



# Study Plan for CWA Section 319(h) and Ohio SWIF and GLRI Projects

**Pre-Implementation Monitoring for Fiscal Year 2016 Projects  
and  
Post-Implementation Monitoring for Selected Previous Years Projects**



Division of Surface Water  
Ecological Assessment Section  
June 16, 2016

**Study Plan for**  
**CWA Section 319(h) and Ohio SWIF and GLRI Projects**  
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**and**  
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**June 16, 2016**

**Objectives**

1. Establish baseline biological and physical habitat quality in new 319 project water bodies by evaluating fish and macroinvertebrate communities, along with assessing physical habitat conditions. This will include evaluation of the attainment status of designated or recommended aquatic life uses of the water bodies expected to be restored by each project.
2. Biological monitoring will also occur at previously implemented 319, SWIF, and GLRI project sites where restoration work has been completed for at least one year.
3. Complete a report summarizing the aquatic biological results by project area.

**Sampling Activities**

***Biological Community Assessment***

The fish communities will be assessed at each sampling site using wading or boat electrofishing methods. Artificial substrate quantitative samplers will be set at applicable macroinvertebrate sampling stations. At all sites where small stream size, low stream flow conditions, or other contingencies will not support placement of artificial substrate samplers, qualitative macroinvertebrate sampling will be conducted. Sampling locations are listed in Table 1 and Figures 1-.

***Stream Habitat Assessment***

Stream habitat will be evaluated at each biological sampling site and will be used in the overall environmental assessment of the waterbodies.

## **Results**

The results of the data collected will provide pre-implementation water resource conditions at each of the FY16 319 project areas. The biological community assessment and physical habitat data will be used to assign/confirm the appropriate aquatic life use, determine aquatic life use attainment/impairment status, and assess physical habitat condition at each water body project area. At previously implemented 319, SWIF, and GLRI project areas, post-construction biological community and physical habitat conditions will be assessed to compare with baseline monitoring results collected prior to project implementation.

## **Quality Assurance/Sampling Methods**

### **Ohio EPA Manuals**

All biological, data processing, and data analysis methods and procedures adhere to those specified in Biological Criteria for the Protection of Aquatic Life, Volumes II - III (Ohio EPA 1987, 1989a, 2015b, 2015c) for biological community assessments, and The Qualitative Habitat Evaluation Index (QHEI); Rationale, Methods, and Application (Ohio EPA 1989c, 2006) for stream habitat assessment.

### **Use Attainment**

Attainment/non-attainment of aquatic life uses will be determined by using biological criteria codified in Ohio Administrative Code (OAC) 3745-1-07, Table 7-17. Numerical biological criteria are based on multimetric biological indices including the Index of Biotic Integrity (IBI) and modified Index of Well-Being (MIwb), indices measuring the response of the fish community, and the Invertebrate Community Index (ICI), which indicates the response of the macroinvertebrate community.

Performance expectations for the tiered aquatic life uses (Warmwater Habitat [WWH], Exceptional Warmwater Habitat [EWH], and Modified Warmwater Habitat [MWH]) were developed using the regional reference site approach (Hughes et al. 1986; Omernik 1987). This fits the practical definition of biological integrity as the biological performance of the natural habitats within a region (Karr and Dudley 1981). Attainment of an aquatic life use is FULL if all three indices (or those available) meet the applicable criteria, PARTIAL if at least one of the indices did not attain and performance did not fall below the fair category, and NON if all indices either fail to attain or any index indicates poor or very poor performance.

### **Stream Habitat Assessment**

Stream habitat is evaluated using the Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA for streams and rivers in Ohio (Ohio EPA 1989b, 2006). Various attributes of the available habitat are scored based on their overall importance to the establishment of viable, diverse aquatic faunas. Evaluations of type and quality of substrate, amount of instream cover, channel morphology, extent of riparian canopy, pool and riffle development and quality, and stream gradient are among the metrics used to evaluate the characteristics of a stream segment, not just the characteristics of a single sampling site. As such, individual sites may have much poorer physical habitat due to a localized disturbance yet still support aquatic communities closely resembling those sampled at adjacent sites with better habitat, provided water quality conditions are similar. QHEI scores from hundreds of segments around the state have indicated that values higher than 60 were generally conducive to the establishment of warmwater faunas while those which scored in excess of 75-80 often typify habitat conditions which have the ability to support exceptional faunas.

### **Biological Community Assessment**

Artificial substrate collections of macroinvertebrates will be collected at all sites with greater than 20 mi<sup>2</sup> drainage areas or at reference site locations (Table 1). This sample provides quantitative data and consists of a composite sample of five modified Hester-Dendy multiple-plate artificial substrate samplers colonized for six weeks. Qualitative macroinvertebrate sampling will be conducted at all sampling locations. This sampling effort consists of an inventory of all observed macroinvertebrate taxa from the natural stream habitats at each site with no attempt to quantify populations other than notations on the predominance of specific taxa or taxa groups within major macrohabitat types (e.g., riffle, run, pool, margin). Detailed macroinvertebrate assemblage sampling protocols are documented in Biological Criteria for the Protection of Aquatic Life, Volume III (2015c).

Fish will be sampled at each sampling location using pulsed DC headwater, wading, or boat electrofishing methods depending on watershed size at each sampling zone (Table 1). Sites with drainage areas greater than 20 mi<sup>2</sup> or at reference site locations will be sampled twice during the sampling index period. Fish are processed in the field which includes identifying each individual to species, counting individuals at all sites, weighing individuals at wading and boat sites, and recording any external abnormalities. Detailed fish assemblage sampling protocols are documented in Biological Criteria for the Protection of Aquatic Life, Volume III (2015c).

### **Water Quality**

Water column chemistry samples will be collected from eight ambient stations within the South Fork Sugar Creek and Loss Creek study areas (Tables 1-3, Figures 1, 12). Water column grab samples and standard field parameters will be collected/measured five times from those locations (Ohio EPA, 2015a). Datasonde<sup>®</sup> deployment is requested for 3 locations. The deployment of continuous monitors should coincide with typical low summer/fall flows (i.e., approaching Q<sub>7, 10</sub>). The Modeling section will be responsible for deployment of the Datasondes<sup>®</sup>.

### **Project Descriptions**

The following summaries describe projects that are recommended for FY16 Section 319(h) subgrant funding followed by completed projects that will be evaluated for post project water resource improvements. These new projects have been identified during the course of the review as having met Section 319(h) eligibility requirements and having the highest potential for water quality improvements within the watershed where they will be implemented. Each of these projects was reviewed by Region 5 Nonpoint Source (NPS) Program staff. Ohio EPA anticipates having all Subgrant funds obligated (contracted) for these projects within approximately 12 months following award of Ohio EPA's Section 319(h) program grant from USEPA Region 5. All pre-implementation projects are assigned to the following EA3 project: Grant Year 2016 319 Projects (Pre-Project Monitoring).

#### **16(h)EPA-09 (Figure 1)**

Holmes Soil & Water Conservation District

Project Contact: Michelle Wood, 330-674-2811; [mwood@co.holmes.oh.us](mailto:mwood@co.holmes.oh.us)

#### **Continuing Water Quality Efforts in the South Fork of the Sugar Creek**

Fifty-nine practices have been installed by 19 producers in the South Fork Sugar Creek through the Alpine WQT, EPRI, and MWCD. An additional six farms installed 8500 feet of fencing through the 2003 OARDC 319 grant, protecting 7520 feet of stream bank. An additional 35 practices on seven farms will be installed with this grant. These 35 practices are structural only, and do not address nutrient management

plans, cover crops or conservation plans. The structural practices addressed by this grant will be to fence livestock off the stream, improve manure management practices, and identify discharges from animal management operations such as milk houses and animal feeding operations and provide incentives and controls to eliminate these sources.

**16(h)EPA-10 (Figure 2)**

City of Wyoming

Project Contact: Lynn Tetley, 513-821-7600 (office), 513-821-7952 (cell); [ltetley@wyomingohio.gov](mailto:ltetley@wyomingohio.gov)

Or maybe: Jennifer Eismeier, 513-563-8800 (office), 513-509-9959 (cell);

[jeismeier@millcreekwatershed.org](mailto:jeismeier@millcreekwatershed.org) .

**Cilley Creek Stream Restoration at Stearns Woods**

The Cilley Creek stream restoration project at Stearns Woods will result in the removal of one small concrete dam, natural channel restoration of 400 linear feet of degraded stream channel, and the restoration of more than 2000 linear feet of natural flow and hydrology. Bioengineering methods will be used to stabilize and restore severely eroding streambanks and in-stream structures such as rock bank treatments will be used to control channel gradient, prevent down cutting and dissipating stream energy. The project will also restore 3 acres currently infested with invasive species and replant with native trees and shrubs. This project is specifically recommended in the state endorsed Lower Mill Creek Watershed Action Plan. This project is being implemented consistent with recommendations within the Congress Run Mill Creek TMDL and/or state-endorsed Watershed Action Plan.

**16(h)EPA-13 (Figures 3 & 4)**

City of Cincinnati

Project Contact: Jennifer Eismeier, 513-563-8800 (office), 513-509-9959 (cell);

[jeismeier@millcreekwatershed.org](mailto:jeismeier@millcreekwatershed.org) .

**Mill Creek Low-Head Dam Modification**

This project will modify two low-head dams on Mill Creek. The negative water quality impacts of these two low-head dams on the Mill Creek will be modified as a result of this project; the City of Cincinnati will install rock riffles immediately adjacent to the downstream edge of these two dams. Removal is not an option due to the wastewater and water infrastructure that are contained within the low-head structures. Rock riffles will eliminate the current water quality impacts by restoring fish passage, improving aeration of the stream, restore naturalized sediment transport and remove existing navigational hazards for recreational canoeists. These projects are part of a much larger effort to restore the highly modified Mill Creek as it flows through the city of Cincinnati. The project is consistent with habitat restoration recommendations within the Mill Creek/West Fork TMDL and the state endorsed Lower Mill Creek Watershed Action Plan. This project is being implemented consistent with recommendations within the Congress Run Mill Creek and West Fork Mill Creek TMDL and/or state-endorsed Watershed Action Plan.

**16(h)EPA-16 (Figure 5)**

City of Cuyahoga Falls

Project Contact: Rebecca M. McCleary, 330-971-8201; [mcclearyrm@cityofcf.com](mailto:mcclearyrm@cityofcf.com)

**Phase II Stream Restoration of Kelsey Creek in Kennedy Park**

This project will restore 750 linear feet of stream channel, install sediment control structures and instream grade structures. The project will also treat invasive species and plant native grasses, trees, shrubs and/or live stakes throughout the project area. Kelsey Creek is a headwater stream and tributary of the Cuyahoga River flowing through a heavily visited city park within Cuyahoga Falls. There is a Middle Cuyahoga River TMDL and a watershed action plan in development. The project is consistent with recommended actions within the TMDL. This project is being implemented consistent with recommendations within the Cuyahoga River TMDL and/or state-endorsed Watershed Action Plan.

