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2023 PROBABILISTIC MONITORING WP FOR THE GREAT MIAMI RIVER BASIN

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Work Plan Organization

This sampling and analysis work plan is an extension of the existing Indiana Department of Environmental Management (IDEM) Watershed Assessment and Planning Branch (WAPB) March 2017 “Quality Assurance Project Plan (QAPP) for Indiana Surface Water Programs” (Surface Water QAPP) (IDEM 2017) and October 2020 “QAPP for Biological Community and Habitat Measurements” (IDEM 2020a), and serves as a link to the existing QAPP as well as an independent QAPP of the project. Per the United States Environmental Protection Agency (U.S. EPA) guidance for QAPPs (U.S. EPA 2006) and the U.S. EPA 2002 Guidance for Quality Assurance Project Plans (U.S. EPA 2002), this work plan establishes criteria and specifications pertaining to a specific water quality monitoring project that are usually described in the following four sections as QAPP elements.

A. Project Management
- A.1. Project Objective
- A.2. Project or Task Organization and Schedule
- A.3. Background and Project or Task Description
- A.4. Data Quality Objectives (DQOs)
- A.5. Training and Staffing Requirements

B. Data Generation and Acquisition
- B.1. Sampling Procedures
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List of Acronyms

AIMS	Assessment Information Management System
ALUS	Aquatic Life Use Support
ASTM	American Society for Testing and Materials
CAC	Chronic Aquatic Criterion
CALM	Consolidated Assessment Listing Methodology
CFU	Colony Forming Unit
DO	Dissolved oxygen
DQA	Data Quality Assessment
DQO	Data Quality Objective
E. coli	*Escherichia coli*
GPS	Global Positioning System
HDPE	High-density polyethylene
HUC	Hydrologic Unit Code
IDOH	Indiana Department of Health (formerly ISDH)
IAC	Indiana Administrative Code
IBI	Index of Biotic Integrity
IDEM	Indiana Department of Environmental Management
µm	Micrometer
m	Meter
mg/L	Milligram per liter
MHAB	Multihabitat
mL	Milliliter
MPN	Most Probable Number
MS/MSD	Matrix Spike and Matrix Spike Duplicate
NHD	National Hydrography Database
NHEERL	National Health Environmental Effects Research Laboratory
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit(s)
OHEPA	Ohio Environmental Protection Agency
OWQ	Office of Water Quality
PPE	Personal Protective Equipment
QA	Quality Assurance
QC	Quality Control
QAPP	Quality Assurance Project Plan
QHEI	Qualitative Habitat Evaluation Index
SM	Standard Method
SOP	Standard Operating Procedure
SU	Standard Units
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
U.S. EPA	United States Environmental Protection Agency
USGS	Unites States Geological Survey
WAPB	Watershed Assessment and Planning Branch
WP	Work plan

DEFINITIONS

Assessment Unit	Reaches of waterbodies, with similar features, assigned unique identifiers, to which all assessment information for a specific reach is associated, and which allow for mapping with geographic information systems.
Backwater	A part of the river not reached by the current, where the water is stagnant.
Elutriate	To purify, separate, or remove lighter or finer particles by washing, decanting, and settling.
15-minute pick	A component of the multihabitat macroinvertebrate sampling method, used to maximize taxonomic diversity while in the field. The 1-minute kick sample and 50-meter sweep sample collected at a site are first combined and elutriated. Macroinvertebrates are then manually removed from the resulting sample for 15 minutes.
50-meter sweep sample	A component of the multihabitat macroinvertebrate sampling method in which approximately 50 meters of all available habitat in a stream or river is sampled with a standard 500 micrometer mesh width D-frame dip net by taking 20–25 individual “jab” or “sweep” samples, which are then composited.
Impoundment	A body of water confined within an enclosure, such as a reservoir.
Lotic	A waterbody, such as a stream or river, in which the water is flowing.
Macroinvertebrate	Aquatic animals which lack a backbone, are visible without a microscope, and spend some period of their lives in or around water.
Marsh	An area of low-lying land that is flooded in wet seasons and typically remains waterlogged at all times.
1-minute kick sample	A component of the multihabitat macroinvertebrate sampling method in which approximately 1 m^2 of riffle or run substrate habitat in a stream or river is sampled with a standard 500 μm mesh width D-frame dip net for approximately 1 minute.

Ocular reticle	A thin piece of glass marked with a linear or areal scale that is inserted into a microscope ocular, superimposing the scale onto the image viewed through the microscope.
Perennial Stream	A stream that has continuous flow in the stream bed all year during years of normal rainfall. Water must be present in at least 50% of the stream reach during the time of fish community sampling.
Periphyton	Algae attached to an aquatic substrate.
Reach	A segment of a stream used for sampling.
Target	A sampling point which falls on a perennial stream within the basin of interest and the boundaries of Indiana.
Wetland	Land areas that are wet for at least part of the year, are poorly drained and are characterized by hydrophytic vegetation, hydric soils, and wetland hydrology.

A. Project Management

A.1. Project Objective

The main objective of the probabilistic monitoring project is to provide a comprehensive, unbiased assessment of the ability of rivers and streams in the Great Miami River Basin to support aquatic life and recreational uses. Sampling for this project will begin in April and continue through November 2023, conditions permitting, with collected samples analyzed for chemical, physical, and biological parameters. Laboratory processing and data analysis for the project will continue through spring of 2024. Data collected during probabilistic monitoring will be used for the following purposes:

- To provide water quality and biological data for assessment of aquatic life and recreational uses as integral components of the IDEM biennial Integrated Water Monitoring and Assessment Report (Integrated Report); thus, satisfying Clean Water Act (CWA) sections 305(b) and 303(d) reporting requirements to the U.S. EPA (33 U.S.C. §1251 et seq. 1972).
- To give a statistically valid estimation of the percent of stream miles supporting or nonsupporting for aquatic life and recreational uses in the basin of interest.
- To provide water quality and biological data which may be useful for municipal, industrial, agricultural, and recreational decision-making processes. These include the Total Maximum Daily Load (TMDL) process and National Pollutant Discharge Elimination System (NPDES) permit modeling of waste load allocations.
- To compile water quality and biological data for trend analyses and future pollution abatement activities.
- To aid in refined chemical and narrative biological water quality criteria.

A.2. Project or Task Organization and Schedule

Table 1. 2023 Probabilistic Monitoring Tasks, Schedule, and Evaluation

Activity	Date(s)	Number of Sites	Frequency of Sampling Related Activity	Parameter to be Sampled	How Evaluated
Site selection	Dec 2022	100 per basin of interest			Randomly ordered list generated by the National Health Environmental Effects Research Laboratory (NHEERL), Western Ecology Division, Corvallis, OR. Sites are stratified in statistically equal numbers of 1st, 2nd, 3rd, and 4th + stream order sites
Site reconnaissance	Jan 2 – Mar 15 2023	All 100 sites	At least one visit but may require several to obtain final approval		Landowner approval, stream access, and safety characteristics for the first 75 “Target” sites; “Nontarget” designations for remaining 25 sites.
Bacteriological sampling	Apr 3 – May 22 2023	First 40 target sites	Five times at equally spaced intervals over a 30 calendar-day period	*Escherichia coli (E. coli)*	Geometric mean (action level is ≥125 Colony Forming Units (CFU)/100mL or ≥125 Most Probable Number (MPN)/100 mL); sampled during recreational season (April – October)
Biological sampling	Jun – mid Nov 2023	First 38 target sites	Fish community (Jun 1 – Oct 15) Macroinvertebrate community (Jul 15 – Nov 15) Qualitative Habitat Evaluation Index (QHEI), once per sample	Fish community; Macroinvertebrate community; Habitat quality	Fish Index of Biotic Integrity (IBI) Macroinvertebrate IBI (mIBI) QHEI evaluated separately for fish and macroinvertebrate communities

Table 1. 2023 Probabilistic Monitoring Tasks, Schedule, and Evaluation (cont.)

Activity	Date(s)	Number of Sites	Frequency of Sampling Related Activity	Parameter to be Sampled	How Evaluated
Water chemistry	April – Sep/Oct 2023	First 45 target sites	Once each in April, Jun-July, and Sept-Oct with a minimum 30 days between sampling events	Total phosphorous Nitrogen, Nitrate and nitrite Dissolved oxygen pH Algal conditions Dissolved metals (See Table 8) Dissolved arsenic Nitrogen ammonia Chloride Free cyanide* Sulfate Total Dissolved Solids Dissolved Organic Carbon	>0.3 mg/L (nutrients) >10.0 mg/L (nutrients) <4.0 mg/L (warm water aquatic life); <6.0 mg/L (cold water fish); dissolved oxygen >120% saturation (nutrients) >9.0 Standard Units (SU) (nutrients); <6.0 or >9.0 SU (warm water aquatic life) Excessive (nutrients, based on field observation) Chronic Aquatic Criterion (CAC) based on hardness CAC based on concentration of 150 µg/L, a conversion factor and water-effect ratio of 1 CAC based on pH and temperature CAC based on hardness and sulfate CAC 5.2 µg/L CAC based on hardness and chloride 750 mg/L (public water supply criterion) There are no criteria for this parameter in the Indiana Administrative Code (IAC).
Algal samples	Sep – Oct 2023	First 45 target sites	Once with the 3rd water chemistry sample in Sept or Oct	Algal Diatoms	Diatom Index of Biotic Integrity

*Analyzed only where the total value exceeds the free Cn criterion of 5.2 µg/L.

A.3. Background and Project or Task Description

The Probabilistic Monitoring Program, created in 1996, is operated through the WAPB of IDEM. Other organizations which help with data preparation, collection, and analysis include private laboratories under contract with the State of Indiana, the Department of Biological and Environmental Sciences at Georgia College and State University, the U.S. EPA National Health Environmental Effects Research Laboratory (NHEERL), U.S. EPA Region V, and the Indiana Department of Natural Resources. Landowners and property managers throughout the state also participate in the Probabilistic Monitoring Program by assisting staff with access to remote stream locations for sample collection.

The Probabilistic Monitoring Program provides a comprehensive, unbiased assessment of all Indiana streams for their ability to support aquatic life and recreational uses by sampling randomly generated sites in major Indiana river basins. Major river basins are sampled using a nine-year rotating basin approach to assess and characterize overall water quality and biological integrity. For target sites, the following categories of data will be investigated and utilized for assessment purposes: bacteriological contamination indicated by *E. coli* counts; water chemistry; diatom, macroinvertebrate, and fish assemblages; and habitat evaluations.

A.4. Data Quality Objectives (DQO)

The DQO process (U.S. EPA 2006) is a planning tool for data collection activities. It provides a basis for balancing control of data uncertainty against available resources. The DQO process is required for all significant data collection efforts of a project. The process is a seven-step systematic planning process used to clarify study objectives, define the types of data needed to achieve the objectives, and establish decision criteria for evaluating data quality. The DQO process for the Probabilistic Monitoring Program is identified in the following seven steps.

A.4.1. State the Problem

Assessments: Indiana is required to assess all waters of the state to determine their designated use attainment status. “Surface waters of the state are designated for full-body contact recreation” and “will be capable of supporting” a “well-balanced, warm water aquatic community” [327 IAC 2-1-3]. This project will gather bacteriological, biological, chemical, and habitat data for the purpose of assessing the designated use attainment status of streams in the Great Miami River Basin.

A.4.2. Identify the Goals of the Study

The objective of this project is to produce a statistically valid estimation of the percent of stream miles supporting or nonsupporting for aquatic life use and recreational use in the Great Miami River Basin. To produce this evaluation, each target site will be sampled for concentrations of physical, chemical, and biological parameters. Sites will be evaluated as supporting or nonsupporting following the decision-making processes that are described in Indiana's 2022 Consolidated Assessment Listing Methodology (CALM). Water quality criteria are shown in Table 2 [327 IAC 2-1-6] and the Indiana 2022 CALM (IDEM 2022b).

In addition to the chemical and bacteriological criteria listed in Table 2, data for several nutrient parameters will be evaluated with the benchmarks listed below (IDEM 2022b). Assuming a minimum of three sampling events, if two or more of the conditions below are met on the same date, the waterbody will be classified as nonsupporting due to excessive nutrients.

- Total phosphorus: one or more measurements >0.3 mg/L
- Nitrogen, (nitrate and nitrite): one or more measurements >10.0 mg/L
- Dissolved oxygen: one or more measurements <4.0 mg/L, or measurements that are consistently at/close to the standard, in the range of 4.0-5.0 mg/L, or dissolved oxygen percent saturation >120%
- pH: one or more measurements >9.0 pH units or measurements consistently at or close to the standard, in the range of 8.7–9.0 pH units
- Algal conditions: visually observed as "Excessive" by trained staff using best professional judgment. Further explanation of this observance is documented in Measurement and Data Acquisition under Algal Community Data on page 28.

<u>Biological criteria:</u>

Indiana narrative biological criteria [327 IAC 2-1-3] states that "all waters, except as described in subdivision (5)," (i.e., limited use waters) "will be capable of supporting" a "well-balanced, warm water aquatic community". The water quality standard definition of a "well-balanced aquatic community" is "an aquatic community that: (A) is diverse in species composition; (B) contains several different trophic levels; and (C) is not composed mainly of pollution tolerant species" [327 IAC 2-1-9]. An interpretation or translation of narrative biological criteria into numeric criteria would be as follows: A stream segment is nonsupporting for aquatic life use when the monitored fish or macroinvertebrate community receives an IBI score of less than 36 (on a scale of 0–60 for fish and 12–60 for macroinvertebrate communities), which is considered "Poor" or "Very Poor" (IDEM 2022b).

Periphyton samples will be preserved and transported to the IDEM laboratory, located in the IDEM Shadeland facility. Diatoms will be identified and enumerated by Georgia College and State University, Department of Biological and Environmental Sciences. Following data entry, the diatom IBI will be calculated; however, assessment methodology for aquatic life use has not been finalized yet.

Following the assessment of each site sampled in the Great Miami River Basin, the percent of stream miles attaining and not attaining recreational use and aquatic life use designations will be calculated. First a spreadsheet is developed which lists the following site information:

- All sites that were initially drawn
- Their status, including whether access denied; site sampled for biology, chemistry, or both; an overdraw site that was not needed
- The assessment status of the site, including impaired; not impaired; NA for denials and unused overdraw sites
- A weight based on stream order and stream miles within the basin.

This data is then analyzed by a software package (*spsurvey*) used with the R statistics environment (IDEM 2020b). Instructions on downloading and using the software are available at: http://archive.epa.gov/nheerl/arm/web/html/software.html. The end product of this analysis is an estimate of the number of stream miles that are, or are not, impaired along with confidence intervals for that particular basin. Calculated mileages will be reported to U.S. EPA in the 2026 update of Integrated Report. Sites not attaining recreational use criteria, or the aquatic life use support (ALUS) designation will be listed in the CWA section 303(d) List of Impaired Waters for Indiana (Consolidated List). Sites not attaining the ALUS designation may be considered for possible additional sampling to determine the extent, causes, and likely sources of the ALUS non-attainment area as a watershed characterization project by the Targeted Monitoring Program.

Site-specific data will be used to classify associated assessment units into one of five major categories in the state's Consolidated List (IDEM 2022b), which will be included in IDEM's 2026 Integrated Report.

Table 2. Water Quality Criteria [327 IAC 2-1-6]

Parameter	Level	Criterion
Dissolved metals (Cd, Cr III, Cr VI, Cu, Pb, Ni, Zn	Calculated based on hardness	CAC
Dissolved arsenic III	150 µg/L (calculated based on a conversion factor and water-effect ratio of 1	CAC
Ammonia nitrogen	Calculated based on pH and temperature	CAC
Chloride	Calculated based on hardness and sulfate	CAC
Free cyanide	5.2 µg/L (analyzed only if Total Cyanide result exceeds the CAC for Free Cyanide)	CAC
Dissolved oxygen	At least 5.0 mg/L (warm water aquatic life) At least 6.0 mg/L (cold water fish*)	Not less than 4.0 mg/L at any time. Not less than 6.0 mg/L at any time and shall not be less than 7.0 mg/L in areas where spawning occurs during the spawning season and in areas used for imprinting during the time salmonids are being imprinted.
pH	6.0 – 9.0 SU	Must remain between 6.0 and 9.0 SU except for daily fluctuations that exceed 9.0 due to photosynthetic activity
Nitrogen, Nitrate and nitrite	10 mg/L	HHC at point of drinking water intake
Sulfate	Calculated based on hardness and chloride	In all waters outside the mixing zone
E. coli (April–October Recreational season)	125 CFU/100mL or 125 MPN/100 mL 235 CFU/100 mL or 235 MPN/100 mL	5 sample geometric mean based on at least 5 samples equally spaced over a 30-day period. Not to exceed in any one sample in a 30-day period except in cases where there are at least 10 samples, 10% of the samples may exceed the criterion
Dissolved solids	750 mg/L	Not to exceed at point of drinking water intake

CAC = Chronic Aquatic Criterion, SU = Standard Units, HHC = Human Health Criteria, MPN = Most Probable Number, CFU = Colony Forming Unit

*Waters protected for cold water fish include those waters designated by the Indiana Department of Natural Resources for put-and-take trout fishing, as well as salmonid waters listed in 327 IAC 2-1.5-5.

A.4.3. Identify Information Inputs

Under the probabilistic design, field monitoring activities are required to collect physical, chemical, algal, bacteriological, biological, and habitat data. These data are required to address the necessary decisions previously described. Monitoring activities take place at target sites for which permission to access has been granted by the necessary landowners or property managers. Due to the statistical nature of the survey design, historical data will not be used in the calculation of predicted stream mileages supporting or nonsupporting aquatic life or recreational uses. Collection procedures for field measurements, bacteriological, algal, chemical, biological, and habitat data will be described in detail under B. Measurement and Data Acquisition.

A.4.4. Define the Boundaries for the Study

For the purpose of this program, the Great Miami River Basin (Figure 1) is geographically defined as within the borders of Indiana contained by the 8-digit Hydrologic Unit Codes (HUC) 05080001, 05080002, and 05080003.

- The Upper Great Miami sub-basin (05080001), located in eastern Indiana, drains approximately 32 square miles within Indiana borders. Using the 2019 National Land Cover Database for the Conterminous United States (Dewitz 2021), predominant land uses are cropland (87%), urban (6%), and forest (6%).
- The Lower Great Miami sub-basin (05080002), located in southeastern Indiana, drains approximately 64 square miles within Indiana borders. Predominant land uses are cropland (74%), forest (10%), urban (9%), and pasture (5%).
- The Whitewater sub-basin (05080003), located in eastern Indiana, drains approximately 1329 square miles within Indiana borders. Major tributaries in this sub-basin include the East and West Forks of the Whitewater River. Predominant land uses are cropland (50%), forest (31%), urban (8%), and pasture (8%).

