool Depth Max = 30: 2.5

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)** 5

Bankfull Width Max=30: 5

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY ☆NOTE: River Left (L) and Right (R) as looking downstream☆

RIPARIAN WIDTH L	R	(Per Bank)	FLOODPLAIN QUALITY L	R	(Most Predominant per Bank)	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 Narrows as it goes upstream

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)

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: Ohio River Distance from Evaluated Stream 2.5 miles

☐ 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: Greenup NRCS Soil Map Page: _____ NRCS Soil Map Stream Order _____

County: Lawrence Township / City: Hamilton / Haverhill

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: 7-19-11 Quantity: _____

Photograph Information: one photograph upstream and downstream

Elevated Turbidity? (Y/N): N Canopy (% open): 50%

Were samples collected for water chemistry? (Y/N): N (Note lab sample no. or id. and attach results) Lab Number: _____

Field Measures: Temp (°C) _____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (µmhos/cm) _____

Is the sampling reach representative of the stream (Y/N) N If not, please explain: stream channel is dry

Additional comments/description of pollution impacts: _____

BIOTIC EVALUATION

Performed? (Y/N): N (If Yes, Record all observations. Voucher collections optional. NOTE: all voucher samples must be labeled with the site ID number. Include appropriate field data sheets from the Primary Headwater Habitat Assessment Manual)

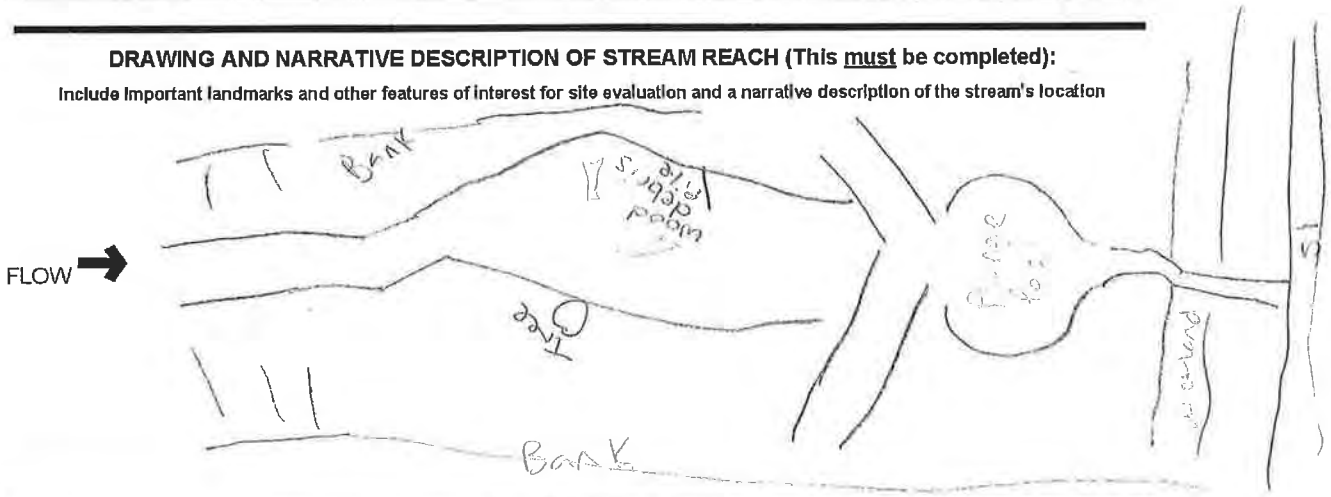
Fish Observed? (Y/N) N Voucher? (Y/N) N Salamanders Observed? (Y/N) N Voucher? (Y/N) N

Frogs or Tadpoles Observed? (Y/N) N Voucher? (Y/N) N Aquatic Macroinvertebrates Observed? (Y/N) N Voucher? (Y/N) N

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



Photograph 1. Stream S1 facing upstream.

Photograph 2. Stream S1 facing downstream

Photograph 3. Stream S2 facing upstream.

Photograph 4. Stream S2 facing downstream.

Photograph 5. Stream S3 facing upstream.

Photograph 6. Stream S3 facing downstream.

Photograph 7. Stream S4 facing downstream.

Photograph 8. Stream S4 facing downstream.

Photograph 9. Stream S5 facing upstream.

Photograph 10. Stream S5 facing downstream.

Photograph 11. Ohio River facing south bank