**16(h)EPA-17 (Figure 6)**

City of Fairview Park

Project Contact: Matthew Hrubey, 440-356-4499 (office); (440) 666-0224 (cell);

[matthew.hrubey@fairviewpark.org](mailto:matthew.hrubey@fairviewpark.org)

**Coe Creek Daylighting and Stream and Habitat Restoration Project**

This project will assist with the day-lighting of 175 linear feet of culverted section of Coe Creek. Using natural channel design methods, the day-lighted section of the creek will be restored to a 200 linear feet natural channel. Coe Creek is a tributary to the Rocky River and ultimately to the central basin of Lake Erie. Using installed grade structures and the planting of native trees, shrubs and live stakes throughout the restored riparian areas, the project will result in improved water quality and natural flow conditions within Coe Creek for a total of nearly 8,000 linear feet. This project is being implemented consistent with recommendations within the Rocky River TMDL and state-endorsed Watershed Action Plan. This project is being implemented consistent with recommendations within the Rocky River TMDL and/or state-endorsed Watershed Action Plan

**16(h)EPA-19 (Figure 7)**

Village of Hunting Valley

Project Contact: Don Cunningham, 440-247-6106 (office), 440-829-9732 (cell);

[dcunningham@huntingvalley.net](mailto:dcunningham@huntingvalley.net)

**Marcourt Farms Chagrin River Restoration Project**

This project will stabilize approximately 500 linear feet of the mainstem of the Chagrin River and restore one acre of riparian areas with native plantings. The project will result in the installation of six bendway weir structures that will redirect the stream flow energy away from the bank and the streambank will be restored to a 3:1 slope. All plantings will be native trees, shrubs and grasses. This project is being implemented consistent with recommendations within the Chagrin River TMDL and state-endorsed Watershed Action Plan. This project is being implemented consistent with recommendations within the Main Branch Chagrin River TMDL and/or state-endorsed Watershed Action Plan.

**16(h)EPA-25 (Figure 8)**

Lorain County Community Development Department

Project Contact: Donald Romancak, 440-328-2323 (office), 440-787-1486 (cell);

[dromancak@loraincounty.us](mailto:dromancak@loraincounty.us)

**Clinton Avenue Ditch Stream and Wetland Restoration Project**

This project will restore approximately 1,950 linear feet of stream channel and riparian areas within an unnamed tributary to the Black River on property owned by the city of Lorain. The project will restore a

meandering channel and reconnect the stream to existing floodplain wetland areas. Restoration activities include installation of erosion/sediment control structures, instream grade structures, treating invasive species and planting of native grasses, trees, shrubs and/or live stakes, constructing inlet/outlet channels and reconnecting the wetlands to the stream. Implementation of this project is consistent with recommendations within the Black River TMDL and the Black River Area of Concern Remedial Action Plan. This project is being implemented consistent with recommendations within the Black River TMDL and/or state-endorsed Watershed Action Plan.

**16(h)EPA-27 (Figure 9)**

Cleveland Metroparks

Project Contact: Kristen Trolio, 216-635-3244 (office); [kmt@clevelandmetroparks.com](mailto:kmt@clevelandmetroparks.com)

**Marrek Pond Dam Removal and Wetland Restoration**

This project will restore the natural hydrology and functionality of the stream including dam removal, draining of Marrek pond, restoration of 640 linear feet of stream, restoration of 0.9 acre of wetlands, and enhancement of 0.4 acre of existing wetlands. Before the pond is drained, Cleveland Metroparks staff will remove all desirable fish species from the pond for use at other fishing areas throughout Cleveland Metroparks. This project is being implemented consistent with recommendations within the Rocky River East Branch TMDL and state-endorsed Watershed Action Plan.

**05(h)L662, - , - , 14SWIF-SEP-86 (Figure 10)**

City of Delaware

Project Contact: Bill Ferrigno, 740-203-1700; [bferrigno@delawareohio.net](mailto:bferrigno@delawareohio.net)

**Olentangy River Dam Removal and Restoration Projects**

In order to return the impounded portions on the Olentangy River to full attainment of at least the WWH Aquatic Life Use, the Panhandle Road Dam, Central Avenue Dam, Williams Street Dam, and two dams just north of the US 23 bridge were removed. This is the first evaluation of the removal of the two dams that were just north of the US 23 bridge.

**10(h)EPA-26S (Figure 11)**

Columbus Downtown Development Corporation

Project Contact: Nell Selander, 614-545-4732; [nselander@downtowncolumbus.com](mailto:nselander@downtowncolumbus.com)

**Scioto Greenways Main Street Dam Removal**

This project successfully removed the Main Street Dam and restored stream channel and riparian areas along approximately 7,000 linear feet of the Scioto River.

**NUTR11-GLRI-01 (Figure 12)**

Crawford Soil and Water Conservation District

Project Contact: Mike A. Hall, (419) 562-8280; [Mike.hall@oh.nacdnet.net](mailto:Mike.hall@oh.nacdnet.net)

**Lake Erie Nutrient Reduction Demonstration Project**

This project implemented a series of targeted nutrient reduction practices in the Loss Creek watershed, a tributary to the Sandusky River. The practices accomplished were: installation of 23 Drainage Water Management Structures to control drainage water from 594 acres, planting 1949 acres of cover crops, variable rate tillage/fertilization implemented on 1046 acres, nutrient management plan development on

5343 acres of cropland including 58 whole farm conservation plans, installation of two (2) grassed waterways to control gully erosion on 0.6 acres, one tile repair that saved the loss of an estimated 147 tons of soil, restoration of 175 linear feet of severely eroded streambank, and 1 manure storage system.

**12(h)EPA-33 (Figure 13)**

Metro Parks, Serving Summit County

Project Contact: Michael Johnson, (330) 867-8040; [mjohnson@summitmetroparks.org](mailto:mjohnson@summitmetroparks.org)

**Pond Brook Restoration**

Successful completion of this project reduced nonpoint source pollutant loadings to Tinkers Creek from Pond Brook and provided additional benefits to water quality in Pond Brook itself. These improvements included natural development of riffle/pool sequences, enhancement of floodplain and riparian connection, and a reduction in thermal impairment. Summit Metro Parks restored 5,500 linear feet of floodplain and stream channel in Pond Brook (which was channelized and entrenched through the project length). Natural flow was restored by reducing stream channel width and establishing meanders through a restored 120 foot wide floodplain. In-stream habitat was restored, including coarse sand substrates, root-wads, boulders, and over-hanging vegetation, and significant riparian re-vegetation. Although not the primary goal of the project, some wetlands were installed in the newly modified floodplain. This project is being implemented consistent with recommendations in the Tinkers Creek TMDL.

**14(h)EPA-13 (Figure 14)**

City of Lancaster

Project Contact: Denise Crews, 740-687-6614; [dcrews@ci.lancaster.oh.us](mailto:dcrews@ci.lancaster.oh.us)

**BALDWIN RUN STREAM RESTORATION PHASE 2**

This project restored 960 linear feet of stream through bank stabilization and in-stream habitat structures including vortex rock weirs and eddy rocks, both of which create habitat for local fish and macroinvertebrates. The bank was stabilized along 250 of the channel through regrading and installing Armorflex matting to protect the bank while allowing vegetation to grow up through the cells. 23 in-stream habitat structures were installed including 3 vortex rock weirs and 4 groups of eddy rocks, totaling 20 boulders in all. A total of 0.35 acres of invasive species were removed as per the plan, and replaced with seed mixtures and live-stake plantings to secure noninvasive, natural vegetation on the streambank. Easements were repurposed as conservation easements prior to restoration construction activities

**14(h)EPA-18 (Figure 13)**

Village of Reminderville

Project Contact: Eugene P. Esser, (330) 657-2145; [epesser@krockesser.com](mailto:epesser@krockesser.com)

**Pond Brook Tributary Restoration**

This project restored approximately 1,200 linear feet of floodplain; restored approximately 500 linear feet of streambank using bio-engineering, recontouring or regrading; and stabilized approximately 1,000 linear feet of streambank using bio-engineering.

**10(h)EPA-25S (Figure 15)**

Butler County Water and Sewer

Project Contact: Steve Seitz, 513-887-5563; [seitzst@butlercountyohio.org](mailto:seitzst@butlercountyohio.org)

**Wildermuth Stream and Wetland Restoration**

Successful completion of this project restored 1,800 linear feet of the East Fork Mill Creek by installing in-stream grade control structures and enhanced the 22-acre Wildermuth floodplain wetland through contoured islands and planting of native vegetation. The project will alleviate extreme flood flows, reduce in-stream erosion and attenuate nutrient loads while broadening opportunities for the public to engage in wetland science and conservation.

Table 1. Section 319(h), SWIF, and GLRI projects, both baseline and follow-up monitoring locations, 2016. The sampling effort abbreviations are: C – standard chemistry; D - Datasonde®, flow measurements and benthic chlorophyll; F – one pass fish; F2 – two pass fish; Mq – macroinvertebrate qualitative sampling; MQ – macroinvertebrate quantitative sampling.

| Stream                               | Location                          | Station ID | RM    | DA   | Stream Code | Lat       | Long       | Sampling | USGS Topo    | Notes  |
|--------------------------------------|-----------------------------------|------------|-------|------|-------------|-----------|------------|----------|--------------|--|
| S. Fk. Sugar Creek                   | CR 114                            | R05S41     | 21.11 | 7.3  | 17-410-000  | 40.4683   | -81.7275   | C,F,Mq   | Baltic       | 16(h)EPA-09, pre and post BMPs in S. Fk. Sugar Cr. basin in Holmes Co. |
| S. Fk. Sugar Creek                   | SR 93                             | 303658     | 18.4  | 19.8 | 17-410-000  | 40.472035 | -81.678416 | C,D,F,Mq | Baltic       | 16(h)EPA-09, pre and post BMPs in S. Fk. Sugar Cr. basin in Holmes Co. |
| Troyer Valley Creek                  | SR 93                             | R05S64     | 1.08  | 2.4  | 17-416-000  | 40.48.67  | -81.6758   | C,F,Mq   | Baltic       | 16(h)EPA-09, pre and post BMPs in S. Fk. Sugar Cr. basin in Holmes Co. |
| Trib. to "Cilley Cr." @ 1.40         | ust. impoundment at Stearns Woods | 303660     | 0.8   | 0.1  | 23-001-020  | 39.230705 | -84.480186 | F,Mq     | Cincinnati E | 16(h)EPA-10, pre removal of old failing lowhead dam                    |
| Mill Creek                           | Center Hill Ave.                  | Q01S12     | 7.85  | 121  | 23-001-000  | 39.1861   | -84.4956   | F2,MQ    | Cincinnati W | 16(h)EPA-13, pre project, ust. low-head dam mitigation                 |
| Mill Creek                           | Salway Park                       | Q01S09     | 4.9   | 139  | 23-001-000  | 39.1611   | -84.5281   | F2,Mq    | Cincinnati W | 16(h)EPA-13, pre project, dst. ust. dam & ust. dst. dam                |
| Mill Creek                           | South Ludlow Ave.                 | 302045     | 4.25  | 141  | 23-001-000  | 39.15729  | -84.5377   | F2,Mq    | Cincinnati W | 16(h)EPA-13, pre project, dst. dst. dam                                |
| Kelsey Creek                         | Northmoreland Blvd.               | 302716     | 0.9   | 2.5  | 19-001-035  | 41.13214  | -81.45576  | F,Mq     | Hudson       | 16(h)EPA-16, pre project, ust. Phase II stream restoration             |
| Kelsey Creek                         | intersection Kelsey/Rainer        | 302252     | 0.75  | 2.6  | 19-001-035  | 41.134461 | -81.45578  | F,Mq     | Hudson       | 12SWIF-10 & 16(h)EPA-16, ust. Phase I and within Phase II              |
| Kelsey Creek                         | footbridge in Kennedy Park        | 302253     | 0.6   | 3    | 19-001-035  | 41.136796 | -81.456786 | F,Mq     | Hudson       | 12SWIF-10 & 16(h)EPA-16, within Phase I and dst. Phase II              |
| Kelsey Creek                         | dst. Munroe Falls Blvd.           | 302254     | 0.25  | 3.3  | 19-001-035  | 41.141363 | -81.456402 | F,Mq     | Hudson       | 12SWIF-10, post project, dst. Phase I stream restoration               |
| Coe Creek (Trib. to Rocky R. @ 6.51) | ust. culvert (~RM 7.4)            | 303661     | 0.8   | 2.7  | 13-001-001  | 41.447076 | -81.845789 | F,Mq     | Lakewood     | 16(h)EPA-17, pre project, culvert removal and stream restoration       |