The target sample population for the basin is defined as all perennial streams in the Great Miami River Basin that lie within the geographic boundaries of Indiana. The sample frame is comprised of all rivers, streams, canals, and ditches as indexed through the NHDPlus HR dataset (Moore et al. 2019). Marshes, wetlands, backwaters, impoundments, dry sites, and streams with no apparent channel, including submerged, or run underground either through natural processes or by anthropogenic channel alterations, are excluded as they are considered nontarget populations. Table 3 gives the site status for 100 potential sampling sites for the Great Miami River Basin. From these 100 potential sites, the first 45 target sites will be sampled for physical, chemical, and algal parameters. Bacteriological sampling will be completed at the first 40 target sites. Biological communities and habitat information will be sampled at the first 38 target sites. For those sites listed as “Target, Approved" but not sampled in Table 3, the site will be listed as "Not-needed" when using the *R* statistics environment software (R Core Team 2021) package *spsurvey* (available on the U.S. EPA Aquatic Resources Monitoring and Analysis webpage, http://archive.epa.gov/nheerl/arm/web/html/software.html or at https://cran.r-project.org/web/packages/spsurvey/spsurvey.pdf) to calculate the percent of perennial stream miles in the basin that support or do not support aquatic life and recreational uses (IDEM 2020b). Sites listed as "Other, Deadline 3/15/2023" in Table 3 were thought to be part of the target population; however, the landowner could not be contacted before the site reconnaissance deadline which occurred on March 15, 2023.

A.4.5. Develop the Analytical Approach

Samples will be collected for physical, chemical, bacteriological parameters, and biological communities when the flow rate of the stream is safe for staff to enter. Considerations include times when water levels are at or above median base flow, when hazardous weather conditions like thunderstorms and heavy rain are in the vicinity; and when unexpected physical barriers prevent access to the site. The field crew chief makes the final determination if the stream is safe to enter. Even if the weather conditions and stream flow are safe, sample collections for biological communities may be postponed at a particular site for one to four weeks due to scouring of the stream substrate or instream cover following a high-water event resulting in nonrepresentative samples.

For assessment purposes in the Integrated Report, aquatic life use and recreational use support decisions will include independent evaluations of chemical, biological, and bacteriological criteria as outlined in Indiana's 2022 CALM (IDEM 2022b, pages 11–15 and 20-22). The fish assemblage will be evaluated at each site using the appropriate IBI (Dufour 2002, Simon 1997; Simon and Dufour 1998, 2005). Macroinvertebrate multihabitat samples will also be evaluated using a statewide mIBI developed for lowest practical taxonomic level identifications. Specifically, a site will be considered nonsupporting for aquatic life use when IBI or mIBI scores are less than 36. Diatom assemblages will be evaluated at each site using the appropriate IBI metrics (Jessup et al. 2021); however, the IBI score will not be used for determining aquatic life use support until an assessment methodology has undergone review in the CALM. Where biological or chemical criteria are nonsupporting for aquatic life use, the site may be considered for possible additional sampling to determine the extent, causes, and likely sources of the ALUS nonattainment area as a watershed characterization project by the Targeted Monitoring Program.

Statistical estimations of the percentage of perennial stream miles in the Great Miami River Basin that support or do not support aquatic life and recreational uses will be made following use-attainment decisions for each site sampled. Estimations will be calculated using the *R* statistics environment software (R Core Team 2014) package *spsurvey* available on the U.S. EPA Aquatic Resources Monitoring and Analysis webpage, http://archive.epa.gov/nheerl/arm/web/html/software.html, or at https://cran.r-project.org/web/packages/spsurvey/spsurvey.pdf (IDEM 2020b).The percent attainment and nonattainment for the target population of the Great Miami River Basin will be published in a table within the 2026 Integrated Report.

Figure 1. Potential Sampling Sites for the Great Miami River Basin.

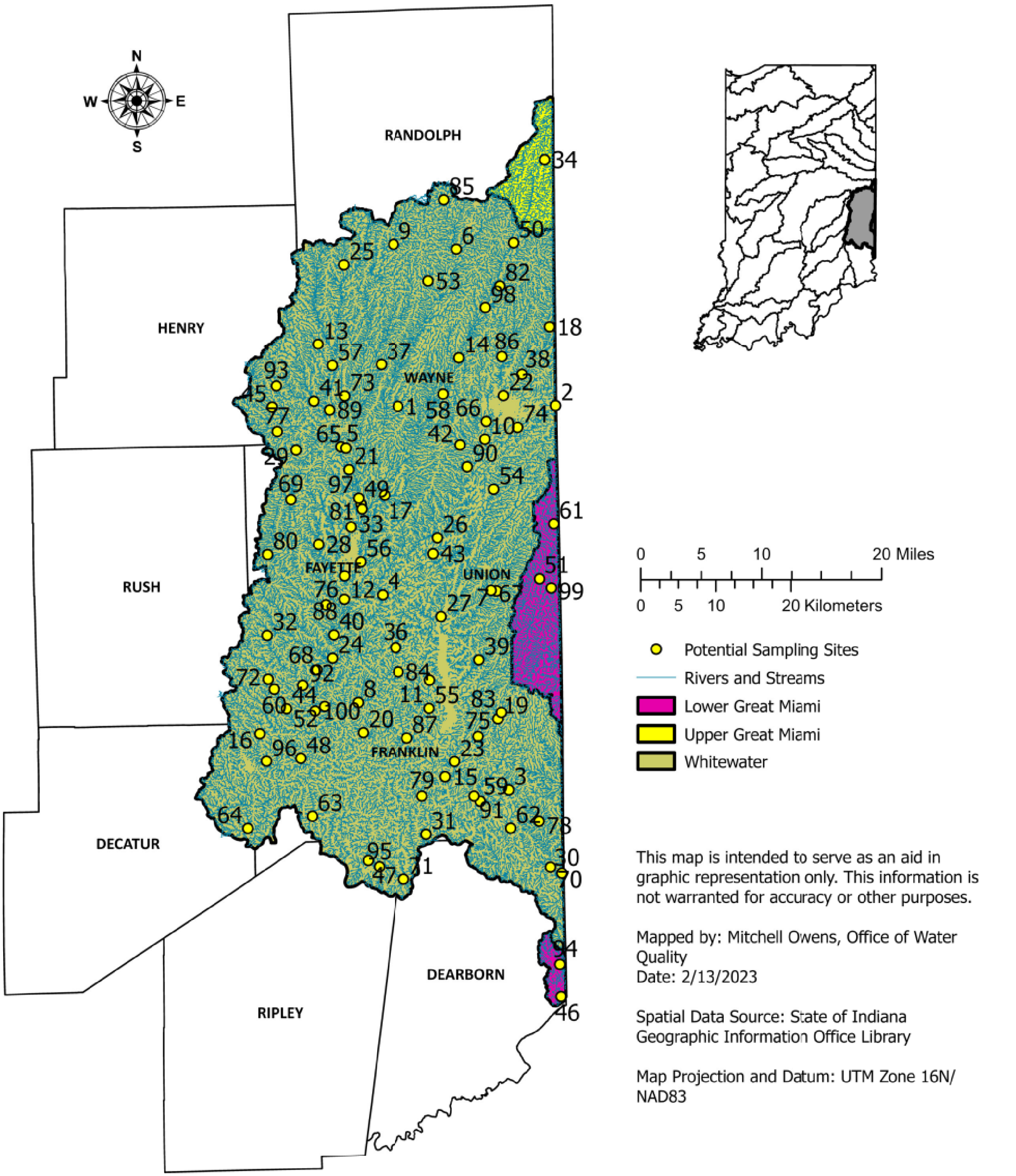

Table 3. List of Potential Sites for the Great Miami River Basin.

Site #	AIMS Site Name	Stream Name and Location	County	Latitude (Decimal Degree)	Longitude (Decimal Degree)	Stream Order	Site Status
1	GMW-02-0015	Black Water Branch @ Black Road	Wayne	39.83070795	-85.05959612	3	Non-target, dry
2	GMW-07-0063	Tributary of East Fork Whitewater River @ West Eaton Pike	Wayne	39.82725979	-84.81410209	1	Target, Approved
3	GMW-08-0031	Tributary of Big Cedar Creek @ English Hill Road	Franklin	39.36609539	-84.90058474	4	Non-target, dry
4	GMW-04-0023	Village Creek @ CR 300 South	Fayette	39.60480602	-85.09025169	3	Non-target, dry
5	GMW-01-0020	Whitewater River @ Mill Street	Wayne	39.78365141	-85.15086729	7	Target, Approved
6	GMW-02-0016	Greens Fork @ CR 100 S	Randolph	40.01925835	-84.96255752	5	Target, Approved
7	GMW-07-0064	Tributary of Hanna Creek	Union	39.60657855	-84.91245396	3	Non-target, dry
8	GMW-06-0024	Duck Creek @ Duck Creek Rd	Franklin	39.47633516	-85.13205614	5	Target, Approved
9	GMW-01-0021	Carlos Drain	Randolph	40.02683654	-85.06134805	4	Non-target, dry
10	GMW-07-0065	East Fork Whitewater River @ Abington Pike	Wayne	39.78885709	-84.92509225	6	Target, Approved
11	GMW-07-0077	Salt Well Creek @ Haynes Road	Franklin	39.5012298	-85.01940573	4	Target, Approved
12	GMW-04-0024	Tributary of Whitewater River @ Ziegler Road	Fayette	39.62867872	-85.14914865	3	Target, Approved
13	GMW-01-0022	Brick Creek @ Brick Church Road	Wayne	39.90811596	-85.18315933	4	Target, Approved
14	GMW-03-0026	Nolands Fork @ Tingler Road	Wayne	39.88753591	-84.96267095	3	Target, Approved
15	GMW-08-0032	Whitewater River @ River Road	Franklin	39.38360637	-84.99857208	8	Target, Approved
16	GMW-05-0016	Bull Fork	Franklin	39.44113484	-85.28575184	4	Non-target, access denied
17	GMW-03-0021	Butlers Creek @ Creek Road	Wayne	39.72448326	-85.08403877	6	Target, Approved
18	GMW-07-0078	Middle Fork East Fork Whitewater River @ Hollansburg Road	Wayne	39.92333575	-84.82033748	3	Target, Approved
19	GMW-08-0033	Tributary of Big Cedar Creek	Franklin	39.45295353	-84.91494368	3	Non-target, dry
20	GMW-06-0025	Whitewater River @ Whitewater Canal State Historical Site	Franklin	39.43996504	-85.12505584	8	Target, Approved
21	GMW-02-0022	Mixed Creek @ Lindsay Road	Wayne	39.75607693	-85.13901173	3	Target, Approved
22	GMW-07-0066	West Fork East Fork Whitewater River @ Bridge Avenue	Wayne	39.84074236	-84.89467194	5	Target, Approved
23	GMW-08-0034	Little Cedar Creek @ Little Cedar Road	Franklin	39.40188033	-84.98353441	5	Target, Approved
24	GMW-04-0025	Whitewater River @ Ott Road	Fayette	39.53006644	-85.17041703	8	Target, Approved
25	GMW-01-0033	Little Creek	Wayne	40.00353343	-85.14030595	4	Non-target, dry
26	GMW-07-0067	East Fork Whitewater River @ Brownsville Road	Union	39.67197732	-85.00216052	7	Target, Approved
27	GMW-07-0068	East Fork Whitewater River	Union	39.57730772	-84.99940344	7	Non-target, impounded stream
28	GMW-04-0037	Little Williams Creek	Fayette	39.66703388	-85.18860234	5	Non-target, access denied
29	GMW-01-0023	Tributary of Symons Creek @ CR 450 West	Fayette	39.78092386	-85.22087766	3	Target, Approved
30	GMW-08-0035	Whitewater River @ State Street	Dearborn	39.26437308	-84.82177513	8	Target, Approved
31	GMW-08-0036	Tributary of East Fork Blue Creek @ East Road	Franklin	39.31487461	-85.03007809	4	Non-target, dry
32	GMW-04-0038	Tributary of Sanes Creek @ South Beaver Road	Fayette	39.55901097	-85.27159874	4	Target, Approved
33	GMW-04-0026	Lick Creek @ SR 1	Fayette	39.68715842	-85.13767865	5	Target, Approved
34	GMU-10-0003	Greenville Creek @ CR 250 South	Randolph	40.12445969	-84.82152632	6	Target, Approved
35	GMW-08-0037		Franklin	39.46811022	-84.85462496	3	Non-target, no stream
36	GMW-06-0026	Duck Creek	Fayette	39.54128437	-85.07141886	3	Non-target, dry
37	GMW-01-0024	Dry Branch	Wayne	39.88158196	-85.0848704	3	Non-target, dry
38	GMW-07-0069	Middle Fork East Fork Whitewater River	Wayne	39.86597736	-84.86496551	6	Non-target, impounded stream
39	GMW-07-0070	Templeton Creek @ Snowden Road	Franklin	39.52424835	-84.94226035	4	Target, Approved
40	GMW-04-0027	Whitewater River @ Boys Club Road	Fayette	39.55794905	-85.16776304	8	Target, Approved
41	GMW-01-0025	Symonds Creek @ Goose Heaven Road	Wayne	39.83905939	-85.19151103	6	Target, Approved
42	GMW-07-0071	Tributary of East Fork Whitewater River	Wayne	39.78282678	-84.96392245	5	Target, Approved
43	GMW-07-0072	East Fork Whitewater River @ Philomah Road	Union	39.65283355	-85.00952536	7	Target, Approved
44	GMW-05-0022	Little Salt Creek	Franklin	39.47056128	-85.2436132	5	Target, Approved
45	GMW-01-0026	Symons Creek @ CR 700 South	Henry	39.831692	-85.256662	5	Target, Approved
46	GML-09-0001	Great Miami River @ Auction Lane	Dearborn	39.11595696	-84.82760799	9	Target, Approved
47	GMW-06-0027	Tributary of Western Creek @ Hoff Road	Ripley	39.28490254	-85.12166799	4	Target, Approved
48	GMW-05-0023	Tributary of Salt Creek @ Shady Road	Franklin	39.4094575	-85.22293021	4	Target, Approved
49	GMW-02-0017	Whitewater River @ Newman Lake Road	Fayette	39.714286	-85.12122075	7	Target, Approved
50	GMW-03-0022	Nolands Fork	Randolph	40.02544957	-84.87311854	5	Target, Approved

Table 3 (continued). List of Potential Sites for the Great Miami River Basin.

Site #	AIMS Site Name	Stream Name and Location	County	Latitude (Decimal Degree)	Longitude (Decimal Degree)	Stream Order	Site Status
51	GML-08-0001	Indian Creek	Union	39.6197877	-84.84519862	4	Non-target, dry
52	GMW-04-0028	Whitewater River @ SR 121	Franklin	39.47301478	-85.18599696	8	Target, Approved
53	GMW-02-0018	Town Creek	Wayne	39.98186956	-85.00786087	4	Target, Approved
54	GMW-07-0073	Smith Creek @ Old SR 112	Wayne	39.72864912	-84.91330608	4	Target, Approved
55	GMW-07-0079	Tributary of Wolf Creek	Franklin	39.46737849	-85.02105596	4	Target, Approved
56	GMW-04-0029	Whitewater River	Fayette	39.64519912	-85.12338876	8	Target, Approved
57	GMW-01-0027	Bear Creek @ Heiney Road	Wayne	39.88176015	-85.16164443	4	Target, Approved
58	GMW-03-0023	Tributary of Nolands Fork	Wayne	39.84430575	-84.98829395	5	Non-target, impounded stream
59	GMW-08-0041	Whitewater River @ Graf Road	Franklin	39.35320657	-84.94518226	8	Target, Approved
60	GMW-05-0017	Little Salt Creek	Franklin	39.49431609	-85.26205287	5	Non-target, access denied
61	GML-06-0004	Church Creek @ SR227	Union	39.68549487	-84.82111353	4	Other, Deadline 3/15
62	GMW-08-0042	Whitewater River	Franklin	39.3197997	-84.89923211	8	Target, Approved
63	GMW-05-0018	Harvey Branch @ Water Street	Franklin	39.33939545	-85.20667097	4	Target, Approved
64	GMW-05-0019	Salt Creek @ Base Road	Decatur	39.32621204	-85.30713032	6	Target, Approved
65	GMW-01-0028	Whitewater River	Wayne	39.78195968	-85.14313126	7	Target, Approved
66	GMW-07-0074	Clear Creek @ Earlham Cemetery	Wayne	39.81022192	-84.92225928	5	Target, Approved
67	GMW-07-0075	Tributary of Hanna Creek	Union	39.60734403	-84.92089585	3	Non-target, dry
68	GMW-04-0030	Tributary of Whitewater River	Franklin	39.51638399	-85.19512192	4	Non-target, dry
69	GMW-04-0031	Williams Creek @ Shrader-Weaver Nature Preserve	Fayette	39.72159426	-85.23048486	6	Target, Approved
70	GMW-08-0038	Whitewater River @ Pinhook Road	Dearborn	39.27189996	-84.83900939	8	Target, Approved
71	GMW-06-0028	Tributary of Pipe Creek @ Walters Road	Dearborn	39.26140023	-85.06650276	3	Other, Deadline 3/15
72	GMW-05-0020	Little Salt Creek	Franklin	39.50637862	-85.27113853	5	Other, Deadline 3/15
73	GMW-01-0029	Beard Run	Wayne	39.84445023	-85.14348292	3	Non-target, dry
74	GMW-07-0076	Tributary of Short Creek	Wayne	39.80215909	-84.87380675	2	Non-target, dry
75	GMW-08-0043	Little Cedar Creek	Franklin	39.43250634	-84.94629293	3	Target, Approved
76	GMW-04-0032	Fall Creek @ CR 350 South	Fayette	39.59419387	-85.17906203	4	Target, Approved
77	GMW-01-0030	Tributary of Roy Run	Henry	39.80339851	-85.24972022	3	Non-target, dry
78	GMW-08-0039	Johnson Fork @ Johnson Fork Road	Franklin	39.32750715	-84.85500484	4	Target, Approved
79	GMW-08-0044	Blue Creek @ Blue Creek Road	Franklin	39.36106322	-85.03519673	6	Target, Approved
80	GMW-04-0033	Tributary of Williams Creek	Fayette	39.6560602	-85.2684128	4	Other, Deadline 3/15
81	GMW-02-0019	Whitewater River @ Newman Lake Road	Fayette	39.70839532	-85.1199238	7	Target, Approved
82	GMW-03-0024	Fountain Creek	Wayne	39.97384789	-84.89600542	5	Target, Approved
83	GMW-08-0045	Big Cedar Creek @ Liberty Pike	Franklin	39.46058575	-84.90923985	5	Other, Deadline 3/15
84	GMW-06-0029	Tributary of Duck Creek @ Davis Road	Franklin	39.51195353	-85.0678823	3	Other, Deadline 3/15
85	GMW-02-0020	Snow Run @ CR 600 South	Randolph	40.07919451	-84.98031432	5	Other, Deadline 3/15
86	GMW-07-0080	Tributary of West Fork East Fork Whitewater River @ Tingler Road	Wayne	39.88784439	-84.8956266	4	Target, Approved
87	GMW-06-0030	Whitewater River	Franklin	39.43240732	-85.05671903	8	Other, Deadline 3/15
88	GMW-04-0034	Whitewater River @ SR 121	Fayette	39.60050878	-85.15042415	8	Other, Deadline 3/15
89	GMW-01-0031	Whitewater River @ Canbridge Road	Wayne	39.82811017	-85.1673208	4	Other, Deadline 3/15
90	GMW-07-0081	East Fork Whitewater River @ Endsley Road	Wayne	39.75634684	-84.95346992	7	Other, Deadline 3/15
91	GMW-08-0040	Whitewater River @ SR 1	Franklin	39.35965771	-84.95449355	8	Other, Deadline 3/15
92	GMW-04-0035	Sanes Creek @ Sanes Creek Road	Franklin	39.4982526	-85.21773853	5	Other, Deadline 3/15
93	GMW-01-0032	Lick Branch	Henry	39.8583447	-85.2497149	4	Other, Deadline 3/15
94	GML-09-0002	Doublelick Run	Dearborn	39.1546453	-84.8283174	5	Other, Deadline 3/15
95	GMW-06-0031	Tributary of Western Creek @ Spader Road	Ripley	39.27696191	-85.10452562	3	Other, Deadline 3/15
96	GMW-05-0021	Bull Fork	Franklin	39.40698659	-85.27632094	5	Other, Deadline 3/15
97	GMW-02-0021	Whitewater River	Wayne	39.72153211	-85.12460597	7	Other, Deadline 3/15
98	GMW-03-0025	Nolands Fork	Wayne	39.9483352	-84.91961853	5	Other, Deadline 3/15
99	GML-06-0005	Little Four Mile Creek @ 9 Mile Road	Union	39.60854269	-84.82745367	5	Other, Deadline 3/15
100	GMW-04-0036	Sillimans Creek	Franklin	39.46725863	-85.19935022	3	Other, Deadline 3/15

A.4.6. Specify Performance or Acceptance Criteria

Good quality data are essential for minimizing decision error. By identifying errors in the sampling design, measurement, and laboratory for physical, chemical, and biological parameters, more confidence can be placed in the percentage of perennial stream miles in the river basin that support or do not support aquatic life and recreational uses. In this project, it is desired to make decisions protective of human health and the environment; therefore, the null hypothesis is that the reach is not supportive of Indiana's aquatic life and recreational uses. The resulting Type 1 and Type 2 decision errors in this project are listed in Table 4 below.

