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Indiana Coolwater Stream Monitoring Work Plan

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IDEM Quality Assurance Staff reviewed and approves this work plan.

Date 09 June 2021

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Work Plan Organization

This work plan (WP) is an extension of the existing Indiana Department of Environmental Management (IDEM) Office of Water Quality (OWQ) Watershed Assessment and Planning Branch (WAPB), March 2017 Quality Assurance Project Plan (QAPP) for Indiana Surface Water Quality Programs (Surface Water QAPP) (IDEM 2017a) and October 2020 QAPP for Biological Community and Habitat Measurements (Biological and Habitat QAPP) (IDEM 2020a). Per the United States Environmental Protection Agency (U.S. EPA) 2006 Guidance on Systematic Planning Using the Data Quality Objectives (DQO) Process (U.S. EPA 2006), the WP establishes criteria and specifications, pertaining to a specific water quality monitoring project, usually described in the following four groups containing elements similar to a QAPP per Guidance for Quality Assurance Project Plans (U.S. EPA 2002).

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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
DQO	Data Quality Objective
GPS	Global Positioning System
HDPE	High-density polyethylene
IAC	Indiana Administrative Code
IBI	Index of Biotic Integrity
IN DNR	Indiana Department of Natural Resources
MS/MSD	Matrix Spike and Matrix Spike Duplicate
NPDES	National Pollutant Discharge Elimination System
OHEPA	Ohio Environmental Protection Agency
QA	Quality Assurance
QC	Quality Control
QAPP	Quality Assurance Project Plan
QHEI	Qualitative Habitat Evaluation Index
SOP	Standard Operating Procedure
SU	Standard Units
TMDL	Total Maximum Daily Load
U.S. EPA	United States Environmental Protection Agency
USGS	Unites States Geological Survey
WP	Work plan

Definitions

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 IDEM multihabitat macroinvertebrate sampling method, used to maximize taxonomic diversity while in the field, in which 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	A component of the IDEM multihabitat macroinvertebrate sampling method in which approximately 50 meters of shoreline 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	Describes 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.
1-minute kick sample	A component of the IDEM multihabitat macroinvertebrate sampling method in which approximately 1 square meter of riffle or run substrate habitat in a stream or river is sampled with a standard 500 micrometer mesh width D-frame dip net for approximately 1 minute.
Ocular reticle	A thin piece of glass marked with a linear or areal scale inserted into a microscope ocular, superimposing the scale onto the image viewed through the microscope.
Perennial stream	A stream which continuously flows 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 fish community sampling equal in length to 15 times the average wetted width of the stream, with a minimum length of 50 meters and a maximum length 500 meters. For macroinvertebrate community sampling, the stream reach is 50 meters of all available habitat.
Target	A sampling point which falls on a perennial stream within the basin of interest and the boundaries of Indiana.
Wetland	Land areas which 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 coolwater stream monitoring project's main objective is to provide continuous stream temperature data with chemical, physical, and biological data from reference and stressed coolwater streams throughout the state of Indiana. Selected sites are from historical IDEM sites supporting coolwater taxa, with a mean stream summer temperature < 22 ºC, and considered reference or stressed based on land use evaluations. Data will be utilized to modify new biotic indices for accurate evaluations of macroinvertebrate and fish communities.

Collect data during monitoring for the following purposes:

- Provide water quality and biological data for assessment of aquatic life use support (ALUS) as integral components of the Integrated Report, thus satisfying 305(b) and 303(d) reporting requirements to U.S. EPA.
- Provide water quality and biological data which may be useful for municipal, industrial, agricultural, and recreational decision-making processes. Including the Total Maximum Daily Load (TMDL) process and National Pollutant Discharge Elimination System (NPDES) permit modeling of waste load allocations.
- Compile water quality and biological data for trend analyses and future pollution abatement activities.
- Aid in the development of refined chemical and narrative biological water quality criteria.

A.2 Project Organization and Schedule

Sampling begins in April 2021 and continues through October 2022. Laboratory processing and data analysis continues through spring of 2023. Table 1 contains the proposed project task organization and schedule.