| Stream                            | Location                                       | Station ID | RM    | DA    | Stream Code | Lat       | Long       | Sampling | USGS Topo     | Notes   |
|-----------------------------------|--|------------|-------|-------|-------------|-----------|------------|----------|---------------|---|
| Chagrin River                     | within the Marcourt Farms Restoration Area     | 301233     | 19.65 | 157   | 15-001-000  | 41.499656 | -81.399492 | F2,MQ    | Chagrin Falls | 16(h)EPA-19, pre project, bank stabelization                        |
| Trib. to Black River @ 6.55       | within the Clinton Ave. Ditch Restoration Area | 303666     | 3.0   | 0.3   | 20-001-002  | 41.412851 | -82.137408 | F,Mq     | Lorain        | 16(h)EPA-25, pre project, stream restoration                        |
| Trib. to E. Br. Rocky R. @ 23.72  | ust. Marrek Pond, Hinkley Reservation          | 303680     | 0.8   | 0.1   | 13-100-012  | 41.207789 | -81.714011 | F,Mq     | W Richfield   | 16(h)EPA-27, pre poject, evaluate for CWH, ust. lake                |
| Trib. to E. Br. Rocky R. @ 23.72  | within Marrek Pond, Hinkley Reservation        | 303681     | 0.6   | 0.1   | 13-100-012  | 41.209147 | -81.712483 | F,Mq     | W Richfield   | 16(h)EPA-27, pre project, Marrek Pond dam removal                   |
| Trib. to E. Br. Rocky R. @ 23.72  | dst. Marrek Pond, Hinkley Reservation          | 303682     | 0.5   | 0.1   | 13-100-012  | 41.209301 | -81.710658 | F,Mq     | W Richfield   | 16(h)EPA-27, pre project, dst. dam removal                          |
| Olentangy River                   | Panhandle Rd. (free-flowing)                   | 301673     | 28.1  | 410   | 02-400-000  | 40.324253 | -83.07077  | F2,MQ    | Delaware      | post Panhandle Road Dam removal                                     |
| Olentangy River                   | Central Ave. (free-flowing)                    | 300583     | 26    | 421   | 02-400-000  | 40.3012   | -83.0634   | F2,MQ    | Delaware      | 05(h)L662, post Central Avenue Dam removal                          |
| Olentangy River                   | Williams St. (free-flowing)                    | 300582     | 25.8  | 421.1 | 02-400-000  | 40.2985   | -83.0618   | F2,MQ    | Delaware      | post Williams Street Dam removal                                    |
| Olentangy River                   | ust. Braumiller Rd. (free-flowing)             | 303672     | 22.5  | 445   | 02-400-000  | 40.258349 | -83.061992 | F2,MQ    | Delaware      | 14SWIF-SEP-86, post removal of two low-head dams                    |
| Scioto River                      | Town St. (free-flowing)                        | 303673     | 131.4 | 1614  | 02-001-000  | 39.9583   | -83.0044   | F2,MQ    | SW Columbus   | 10(h)EPA-26S, post Main Street Dam removal                          |
| Loss Creek                        | SR 96  | 301595     | 5.18  | 2.1   | 05-041-000  | 40.86464  | -82.764055 | C,F,Mq   | N Robinson    | NUTR11-GLRI-01, post BMPs   |
| Loss Creek                        | Loss Creek Rd., ust trib.                      | 301594     | 3.73  | 2.9   | 05-041-000  | 40.862557 | -82.775703 | C,F,Mq   | N Robinson    | NUTR11-GLRI-01, post BMPs   |
| Loss Creek                        | Biddle Rd.                                     | U02G03     | 0.96  | 11.7  | 05-041-000  | 40.841717 | -82.818239 | C,D,F,Mq | N Robinson    | NUTR11-GLRI-01, post BMPs   |
| S. Fk. Loss Cr. (Trib. @ RM 2.98) | Loss Creek Rd.                                 | 201377     | 0.04  | 6.8   | 05-041-001  | 40.850796 | -82.792609 | C,F,Mq   | N Robinson    | NUTR11-GLRI-01, post BMPs   |
| Allen Run                         | Crestline Rd.                                  | U02G20     | 1.18  | 4.1   | 05-043-000  | 40.785057 | -82.773902 | C,D,F,Mq | N Robinson    | NUTR11-GLRI-01, post BMPs   |
| Pond Brook                        | Tradewind Cove Rd.                             | F01S42     | 3.7   | 1.6   | 19-008-000  | 41.335653 | -81.402102 | F,Mq     | Twinsburg     | 12(h)EPA-33, post project, ust. stream restoration area, ust. WWTPs |

| Stream                     | Location                              | Station ID | RM   | DA   | Stream Code | Lat        | Long        | Sampling | USGS Topo | Notes   |
|----------------------------|---------------------------------------|------------|------|------|-------------|------------|-------------|----------|-----------|---|
| Pond Brook                 | dst. Aurora and Geauga WWTPs          | F01S41     | 3.4  | 5    | 19-008-000  | 41.3314    | -81.4028    | F,Mq     | Twinsburg | 12(h)EPA-33, post project, ust. stream restoration area, dst. WWTPs       |
| Pond Brook                 | in restoration area                   | 301659     | 2.59 | 9.8  | 19-008-000  | 41.3216    | -81.4013    | F,Mq     | Twinsburg | 12(h)EPA-33, post project, within stream restoration area, Phase I?       |
| Pond Brook                 | just dst. of trib.                    | F01W28     | 2.39 | 10.9 | 19-008-000  | 41.3186    | -81.4004    | F,Mq     | Twinsburg | 12(h)EPA-33, post project, within stream restoration area, Phase II?      |
| Pond Brook                 | SR 82                                 | F01S40     | 1.41 | 15.7 | 19-008-000  | 41.305     | -81.3997    | F,Mq     | Twinsburg | 12(h)EPA-33, post project, dst. stream restoration area                   |
| Baldwin Run                | dst. Ewing Run/Fetter Run             | 302671     | 0.7  | 11.7 | 01-046-000  | 39.71543   | -82.58047   | F,Mq     | Lancaster | 14(h)EPA-13, post project, within stream restoration area                 |
| Baldwin Run                | adj. Mary Burnham Park, ust. RR       | J01S15     | 0.4  | 12.8 | 01-046-000  | 39.711044  | -82.581895  | F,Mq     | Lancaster | 14(h)EPA-13, post project, dst. stream restoration area                   |
| Fetters Run                | adj. Lanreco Park, dst. 6th Ave.      | 302673     | 0.2  | 6.5  | 01-047-000  | 39.718725  | -82.581959  | F,Mq     | Lancaster | 14(h)EPA-13, post project, ust. stream restoration area                   |
| Ewing Run                  | Pleasantville Rd.                     | 302672     | 0.17 | 5.2  | 01-046-001  | 39.719     | -82.5788    | F,Mq     | Lancaster | 14(h)EPA-13, ust. proj., park in empty lot NE of bridge                   |
| Trib. to Pond Brook (3.90) | dst. Liberty Rd.                      | 302680     | 0.92 | 1.2  | 19-008-004  | 41.33902   | -81.41895   | F,Mq     | Twinsburg | 14(h)EPA-18, post project, ust. stream restoration area                   |
| Trib. to Pond Brook (3.90) | from Glenway Drive                    | 302678     | 0.5  | 1.3  | 19-008-004  | 41.3401    | -81.41207   | F,Mq     | Twinsburg | 14(h)EPA-18, post project, within stream restoration area                 |
| Trib. to Pond Brook (3.90) | Outriggers Cove                       | 302677     | 0.01 | 1.6  | 19-008-004  | 41.33779   | -81.40338   | F,Mq     | Twinsburg | 14(h)EPA-18, post project, dst. stream restoration area                   |
| E. Fk. Mill Creek          | Allen Rd.                             | 600460     | 1.85 | 8.1  | 23-006-000  | 39.3133734 | -84.4264152 | F,Mq     | Glendale  | 10(h)EPA-25S, post project, ust. Wildermuth side-channel restoration area |
| E. Fk. Mill Creek          | ust. Butler Co. Upper Mill Creek WWTP | 301418     | 1.15 | 9    | 23-006-000  | 39.3038709 | -84.4311918 | F,Mq     | Glendale  | 10(h)EPA-25S, post project, dst. Wildermuth side-channel restoration area |

Table 2. Ohio EPA laboratory and field sampling load for the 319(h)/SWIF study areas, 2016. Total number of water column analytes does not include field parameters.

| Sample Type                               | No. of Lab Parameters | No. Sites | Passes | Total Samples/Parameters |
|---|-----------------------|-----------|--------|--------------------------|
| <b>Conventional Water Quality (total)</b> | 13                    | 8         | 5      | 40 / 520                 |
| <b>Datasonde®</b>                         | –                     | 3         | 1      | 3                        |
| <b>Benthic Chlorophyll a</b>              | 1                     | 3         | 1      | 3                        |
| <b>Fish Stations (total)</b>              | –                     | 41        | 1-2    | 51 /-                    |
| 2x  | –                     | 9         | 2      | 19 /-                    |
| 1x  | –                     | 32        | 1      | 32 /-                    |
| <b>Macrobenthos (total)</b>               | –                     | 41        | –      | –                        |
| Quantitative (Hester Dendy)               | –                     | 7         | –      | –                        |
| Qualitative (Natural Substrates)          | –                     | 34        | –      | –                        |

Table 3. List of chemical/physical water quality parameters to be analyzed/ measured in surface water from the 319(h)/SWIF study areas, 2016. Water samples will be collected from streams 5 times.