Table 4. Decision Error Associated with Probabilistic Monitoring.

	Actual Status of Sampled Stream Reaches of the Studied Watershed	
WAPB Work Plan Findings	**Stream reach IS supportive of aquatic life and recreational use**	**Stream reach IS NOT supportive of aquatic life and recreational use**
Stream reach IS supportive of aquatic life and recreational use	Stream reach is correctly identified as supporting aquatic life and recreational use	**Decision Error (Type 1)**
Stream reach IS NOT supportive of aquatic life and recreational use	**Decision Error (Type 2)**	Stream reach is correctly identified as NOT supporting aquatic life and recreational use

The probabilistic sampling design provides estimations of the proportion of streams in the basin attaining designated uses with a 95% confidence level. A minimum of 38 probabilistic sites will be sampled in the basin to assure this confidence level is reached for overall stream mileage estimations (see Sampling Design and Site Locations, page 19).

Site specific aquatic life use and recreational use assessments include program specific controls to identify the introduction of errors. These controls include water chemistry and bacteriological blanks and duplicates, biological site revisits or duplicates, and laboratory controls through verification of species identifications as described in IDEM QAPPs and SOPs (IDEM, 2017, 2020a, 2020c, 2020d, 2023a, 2023b, 2023d, 2023e, 2023f, 2023h).

The QA/QC process detects deficiencies in the data collection as set forth in the QAPP (IDEM 2017, 2020a). The QAPP requires all contract laboratories to adhere to rigorous standards during sample analyses and to provide good quality usable data. Chemists within the WAPB provide a QA review of the laboratory analytical results. Any data which is "Rejected" due to analytical problems or errors will not be used for water quality assessment decisions. Any data flagged as “Estimated” may be used on a case-by-case basis and is noted in the QA/QC report. Criteria for acceptance or rejection of results as well as application of data quality flags is presented in the Surface Water QAPP, Table D3-1: Data Qualifiers and Flags, page 184 (IDEM 2017) and Biological and Habitat QAPP, pages 32-36 (IDEM 2020a). Precision and accuracy goals with acceptance limits for applicable analytical methods are provided in the Surface QAPP, Table A7-1: Precision and Accuracy Goals for Data Acceptability by Matrix, pages 61–63; and Table B2.1.1.8-2 Field Parameters, page 117 (IDEM 2017). Further investigation will be conducted in response to consistent “rejected” data in determining the source of error. Field techniques used during sample collection and preparation, along with laboratory procedures will be subject to evaluation by both the WAPB QA manager and project manager in troubleshooting error introduced throughout the entire data collection process. Corrective actions will be implemented once the source of error is determined per the QAPP (IDEM 2017, IDEM 2020a).

If funding and resources are available, results showing nonsupport for aquatic life use will be subsequently verified through a targeted monitoring program prior to completion of the Integrated Report. Those stream reaches showing nonsupport may also be verified through the TMDL development process.

A.4.7. Develop the Plan for Obtaining Data

The probabilistic rotating basin design is optimal for assessing the recreational use and ALUS status of river and stream resources in Indiana. The design facilitates statistically valid estimations of the total percent of perennial stream miles within the basin of interest that are nonsupporting for aquatic life and recreational uses. The estimations are derived from total perennial stream miles in the basin of interest and the design requires minimal use of sampling and staff resources (see Sampling Design and Site Locations, page 19).

A.5. Training and Staffing Requirements

Table 5. Project Roles, Experience, and Training

Role	Required Training/Experience	Responsibilities	Training References
Project manager	-Database experience -Experience in project management and QA/QC procedures	-Establish project in the Assessment Information Management System (AIMS) II database -Oversee development of project work plan -Oversee entry and QC of field data -Querying data from AIMS II to determine	-AIMS II Database User Guide -IDEM 2017, 2018, 2020a, 2020b, 2022b -U.S. EPA 2002, 2006

Role	Required Training/Experience	Responsibilities	Training References
		results not meeting water quality criteria -Calculating predicted percentage of perennial stream miles nonsupporting for aquatic life uses and recreational uses in the river basin of interest	
Field crew chief macroinvertebrate and fish community sampling	-At least one year of experience in sampling methodology and taxonomy of aquatic communities in the region -Annually review the principles and techniques of electrofishing -Annually review relevant safety procedures -Annually review relevant SOP documents for field operations	-Complete field data sheets -Taxonomic accuracy -Sampling efficiency and representation -Voucher specimen tracking -Overall operation of the field crew -Adherence to safety and field SOP procedures by crew members -Ensure that multiprobe analyzers are calibrated weekly prior to field sampling activities -Ensure that field sampling equipment is functioning properly and loaded into field vehicles prior to field sampling activities	-Dufour 2002 -IDEM 2008, 2010a, 2010b, 2019, 2020a, 2020c, 2020d, 2021b, 2022a, 2022b, 2023b, 2023c, 2023d, 2023f -Simon 1997 -Simon and Dufour 1998, 2005 -YSI 2017, 2018
Field crew members – macroinvertebrate and fish community sampling	-Complete hands-on training for sampling methodology prior to participation in field sampling activities -Review the principles and techniques of electrofishing -Review relevant safety procedures -Review relevant SOP documents for field operations	-Follow all safety and SOP procedures while engaged in field sampling activities -Follow direction of field crew chief while engaged in field sampling activities	-IDEM 2008, 2010a, 2010b, 2019, 2020c, 2020d, 2021b, 2022a, 2023b, 2023c, 2023d, 2023f -YSI 2017, 2018
Field crew chief – water chemistry, algal, and/or bacteriological sampling	-At least one year of experience in sampling methodology -Annually review relevant safety procedures -Annually review relevant SOP documents for field operations	-Completion of field data sheets -Sampling efficiency and representation -Overall operation of the field crew -Adherence to safety and field SOP procedures by crew members	-IDEM 2008, 2010a, 2010b, 2019, 2020a, 2020c, 2020d, 2021b, 2022a, 2022b, 2023a, 2023c, 2023e, 2023h -YSI 2017, 2018

Role	Required Training/Experience	Responsibilities	Training References
		-Ensure that multiprobe analyzers are calibrated weekly prior to field sampling activities -Ensure that field sampling equipment is functioning properly and loaded into field vehicles prior to field sampling activities	
Field crew members – water chemistry, algal, and/or bacteriological sampling	-Complete hands-on training for sampling methodology prior to participation in field sampling activities -Review relevant safety procedures -Review relevant SOP documents for field operations	-Follow all safety and SOP procedures while engaged in field sampling activities -Follow direction of field crew chief while engaged in field sampling activities	-IDEM 2008, 2010a, 2010b, 2019, 2020c, 2020d, 2021b, 2022a, 2023a, 2023c, 2023e, 2023h -YSI 2017, 2018
Laboratory supervisor – macroinvertebrate and fish community sample processing	-At least one year of experience in taxonomy of aquatic communities in the region -Annually review relevant safety procedures -Annually review relevant SOP documents for laboratory operations	-Identification of fish and macroinvertebrate specimens collected during field sampling -Completion of laboratory data sheets -Verify taxonomic accuracy of processed samples -Voucher specimen tracking -Adherence to safety and SOP procedures by laboratory staff -Check data for completeness -Perform all necessary calculations on the data -Ensure that data are entered into the AIMS II Database -Ensure that required QA/QC are performed on the data -Querying data from AIMS II to determine results not meeting Water Quality Criteria	-IDEM 2008, 2010a, 2010b, 2019, 2020a, 2021b -AIMS II Database User Guide
Laboratory staff – macroinvertebrate and fish community sample processing	-Complete hands-on training for laboratory sample processing methodology prior to participation in laboratory sample processing activities	-Adhere to safety and SOP procedures -Follow Laboratory Supervisor direction while processing samples -Identification of fish and macroinvertebrate	-IDEM 2008, 2010a, 2010b, 2019, 2021b -AIMS II Database User Guide

Role	Required Training/Experience	Responsibilities	Training References
	-Annually review relevant safety procedures -Annually review relevant SOP documents for laboratory operations	specimens collected during field sampling -Completion of laboratory data sheets, perform necessary calculations on data, enter field sheets	
Laboratory supervisor – water chemistry, algal and/or bacteriological sample processing	-Annually review relevant safety procedures -Annually review relevant SOP documents for field operations	-Completion of laboratory data sheets -Adherence to safety and SOP procedures by laboratory staff -Check data for completeness -Perform all necessary calculations on the data -Ensure that data are entered into the AIMS Data Base -Ensure that required QA/QC are performed on the data -Querying data from AIMS II to determine results not meeting Water Quality Criteria	-IDEM 2008, 2010a, 2010b, 2017, 2019, 2020a, 2021b, 2023e, 2023h -AIMS II Database User Guide
Quality assurance officer	-Familiarity with QA/QC practices and methodologies -Familiarity with the QAPPs and data qualification methodologies	-Ensure adherence to QA/QC requirements of QAPP -Evaluate data collected by sampling crews for adherence to project work plan -Review data collected by field sampling crews for completeness and accuracy -Perform a data quality analysis of data generated by the project -Assign data quality levels based on the data quality analysis -Import data into the AIMS data base -Ensure that field sampling methodology audits are completed according to WAPB procedures	-IDEM 2017, 2018, 2020a, 2021a, 2022b, 2023a -U.S. EPA 2002, 2006 -AIMS II Database User Guide

B. Measurement and Data Acquisition

B.1. Sampling Design and Site Locations

Sites are generated by the U.S. EPA, NHEERL, Western Ecology Division, in Corvallis, Oregon using Environmental Monitoring Assessment Program selection methods. The Environmental Monitoring Assessment Program design uses a statistically valid number of randomly selected sites to assess and characterize the overall water quality and biotic integrity of the basin of study. To statistically estimate the percent of the basin attaining designated uses with a 95% confidence level, a minimum of 38 probabilistic sites will be sampled in the basin of interest. This minimum required number of sites was determined by analyzing IDEM fish community IBI metric scores from 317 sites sampled from 1996–2000 with the following formula:

$$n = \frac{s^2}{(p)^2(\bar{x})^2}$$

where $\boldsymbol{n}$ is the number of sites required, $\boldsymbol{s}$ is the sample standard deviation (10.98922), $\bar{\boldsymbol{x}}$ is the sample mean (35.52366), and $\boldsymbol{p}$ is the p-value (set at 0.05 for a 95% confidence level) (Elliott 1983). A sample size of 38 was thereby determined to be sufficient to arrive at the "true" average IBI score for a basin 95% of the time. This sample size was also found to be sufficient to provide 80% estimations for eight of the more frequently used individual metrics used in the calculation of the fish community IBI.

Site selection is stratified to ensure effort is equally distributed between stream orders for equal representation of the various stream sizes within the basin. IDEM's site selection process incorporates a stratified random probability design in order to select an approximately equal number of 1^{st}, 2^{nd}, 3^{rd}, and 4^{th} order and higher streams in the basin. Utilizing the stratification method ensures that a greater number of sampling sites on lesser order streams are not chosen based on proportion of stream miles. An over draw of sampling sites is requested to compensate for denial of access, dry stream conditions, and sites presenting extremely difficult or unsafe access.

Site reconnaissance activities will be conducted in-house and through physical site visits (IDEM 2023g). In-house activities will include preparation and review of site maps and aerial photographs; initial evaluation of target or nontarget site status; potential access routes; and initial property owner searches. Physical site visits will include property owner consultations; verification of site status (target or nontarget); confirmation and documentation of access routes; and determination of equipment needed to properly sample the site. Precise coordinates for each approved target site will be determined using an agency approved handheld Global Positioning System (GPS) unit which can verify horizontal precision of five meters or less (IDEM 2022a, 2023c). All 100 potential sites are to be visited at least once during site reconnaissance to determine target or nontarget status (marsh, dry, backwater, etc.). However, landowner permission and site access will be determined for only the first 75 potential sites with the remaining 25 sites noted only as “Target” or “NonTarget”. After each site has been visited once, and at least 45 sites have been approved in the basin of interest, field work for site reconnaissance activities should be minimal. Although 12 weeks is the maximum time allotted for site reconnaissance field work (see A. Project Management, A.4 Data Quality Objectives), most work can be completed in a six-week period depending upon weather, drive time to sites, and other unforeseeable constraints. The remaining work, if possible, can be done in the office with phone calls to seek landowner permission. If permission to visit a site is then granted before the 12-week deadline, a daytrip or overnight may be needed to determine access routes, equipment, and more accurate GPS coordinates. Once the deadline is reached, those sites that were not accessible through bridge right-of-way, yet appeared to be “target” from the nearest bridge, will be entered into the database with the Reconnaissance Decision as “No, Other” with the following text in the Comments field “Unable to contact landowner by deadline" along with the date and initials of the person entering the data and writing it on the IDEM Site Reconnaissance Form (Attachment 1).

Table 3 lists the potential sampling sites generated by U.S. EPA Corvallis for the Great Miami River Basin. Target sampling sites will be taken in sequential order as shown in Table 3 until the 45 sites are sampled for algal community and water chemistry, 40 sites for bacteriological sampling, and 38 sites for biological sampling programs. If a site is considered “nontarget” (dry, backwater, marsh/wetland, etc.) or unavailable to sample for some other reason (physical barrier, landowner denial, etc.), the next target site on the list will be taken. Figure 1 depicts potential sampling sites generated by U.S. EPA Corvallis for this project and their approximate locations.

B.2. Sampling Methods and Sample Handling

B.2.1. Bacteriological Sampling

The bacteriological sampling will be conducted by one or two teams consisting of two staff (IDEM 2023a). The work effort will require an average of one hour per site per week. Samples will be processed in the IDEM Fixed and/or Mobile *E. coli* Laboratory (van) equipped with all materials and equipment necessary for the Standard Method (SM) 9223B Colilert® *E. coli* Test Method near the sampling sites. Five samples from each site (40 sites total) will be collected at equally spaced intervals over a thirty calendar-day period. Staff will collect the samples in a 120 mL presterilized wide mouth container from the center of flow (if the stream is wadeable) or from the shoreline using a pole sampler (if the stream is not wadeable). This is subject to field staff determination based on available Personal Protective Equipment (PPE), turbidity, and other factors. However, streams waist deep or shallower are generally considered wadeable. All samples will be consistently labeled, cooled, and held at a temperature less than 10ºC during transport. All *E. coli* samples will be collected on a schedule such that any sampling crew can deliver them to the IDEM Fixed or Mobile *E. coli* Laboratory for analyses within the bacteriological holding time of six hours.

The IDEM *E. coli* Mobile Laboratory is used in this project to facilitate *E. coli* testing by eliminating the necessity of transporting samples to distant contract laboratories within a six-hour holding time. The *E. coli* Mobile Laboratory provides workspace containing storage for samples, supplies for Colilert® Quanti-tray testing, and all equipment needed for collecting, preparing, incubating, and analyzing results. All supplies will be obtained from IDEXX Laboratories, Inc., Westbrook, Maine.

B.2.2. Water Chemistry Sampling

During three discrete sampling events, one team of two staff will collect grab water chemistry samples, and record water chemistry field measurements and physical site descriptions on the IDEM Stream Sampling Field Data Sheet (Attachment 2). All water chemistry sampling will adhere to the Water Chemistry Field Sampling Procedures (IDEM 2020d). Water chemistry sampling usually takes 30 minutes to complete for each site, depending on accessibility.

B.2.3. Algal Sampling

In addition to standard water chemistry sampling, one team of two staff will collect attached periphyton samples (IDEM 2023e) at all sites during the third round of water chemistry sampling in September or October (Table 1) for the purposes of diatom community enumeration, identification, and subsequent diatom IBI calculation.

Sampling for an average site that includes all of the above parameters will require approximately 1.5 hours of effort. The Algal Biomass Lab Datasheet (Attachment 3) will be used to record information regarding substrates sampled for periphyton and physical parameters of the stream sampling area. See IDEM 2023e for a description of methods used in algal community sampling.

Periphyton samples are processed in the IDEM laboratory to create permanent diatom slide mounts. See IDEM 2023h for a description of methods used in preparing samples for diatom identification and enumeration.

B.2.4. Fish Community Sampling

Fish community sampling will be performed using various standardized electrofishing methodologies depending on stream size and site accessibility. Fish assemblage assessments will be performed in a sampling reach of 15 times the average wetted width, with a minimum reach of 50 meters and a maximum reach of 500 meters (IDEM 2023b). An attempt will be made to sample all habitat types available (i.e., pools, shallows; see IDEM 2023g, pg. 10–11, for more potential habitat types) within the sample reach to ensure adequate representation of the fish community present at the time of the sampling event. The possible list of electrofishers to be utilized include: the Midwest Lake Electrofishing Systems (MLES) Infinity XStream, Smith-Root LR-24 or LR-20B Series backpack electrofishers; or MLES Infinity Control Box with MLES junction box and rat-tail cathode cable, assembled in a canoe. If parts of the stream are not wadeable, the system may require the use of a dropper boom array outfitted in a canoe or possibly a 12- or 14-foot Loweline boat. For nonwadeable sites, the Smith-Root Type VI-A electrofisher or MLES Infinity Control Box assembled in a 16-foot Loweline or Blazer boat (IDEM 2023b) may be used.

Sample collections during high flow or turbid conditions will be avoided due to 1) low collection rates which result in nonrepresentative samples and 2) safety considerations for the sampling team. Sample collection during late autumn will be avoided due to the cooling of water temperature, which may affect the responsiveness of some species to the generated electric field. This lack of responsiveness can result in samples that are not representative of the stream's fish assemblage (IDEM 2023b).

Fish will be collected using dipnets with fiberglass handles and netting of 1/8-inch bag mesh. Fish collected in the sampling reach will be sorted by species into baskets or buckets. Young-of-the-year fish less than 20 millimeters (mm) total length will not be retained in the community sample (IDEM 2023b).