| Parameter                   | Units | Method        | MDL  |
|-----------------------------|-------|---------------|------|
| Temperature                 | °C    | YSI 556 Meter |      |
| Dissolved Oxygen            | mg/L  | YSI 556 Meter |      |
| Dissolved Oxygen            | %     | YSI 556 Meter |      |
| pH                          | SU    | YSI 556 Meter |      |
| Conductivity                | µS/cm | YSI 556 Meter |      |
| Specific Conductivity       | µS/cm | YSI 556 Meter |      |
| Dissolved Solids            | mg/L  | SM 2540 C     | 10   |
| Suspended Solids            | mg/L  | SM 2540 D     | 5    |
| Alkalinity                  | mg/L  | USEPA 310.1   | 5    |
| Ammonia                     | mg/L  | USEPA 350.1   | 0.05 |
| Chemical Oxygen Demand      | mg/L  | USEPA 410.4   | 20   |
| Chloride                    | mg/L  | USEPA 325.1   | 5    |
| Specific Conductivity (lab) | µS/cm | SM 2510 B     | 2    |
| Nitrate-Nitrite             | mg/L  | USEPA 350.1   | 0.5  |
| Nitrite                     | mg/L  | USEPA 353.2   | 0.02 |
| Sulfate                     | mg/L  | USEPA 375.2   | 10   |
| Kjeldahl Nitrogen           | mg/L  | USEPA 351.2   | 0.2  |
| Orthophosphate              | mg/L  | USEPA 365.1   | 0.01 |
| Phosphorus                  | mg/L  | USEPA 365.4   | 0.01 |
| Chlorophyll a               | µg/L  | USEPA 445.0   |      |

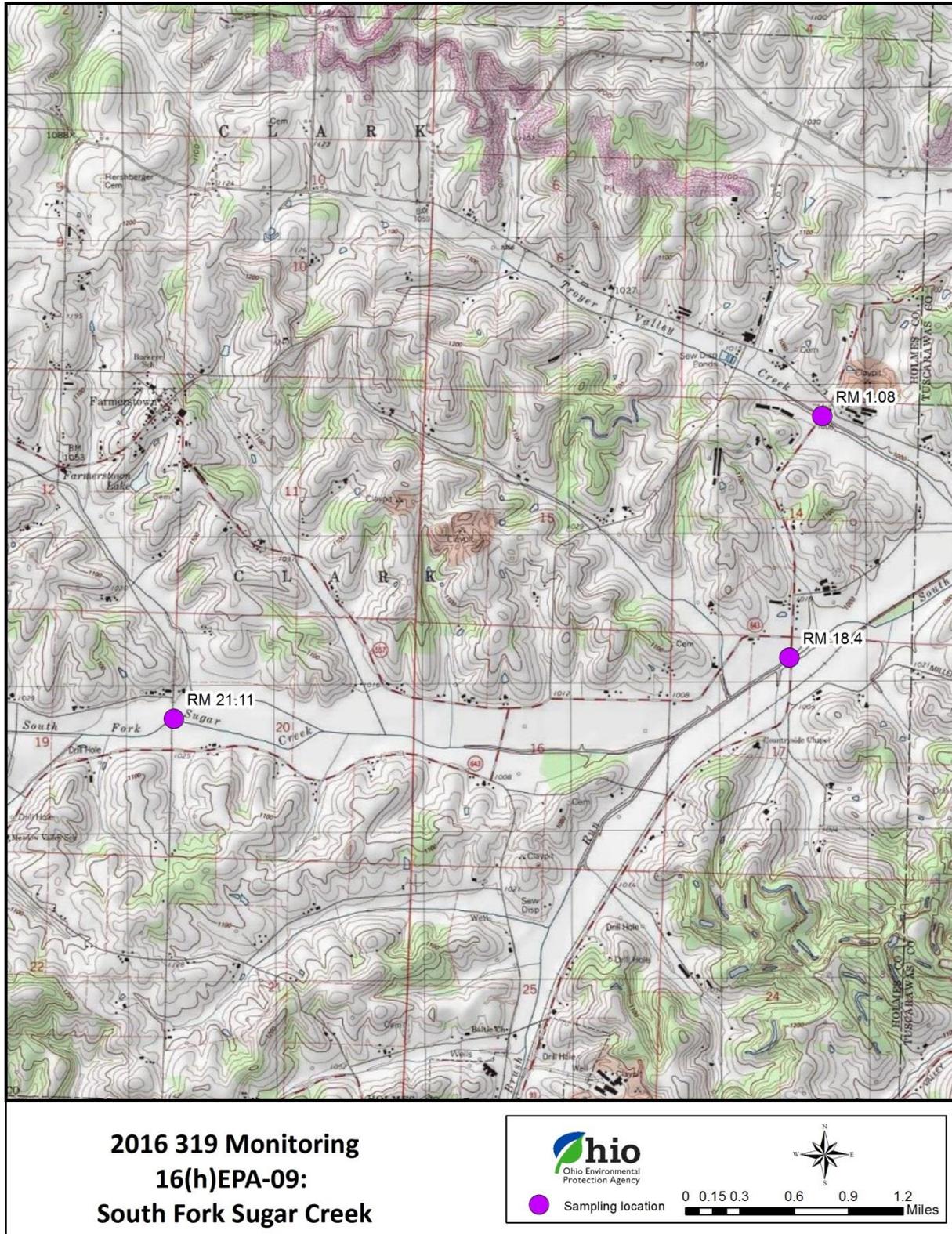


Figure 1. South Fork Sugar Creek basin sampling locations, 2016 [16(h)EPA-09].



Figure 2. Tributary to Cilley Creek sampling location, 2016 [16(h)EPA-10].

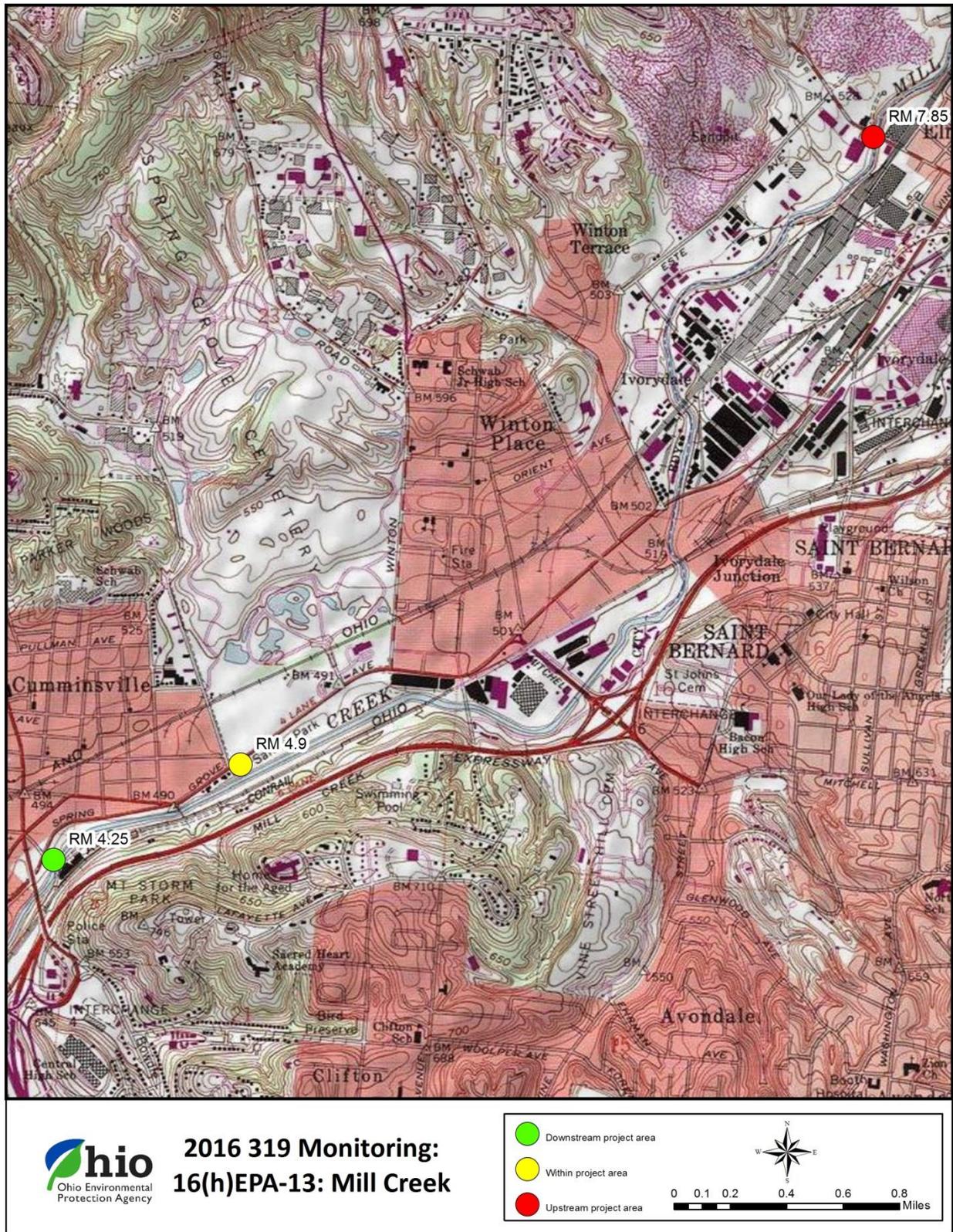
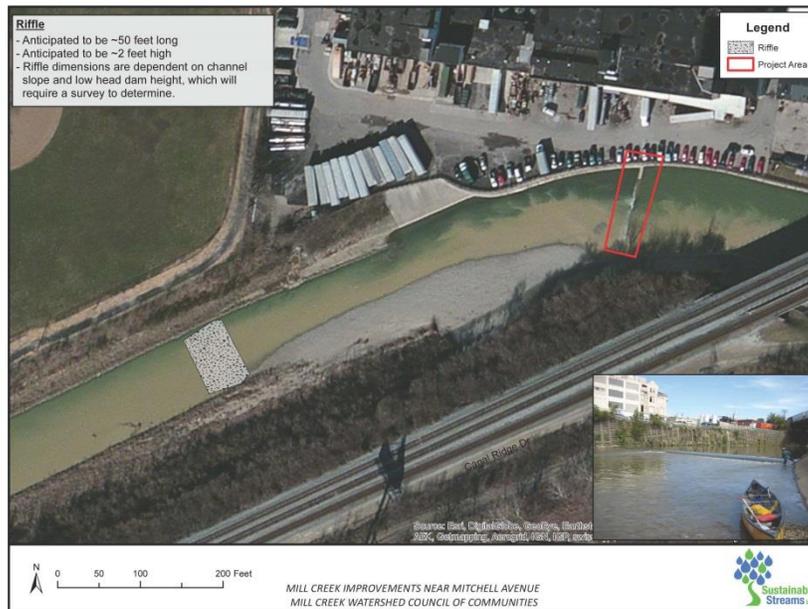
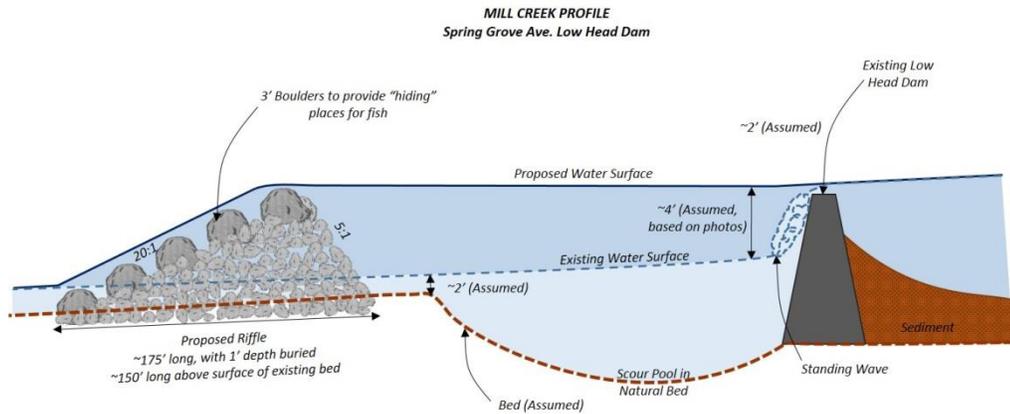


Figure 3. Mill Creek sampling locations, 2016 [16(h)EPA-13].