For each field taxonomist, generally the crew leader, a complete set of fish vouchers are retained for any different species encountered during the summer sampling season. Vouchers may consist of either preserved specimens or digital images. Prior to processing fish specimens and completion of the fish community datasheet, one to two individuals per new species encountered may be preserved in 3.7% formaldehyde solution to serve as representative fish vouchers if the fish specimens can be positively identified and the individuals for preservation are small enough to fit in a 2000 mL jar. If, however, the specimens are too large to preserve, a photo of key characteristics, like fin shape, size, or body coloration, will be taken for later examination (IDEM 2023b). Also, prior to sampling, 10% of the sites will be randomly selected for revisiting and a few representative individuals of all species found at the site will be preserved or photographed to serve as vouchers (IDEM 2020a). Taxonomic characteristics for possible species encountered in the basin of interest will be reviewed prior to field work. Fish specimens should also be preserved if they cannot be positively identified in the field, those that co-occur like the Striped and Common Shiners, and those that are difficult to identify when immature. Additionally, individuals appearing to be hybrids, have unusual anomalies, dead specimens that are taxonomically valuable for undescribed taxa like the Red Shiner or Jade Darter, life history studies, or research projects (IDEM 2023b) should also be preserved.

Data will be recorded for nonpreserved fish on the IDEM Fish Collection Data Sheet (Attachment 4) consisting of the following: number of individuals, minimum and maximum total length (mm), mass weight in grams (g), and number of individuals with deformities, eroded fins, lesions, tumors, and other anomalies (DELTs). Once the data have been recorded, specimens will be released within the sampling reach from which they were collected. Data will be recorded for preserved fish specimens following taxonomic identification in the laboratory (IDEM 2023b).

B.2.5. Macroinvertebrate Sampling

Aquatic benthic macroinvertebrate samples are collected using a modification of the U.S. EPA Rapid Bioassessment Protocol multihabitat (MHAB) approach using a D-frame dip net (Plafkin et al. 1989; Barbour et al. 1999; Klemm et al. 1990; IDEM 2023d). The IDEM MHAB approach (IDEM 2023d) is composed of a 1-minute "kick" sample within a riffle or run. A kick sample is collected by disturbing one square meter of stream bottom substrate in a riffle or run habitat and collecting the dislodged macroinvertebrates within the dipnet. A 50-meter "sweep" sample of additional instream habitats is collected by disturbing habitats such as emergent vegetation, root wads, coarse particulate organic matter, depositional zones, logs, and sticks; and collecting the dislodged macroinvertebrates within the dipnet. The 50-meter length of riparian corridor that is sampled at each site will be defined using a tape measure or rangefinder. If the stream is too deep to wade, a boat will be used to sample the 50-meter zone along the shoreline that has the best available habitat. The 1-minute "kick" (if collected) and 50-meter "sweep" samples are combined in a bucket of water. The sample will be elutriated through a U.S. standard number 35 (500 µm) sieve a minimum of five times so that all rocks, gravel, sand, and large pieces of organic debris are removed from the sample. The remaining sample is then transferred from the sieve to a white plastic tray. The collector (while still onsite) will conduct a 15-minute pick of macroinvertebrates at a single organism rate with an effort to pick for maximum organism diversity and relative abundance through turning and examination of the entire sample in the tray. The resulting picked sample will be preserved in 80% isopropyl alcohol; returned to the laboratory for identification at the lowest practical taxonomic level, usually genus or species level, when possible; and evaluated using the MHAB macroinvertebrate IBI.

B.2.6. Habitat Assessments

Habitat assessments will be completed immediately following macroinvertebrate and fish community sample collections at each site using a slightly modified version of the Ohio Environmental Protection

Agency (OHEPA) Procedures for Completing the QHEI, 2006 edition (OHEPA 2006). A separate QHEI (Attachment 5) must be completed for these two sample types since the sampling reach length may differ. A sample reach length is 50 meters for macroinvertebrates and between 50 to 500 meters for fish. See IDEM 2023f for a description of the method used in completing the QHEI.

B.2.7. Field Parameter Measurements

Dissolved oxygen, pH, water temperature, specific conductance, and dissolved oxygen percent saturation will be measured with a data sonde during each sampling event, regardless of the sample type being collected. Measurement procedures and operation of the data sonde shall be performed according to the manufacturers' manuals (IDEM 2020c). Turbidity will be measured with a Hach turbidity kit, and the meter number written in the comments under the field parameter measurements (IDEM 2020d). If a Hach turbidity kit is not available, the data sonde measurement for turbidity will be recorded and noted in the comments. All field parameter measurements and weather codes will be recorded on the IDEM Stream Sampling Field Data Sheet (Attachment 2) with other sampling observations. A digital photo will also be taken upstream and downstream of the site during each sampling event.

B.3. Analytical Methods

Table 6 lists the *E. coli* bacteriological and field parameters with their respective test method and IDEM quantification limits. Table 7 shows bacteriological and water chemistry sample container, preservative, and holding time requirements when all samples must be iced to 4°C. Table 8 lists numerous parameters like priority metals, anions/physical, and nutrients/organic with their respective test methods, IDEM reporting limits, and contract laboratory reporting limits. The IDEM OWQ Field Chain of Custody Form (Attachment 6) and the 2023 Corvallis Water Sample Analysis Request Forms (Attachment 7) accompanies each sample set through the analytical process.

B.4. Quality Control and Custody Requirements

QA protocols will follow part B5 of the Surface Water QAPP (IDEM 2017, pg. 170) and B.5 of the Biological and Habitat QAPP (IDEM 2020a, pg. 27).

B.4.1. Bacteriological Data

Bacteriological samples will be analyzed using the SM 9223B Enzyme Substrate Coliform Test Method (see Table 6 for quantification limits). Samples will be collected using 120 mL presterilized wide mouth containers and adhere to the six-hour holding time (Table 7). Analytical results from the IDEM Fixed and/or Mobile *E. coli* Laboratory include QC check sample results from which precision, accuracy, and completeness can be determined for each batch of samples (IDEM 2017). Raw data are archived by analytical batch for easy retrieval and review. Chain of custody procedures must be followed and include: time of collection, time of setup, time of reading the results, and time and method of disposal (IDEM 2023a). Any method deviations will be thoroughly documented in the field notes.

All QA/QC samples will be tested according to the following guidelines:

Field duplicate: Field duplicates will be collected at a frequency of 1 per batch or at least 1 for every 20 samples collected (≥ 5%).

Field blank: Field blanks will be collected at a frequency of 1 per batch or at least 1 for every 20 samples collected (≥ 5%).

Laboratory blank: Laboratory blanks (sterile laboratory water blanks) will be tested at a frequency of 1 per day.

Positive control: Each lot of media will be tested with *E. coli* bacterial cultures for positive performance (SM 9020 B.8 and B.9).

Negative controls: Each lot of media will be tested with bacterial cultures other than *E. coli* or a noncoliform for negative performance (SM 9020 B.8 and B.9).

QA documentation for each batch of samples consists of a chain of custody form, a QA/QC summary sheet, and spreadsheets of results. This documentation is submitted to the Technical and Logistical Services Section for QA review and the assignment of an appropriate DQA Level.

B.4.2. Water Chemistry Data

Sample bottles and preservatives certified for purity will be used. Sample collection procedures, including the container and preservative used for each parameter and holding times will adhere to U.S. EPA requirements for water chemistry testing (see Table 8). Field duplicates and matrix spike/matrix spike duplicates (MS/MSD) shall be collected at the rate of one per sample analysis set or one per every 20 samples, whichever is greater (IDEM 2017). Additionally, field blank samples using American Society for Testing and Materials (ASTM) D1193-91 Type I water will be taken at a rate of one set per sampling crew for each week of sampling activity (IDEM 2020d). All samples collected for water chemistry analysis will be processed by Pace Analytical Services, Inc. (Indianapolis, Indiana) following the specifications set forth in Request for Proposals 22-68153 (IDEM 2021a).

Table 6. Bacteriological and Field Parameters showing method and IDEM quantification limit.

Parameters	Method	IDEM Quantification Limit
E. coli (Enzyme Substrate Coliform Test)	SM [1] 9223B	1 MPN [2] / 100 mL
Dissolved oxygen (data sonde optical)	ASTM D888-09	0.05 mg/L
Dissolved oxygen % Saturation (data sonde optical)	ASTM D888-09	0.05 %

Dissolved oxygen (membrane probe)	SM4500-OG [3]	0.05 mg/L
pH (data sonde)	U.S. EPA 150.2	0.10 SU
pH (field pH meter)	SM 4500H-B [3]	0.10 SU
Specific conductance (data sonde)	SM 2510B	1.00 μmhos/cm
Temperature (data sonde)	SM 2550B(2)	0.1 Degrees Celsius (°C)
Temperature (field meter)	SM 2550B(2) [3]	0.1 Degrees Celsius (°C)
Turbidity (data sonde)	SM 2130B	0.02 NTU [4]
Turbidity (Hach™ turbidity kit)	U.S. EPA 180.1	0.05 NTU [4]

[1] SM = Standard Method
[2] 1 MPN (Most Probable Number) = 1 CFU (Colony Forming Unit)
[3] Method used for Field Calibration Check
[4 NTU] = Nephelometric Turbidity Unit(s)

Table 7. Bacteriological and Water Chemistry Sample Container, Preservative, and Holding Time Requirements[1]

Parameter	Container	Preservative	Holding Time
[1,2] Alkalinity as $CaCO_3$*	1 L, HDPE, narrow mouth	None	14 days
[3] Ammonia-N**	1 L, glass, Amber Boston Round	H_2SO_4 < pH 2	28 days
Chloride*	1 L, HDPE, narrow mouth	None	28 days
Chemical oxygen demand**	1 L, glass, Amber Boston Round	H_2SO_4 < pH 2	28 days
Cyanide (All forms)	1 L, HDPE, narrow mouth	NaOH > pH 12	14 days
Dissolved organic carbon	1 L, glass, Amber Boston Round	H_2SO_4 < pH 2	28 days
E. coli	120 mL, presterilized, wide mouth	$Na_2S_2O_3$	6 hours
Hardness (as $CaCO_3$*) calculated	1 L, HDPE, narrow mouth	HNO_3 < pH 2	6 months
Metals (Total and Dissolved)	1 L, HDPE, narrow mouth	HNO_3 < pH 2	6 months
Nitrogen, nitrate + nitrite**	1 L, glass, Amber Boston Round	H_2SO_4 < pH 2	28 days
Total phosphorus**	1 L, glass, Amber Boston Round	H_2SO_4 < pH 2	28 days
[5] Solids (All Forms)*	1 L, HDPE, narrow mouth	None	7 days
Sulfate*	1 L, HDPE, narrow mouth	None	28 days
Total Kjeldahl nitrogen**	1 L, glass, Amber Boston Round	H_2SO_4 < pH 2	28 days
Total organic carbon**	1 L, glass, Amber Boston Round	H_2SO_4 < pH 2	28 days
Dissolved organic carbon**	1 L, glass, Amber Boston Round	H_2SO_4 < pH 2	28 days

[1] All samples iced to 4°C.
[2] General chemistry includes all parameters noted with an *
[3] Nutrients include all parameters noted with a **
[4] HDPE – High Density Polyethylene
[5] Separate 1 Liter sample is required for Total Suspended Solids

Table 8. Water Chemistry Parameters with Test Method and IDEM and Laboratory Reporting Limits.

Priority Metals					
Parameter	Total	Dissolved	Test Method	IDEM-requested Reporting Limit (µg/L)	Pace Laboratory Reporting Limit (µg/L)
Aluminum	☒	☒	U.S. EPA 200.8	10	10
Antimony	☒	☒	U.S. EPA 200.8	1	1
Arsenic	☒	☒	U.S. EPA 200.8	2	1
Calcium	☒	☐	U.S. EPA 200.7	20	1,000
Cadmium	☒	☒	U.S. EPA 200.8	1	0.2
Chromium	☒	☒	U.S. EPA 200.8	3	2
Copper	☒	☒	U.S. EPA 200.8	2	1
Lead	☒	☒	U.S. EPA 200.8	2	1
Magnesium	☒	☐	U.S. EPA 200.7	95	1,000
Nickel	☒	☒	U.S. EPA 200.8	1.5	0.5
Selenium	☒	☒	U.S. EPA 200.8	4	1
Silver	☒	☒	U.S. EPA 200.8	0.3	0.5
Zinc	☒	☒	U.S. EPA 200.8	5	3

Anions/Physical			
Parameter	Pace Test Method	IDEM-requested Reporting Limit (mg/L)	Pace Laboratory Reporting Limit (mg/L)
Alkalinity (as $CaCO_3$)	SM 2320B	10	10
Total Solids	SM 2540B	1	10
Total Suspended Solids	SM 2540D	1	2.5
Dissolved Solids	SM 2540C	10	10
Sulfate	U.S. EPA 300.0	0.05	0.25
Chloride	U.S. EPA 300.0	1	0.25
Hardness (as $CaCO_3$) by calculation	SM 2340B	0.4	10

Nutrients/Organic (Pace)			
Parameter	Pace Test Method	IDEM-requested Reporting Limit (mg/L)	Pace Laboratory Reporting Limit (mg/L)
Total Kjeldahl Nitrogen (TKN)	U.S. EPA 351.2	0.1	0.5
Ammonia-N	U.S. EPA 350.1	0.01	0.1
Nitrogen, Nitrate + Nitrite	U.S. EPA 353.2	0.05	0.1
Total Phosphorus	U.S. EPA 365.1	0.01	0.05
Total Organic Carbon (TOC)	SM 5310C	1	1
Dissolved Organic Carbon (DOC)	SM 5310C	1	1
Cyanide-Total	U.S. EPA 335.4	0.01	0.005
Cyanide-Weak Acid Dissociable	SM 4500CN-I	0.01	0.005
Chemical Oxygen Demand (COD)	U.S. EPA 410.4	3	10

SM: Standard Methods for the Examination of Water and Wastewater
U.S. EPA: United States Environmental Protection Agency

B.4.3. Algal Community Data

Excessive algal conditions will be recorded by staff if an algal bloom is observed on the water's surface or in the water column. Staff are not calibrated on this rating and the decision as to the severity of the bloom is based on best professional judgement, but an algal mat on the surface of the water or a bloom that gives the water the appearance of green paint would be justification for a decision of excessive algal conditions.

Duplicate diatom samples will be collected at 10 percent of sampling sites, approximately 5 in the basin. To decrease the potential for cross contamination and bias of the algal samples, all equipment that has come in contact with the sample will be cleaned with detergent and rinsed with ASTM D1193-91 Type III water after sampling has been completed at a given site. All sample labels must be accurately and thoroughly completed, including AIMS II sample numbers, date, stream name, and sampling location. Chain of custody forms will be completed in the field to document the collection and transfer of samples to the laboratory. Upon arrival to the laboratory, samples will be checked in by the laboratory manager. For the diatom samples, a Laboratory Chain of Custody Form (Attachment 8) will be used to document when the sample is removed from storage to be processed and made into a permanent mount.

QC of the diatom sampling, enumeration, and identification project will be documented by QC checks of both field and laboratory data. See page 23 in IDEM 2023h for a description of QA/QC protocols used in Diatom Identification and Enumeration. At least ten percent and up to 100 percent of diatom samples will be analyzed and verified (IDEM 2020a) by the Department of Biological and Environmental Sciences of Georgia College and State University following the specifications set forth in IDEM 2023h.

B.4.4. Fish Community Data

Fish community sampling revisits will be performed at a rate of 10 percent of the total fish community sites sampled, approximately 4 in the basin (IDEM 2023b). Revisit sampling will be performed with at least 2 weeks of recovery between the initial and revisit sampling events. The fish community revisit sampling and habitat assessment will be performed with either a partial or complete change in field team members (IDEM 2023b). The resulting IBI and QHEI total score between the initial visit and the revisit will be used to evaluate precision (IDEM 2020a). The IDEM OWQ Chain of Custody Form is used to track samples from the field to the laboratory (Attachment 6). Fish taxonomic identifications made by IDEM staff in the laboratory may be verified by regionally recognized non-IDEM freshwater fish taxonomists (e.g., Brant Fisher, Nongame Aquatic Biologist, Indiana Department of Natural Resources). All raw data are: 1) checked for completeness; 2) utilized to calculate derived data (i.e., total weight of all specimens of a taxon), which is entered into the AIMS II database; and 3) checked again for data entry errors.

B.4.5. Macroinvertebrate Community Data

Sites at which duplicate macroinvertebrate field samples will be collected are randomly selected prior to the beginning of the field season and occur at a rate of 10 percent of the total macroinvertebrate community sites sampled, approximately 4 in the basin. The macroinvertebrate community duplicate sample and corresponding habitat assessment will be performed by the same team member who performed the original sample and will be conducted immediately after the initial sample is collected. This will result in a precision evaluation based on a 10% duplicate of samples collected (IDEM 2020a). Sites in the basin will be divided equally among the macroinvertebrate staff; each staff will be responsible for collecting at least one duplicate sample. The IDEM OWQ Field Chain of Custody Form is used to track samples from the field to the laboratory (Attachment 6). The IDEM macroinvertebrate laboratory supervisor maintains Laboratory identifications and QA/QC of taxonomic work. A Laboratory Chain of Custody Form (Attachment 8) will be used to document when the sample is removed from storage to be processed and when the sample is returned to storage. 10% of samples (the initial samples taken at sites where duplicate samples were collected) will be verified by an outside taxonomist (IDEM 2020a).

B.5. Field Parameter Measurements, Instrument Testing, Calibration

The data sonde will be calibrated immediately prior to each week’s sampling (IDEM 2020c). The dissolved oxygen component of the calibration procedure will be conducted using the air calibration method. Calibration results and drift values will be recorded, maintained, stored, and archived in the calibration laboratories at the Shadeland facility. The drift value is the difference between two successive calibrations. Field parameter calibrations will conform to the procedures described in the instrument user’s manuals (IDEM 2020c, IDEM 2020d). The unit will be field checked for accuracy once during the week by comparison with a YSI D.O. meter (IDEM 2020c) as well as Hach turbidity and Oakton pH and temperature meters (IDEM 2020d). Weekly field calibration records will be recorded in the field calibrations portion of Attachment 2 and entered into the AIMS II database. The YSI D.O. meter will also be used in the field at sites where the dissolved oxygen concentration is 4.0 mg/L or less.

B.5.1. Field Analysis Data

In-situ water chemistry field data are collected in the field using calibrated or standardized equipment. Calculations may be done in the field or later at the office. Analytical results, which have limited QC checks, are included in this category. Detection limits and ranges have been set for each analysis. QC checks are performed on information for field or laboratory results to estimate precision, accuracy, and completeness for the project, as described in the Surface Water QAPP (IDEM 2017) Section C1.1 on page 176.

B.5.2. Algal Community Data

IDEM 2023e describes the equipment required for the collection of periphyton; none of this equipment requires calibration. Equipment has been field tested to ensure its capability of appropriately removing periphyton from different types of substrates such as rocks, sticks, or sand/silt (IDEM 2023e).

IDEM 2023h describes the equipment required for the preparation of permanent diatom mounts; other than the micropipetter, none of the laboratory equipment requires calibration. The micropipetter will be checked and recalibrated as necessary according to manufacturer's specifications (IDEM 2023h).

A Nikon differential interference contrast (DIC) microscope, and Nikon Elements D camera and imaging system will be used for identification and enumeration of diatoms. Branch staff calibrated the ocular reticle in the microscope. The ocular reticle was calibrated at each magnification with a stage micrometer. The calibration should be checked again if the microscope is moved to a new location.

C. Assessment and Oversight

Field and laboratory performance and system audits will be conducted to ensure good quality data. The field and laboratory performance checks include precision measurements by relative percent difference (RPD) of field and laboratory duplicate (IDEM 2017, pp. 56, 61–63), accuracy measurements by percent of recovery of MS/MSD samples analyzed in the laboratory (IDEM 2017, pp. 58, 61–63), and completeness measurements by the percent of planned samples that are actually collected, analyzed, reported, and usable for the project (IDEM 2017, p. 58).

For biological and habitat measurements, field performance measurements include: completeness (IDEM 2020a, pp. 10-11, 14, 17) examination of fish IBI score differences and the RPD for number of fish species at the revisit sites (IDEM 2020a, pp. 9-10), RPD for number of taxon for macroinvertebrate duplicate samples (IDEM 2020a, p. 13), RPD for number of taxon for diatom duplicate samples (IDEM 2020a, p. 17), and RPD between the two total QHEI scores (IDEM 2020a, p. 18). Lab performance measurements include: PTD for fish (IDEM 2020a, p. 12), macroinvertebrates (IDEM 2020a, pp. 15-16) and diatoms (IDEM 2020a, p. 18); as well as PDE and PSE for macroinvertebrates (IDEM 2020a, pp. 14-16).

Field audits will be conducted biannually by staff of the IDEM WAPB to ensure that sampling activities adhere to approved SOPs. Audits are systematically conducted by WAPB QA staff to include all WAPB personnel that engage in field sampling activities. WAPB field staff involved with sample collection and preparation will be evaluated by QA staff trained in the associated sampling SOPs, and in the processes related to conducting an audit. QA staff will produce an evaluation report documenting each audit for review by those field staff audited, as well as WAPB management. Corrective actions will be communicated to, and implemented by, field staff as a result of the audit process (IDEM 2017, p. 176–177; IDEM 2020a, p. 31).

Contract laboratories are required to have NELAC audits at the beginning of a laboratory contract and at least once a year during the contract. In addition, performance studies conducted by the contract laboratories are reviewed annually by IDEM QA staff. The audit includes any or all of the operational quality control elements of the laboratory's quality assurance system. All applicable elements of this quality assurance project plan and the laboratory contract requirements are addressed including, but not limited to, sampling handling, sample analysis, record keeping, preventative maintenance, proficiency testing, personnel requirements, training, and workload. (IDEM 2017, pp. 177-178).

For macroinvertebrate verifications by an external lab, the lab is required to maintain Society for Freshwater Science taxonomic certifications for their taxonomists. Genus level taxonomic certifications are required for 1. Eastern General Arthropods, 2. Eastern Ephemeroptera, Plecoptera and Trichoptera, 3. Chironomidae, and 4. Oligochaeta.

C.1. Data Quality Assessment Levels

The samples and various types of data collected by this program are intended to meet the QA criteria and rated DQA Level 3, as described in the Surface Water QAPP (IDEM 2017, pp. 182–183) and the Biological and Habitat QAPP (IDEM 2020a, pp. 34-35).

D. Data Validation and Usability

Quality Assurance reports to management and data validation and usability are also important components of the QAPP which ensures good quality data for this project. A QA audit report will be submitted to the QA manager and project manager for review for this project should problems arise and need to be investigated and corrected. Data are reduced by converting from raw analytical data into final results in proper reporting units, validated by qualifying based on the performance of field and laboratory QC measures incorporated into the sampling and analysis procedures, and reported by describing so as to completely document the calibration, analysis, QC measures, and calculations. These steps allow users to assess the data to ensure it meets the project data quality objectives.

D.1. Quality Assurance – Data Qualifiers and Flags

The various data qualifiers and flags used for QA and validation of the data are found on pages 184–185 of the Surface Water QAPP (IDEM 2017) and pages 33-34 of the Biological and Habitat QAPP (IDEM 2020a).

D.2. Data Usability

The environmental data collected and its usability are qualified per each lab or field result obtained and classified into one or more of the four categories: Acceptable Data, Enforcement Capable Results, Estimated Data, and Rejected Data as described on page 184 of the Surface Water QAPP (IDEM 2017) and page 35-36 of the Biological and Habitat QAPP (IDEM 2020a).

D.3. Information, Data, and Reports

Data collected in 2023 will be recorded in the AIMS II database and presented in three compilation summaries. The first summary will be a general compilation of the 2023 Great Miami River Basin field and water chemistry data prepared for use in the 2024 Integrated Report. The second summary will be in database report format containing biological results and habitat evaluations, which will be produced for inclusion in the Integrated Report as well as individual site folders. All site folders are maintained at the WAPB facility. The third summary will include diatom species taxa names and enumerations on laboratory bench sheets. Using U.S. EPA's *spsurvey* package, written in the "R" programing language (R Core Team 2014), the percent of perennial stream miles in the basin that support, or do not support aquatic life and recreational uses will be made following use attainment decisions for each site sampled (IDEM 2020b). All data and reports will be made available to public and private entities which may find the data useful for municipal, industrial, agricultural, and recreational decision making processes (TMDL, NPDES permit modeling, Watershed Restoration Projects, Water Quality Criteria refinement, etc.).

D.4. Laboratory and Estimated Cost

Laboratory analysis and data reporting for this project will comply with the Surface Water QAPP and TMDL Program (B-001-OWQ-WAP-XX-17-Q-R4, see IDEM 2017), Request for Proposals 22-68153 (see IDEM 2021a), and the IDEM Quality Management Plan (IDEM 2018). Analytical tests on the water chemistry parameters outlined in Table 8 will be performed by Pace Analytical Services in Indianapolis, Indiana. Accreditation related to Pace Indy is included as Appendix 1. Supplies for the bacteriological sampling will come from IDEXX Laboratories, Inc., Westbrook, Maine. Algal samples will be collected by IDEM staff. Periphyton laboratory processing and diatom slide mounting will be performed by IDEM Staff. Diatom identification and enumeration will be performed by an outside contractor (IDEM 2020a), the Department of Biological and Environmental Sciences, Georgia College and State University. All fish and macroinvertebrate samples will be collected and analyzed by IDEM staff. An outside contractor (IDEM 2020a) will verify ten percent of macroinvertebrate samples. The anticipated budget for laboratory cost for the project is outlined in Table 9.

Table 9. Total Estimated Laboratory Cost for the Project.

Analysis	Number of Samples Collected	Laboratory	Estimated Cost
Water chemistry	3 times @ 45 sites + 15 duplicates + 15 field blanks (1 per sample week) = 165 samples	Pace Analytical Services 7726 Moller Road. Indianapolis, Indiana 46268	$95,255
Bacteriological (*E. coli)*	5 times @ 40 sites + 10 blanks + 10 duplicates + 30 equipment blanks = 250 samples	IDEM Fixed and/or Mobile *E.coli* Laboratory Supplies: IDEXX Laboratories, Inc. One IDEXX Drive Westbrook, Maine 04092	$1,175
Diatom identification and enumeration	1 time @ 45 sites + 5 duplicates (1 per sample week) = 50 samples All samples sent out for verification	Department of Biological and Environmental Sciences Georgia College and State University 320 S. Wayne St. Milledgeville, Georgia 31061	$8750
Macroinvertebrate identification	1 time @ 38 sites + 4 duplicates = 42 samples 4 samples (10%) sent out for verification	Rhithron Associates, Inc. 33 Fort Missoula Road Missoula, Montana 59804	$920
		Total	$106,085

Table 10. Personnel Safety and Reference Manuals

Role	Required Training/Experience	Training References	Training Notes
All staff that participate in field activities	-Basic First Aid and Cardiopulmonary Resuscitation (CPR) -Personal Protective Equipment (PPE) Policy -Personal Flotation Devices (PFD)	-A minimum of 4 hours of in-service training provided by WAPB (IDEM 2010a) -IDEM 2008 -February 29, 2000 WAPB internal memorandum regarding use of approved PFDs	-Staff lacking 4 hours of in-service training or appropriate certification will be accompanied in the field at all times by WAPB staff that meet Health and Safety Training requirements -When working on boundary waters as defined by Indiana Code (IC) 14-8-2-27 or between sunset and sunrise on any waters of the state, all personnel in the watercraft must wear a high intensity whistle and Safety of Life at Sea (SOLAS) certified strobe light.

E. References

Code of Federal Regulations, 40 CFR Part 130.7 Total maximum daily loads (TMDL) and individual water quality-based effluent limitations.

(U.S. EPA 2002). Guidance for Quality Assurance Project Plans. EPA QA/G-5, EPA/240R-02/009. U.S. EPA, Office of Environmental Information, Washington D.C.

(U.S. EPA 2005). Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act, July 29, 2005. Washington, D.C.: U.S. Environmental Protection Agency.

(U.S. EPA 2006). Guidance on Systematic Planning Using the Data Quality Objectives Process. EPA QA/G-4. EPA/240/B-06/001. U.S. EPA, Office of Environmental Information, Washington D.C.

(U.S. EPA 2016). Weight of Evidence in Ecological Assessment. EPA/100/R-16/001. U.S. EPA, Office of Environmental Information, Washington D.C.

U.S. EPA, National Health and Environmental Effects Research Lab (NHEERL)/Office of Research and Development (ORD) Western Ecology Division, 200 S.W. 35th Street, Corvallis, OR 97333-4902.

(IC 14-8-2-27) IC (Indiana Code), Title 14 Natural and Cultural Resources, Article 8 General Provisions and Definitions. 2017.

[327 IAC 2] IAC (Indiana Administrative Code), Title 327 Water Pollution Control Division, Article 2. Water Quality Standards. Last updated March 14, 2018.

(IDEM 2008). IDEM Personal Protective Equipment Policy, revised May 1 2008. A-059-OEA-08-P-R0. Office of External Affairs, Indiana Department of Environmental Management, Indianapolis, Indiana.

(IDEM 2010a). IDEM Health and Safety Training Policy, revised October 1 2010. A-030-OEA-10-P-R2. IDEM, Indianapolis, Indiana.

(IDEM 2010b). IDEM Injury and Illness Resulting from Occupational Exposure Policy, revised October 1 2010. A-034-OEA-10-P-R2. IDEM, Indianapolis, Indiana.

(IDEM 2017). Quality Assurance Project Plan for Indiana Surface Water Programs, Revision 4. B-001-OWQ-WAP-XX-17-Q-R4. Indiana Department of Environmental Management, Office of Water Quality, Watershed Assessment and Planning Branch, Indianapolis, Indiana.

(IDEM 2018). IDEM Agency Wide Quality Management Plan. IDEM, Indiana Government Center North, 100 N. Senate Ave., Indianapolis, Indiana, 46204.

(IDEM 2019) IDEM Hazard Communication (HazCom) Plan. IDEM, Office of Program Support, Indianapolis, Indiana.

(IDEM 2020a). Quality Assurance Project Plan for Biological Community and Habitat Measurements. B-003-OWQ-WAP-XXX-20-Q-R0. Indiana

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F. Distribution List

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Attachment 1. IDEM Site Reconnaissance Form

IDEM

Site Reconnaissance Form

EPA Site Identifier	Rank
Recon #: Trip #:	

Site Number: ______ Stream: ______ County: ______

Location Description: ______

Reconnaissance Data Collected

Recon Date | Crew Members

Avg. Width (m) | Avg. Depth (m) | Max. Depth (m) | Nearest Town

Water Present? ☐ | Site Wadeable? ☐ | Riffle/Run Present? ☐ | Road/Public Access Possible? ☐

Site Impacted by Livestock? ☐ | Collect Sediment? ☐ | Gauge Present? ☐

Landowner/Contact Information

First Name | Last Name

Street Address

City | State | Zip

Telephone | E-Mail Address

Pamphlet Distributed? ☐ | Please Call in Advance? ☐ | Results Requested? ☐

Rating, Results, Comments, and Planning

Site Rating By Category (1=easy, 10=difficult)
Access Route
Safety Factor
Sampling Effort

Reconnaissance Decision

- Pre-Recon
- Recon in process
- Approved Site
- No, Landowner denied access
- No, Dry
- No, Stream channel missing
- No, Physical barriers
- No, Impounded stream
- No, Marsh/Wetland
- No, Bridge gone or not accessible
- No, Unsafe due to traffic or location
- No, Site impacted by backwater
- No, Other

Equipment Selected

Circle Equipment Needed

- Backpack
- Boat
- Totebarge
- Longline
- Scanoe
- Seine
- Weighted Handline
- Waders
- Gill Net

Comments

Sketch of Stream & Access Route – Indicate Flow, Direction, Obstacles, & Land Use (Use Back of Page, if Necessary)

Attachment 2. IDEM Stream Sampling Field Data Sheet

IDEM Stream Sampling Field Data Sheet

Analysis Set #	EPA Site ID	Rank

Sample #	Site #	Sample Medium	Sample Type	Duplicate Sample #

Stream Name:		River Mile:		County:	
Site Description:					

Survey Crew Chief	Sample Collectors				Sample Collected		Hydrolab #	Water Depth/Gage Ht (ft)	Water Flow (cf/sec)	Flow Estimated?	Algae?	Aquatic Life?
	1	2	3	4	Date	Time						
										☐	☐	☐

Sample Taken?	Aliquots	Water Flow Type	Water Appearance	Canopy Closed %
◇ Yes ◇ No; Frozen	◇ 1 ◇ 2 ◇ 3 ◇ 4	◇ Riffle ◇ Dry ◇ Stagnant	◇ Clear ◇ Green ◇ Sheen	◇ 0-20% ◇ 60-80%
◇ No; Stream Dry ◇ No; Other	◇ 6 ◇ 8 ◇ 12 ◇ 24	◇ Pool ◇ Run ◇ Flood	◇ Murky ◇ Black ◇ Other	◇ 20-40% ◇ 80-100%
◇ No; Owner refused Access	◇ 48 ◇ 72 ◇ AS-Flow	◇ Glide ◇ Eddy ◇ Other	◇ Brown ◇ Gray (Septic/Sewage)	◇ 40-60%

Special Notes:	

Field Data:

Date (m/d/yy)	24-hr Time (hh:mm)	D.O. (mg/l)	pH	Water Temp (°C)	Spec Cond (µohms/cm)	Turbidity (NTU)	% Sat.	Chlorine (mg/l)	Chloride (mg/l)	Chlorophyll (mg/l)	Weather Codes			
											SC	WD	WS	AT
Comments														
Comments														
Comments														
Comments														
Comments														
Comments														

Measurement Flags		
	<	< Min. Meter Measurement
	>	> Max. Meter Measurement
	E	Estimated (See Comments)
	R	Rejected (See Comments)

Weather Code Definitions

SC Sky Conditions		WD Wind Direction	WS Wind Strength	AT Air Temp
1 Clear	8 Rain	00 North (0 degrees)	0 Calm	1 < 32
2 Scattered	9 Snow	09 East (90 degrees)	1 Light	2 33-45
3 Partly	10 Sleet	18 South (180 degrees)	2 Mod./Light	3 46-60
4 Cloudy		27 West (270 degrees)	3 Moderate	4 61-75
5 Mist			4 Mod./Strong	5 76-85
6 Fog			5 Strong	6 > 86
7 Shower			6 Gale	

Field Calibrations:

Date (m/d/yy)	Time (hh:mm)	Calibrator Initials	Calibrations			
			Type	Meter #	Value	Units

Calibration Type	
	pH
	DO
	Turbidity

Preservatives/Bottle Lots:

Group: Preservative	Preservative Lot #	Bottle Type	Bottle Lot #

Groups: Preservatives	
GC	General Chemistry: Ice
Nx	Nutrients: H2SO4
Metals	Metals: HNO3
CN	Cyanide: NaOH
O&G	Oil & Grease: H2SO4
Toxics	Toxics: Ice
Ecoli	Bacteriology: Ice
VOA	Volatile Organics: HCl & Thiosulfate
Pest	Pesticides: Ice
Phen	Phenols: H2SO4
Sed	Sediment: Ice
Gly	Glyphosate: Thiosulfate
Hg	Mercury(1631): HCl
Cr6	ChromiumVI(1636): NaOH
MeHg	Methyl Mercury(1630): HCl

Bottle Types	
2000P	2000mL Plastic, Narrow Mouth
1000P	1000mL Plastic, Narrow Mouth
500P	500mL Plastic, Narrow Mouth
250P	250mL Plastic, Narrow Mouth
1000G	1000mL Glass, Narrow Mouth
500G	500mL Glass, Wide Mouth
250G	250mL Glass, Wide Mouth
125G	125mL Glass, Wide Mouth
40GV	40mL Glass Vial
120PB	120ml Plastic (Bacteria Only)
1000PF	1000mL Plastic, Corning Filter
500PF	500mL Plastic, Corning Filter
60P	60mL Plastic
250T	250mL Teflon
500T	500mL Teflon
125T	125mL Teflon

Data Entered By: ________________ QC1: ________________
QC2: ________________

Attachment 3. IDEM Algal Biomass Lab Data Sheet

IDEM

Algal Biomass Lab Datasheet

Sample #	Site	Stream

Supporting Site Information

Traditional Forestry % Closed Canopy: ☐ <=10m ☐ >10m (Measure center only if width <=10m, record to nearest whole percent)

	North	East	South	West	Average x 1.04 =
Left Bank					
Center					
Right Bank					
Total %CC (Average from above, or Center only = %CC)				100 - %CC	

Phytoplankton Information

Sampling Method: ☐ Grab Sample (Dip) ☐ Multiple Verticles Number of Verticles:

Chlorphyll A	Blank	Filter 1	Filter 2	Filter 3	Filter 4
Sample Time					
Sample Volume (mL)					

Periphyton Information

Periphyton Habitat: ☐ Epilithic (Area-Scape) ☐ Epidendric (Cylinder Scrape) ☐ Epipsammic (Petri Dish)

Diatom Sample Collected: ☐ Yes ☐ No | Diatom Volume: mL | Formalin Volume: mL | Slurry Volume mL

Chlorphyll A	Blank	Filter 1	Filter 2	Filter 3	Filter 4
Sample Time					
Sample Volume (mL)					

Periphyton Area Calculation

Cylinder Scrape

Snag #	Length (cm)(L)	Circumference U_1	U_2	U_3	U	Area (L * U)
1						
2						
3						
4						
5						
					Total Area (cm²)	

Area Scrape (Using SG-92)

Rock#	1	2	3	4	5
Area (cm²)	7.38	7.38	7.38	7.38	7.38
Total (cm²)	36.9				

Petri Dish

Number of Discrete Samples (n):	
Total Area of One Sampler (a):	19.01 cm²
Total Sample Area (n * a):	

Stream Discharge / Rainfall Information

Nearest USGS Gage Site: ☐ Upstream ☐ Downstream ☐ No USGS Gage Near

River miles from site:	Discharge CFS at sampling: CFS
Gage location:	Discharge days since 50% flow exceeded: days

Rainfall data source: ☐ NOAA ☐ CoCoRaHS ☐ Indiana State Climate Office ☐ USGS gage rain gauge ☐ Other:

Total precipitation at sampling: in. on date:	Cumulative rain 7 days previous to sampling: in. Inches since last rainfall previous to sampling: in. Days since last rainfall previous to sampling: days
Rain station location, county:	

Identifier	Date	Reviewer 1	Date	Reviewer 2	Date	Notes:
		☐ Review 1 Completed		☐ Review 2 Completed		

Attachment 4. IDEM Fish Collection Data Sheet (front)