**Figure 4.** Design profile and photos of the proposed riffle placements on Mill Creek, 16(h)EPA-13.

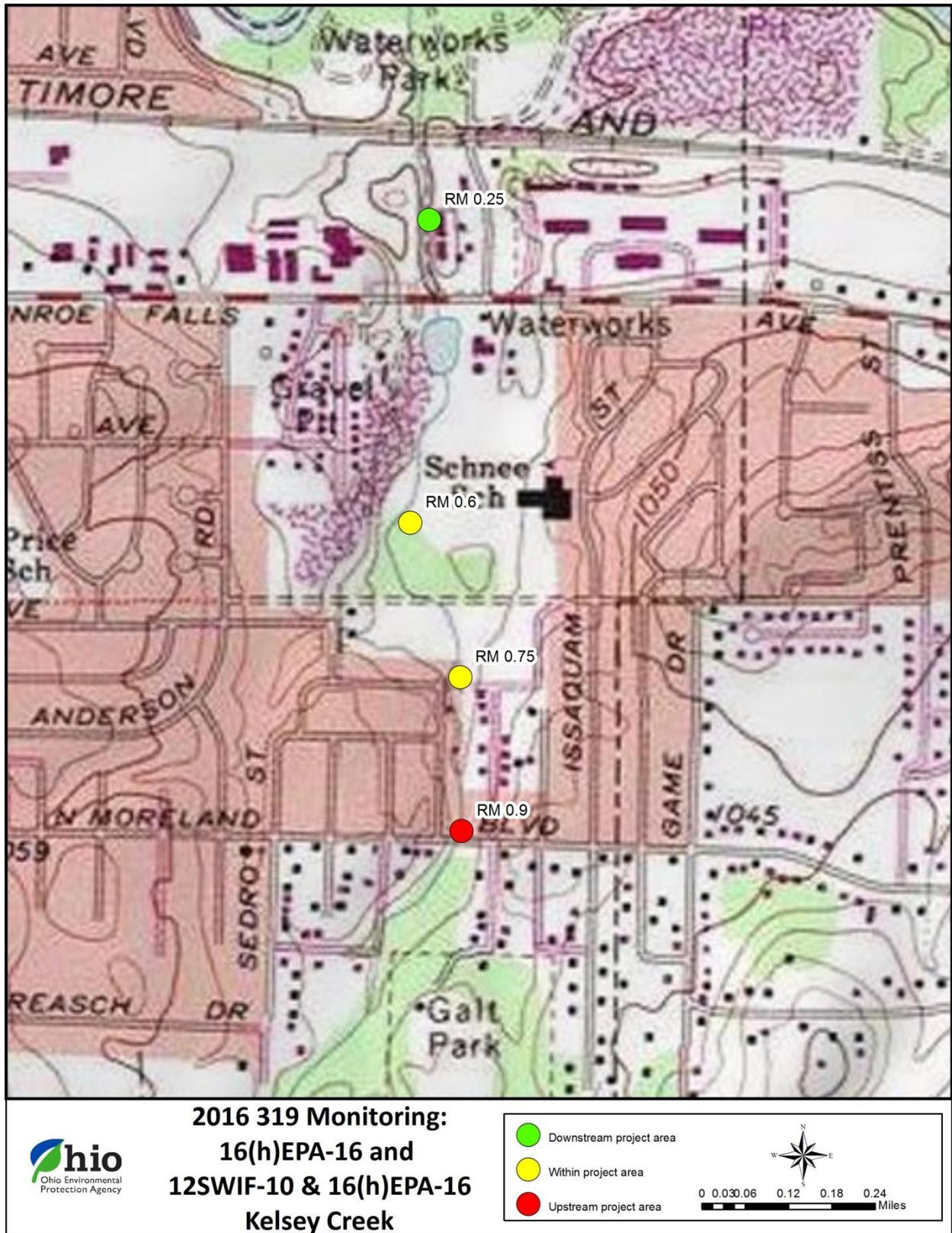


Figure 5. Kelsey Creek sampling locations, 2016 [16(h)EPA-16 and 12SWIF-10].

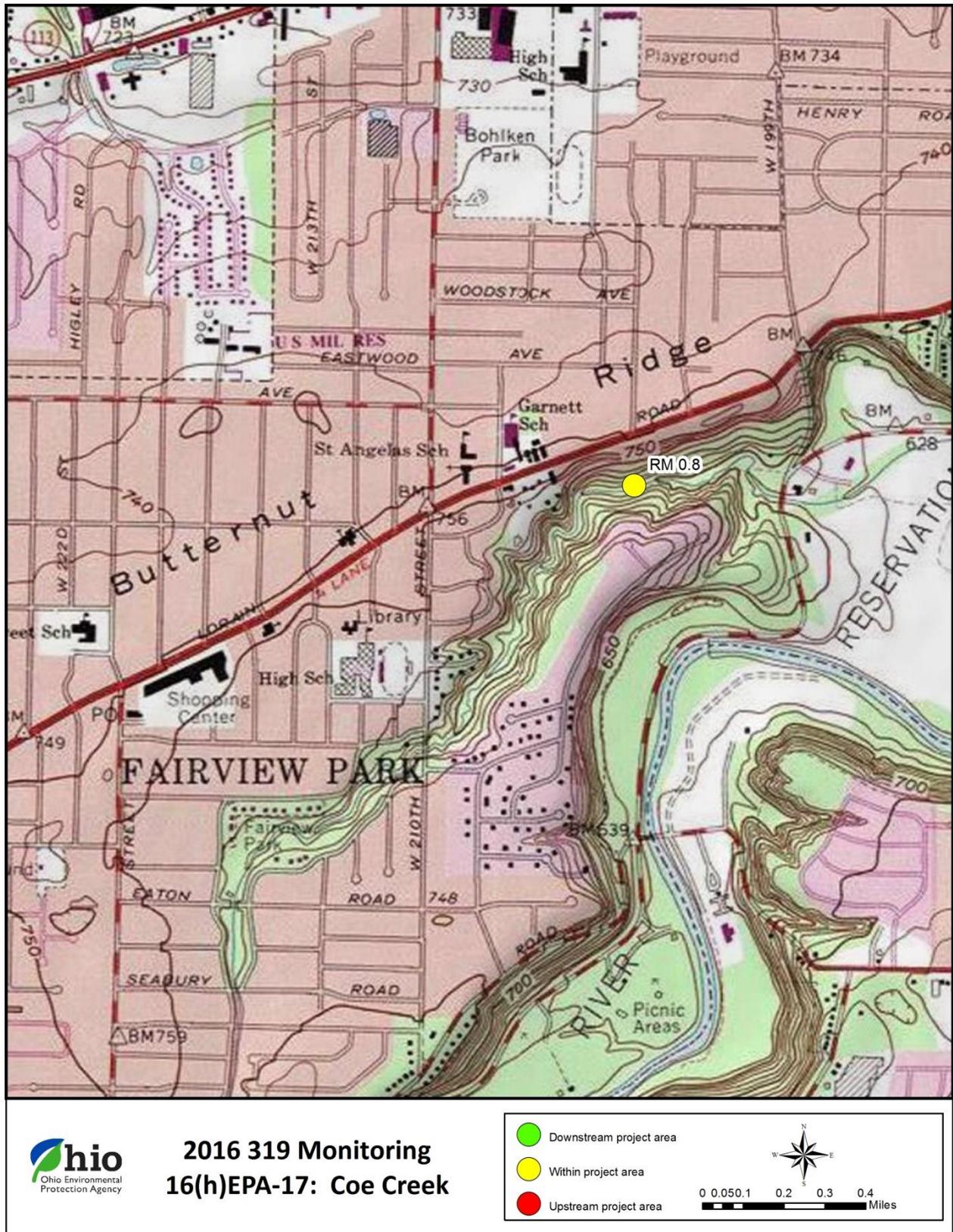


Figure 6. Coe Creek (trib. to Rocky River @ RM 6.51) sampling location, 2016 [16(h)EPA-17].

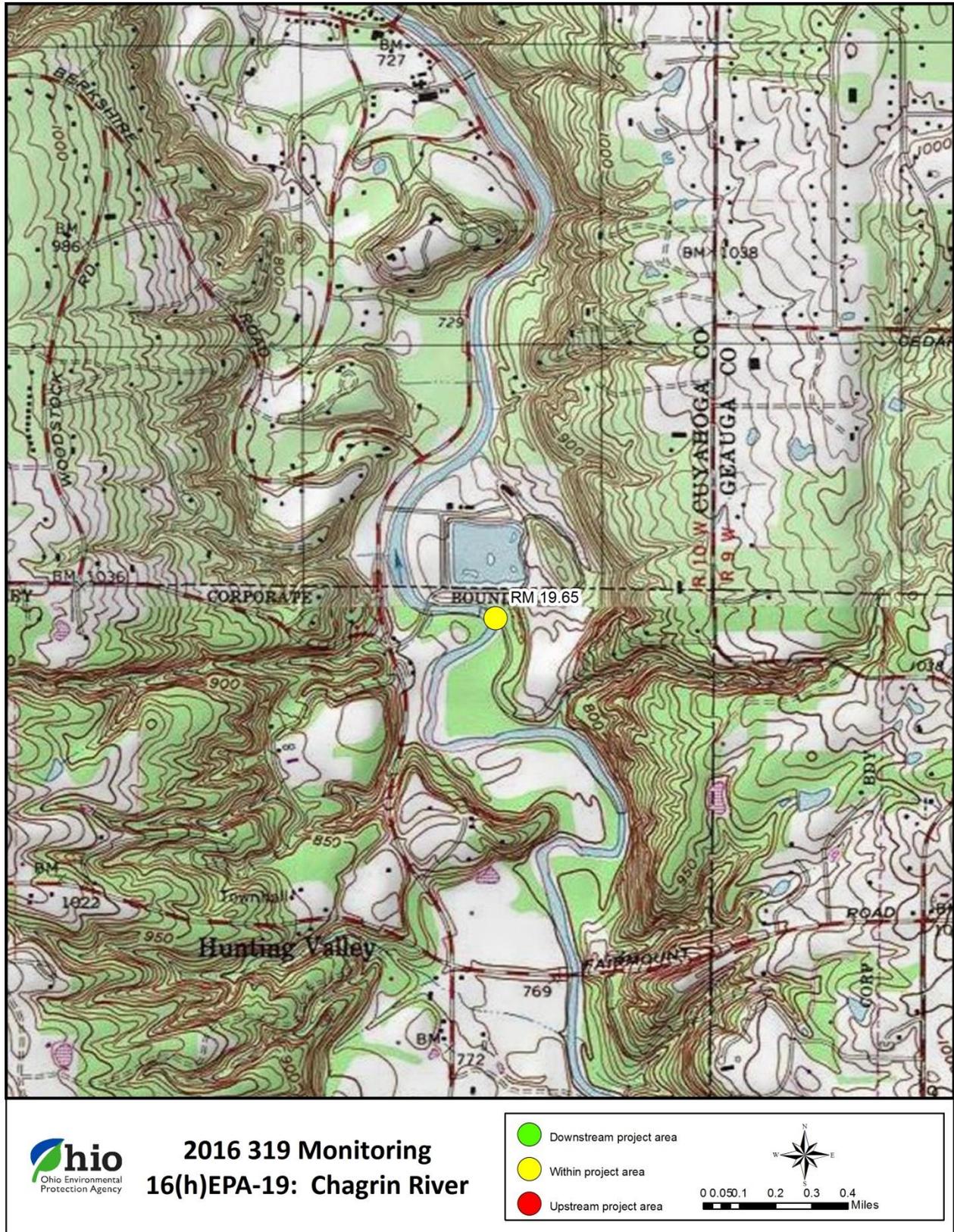


Figure 7. Chagrin River sampling location, 2016 [16(h)EPA-19].

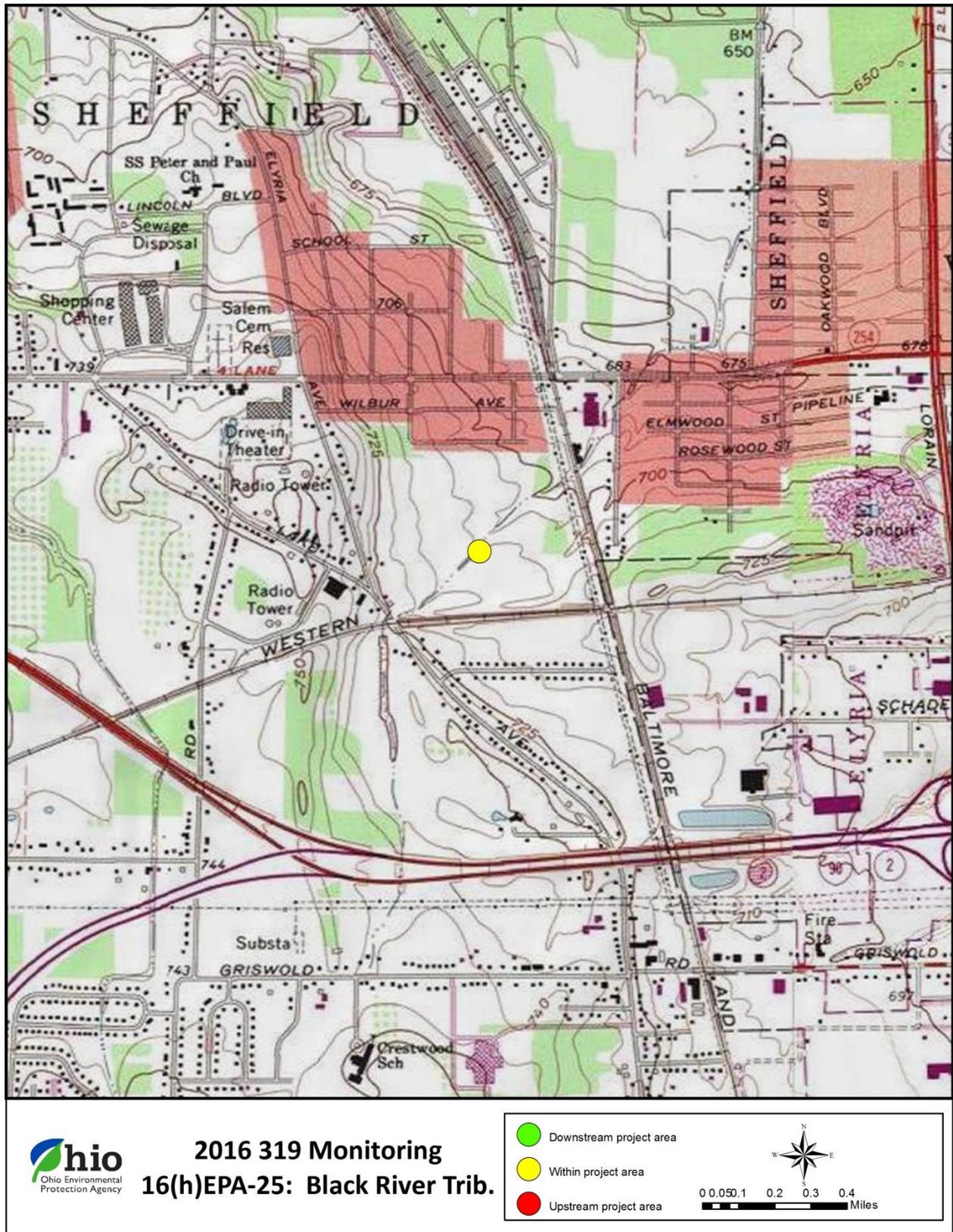


Figure 8. Tributary to Black River @ RM 6.55 sampling location, 2016 [16(h)EPA-25].

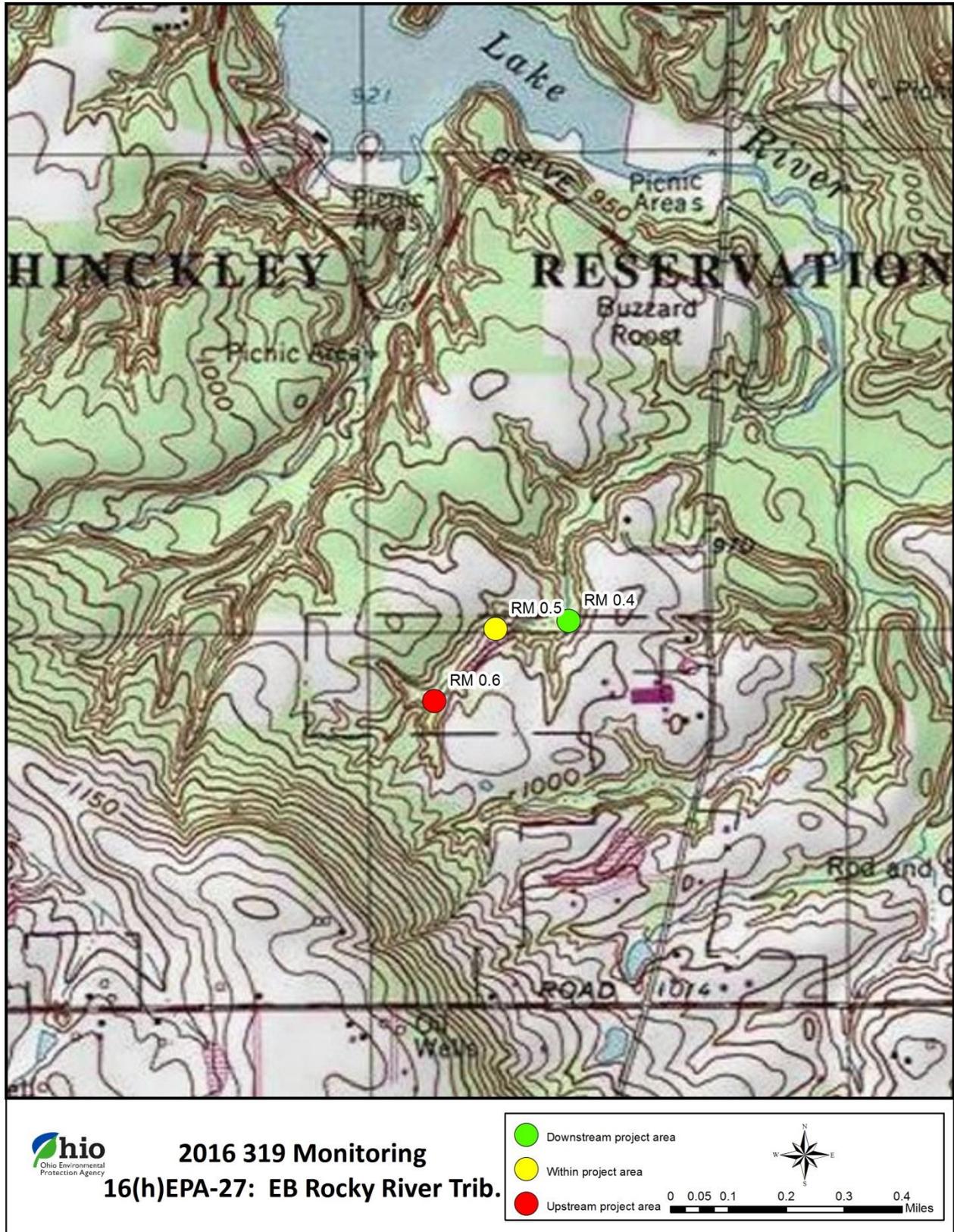


Figure 9. Tributary to E. Br. River @ RM 23.72 sampling locations, 2016 [16(h)EPA-27].