IDEM
OWQ-WATERSHED ASSESSMENT AND PLANNING BRANCH

Event ID______________ Voucher jars_______ Unknown jars________ Equipment________________ Page _____ of ______
Voltage_______ Time fished (sec)________ Distance fished (m)_________ Max. depth (m)_________ Avg. depth (m)________
Avg. width (m)______ Bridge in reach_____ Is reach representative_____ If no, why________________________________
Elapsed time at site (hh:mm)____:____ Comments____

Museum data: Initials__________ ID date__________ Jar count__________ Fish Total__________

Coding for Anomalies: D – deformities E – eroded fins L – lesions T – tumor M – multiple DELT anomalies O – other (A – anchor worm C – leeches W – swirled scales Y – popeye S – emaciated F – fungus P – parasites) H – heavy L – light (these codes may be combined with above codes)

TOTAL # OF FISH				WEIGHT (s) (mass g)				(length mm)	ANOMALIES					
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												

KRW: Rev/09.26.18 Calculation:________ QC1 + Entry________ QC 1 ________ QC 2________

Attachment 4. IDEM Fish Collection Data Sheet (back)

Event ID______________ Page _____ of ______

								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												

KRW: Rev/09.26.18

Attachment 5. IDEM OWQ Biological Qualitative Habitat Evaluation Index (front)

OWQ Biological QHEI (Qualitative Habitat Evaluation Index)

Sample #	bioSample #	Stream Name	Location

Surveyor	Sample Date	County	Macro Sample Type	☐ Habitat Complete	QHEI Score:

1] *SUBSTRATE* Check ONLY Two predominant substrate TYPE BOXES and check every type present

Check ONE (Or 2 & average)

BEST TYPES PREDOMINANT	PRESENT P/G R/R	OTHER TYPES PREDOMINANT	PRESENT P/G R/R	ORIGIN	QUALITY
☐☐ BLDR/SLABS [10]	☐☐	☐☐ HARDPAN [4]	☐☐	☐ LIMESTONE [1]	SILT ☐ HEAVY [-2]
☐☐ BOULDER [9]	☐☐	☐☐ DETRITUS [3]	☐☐	☐ TILLS [1]	☐ MODERATE [-1]
☐☐ COBBLE [8]	☐☐	☐☐ MUCK [2]	☐☐	☐ WETLANDS [0]	☐ NORMAL [0]
☐☐ GRAVEL [7]	☐☐	☐☐ SILT [2]	☐☐	☐ HARDPAN [0]	☐ FREE [1]
☐☐ SAND [6]	☐☐	☐☐ ARTIFICIAL [0]	☐☐	☐ SANDSTONE [0]	EMBEDDEDNESS ☐ EXTENSIVE [-2]
☐☐ BEDROCK [5]	☐☐	(Score natural substrates; ignore sludge from point-sources)		☐ RIP/RAP [0]	☐ MODERATE [-1]
				☐ LACUSTRINE [0]	☐ NORMAL [0]
				☐ SHALE [-1]	☐ NONE [1]
				☐ COAL FINES [-2]	

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

Substrate Maximum 20

Comments

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

___ UNDERCUT BANKS [1] ___ POOLS > 70cm [2] ___ OXBOWS, BACKWATERS [1]
___ OVERHANGING VEGETATION [1] ___ ROOTWADS [1] ___ AQUATIC MACROPHYTES [1]
___ SHALLOWS (IN SLOW WATER) [1] ___ BOULDERS [1] ___ 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

Comments

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

Comments

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

River right looking downstream

L R EROSION	L R RIPARIAN WIDTH	L R FLOOD PLAIN QUALITY	L R
☐☐ NONE/LITTLE [3]	☐☐ WIDE > 50m [4]	☐☐ FOREST, SWAMP [3]	☐☐ CONSERVATION TILLAGE [1]
☐☐ MODERATE [2]	☐☐ MODERATE 10-50m [3]	☐☐ SHRUB OR OLD FIELD [2]	☐☐ URBAN OR INDUSTRIAL [0]
☐☐ HEAVY/SEVERE [1]	☐☐ NARROW 5-10m [2]	☐☐ RESIDENTIAL, PARK, NEW FIELD [1]	☐☐ MINING /CONSTRUCTION [0]
	☐☐ VERY NARROW [1]	☐☐ FENCED PASTURE [1]	Indicate predominant land use(s) past 100m riparian.
	☐☐ NONE [0]	☐☐ OPEN PASTURE, ROWCROP [0]	

Riparian Maximum 10

Comments

5] *POOL/GLIDE AND RIFFLE/RUN QUALITY*

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

Pool/Current Maximum 12

Comments

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 < 5 cm [metric = 0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0]
			☐ EXTENSIVE [-1]

Riffle/Run Maximum 8

Comments

6] *GRADIENT* (ft/mi) ☐ VERY LOW - LOW [2–4] %POOL: %GLIDE:
☐ MODERATE [6 - 10]
DRAINAGE AREA (mi²) ☐ HIGH - VERY HIGH [10 - 6] %RUN: %RIFFLE:

Gradient Maximum 10

Entered ______________ QC1 ______________ QC2 ______________ IDEM 02/01/2023

Attachment 5 (cont.). IDEM OWQ Biological QHEI (back)

OWQ Biological QHEI (Qualitative Habitat Evaluation Index)

COMMENT ______________________________

A-CANOPY
- ☐ > 85% - Open
- ☐ 55% - < 85%
- ☐ 30% - < 55%
- ☐ 10% - < 30%
- ☐ < 10% - Closed

B-AESTHETICS
- ☐ Nuisance algae
- ☐ Invasive macrophytes
- ☐ Excess turbidity
- ☐ Discoloration
- ☐ Foam/Scum
- ☐ Oil sheen
- ☐ Trash/Litter
- ☐ Nuisance odor
- ☐ Sludge deposits
- ☐ CSOs/SSOs/Outfalls

C-RECREATION

	Area	Depth
Pool:	☐ > 100 ft^2	☐ > 3 ft

D-MAINTENANCE
- ☐ Public ☐ Private
- ☐ Active ☐ Historic
- Succession: ☐ Young ☐ Old
- ☐ Spray ☐ Islands ☐ Scoured
- Snag : ☐ Removed ☐ Modified
- Leveed: ☐ One sided ☐ Both banks
- ☐ Relocated ☐ Cutoffs
- Bedload: ☐ Moving ☐ Stable
- ☐ Armoured ☐ Slumps
- ☐ Impounded ☐ Desiccated
- ☐ Flood control ☐ Drainage

E-ISSUES
- ☐ WWTP ☐ CSO ☐ NPDES
- ☐ Industry ☐ Urban
- ☐ Hardened ☐ Dirt & Grime
- ☐ Contaminated ☐ Landfill
- BMPs: ☐ Construction ☐ Sediment
- ☐ Logging ☐ Irrigation ☐ Cooling
- Erosion: ☐ Bank ☐ Surface
- ☐ False bank ☐ Manure ☐ Lagoon
- ☐ Wash H_2O ☐ Tile ☐ H_2O Table
- Mine: ☐ Acid ☐ Quarry
- Flow: ☐ Natural ☐ Stagnant
- ☐ Wetland ☐ Park ☐ Golf
- ☐ Lawn ☐ Home
- ☐ Atmospheric deposition
- ☐ Agriculture ☐ Livestock

Looking upstream (> 10m, 3 readings; ≤ 10m, 1 reading in middle); Round to the nearest whole percent

	Right	Middle	Left	Total Average
% open	___ %	___ %	___ %	___ %

Stream Width (m):

Stream Drawing:

IDEM 02/01/2023

Attachment 6. IDEM OWQ Field Chain of Custody Form

IDEM

Indiana Department of Environmental Management

OWQ Chain of Custody Form

Project:

OWQ Sample Set or Trip #:

I Certify that the sample(s) listed below was/were collected by me, or in my presence. Date:____________________

Signature:____ Section:____________________

Sample Media (☐ Water, ☐ Algae,☐ Fish, ☐ Macro, ☐ Cyanobacteria/Microcystin, ☐ Sediment)

Lab Assigned Number / Event ID	IDEM Control Number	Sample Type	ID	1000 ml P.N.M.	1000 ml G.N.M.	40 ml Vial	120 ml P (Bact)	2000 ml Nalgene	250 ml Nalgene	125 ml Glass	Date and Time Collected		One check per bottle present
											Date	Time	

P = Plastic	G = Glass	N.M. = Narrow Mouth	Bact = Bacteriological Only	Should samples be iced?	Y	N
M = MS/MSD	B = Blank	D = Duplicate	R = Revisit			

Carriers

I certify that I have received the above sample(s).

Signature	Date	Time	Seals Intact		Comments
Relinquished By:			Y	N	
Received By:					
Relinquished By:			Y	N	
Received By:					
Relinquished By:			Y	N	
Received By:					
IDEM Storage Room #					

Lab Custodian

I certify that I have received the above sample(s), which has/have been recorded in the official record book. The same sample(s) will be in the custody of competent laboratory personnel at all times, or locked in a secured area.

Signature:______________________________ Date:______________ Time:_____________

Lab:__________________________________ Address:__________________________________

Revision Date: 4/27/2016

Attachment 7. IDEM Corvallis Water Sample Analysis Request Form (Pace Analytical)

Indiana Department of Environmental Management
Office of Water Quality
Watershed Planning and Assessment Branch
www.idem.IN.gov

Water Sample Analysis Request **PROFILE #284**

Project Name: **2023 Probabilistic Monitoring** _Composite ☐ Grab ☒

OWQ Sample Set	23WQW001	IDEM Sample Nos.	
Crew Chief		Lab Sample Nos.	
Collection Date		Lab Delivery Date	

Anions and Physical Parameters

Parameter	Test Method	Total	Dissolved
Alkalinity (as $CaCO_3$)	SM2320B	☒ **	☐
Total Solids	SM2540B	☒ **	
Suspended Solids	SM2540D	☒ **	
Dissolved Solids	SM2540C		☒ **
Sulfate (as SO_4)	300.0	☐ **	☒ **
Chloride (as Cl)	300.0	☐ **	☒ **
Hardness (Calculated)	SM-2340B	☒ **	☐ **
Fluoride (as F)	SM4500-F-C	☐ **	☐ **

Priority Pollutant Metals Water Parameters

Parameter	Test Method	Total	Dissolved
Antimony (as Sb)	200.8	☒	☒
Arsenic (as As)	200.8	☒	☒
Beryllium (as Be)	200.8	☐	☐
Cadmium (as Cd)	200.8	☒	☒
Chromium (as Cr)	200.8	☒	☒
Copper (as Cu)	200.8	☒	☒
Lead (as Pb)	200.8	☒	☒
Mercury, Low Level	1631, Rev E.	☐	☐
Nickel (as Ni)	200.8	☒	☒
Selenium (as Se)	200.8	☒	☒
Silver (as Ag)	200.8	☒	☒
Thallium (as Tl)	200.8	☐	☐
Zinc (as Zn)	200.8	☒	☒

Cations and Secondary Metals Parameters

Parameter	Test Method	Total	Dissolved
Aluminum (as Al)	**200.8**	☒	☒
Barium (as Ba)	200.8	☐	☐
Boron (as B)	200.8	☐	☐
Calcium (as Ca)	**200.7**	☒ ***	☐
Cobalt (as Co)	200.8	☐	☐
Iron (as Fe)	200.7	☐	☐
Magnesium (as Mg)	**200.7**	☒ ***	☐
Manganese (as Mn)	200.8	☐	☐
Sodium (as Na)	200.7	☐	☐
Silica, Total Reactive (as SiO_2)	200.7	☐	☐
Strontium (as Sr)	200.8	☐	☐

Send reports (Fed. Ex. or UPS) to:
Tim Bowren - IDEM
Bldg. 20, STE 100
2525 North Shadeland Ave.
Indianapolis, IN 46219

Deliver reports to:
Tim Bowren - IDEM
Bldg. 20, STE 100
2525 North Shadeland Ave.
Indianapolis, IN 46219

Organic Water Parameters

Parameter	Test Method	Total
Priority Pollutants: Oranochlorine Pesticides and PCBs	608	☐
Priority Pollutants: VOCs - Purgeable Organics	624	☐
Priority Pollutants: Base/Neutral Extractables	625	☐
Priority Pollutants: Acid Extractables	625	☐
Phenolics, 4AAP	420.4	☐
Oil and Grease, Total	1664A	☐

Nutrient & Organic Water Chemistry Parameters

Parameter	Test Method	Total	Dissolved
Ammonia Nitrogen	350.1	☒	☐
$CBOD_5$	SM5210B	☐	
Total Kjeldahl Nitrogen (TKN)	351.2	☒	☐
Nitrogen, Nitrate + Nitrite as N	353.2	☒	☐
Total Phosphorus	365.1	☒	☐
TOC (Total Organic Carbon)	SM 5310C	☒	
DOC (Dissolved Organic Carbon)	SM 5310C		☒
COD	410.4	☒	☐
Cyanide (Total)	335.4	☐	☐
Cyanide (Free)	SM4500CN-I	☒ *	☐
Cyanide (Amenable)	SM4500CN-G	☒ *	☐
Sulfide, Total	376.2	☐	☐

RFP 22-68153 Contract Number:	58463 (Pace-Indy) PO # 20003041-4 (Pace-Indy)

30 day reporting time required.

Notes:

** = DO NOT RUN PARAMETER IF SAMPLE IDENTIFIED AS A BLANK ON THE CHAIN OF CUSTODY

* = RUN ONLY IF TOTAL CYANIDE IS DETECTED

*** = *Report Calcium, Magnesium components of Total Hardness (Calculated)*

Testing Laboratory: Pace Analytical Services, Inc.
Attn: Olivia Deck
Phone: 317-228-3102 7726 Moller Road
Indianapolis, IN 46268

Attachment 8. IDEM OWQ Biological Samples Laboratory Chain of Custody Form

INDIANA DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT
OFFICE OF WATER QUALITY BIOLOGICAL SAMPLES
LABORATORY CHAIN OF CUSTODY

ROOM # ______

By placing your initials below, you are certifying that the sample(s) listed below was/were processed by you or in your presence in the processing room noted below and returned to the noted storage room.

Sample Type AD = Algae Diatom AS = Algae, Soft F = fish M = macro	**Event ID or Macro #**	**IDEM Sample #**	# of 2000 mL Nalgene Jar	# of 250 mL Nalgene Jar	# of 125 mL Glass Jar	**Removed from Storage for Processing**		Processing Room #	Initials	**Placed in Storage after Processing**		Storage Room #	Initials	# of Olive Voucher Jars	# of Slides	# of Close Top Test Tubes	**Sample Split** P = Permanent T = Temporary
	(YY____) or (_________)	(AB_____)				Date (mm/dd/yyyy)	Time (24hr)			Date (mm/dd/yyyy)	Time (24hr)						
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Lab: Indiana Department of Environmental Management

Address: 2525 N. Shadeland Ave., Laboratory Room 121, 124, 125, Indianapolis, IN 46219

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents

State of Kansas

Department of Health and Environment

CERTIFICATE

This is to certify that Certification No.: E-10177

Pace Analytical Services, Inc - Indianapolis IN

7726 Moller Road

Indianapolis, IN 46268-4163

has been accredited in accordance with K.S.A. 65-1,109a under the standards adopted in K.A.R. 28-15-36 for performing environmental analyses for the parameters listed on the most current scope of accreditation. Continuous accreditation depends on successful, ongoing participation in the program. Clients are urged to verify with this agency the laboratory's certification status for particular methods and analytes.

Effective Date: 5/1/2022

Expiration Date: 4/30/2023

Myron Gunsalus
Director
Office of Laboratory Services

Carissa Robertson
Certification Section Chief
Office of Laboratory Services

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents

Division of Environment
Kansas Health and Environmental Laboratories
Environmental Laboratory Improvement Program
6810 SE Dwight Street
Topeka, KS 66620

Kansas Department of Health and Environment

Phone: 785-296-3811
Fax: 785-559-5207
KDHE.ELIPO@KS.GOV
www.kdheks.gov/envlab

Janet Stanek, Secretary

Laura Kelly, Governor

The Kansas Department of Health and Environment encourages all clients and data users to verify the most current scope of accreditation for certification number E-10177

The analytes tested and the corresponding matrix and method which a laboratory is authorized to perform at any given time will be those indicated in the most recently issued scope of accreditation. The most recent scope of accreditation supersedes all previously issued scopes of accreditation. It is the certified laboratory's responsibility to review this document for any discrepancies. This scope of accreditation will be recalled in the event that your laboratory's certification is revoked.

Accreditation Start: 5/1/2022 Accreditation End: 4/30/2023

EPA Number: ***IN00043*** **Scope of Accreditation for Certification Number: E-10177**

Pace Analytical Services, Inc - Indianapolis IN

Program/Matrix: ***CWA (Non Potable Water)***

	Primary AB
Method ASTM D516-11	
Sulfate	KS
Method EPA 1631E	
Mercury	KS
Method EPA 1664A	
Oil & Grease	KS
Method EPA 180.1	
Turbidity	KS
Method EPA 200.7	
Aluminum	KS
Antimony	KS
Arsenic	KS
Barium	KS
Beryllium	KS
Boron	KS
Cadmium	KS
Calcium	KS
Chromium	KS
Cobalt	KS
Copper	KS
Copper	KS
Iron	KS
Lead	KS
Magnesium	KS
Manganese	KS
Molybdenum	KS

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents

EPA Number: ***IN00043*** **Scope of Accreditation for Certification Number: E-10177** Page 2 of 26

Pace Analytical Services, Inc - Indianapolis IN

	Primary AB
Program/Matrix: ***CWA (Non Potable Water)***	
Nickel	KS
Potassium	KS
Selenium	KS
Silver	KS
Sodium	KS
Strontium	KS
Thallium	KS
Tin	KS
Titanium	KS
Vanadium	KS
Zinc	KS
Method EPA 200.8	
Aluminum	KS
Antimony	KS
Arsenic	KS
Barium	KS
Beryllium	KS
Boron	KS
Cadmium	KS
Chromium	KS
Cobalt	KS
Copper	KS
Lead	KS
Manganese	KS
Molybdenum	KS
Nickel	KS
Selenium	KS
Silver	KS
Thallium	KS
Tin	KS
Titanium	KS
Vanadium	KS
Zinc	KS
Method EPA 245.1	
Mercury	KS
Method EPA 300.0	
Bromide	KS
Chloride	KS
Fluoride	KS
Nitrate	KS
Nitrate-nitrite	KS
Nitrite	KS
Sulfate	KS
Method EPA 335.4	
Amenable cyanide	KS
Cyanide	KS

Kansas Department of Health and Environment
Kansas Health Environmental Laboratories
6810 SE Dwight Street, Topeka, KS 66620

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents

EPA Number: *IN00043* **Scope of Accreditation for Certification Number:** **E-10177** Page 3 of 26