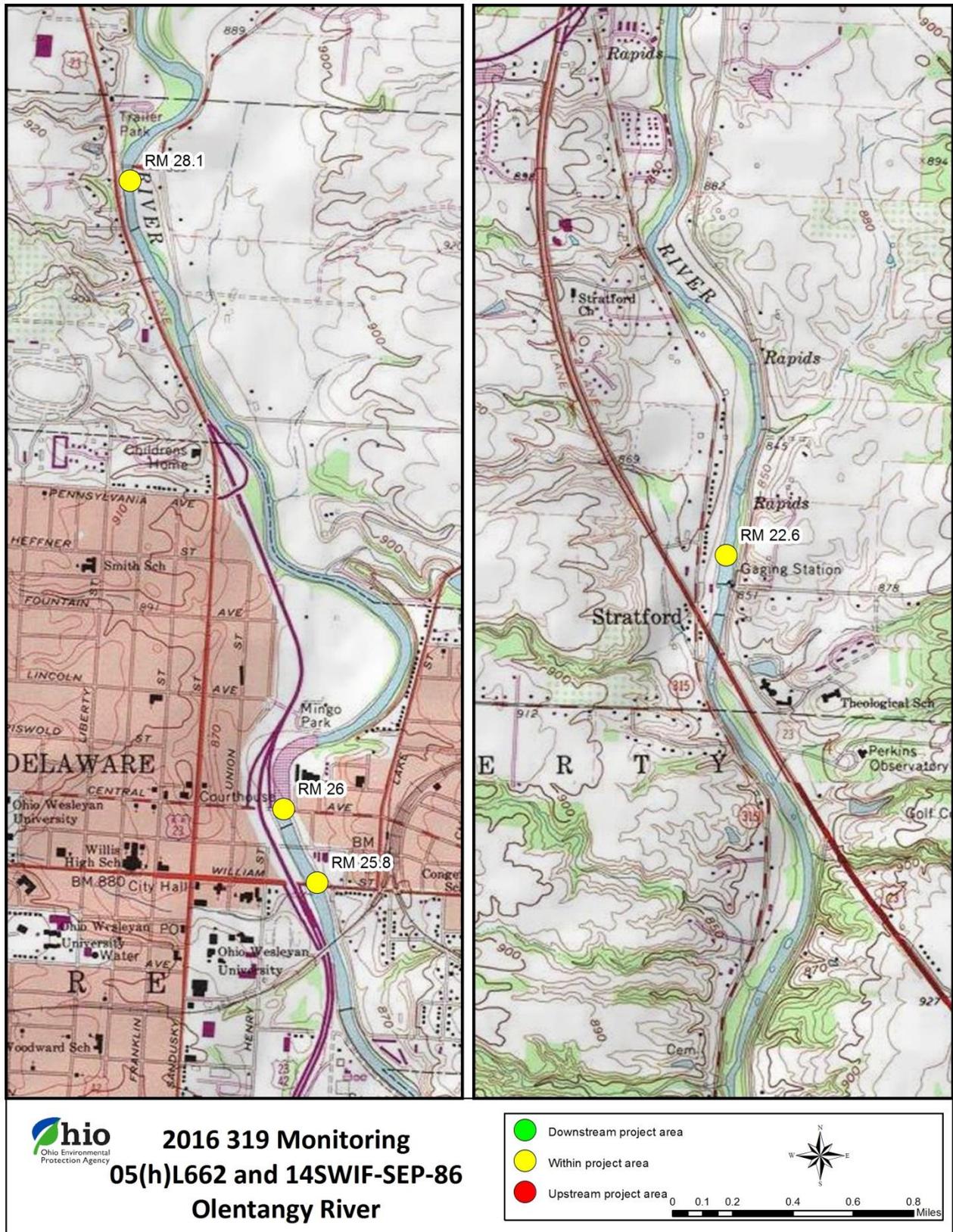


Figure 10. Olentangy River sampling locations, 2016 [05(h)L662, -, -, and 14SWIF-SEP-86].

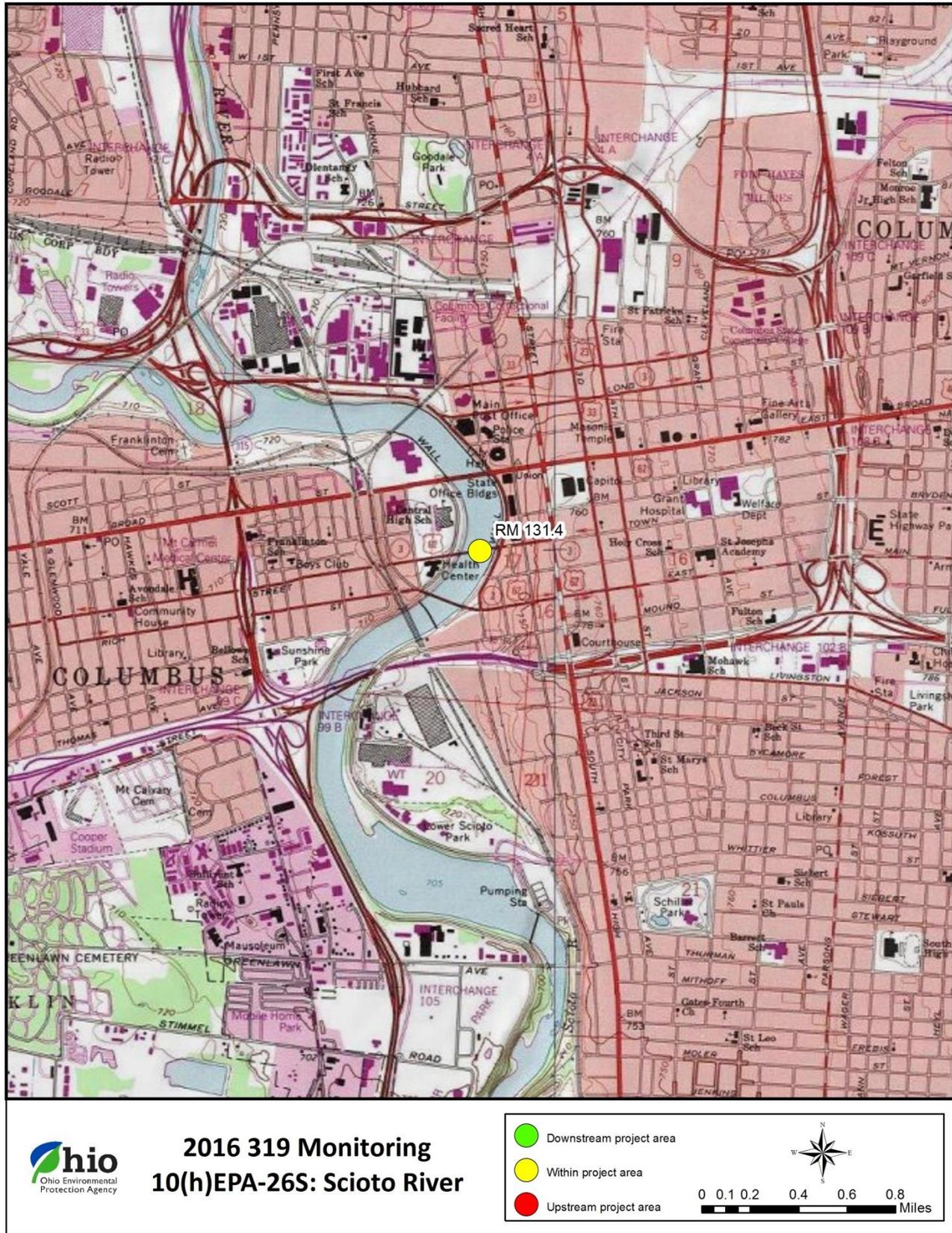


Figure 11. Scioto River sampling location, 2016 [10(h)EPA-26S].

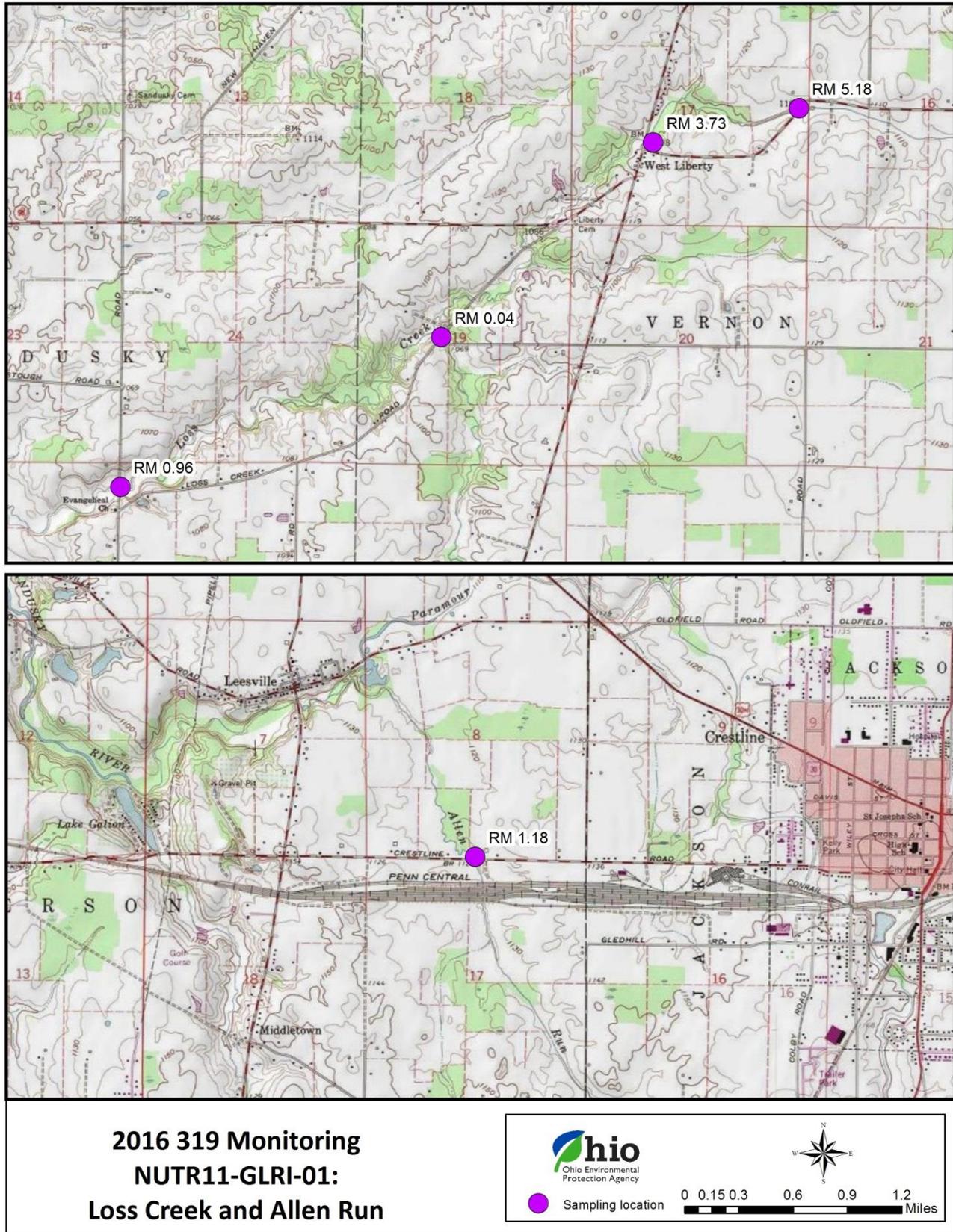


Figure 12. Loss Creek and Allen Run sampling locations, 2016 (NUTR11-GLRI-01).