Pace Analytical Services, Inc - Indianapolis IN **Primary AB**

Program/Matrix: *CWA (Non Potable Water)*

Method EPA 350.1	
Ammonia as N	KS
Method EPA 351.2	
Total Kjeldahl Nitrogen (TKN)	KS
Method EPA 351.2 minus EPA 350.1	
Organic nitrogen	KS
Method EPA 353.2	
Nitrate	KS
Nitrate-nitrite	KS
Nitrite	KS
Method EPA 365.1	
Phosphorus	KS
Method EPA 410.4	
Chemical oxygen demand	KS
Method EPA 420.4	
Total phenolics	KS
Method EPA 6010B	
Arsenic	KS
Cadmium	KS
Copper	KS
Lead	KS
Molybdenum	KS
Nickel	KS
Selenium	KS
Strontium	KS
Total chromium	KS
Zinc	KS
Method EPA 6020	
Arsenic	KS
Cadmium	KS
Copper	KS
Lead	KS
Nickel	KS
Selenium	KS
Total chromium	KS
Zinc	KS
Method EPA 608.3 GC-ECD	
4,4'-DDD	KS
4,4'-DDE	KS
4,4'-DDT	KS
Aldrin	KS
alpha-BHC (alpha-Hexachlorocyclohexane)	KS
Aroclor-1016 (PCB-1016)	KS
Aroclor-1221 (PCB-1221)	KS
Aroclor-1232 (PCB-1232)	KS

Kansas Department of Health and Environment
Kansas Health Environmental Laboratories
6810 SE Dwight Street, Topeka, KS 66620

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents

EPA Number: ***IN00043*** **Scope of Accreditation for Certification Number: E-10177** Page 4 of 26

Pace Analytical Services, Inc - Indianapolis IN

	Primary AB
Program/Matrix: ***CWA (Non Potable Water)***	
Aroclor-1242 (PCB-1242)	KS
Aroclor-1248 (PCB-1248)	KS
Aroclor-1254 (PCB-1254)	KS
Aroclor-1260 (PCB-1260)	KS
beta-BHC (beta-Hexachlorocyclohexane)	KS
Chlordane (tech.)(N.O.S.)	KS
delta-BHC	KS
Dieldrin	KS
Endosulfan I	KS
Endosulfan II	KS
Endosulfan sulfate	KS
Endrin	KS
Endrin aldehyde	KS
gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)	KS
Heptachlor	KS
Heptachlor epoxide	KS
Methoxychlor	KS
Toxaphene (Chlorinated camphene)	KS
Method EPA 624.1	
1,1,1-Trichloroethane	KS
1,1,2,2-Tetrachloroethane	KS
1,1,2-Trichloroethane	KS
1,1-Dichloroethane	KS
1,1-Dichloroethylene	KS
1,2-Dichlorobenzene (o-Dichlorobenzene)	KS
1,2-Dichloroethane (Ethylene dichloride)	KS
1,2-Dichloropropane	KS
1,3-Dichlorobenzene	KS
1,4-Dichlorobenzene	KS
2-Chloroethyl vinyl ether	KS
Acrolein (Propenal)	KS
Acrylonitrile	KS
Benzene	KS
Bromodichloromethane	KS
Bromoform	KS
Carbon tetrachloride	KS
Chlorobenzene	KS
Chlorodibromomethane	KS
Chloroethane (Ethyl chloride)	KS
Chloroform	KS
cis-1,3-Dichloropropene	KS
Ethylbenzene	KS
Methyl bromide (Bromomethane)	KS
Methyl chloride (Chloromethane)	KS
Methylene chloride (Dichloromethane)	KS
Naphthalene	KS

Kansas Department of Health and Environment
Kansas Health Environmental Laboratories
6810 SE Dwight Street, Topeka, KS 66620

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents

EPA Number: *IN00043* **Scope of Accreditation for Certification Number:** E-10177 Page 5 of 26

Pace Analytical Services, Inc - Indianapolis IN

Program/Matrix: *CWA (Non Potable Water)*	Primary AB
Tetrachloroethylene (Perchloroethylene)	KS
Toluene	KS
trans-1,2-Dichloroethylene	KS
trans-1,3-Dichloropropylene	KS
Trichloroethene (Trichloroethylene)	KS
Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	KS
Vinyl chloride	KS
Xylene (total)	KS
Method EPA 625.1	
1,2,4-Trichlorobenzene	KS
1,2-Dichlorobenzene (o-Dichlorobenzene)	KS
1,3-Dichlorobenzene	KS
1,4-Dichlorobenzene	KS
2,2'-Oxybis(1-chloropropane), bis(2-Chloro-1-methylethyl)ether	KS
2,4,6-Trichlorophenol	KS
2,4-Dichlorophenol	KS
2,4-Dimethylphenol	KS
2,4-Dinitrophenol	KS
2,4-Dinitrotoluene (2,4-DNT)	KS
2,6-Dinitrotoluene (2,6-DNT)	KS
2-Chloronaphthalene	KS
2-Chlorophenol	KS
2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	KS
2-Nitrophenol	KS
3,3'-Dichlorobenzidine	KS
4-Bromophenyl phenyl ether	KS
4-Chloro-3-methylphenol	KS
4-Chlorophenyl phenylether	KS
4-Nitrophenol	KS
Acenaphthene	KS
Acenaphthylene	KS
Anthracene	KS
Benzidine	KS
Benzo(a)anthracene	KS
Benzo(a)pyrene	KS
Benzo(b)fluoranthene	KS
Benzo(g,h,i)perylene	KS
Benzo(k)fluoranthene	KS
bis(2-Chloroethoxy)methane	KS
bis(2-Chloroethyl) ether	KS
Butyl benzyl phthalate	KS
Chrysene	KS
Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	KS
Dibenz(a,h) anthracene	KS
Diethyl phthalate	KS
Dimethyl phthalate	KS

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Kansas Health Environmental Laboratories
6810 SE Dwight Street, Topeka, KS 66620

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents

EPA Number: ***IN00043*** **Scope of Accreditation for Certification Number: E-10177**

Pace Analytical Services, Inc - Indianapolis IN

	Primary AB
Program/Matrix: ***CWA (Non Potable Water)***	
Di-n-butyl phthalate	KS
Di-n-octyl phthalate	KS
Fluoranthene	KS
Fluorene	KS
Hexachlorobenzene	KS
Hexachlorobutadiene	KS
Hexachloroethane	KS
Indeno(1,2,3-cd) pyrene	KS
Isophorone	KS
Naphthalene	KS
Nitrobenzene	KS
n-Nitrosodimethylamine	KS
n-Nitrosodi-n-propylamine	KS
n-Nitrosodiphenylamine	KS
Pentachlorophenol	KS
Phenanthrene	KS
Phenol	KS
Pyrene	KS
Method EPA 7470A	
Mercury	KS
Method EPA 7471A	
Mercury	KS
Method EPA 8015D	
Propylene glycol	KS
Method EPA 8260C	
1,1,2-Trichloro-1,2,2-trifluoroethane	KS
1,3,5-Trichlorobenzene	KS
Method EPA 8270C	
1-Methylnaphthalene	KS
Carbazole	KS
Method OIA 1677-09	
Available Cyanide	KS
Free cyanide	KS
Method SM 2310 B-2011	
Acidity, as CaCO3	KS
Method SM 2320 B-2011	
Alkalinity as CaCO3	KS
Method SM 2340 B-2011	
Hardness	KS
Method SM 2540 B-2011	
Residue-total	KS
Method SM 2540 C-2011	
Residue-filterable (TDS)	KS
Method SM 2540 D-2011	

Kansas Department of Health and Environment
Kansas Health Environmental Laboratories
6810 SE Dwight Street, Topeka, KS 66620

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents

EPA Number: ***IN00043*** **Scope of Accreditation for Certification Number: E-10177** Page 7 of 26

Pace Analytical Services, Inc - Indianapolis IN

	Primary AB
Program/Matrix: ***CWA (Non Potable Water)***	
Residue-nonfilterable (TSS)	KS
Method SM 2540 F-2011	
Residue-settleable	KS
Method SM 3500-Cr B-2011	
Chromium VI	KS
Method SM 4500-Cl G-2011	
Total residual chlorine	KS
Method SM 4500-Cl⁻ E-2011	
Chloride	KS
Method SM 4500-CN⁻ C-2011	
Cyanide	KS
Method SM 4500-CN⁻ E-2011	
Cyanide	KS
Method SM 4500-CN⁻ G-2011	
Amenable cyanide	KS
Method SM 4500-F⁻ C-2011	
Fluoride	KS
Method SM 4500-H+ B-2011	
pH	KS
Method SM 4500-NH3 G-2011	
Ammonia as N	KS
Method SM 4500-P E-2011	
Orthophosphate as P	KS
Method SM 4500-S2⁻ D-2011	
Sulfide	KS
Method SM 5210 B-2011	
Biochemical oxygen demand	KS
Carbonaceous BOD, CBOD	KS
Method SM 5310 C-2011	
Total organic carbon	KS
Method SM 5540 C-2011	
Surfactants - MBAS	KS
Method TKN-NH3-CAL	
Organic nitrogen	KS

Kansas Department of Health and Environment
Kansas Health Environmental Laboratories
6810 SE Dwight Street, Topeka, KS 66620

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents

EPA Number: *IN00043* **Scope of Accreditation for Certification Number:** **E-10177** Page 8 of 26

Pace Analytical Services, Inc - Indianapolis IN

Program/Matrix: ***RCRA (Non Potable Water)***

Method / Analyte	Primary AB
Method EPA 1010A	
Ignitability	KS
Method EPA 1311	
Toxicity Characteristic Leaching Procedure (TCLP)	KS
Method EPA 1312	
Synthetic Precipitation Leaching Procedure (SPLP)	KS
Method EPA 6010B	
Aluminum	KS
Antimony	KS
Arsenic	KS
Barium	KS
Beryllium	KS
Boron	KS
Cadmium	KS
Calcium	KS
Chromium	KS
Cobalt	KS
Copper	KS
Iron	KS
Lead	KS
Lithium	KS
Magnesium	KS
Manganese	KS
Molybdenum	KS
Nickel	KS
Potassium	KS
Selenium	KS
Silicon	KS
Silver	KS
Sodium	KS
Strontium	KS
Thallium	KS
Tin	KS
Titanium	KS
Vanadium	KS
Zinc	KS
Method EPA 6020	
Aluminum	KS
Antimony	KS
Arsenic	KS
Barium	KS
Beryllium	KS
Cadmium	KS
Chromium	KS
Cobalt	KS
Copper	KS

Kansas Department of Health and Environment
Kansas Health Environmental Laboratories
6810 SE Dwight Street, Topeka, KS 66620

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents

Pace Analytical Services, Inc - Indianapolis IN — **Primary AB**

Program/Matrix: ***RCRA (Non Potable Water)***

Lead	KS
Manganese	KS
Molybdenum	KS
Nickel	KS
Selenium	KS
Silver	KS
Thallium	KS
Thorium	KS
Uranium	KS
Vanadium	KS
Zinc	KS
Method EPA 7196A	
Chromium VI	KS
Method EPA 7470A	
Mercury	KS
Method EPA 7471A	
Mercury	KS
Method EPA 8011	
1,2-Dibromo-3-chloropropane (DBCP)	KS
1,2-Dibromoethane (EDB, Ethylene dibromide)	KS
Method EPA 8015D	
Diesel range organics (DRO)	KS
Ethanol	KS
Ethylene glycol	KS
Gasoline range organics (GRO)	KS
Isobutyl alcohol (2-Methyl-1-propanol)	KS
Isopropyl alcohol (2-Propanol, Isopropanol)	KS
Methanol	KS
n-Butyl alcohol (1-Butanol, n-Butanol)	KS
n-Propanol (1-Propanol)	KS
Propylene glycol	KS
Method EPA 8081B	
4,4'-DDD	KS
4,4'-DDE	KS
4,4'-DDT	KS
Aldrin	KS
alpha-BHC (alpha-Hexachlorocyclohexane)	KS
alpha-Chlordane, cis-Chlordane	KS
beta-BHC (beta-Hexachlorocyclohexane)	KS
Chlordane (tech.)(N.O.S.)	KS
delta-BHC	KS
Dieldrin	KS
Endosulfan I	KS
Endosulfan II	KS
Endosulfan sulfate	KS

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents

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Pace Analytical Services, Inc - Indianapolis IN **Primary AB**

Program/Matrix: ***RCRA (Non Potable Water)***

Endrin	KS
Endrin aldehyde	KS
Endrin ketone	KS
gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)	KS
gamma-Chlordane	KS
Heptachlor	KS
Heptachlor epoxide	KS
Methoxychlor	KS
Toxaphene (Chlorinated camphene)	KS
Method EPA 8082A	
Aroclor-1016 (PCB-1016)	KS
Aroclor-1221 (PCB-1221)	KS
Aroclor-1232 (PCB-1232)	KS
Aroclor-1242 (PCB-1242)	KS
Aroclor-1248 (PCB-1248)	KS
Aroclor-1254 (PCB-1254)	KS
Aroclor-1260 (PCB-1260)	KS
Method EPA 8141B	
Atrazine	KS
Azinphos-methyl (Guthion)	KS
Chlorpyrifos	KS
Chlorpyrifos-methyl	KS
Demeton-o	KS
Demeton-s	KS
Diazinon	KS
Dichlorovos (DDVP, Dichlorvos)	KS
Dimethoate	KS
Disulfoton	KS
Famphur	KS
Malathion	KS
Merphos	KS
Methyl parathion (Parathion, methyl)	KS
Naled	KS
Parathion, ethyl	KS
Phorate	KS
Ronnel	KS
Simazine	KS
Terbufos	KS
Tetrachlorvinphos (Stirophos, Gardona) E-isomer	KS
Method EPA 8151A	
2,4,5-T	KS
2,4-D	KS
2,4-DB	KS
3,5-Dichlorobenzoic acid	KS
Acifluorfen	KS
Bentazon	KS

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Pace Analytical Services, Inc - Indianapolis IN

Program/Matrix: ***RCRA (Non Potable Water)***

	Primary AB
Dalapon	KS
DCPA di acid degradate	KS
Dicamba	KS
Dichloroprop (Dichlorprop)	KS
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	KS
MCPA	KS
MCPP	KS
Pentachlorophenol	KS
Picloram	KS
Silvex (2,4,5-TP)	KS
Method EPA 8260C	
1,1,1,2-Tetrachloroethane	KS
1,1,1-Trichloroethane	KS
1,1,2,2-Tetrachloroethane	KS
1,1,2-Trichloro-1,2,2-trifluoroethane	KS
1,1,2-Trichloroethane	KS
1,1-Dichloroethane	KS
1,1-Dichloroethylene	KS
1,1-Dichloropropene	KS
1,2,3-Trichlorobenzene	KS
1,2,3-Trichloropropane	KS
1,2,4-Trichlorobenzene	KS
1,2,4-Trimethylbenzene	KS
1,2-Dibromo-3-chloropropane (DBCP)	KS
1,2-Dibromoethane (EDB, Ethylene dibromide)	KS
1,2-Dichlorobenzene (o-Dichlorobenzene)	KS
1,2-Dichloroethane (Ethylene dichloride)	KS
1,2-Dichloropropane	KS
1,3,5-Trichlorobenzene	KS
1,3,5-Trimethylbenzene	KS
1,3-Dichlorobenzene	KS
1,3-Dichloropropane	KS
1,4-Dichlorobenzene	KS
1,4-Dioxane (1,4- Diethyleneoxide)	KS
1-Methylnaphthalene	KS
2,2-Dichloropropane	KS
2-Butanone (Methyl ethyl ketone, MEK)	KS
2-Chloroethyl vinyl ether	KS
2-Chlorotoluene	KS
2-Hexanone	KS
2-Methylnaphthalene	KS
4-Chlorotoluene	KS
4-Isopropyltoluene (p-Cymene,p-Isopropyltoluene)	KS
4-Methyl-2-pentanone (MIBK)	KS
Acetone	KS
Acetonitrile	KS

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Pace Analytical Services, Inc - Indianapolis IN

Program/Matrix: ***RCRA (Non Potable Water)***

Analyte	Primary AB
Acrolein (Propenal)	KS
Acrylonitrile	KS
Allyl chloride (3-Chloropropene)	KS
Benzene	KS
Bromobenzene	KS
Bromochloromethane	KS
Bromodichloromethane	KS
Bromoform	KS
Carbon disulfide	KS
Carbon tetrachloride	KS
Chlorobenzene	KS
Chlorodibromomethane	KS
Chloroethane (Ethyl chloride)	KS
Chloroform	KS
Chloroprene (2-Chloro-1,3-butadiene)	KS
cis-1,2-Dichloroethylene	KS
cis-1,3-Dichloropropene	KS
Cyclohexane	KS
Dibromomethane (Methylene bromide)	KS
Dichlorodifluoromethane (Freon-12)	KS
Diethyl ether	KS
Ethyl acetate	KS
Ethyl methacrylate	KS
Ethylbenzene	KS
Hexachlorobutadiene	KS
Iodomethane (Methyl iodide)	KS
Isobutyl alcohol (2-Methyl-1-propanol)	KS
Isopropylbenzene	KS
Methacrylonitrile	KS
Methyl acetate	KS
Methyl bromide (Bromomethane)	KS
Methyl chloride (Chloromethane)	KS
Methyl methacrylate	KS
Methyl tert-butyl ether (MTBE)	KS
Methylcyclohexane	KS
Methylene chloride (Dichloromethane)	KS
m-Xylene	KS
Naphthalene	KS
n-Butyl alcohol (1-Butanol, n-Butanol)	KS
n-Butylbenzene	KS
n-Hexane	KS
n-Propylbenzene	KS
o-Xylene	KS
Propionitrile (Ethyl cyanide)	KS
p-Xylene	KS
sec-Butylbenzene	KS
Styrene	KS

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Pace Analytical Services, Inc - Indianapolis IN

	Primary AB
Program/Matrix: *RCRA (Non Potable Water)*	
tert-Butyl alcohol	KS
tert-Butylbenzene	KS
Tetrachloroethylene (Perchloroethylene)	KS
Tetrahydrofuran (THF)	KS
Toluene	KS
trans-1,2-Dichloroethylene	KS
trans-1,3-Dichloropropylene	KS
trans-1,4-Dichloro-2-butene	KS
Trichloroethene (Trichloroethylene)	KS
Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	KS
Vinyl acetate	KS
Vinyl chloride	KS
Xylene (total)	KS
Method EPA 8270C	
1,2,4,5-Tetrachlorobenzene	KS
1,2,4-Trichlorobenzene	KS
1,2-Dichlorobenzene (o-Dichlorobenzene)	KS
1,2-Diphenylhydrazine	KS
1,3,5-Trinitrobenzene (1,3,5-TNB)	KS
1,3-Dichlorobenzene	KS
1,3-Dinitrobenzene (1,3-DNB)	KS
1,4-Dichlorobenzene	KS
1,4-Naphthoquinone	KS
1,4-Phenylenediamine	KS
1-Methylnaphthalene	KS
1-Naphthylamine	KS
2,2'-Oxybis(1-chloropropane), bis(2-Chloro-1-methylethyl)ether	KS
2,3,4,6-Tetrachlorophenol	KS
2,4,5-Trichlorophenol	KS
2,4,6-Trichlorophenol	KS
2,4-Dichlorophenol	KS
2,4-Dimethylphenol	KS
2,4-Dinitrophenol	KS
2,4-Dinitrotoluene (2,4-DNT)	KS
2,6-Dichlorophenol	KS
2,6-Dinitrotoluene (2,6-DNT)	KS
2-Acetylaminofluorene	KS
2-Chloronaphthalene	KS
2-Chlorophenol	KS
2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	KS
2-Methylaniline (o-Toluidine)	KS
2-Methylaniline (o-Toluidine)	KS
2-Methylnaphthalene	KS
2-Methylphenol (o-Cresol)	KS
2-Naphthylamine	KS
2-Nitroaniline	KS

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Pace Analytical Services, Inc - Indianapolis IN