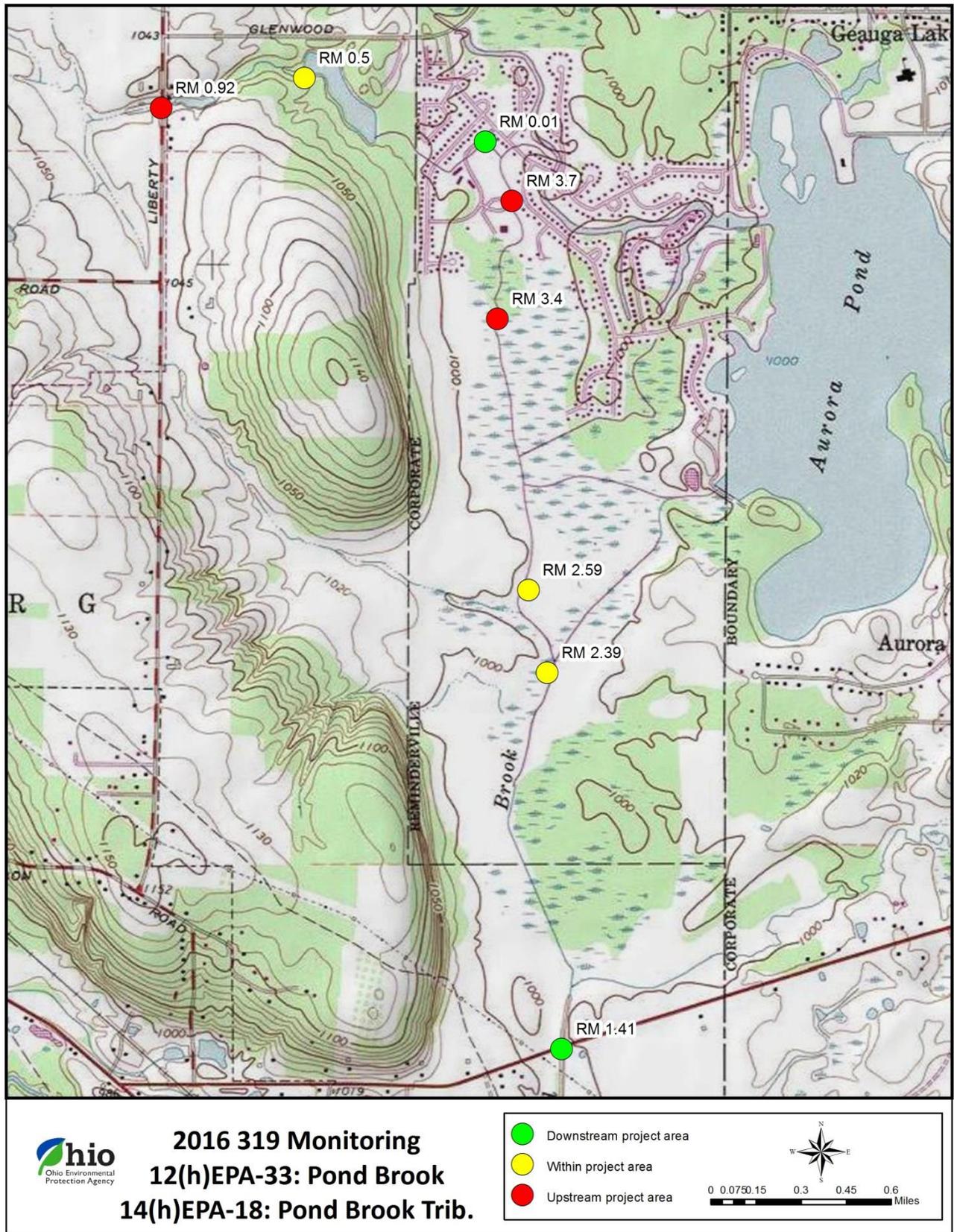


Figure 13. Pond Brook [12(h)EPA-33] and trib. to Pond Brook [14(h)EPA-18] sampling locations, 2016.

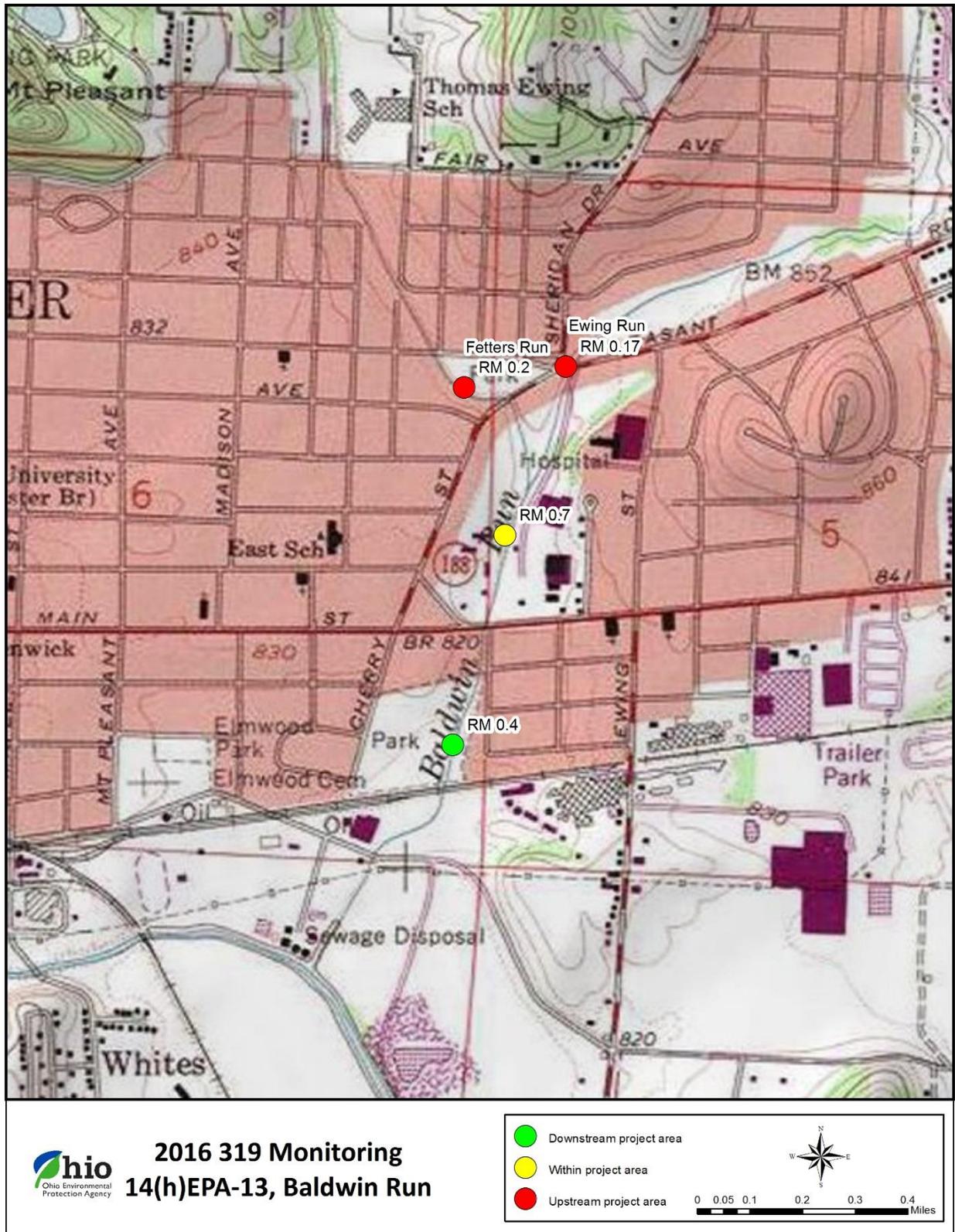


Figure 14. Baldwin Run sampling locations, 2016 [14(h)EPA-13].

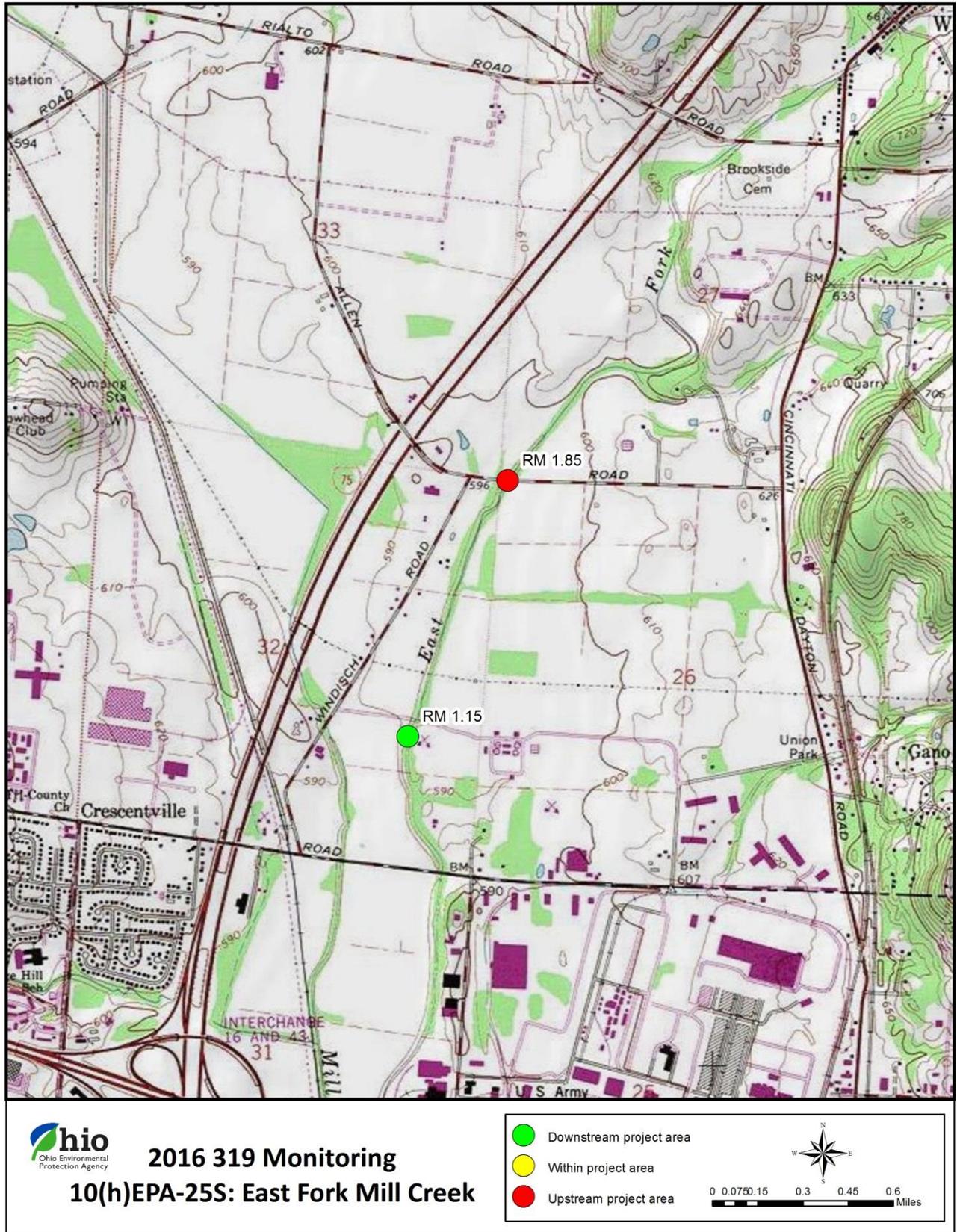


Figure 15. East Fork Mill Creek sampling locations, 2016 [10(h)EPA-25S].

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