Program/Matrix: ***RCRA (Non Potable Water)***

	Primary AB
2-Nitrophenol	KS
2-Picoline (2-Methylpyridine)	KS
3,3'-Dichlorobenzidine	KS
3,3'-Dimethylbenzidine	KS
3-Methylcholanthrene	KS
3-Methylphenol (m-Cresol)	KS
3-Nitroaniline	KS
4-Aminobiphenyl	KS
4-Bromophenyl phenyl ether	KS
4-Chloro-3-methylphenol	KS
4-Chloroaniline	KS
4-Chlorophenyl phenylether	KS
4-Dimethyl aminoazobenzene	KS
4-Methylphenol (p-Cresol)	KS
4-Nitroaniline	KS
4-Nitrophenol	KS
4-Nitroquinoline 1-oxide	KS
5-Nitro-o-toluidine	KS
7,12-Dimethylbenz(a) anthracene	KS
a-a-Dimethylphenethylamine	KS
Acenaphthene	KS
Acenaphthylene	KS
Acetophenone	KS
Aniline	KS
Anthracene	KS
Aramite	KS
Atrazine	KS
Benzaldehyde	KS
Benzidine	KS
Benzo(a)anthracene	KS
Benzo(a)pyrene	KS
Benzo(b)fluoranthene	KS
Benzo(g,h,i)perylene	KS
Benzo(k)fluoranthene	KS
Benzoic acid	KS
Benzyl alcohol	KS
Biphenyl	KS
bis(2-Chloroethoxy)methane	KS
bis(2-Chloroethyl) ether	KS
Butyl benzyl phthalate	KS
Caprolactam	KS
Carbazole	KS
Chlorobenzilate	KS
Chrysene	KS
Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	KS
Diallate	KS
Dibenz(a,h) anthracene	KS

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Program/Matrix: *RCRA (Non Potable Water)*

	Primary AB
Dibenzofuran	KS
Diethyl phthalate	KS
Dimethoate	KS
Dimethyl phthalate	KS
Di-n-butyl phthalate	KS
Di-n-octyl phthalate	KS
Diphenylamine	KS
Disulfoton	KS
Ethyl methanesulfonate	KS
Famphur	KS
Fluoranthene	KS
Fluorene	KS
Hexachlorobenzene	KS
Hexachlorobutadiene	KS
Hexachlorocyclopentadiene	KS
Hexachloroethane	KS
Hexachlorophene	KS
Hexachloropropene	KS
Indeno(1,2,3-cd) pyrene	KS
Isodrin	KS
Isophorone	KS
Isosafrole	KS
Kepone	KS
Methapyrilene	KS
Methyl methanesulfonate	KS
Methyl parathion (Parathion, methyl)	KS
Naphthalene	KS
Nitrobenzene	KS
n-Nitrosodiethylamine	KS
n-Nitrosodimethylamine	KS
n-Nitroso-di-n-butylamine	KS
n-Nitrosodi-n-propylamine	KS
n-Nitrosodiphenylamine	KS
n-Nitrosomethylethylamine	KS
n-Nitrosomorpholine	KS
n-Nitrosopiperidine	KS
n-Nitrosopyrrolidine	KS
o,o,o-Triethyl phosphorothioate	KS
Parathion, ethyl	KS
Pentachlorobenzene	KS
Pentachloronitrobenzene	KS
Pentachlorophenol	KS
Phenacetin	KS
Phenanthrene	KS
Phenol	KS
Phorate	KS
p-Phenylenediamine	KS

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Pace Analytical Services, Inc - Indianapolis IN

	Primary AB
Program/Matrix: ***RCRA (Non Potable Water)***	
Pronamide (Kerb)	KS
Pyrene	KS
Pyridine	KS
Safrole	KS
Sulfotep (Tetraethyl dithiopyrophosphate)	KS
Thionazin (Zinophos)	KS
Method EPA 8270C SIM	
1-Methylnaphthalene	KS
2-Methylnaphthalene	KS
Acenaphthene	KS
Acenaphthylene	KS
Anthracene	KS
Benzo(a)anthracene	KS
Benzo(a)pyrene	KS
Benzo(b)fluoranthene	KS
Benzo(g,h,i)perylene	KS
Benzo(k)fluoranthene	KS
Chrysene	KS
Dibenz(a,h) anthracene	KS
Fluoranthene	KS
Fluorene	KS
Indeno(1,2,3-cd) pyrene	KS
Naphthalene	KS
Phenanthrene	KS
Pyrene	KS
Method EPA 9012A	
Amenable cyanide	KS
Cyanide	KS
Method EPA 9038	
Sulfate	KS
Method EPA 9056A	
Bromide	KS
Chloride	KS
Fluoride	KS
Iodide	KS
Nitrate	KS
Nitrite	KS
Sulfate	KS
Method EPA 9066	
Total phenolics	KS
Method EPA 9095B	
Paint Filter Test	KS
Method EPA RSK-175 (GC/FID)	
Ethane	KS
Ethene	KS

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Pace Analytical Services, Inc - Indianapolis IN **Primary AB**

Program/Matrix: ***RCRA (Non Potable Water)***

Methane	KS

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Pace Analytical Services, Inc - Indianapolis IN **Primary AB**

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

Method EPA 1010A	
Ignitability	KS
Method EPA 1311	
Toxicity Characteristic Leaching Procedure (TCLP)	KS
Method EPA 1312	
Synthetic Precipitation Leaching Procedure (SPLP)	KS
Method EPA 6010B	
Aluminum	KS
Antimony	KS
Arsenic	KS
Barium	KS
Beryllium	KS
Boron	KS
Cadmium	KS
Calcium	KS
Chromium	KS
Cobalt	KS
Copper	KS
Iron	KS
Lead	KS
Magnesium	KS
Manganese	KS
Molybdenum	KS
Nickel	KS
Potassium	KS
Selenium	KS
Silver	KS
Sodium	KS
Strontium	KS
Thallium	KS
Tin	KS
Titanium	KS
Vanadium	KS
Zinc	KS
Method EPA 6020	
Aluminum	KS
Antimony	KS
Arsenic	KS
Barium	KS
Beryllium	KS
Cadmium	KS
Chromium	KS
Cobalt	KS
Copper	KS
Lead	KS
Manganese	KS

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Pace Analytical Services, Inc - Indianapolis IN **Primary AB**

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

Nickel	KS
Selenium	KS
Silver	KS
Thallium	KS
Vanadium	KS
Zinc	KS
Method EPA 7196A	
Chromium VI	KS
Method EPA 7470A	
Mercury	KS
Method EPA 7471A	
Mercury	KS
Method EPA 8015D	
Diesel range organics (DRO)	KS
Ethanol	KS
Ethylene glycol	KS
Gasoline range organics (GRO)	KS
Isobutyl alcohol (2-Methyl-1-propanol)	KS
Isopropyl alcohol (2-Propanol, Isopropanol)	KS
Methanol	KS
n-Butyl alcohol (1-Butanol, n-Butanol)	KS
n-Propanol (1-Propanol)	KS
Propylene glycol	KS
Method EPA 8081B	
4,4'-DDD	KS
4,4'-DDE	KS
4,4'-DDT	KS
Aldrin	KS
alpha-BHC (alpha-Hexachlorocyclohexane)	KS
alpha-Chlordane, cis-Chlordane	KS
beta-BHC (beta-Hexachlorocyclohexane)	KS
Chlordane (tech.)(N.O.S.)	KS
delta-BHC	KS
Dieldrin	KS
Endosulfan I	KS
Endosulfan II	KS
Endosulfan sulfate	KS
Endrin	KS
Endrin aldehyde	KS
Endrin ketone	KS
gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)	KS
gamma-Chlordane	KS
Heptachlor	KS
Heptachlor epoxide	KS
Methoxychlor	KS
Toxaphene (Chlorinated camphene)	KS

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Pace Analytical Services, Inc - Indianapolis IN **Primary AB**

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

Method EPA 8082A

Aroclor-1016 (PCB-1016)	KS
Aroclor-1221 (PCB-1221)	KS
Aroclor-1232 (PCB-1232)	KS
Aroclor-1242 (PCB-1242)	KS
Aroclor-1248 (PCB-1248)	KS
Aroclor-1254 (PCB-1254)	KS
Aroclor-1260 (PCB-1260)	KS

Method EPA 8141B

Atrazine	KS
Azinphos-methyl (Guthion)	KS
Chlorpyrifos	KS
Chlorpyrifos-methyl	KS
Demeton-o	KS
Demeton-s	KS
Diazinon	KS
Dichlorovos (DDVP, Dichlorvos)	KS
Dimethoate	KS
Disulfoton	KS
Famphur	KS
Malathion	KS
Merphos	KS
Methyl parathion (Parathion, methyl)	KS
Naled	KS
Parathion, ethyl	KS
Phorate	KS
Ronnel	KS
Simazine	KS
Terbufos	KS
Tetrachlorvinphos (Stirophos, Gardona) E-isomer	KS

Method EPA 8151A

2,4,5-T	KS
2,4-D	KS
2,4-DB	KS
3,5-Dichlorobenzoic acid	KS
Acifluorfen	KS
Bentazon	KS
Dalapon	KS
DCPA di acid degradate	KS
Dicamba	KS
Dichloroprop (Dichlorprop)	KS
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	KS
MCPA	KS
MCPP	KS
Pentachlorophenol	KS
Picloram	KS

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	Primary AB
Program/Matrix: ***RCRA (Solid & Hazardous Material)***	
Silvex (2,4,5-TP)	KS
Method EPA 8260C	
1,1,1,2-Tetrachloroethane	KS
1,1,1-Trichloroethane	KS
1,1,2,2-Tetrachloroethane	KS
1,1,2-Trichloro-1,2,2-trifluoroethane	KS
1,1,2-Trichloroethane	KS
1,1-Dichloroethane	KS
1,1-Dichloroethylene	KS
1,1-Dichloropropene	KS
1,2,3-Trichlorobenzene	KS
1,2,3-Trichloropropane	KS
1,2,4-Trichlorobenzene	KS
1,2,4-Trimethylbenzene	KS
1,2-Dibromo-3-chloropropane (DBCP)	KS
1,2-Dibromoethane (EDB, Ethylene dibromide)	KS
1,2-Dichlorobenzene (o-Dichlorobenzene)	KS
1,2-Dichloroethane (Ethylene dichloride)	KS
1,2-Dichloropropane	KS
1,3,5-Trichlorobenzene	KS
1,3,5-Trimethylbenzene	KS
1,3-Dichlorobenzene	KS
1,3-Dichloropropane	KS
1,4-Dichlorobenzene	KS
1,4-Dioxane (1,4- Diethyleneoxide)	KS
1-Methylnaphthalene	KS
2,2-Dichloropropane	KS
2-Butanone (Methyl ethyl ketone, MEK)	KS
2-Chloroethyl vinyl ether	KS
2-Chlorotoluene	KS
2-Hexanone	KS
2-Methylnaphthalene	KS
4-Chlorotoluene	KS
4-Isopropyltoluene (p-Cymene,p-Isopropyltoluene)	KS
4-Methyl-2-pentanone (MIBK)	KS
Acetone	KS
Acetonitrile	KS
Acrolein (Propenal)	KS
Acrylonitrile	KS
Allyl chloride (3-Chloropropene)	KS
Benzene	KS
Bromobenzene	KS
Bromochloromethane	KS
Bromodichloromethane	KS
Bromoform	KS
Carbon disulfide	KS

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Pace Analytical Services, Inc - Indianapolis IN

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

	Primary AB
Carbon tetrachloride	KS
Chlorobenzene	KS
Chlorodibromomethane	KS
Chloroethane (Ethyl chloride)	KS
Chloroform	KS
cis-1,2-Dichloroethylene	KS
cis-1,3-Dichloropropene	KS
Dibromomethane (Methylene bromide)	KS
Dichlorodifluoromethane (Freon-12)	KS
Diethyl ether	KS
Ethyl acetate	KS
Ethyl methacrylate	KS
Ethylbenzene	KS
Hexachlorobutadiene	KS
Iodomethane (Methyl iodide)	KS
Isopropylbenzene	KS
Methacrylonitrile	KS
Methyl bromide (Bromomethane)	KS
Methyl chloride (Chloromethane)	KS
Methyl methacrylate	KS
Methyl tert-butyl ether (MTBE)	KS
Methylene chloride (Dichloromethane)	KS
m-Xylene	KS
Naphthalene	KS
n-Butyl alcohol (1-Butanol, n-Butanol)	KS
n-Butylbenzene	KS
n-Hexane	KS
n-Propylbenzene	KS
o-Xylene	KS
Propionitrile (Ethyl cyanide)	KS
p-Xylene	KS
sec-Butylbenzene	KS
Styrene	KS
tert-Butyl alcohol	KS
tert-Butylbenzene	KS
Tetrachloroethylene (Perchloroethylene)	KS
Toluene	KS
trans-1,2-Dichloroethylene	KS
trans-1,3-Dichloropropylene	KS
trans-1,4-Dichloro-2-butene	KS
Trichloroethene (Trichloroethylene)	KS
Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	KS
Vinyl acetate	KS
Vinyl chloride	KS
Xylene (total)	KS

Method EPA 8270C

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Pace Analytical Services, Inc - Indianapolis IN

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

Analyte	Primary AB
1,2,4,5-Tetrachlorobenzene	KS
1,2,4-Trichlorobenzene	KS
1,2-Dichlorobenzene (o-Dichlorobenzene)	KS
1,2-Diphenylhydrazine	KS
1,3-Dichlorobenzene	KS
1,3-Dinitrobenzene (1,3-DNB)	KS
1,4-Dichlorobenzene	KS
1,4-Naphthoquinone	KS
1,4-Phenylenediamine	KS
1-Methylnaphthalene	KS
1-Naphthylamine	KS
2,2'-Oxybis(1-chloropropane), bis(2-Chloro-1-methylethyl)ether	KS
2,3,4,6-Tetrachlorophenol	KS
2,4,5-Trichlorophenol	KS
2,4,6-Trichlorophenol	KS
2,4-Dichlorophenol	KS
2,4-Dimethylphenol	KS
2,4-Dinitrophenol	KS
2,4-Dinitrotoluene (2,4-DNT)	KS
2,6-Dichlorophenol	KS
2,6-Dinitrotoluene (2,6-DNT)	KS
2-Acetylaminofluorene	KS
2-Chloronaphthalene	KS
2-Chlorophenol	KS
2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	KS
2-Methylaniline (o-Toluidine)	KS
2-Methylaniline (o-Toluidine)	KS
2-Methylnaphthalene	KS
2-Methylphenol (o-Cresol)	KS
2-Naphthylamine	KS
2-Nitroaniline	KS
2-Nitrophenol	KS
2-Picoline (2-Methylpyridine)	KS
3,3'-Dichlorobenzidine	KS
3,3'-Dimethylbenzidine	KS
3-Methylcholanthrene	KS
3-Methylphenol (m-Cresol)	KS
3-Nitroaniline	KS
4-Aminobiphenyl	KS
4-Bromophenyl phenyl ether	KS
4-Chloro-3-methylphenol	KS
4-Chloroaniline	KS
4-Chlorophenyl phenylether	KS
4-Dimethyl aminoazobenzene	KS
4-Methylphenol (p-Cresol)	KS
4-Nitroaniline	KS
4-Nitrophenol	KS

Kansas Department of Health and Environment
Kansas Health Environmental Laboratories
6810 SE Dwight Street, Topeka, KS 66620

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents

Pace Analytical Services, Inc - Indianapolis IN

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

	Primary AB
4-Nitroquinoline 1-oxide	KS
5-Nitro-o-toluidine	KS
7,12-Dimethylbenz(a) anthracene	KS
a-a-Dimethylphenethylamine	KS
Acenaphthene	KS
Acenaphthylene	KS
Acetophenone	KS
Aniline	KS
Anthracene	KS
Aramite	KS
Benzidine	KS
Benzo(a)anthracene	KS
Benzo(a)pyrene	KS
Benzo(b)fluoranthene	KS
Benzo(g,h,i)perylene	KS
Benzo(k)fluoranthene	KS
Benzoic acid	KS
Benzyl alcohol	KS
bis(2-Chloroethoxy)methane	KS
bis(2-Chloroethyl) ether	KS
Butyl benzyl phthalate	KS
Carbazole	KS
Chlorobenzilate	KS
Chrysene	KS
Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	KS
Diallate	KS
Dibenz(a,h) anthracene	KS
Dibenzofuran	KS
Diethyl phthalate	KS
Dimethoate	KS
Dimethyl phthalate	KS
Di-n-butyl phthalate	KS
Di-n-octyl phthalate	KS
Diphenylamine	KS
Disulfoton	KS
Ethyl methanesulfonate	KS
Famphur	KS
Fluoranthene	KS
Fluorene	KS
Hexachlorobenzene	KS
Hexachlorobutadiene	KS
Hexachlorocyclopentadiene	KS
Hexachloroethane	KS
Hexachlorophene	KS
Hexachloropropene	KS
Indeno(1,2,3-cd) pyrene	KS
Isodrin	KS

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EPA Number: ***IN00043*** **Scope of Accreditation for Certification Number: E-10177**

Pace Analytical Services, Inc - Indianapolis IN **Primary AB**

Program/Matrix: ***RCRA (Solid & Hazardous Material)***

Isophorone	KS
Isosafrole	KS
Kepone	KS
Methapyrilene	KS
Methyl methanesulfonate	KS
Methyl parathion (Parathion, methyl)	KS
Naphthalene	KS
Nitrobenzene	KS
n-Nitrosodiethylamine	KS
n-Nitrosodimethylamine	KS
n-Nitroso-di-n-butylamine	KS
n-Nitrosodi-n-propylamine	KS
n-Nitrosodiphenylamine	KS
n-Nitrosomethylethylamine	KS
n-Nitrosomorpholine	KS
n-Nitrosopiperidine	KS
n-Nitrosopyrrolidine	KS
o,o,o-Triethyl phosphorothioate	KS
Parathion, ethyl	KS
Pentachlorobenzene	KS
Pentachloronitrobenzene	KS
Pentachlorophenol	KS
Phenacetin	KS
Phenanthrene	KS
Phenol	KS
Phorate	KS
Pronamide (Kerb)	KS
Pyrene	KS
Pyridine	KS
Safrole	KS
Sulfotep (Tetraethyl dithiopyrophosphate)	KS
Thionazin (Zinophos)	KS

Method EPA 8270C SIM

1-Methylnaphthalene	KS
2-Methylnaphthalene	KS
Acenaphthene	KS
Acenaphthylene	KS
Anthracene	KS
Benzo(a)anthracene	KS
Benzo(a)pyrene	KS
Benzo(b)fluoranthene	KS
Benzo(g,h,i)perylene	KS
Benzo(k)fluoranthene	KS
Chrysene	KS
Dibenz(a,h) anthracene	KS
Fluoranthene	KS

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EPA Number: ***IN00043*** **Scope of Accreditation for Certification Number: E-10177** Page 26 of 26

Pace Analytical Services, Inc - Indianapolis IN

Program/Matrix: ***RCRA (Solid & Hazardous Material)***	**Primary AB**
Fluorene	KS
Indeno(1,2,3-cd) pyrene	KS
Naphthalene	KS
Phenanthrene	KS
Pyrene	KS
Method EPA 9012A	
Amenable cyanide	KS
Cyanide	KS
Method EPA 9045C	
pH	KS
Method EPA 9066	
Total phenolics	KS
Method EPA 9095B	
Paint Filter Test	KS

End of Scope of Accreditation

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