Table 1. Coolwater Stream Monitoring Tasks, Schedule, and Evaluation

Activity	Dates	Number of Sites	Frequency of Sampling Related Activity	Parameter Sampled	How Evaluated
Site selection	Dec 2020 – Jan 2021	216 sites			Select sites using historical IDEM sites containing coolwater taxa, a mean stream summer temperature < 22 ºC, and considered reference or stressed based on land use evaluations.
Site reconnaissance	Feb 2021 – April 2021	138 sites	May require several visits to obtain final approval		Assess sites for landowner approval, stream access, and safety characteristics for the 138 sites.
Water chemistry	April 5, – Oct 29, 2021 April 4 – Oct 28 2022	45 sites (1 of 45 sites sampled as part of the Probabilistic Monitoring Program) 45 sites (1 of 45 sites will be sampled as part of the Probabilistic Monitoring Program; 4 of 45 sites will be sampled as part of the Reference Site Monitoring Program)	Once each in April, June, and Sept or Oct with a minimum 30 days between sampling events	Total phosphorous Nitrogen, Nitrate + Nitrite Dissolved oxygen (DO) DO pH pH Algal conditions Dissolved metals (Table 8) Dissolved arsenic (III) Nitrogen ammonia Chloride Sulfate Total dissolved solids	>0.3 mg/L (for nutrients) >10.0 mg/L (for nutrients) <4.0 mg/L (warm water aquatic life); <6.0 mg/L (cold water aquatic life); Dissolved oxygen >125% saturation (nutrients) >9.0 Standard Units (SU) (for nutrients) <6 or >9 SU (warm water aquatic life) Excessive (for nutrients, based on observation) Chronic Aquatic Criterion (CAC) based on hardness 190 µg/L CAC based on pH and temperature CAC based on hardness and sulfate Based on hardness and chloride 750 mg/L

Table 1. Coolwater Stream Monitoring Tasks, Schedule, and Evaluation (cont.)

Activity	Date(s)	Number of Sites	Frequency of Sampling-related activity	Parameter to be sampled	How evaluated
Algal samples	Sept – Oct 2021	Subset of 1 probabilistic site	Once with 3rd water chemistry sample in Sept or Oct	Algal diatoms	Diatom identification and enumeration
	Sept – Oct 2022	Subset of 1 probabilistic site	Once with 3rd water chemistry sample in Sept or Oct	Algal diatoms	Diatom identification and enumeration
	Sept – Oct 2022	Subset of 4 reference sites	Once with 3rd water chemistry sample in Sept or Oct	Algal diatoms Algal biomass	Diatom identification and enumeration Chlorophyll *a*
Fish community and habitat quality	June 1 – October 15, 2021	45 sites (1 of 45 sites sampled as part of the Probabilistic Monitoring Program)	Once June 1 – October 15, 2021	Fish community Habitat quality	Fish Index of Biotic Integrity (IBI) Qualitative Habitat Evaluation Index (QHEI)
	June 1 – October 14, 2022	45 sites (1 of 45 sites sampled as part of the Probabilistic Monitoring Program; 4 of 45 sites sampled as part of the Reference Site Monitoring Program)	Once June 1 – October 14, 2022	Fish community Habitat quality	Fish Index of Biotic Integrity (IBI) QHEI

Activity	Date(s)	Number of Sites	Frequency of Sampling-related activity	Parameter to be sampled	How evaluated
Macroinvertebrate community and habitat quality	July 12 – Nov 12, 2021	45 sites (1 of 45 sites sampled as part of the Probabilistic Monitoring Program)	Once July 12 – November 12, 2021	Macroinvertebrate community Habitat quality	Macroinvertebrate IBI QHEI
	July 11 – Nov 11, 2022	45 sites (1 of 45 sites sampled as part of the Probabilistic Monitoring Program; 4 of 45 sites sampled as part of the Reference Site Monitoring Program)	Once July 11 – November 11, 2022	Macroinvertebrate community Habitat quality	Macroinvertebrate IBI QHEI
Water temperature continuous monitoring	April 2021 – October 2022	90 sites	Temperature recorded every 30 minutes; downloaded every other month	Water temperature	Minimum, maximum, and average change in water temperature for the 19 months deployed. Thermologgers may be pulled in the winter if threat of freezing solid.

A.3. Project Description

IDEM, working with U.S. EPA and Tetra Tech, is modifying new biological indices for coolwater streams in Indiana. Identify coolwater streams, mean stream summer temperature less than 22 ºC, using the temperature tipping points for coolwater taxa and stream temperature data modeling. Determine temperature tipping points for coolwater taxa, using plots of cold or cool taxa, and warm taxa versus maximum water temperature between 15 ºC and 30 ºC. Validate stream temperature models and tools, used to identify coolwater streams, by deploying temperature loggers and collecting biological assemblages at reference and stressed coolwater sites around the state. Determine the disturbance of a site, reference or stressed, using land use evaluations and identification of other anthropogenic impacts such as road crossings, point source impacts, and population density. Following data collection, modify new biotic indices to accurately evaluate biological assemblage expectations for coolwater streams. Collected data fulfill several goals such as development of a Coolwater IBI for macroinvertebrate and fish communities, and ALUS assessments at probabilistic, reference, and watershed characterization sites.

A.4. Data Quality Objectives

The DQO planning process (Guidance on Systematic Planning Using Data Quality Objectives (DQOs) Process EPA QA/G-4) is a tool for planning environmental data collection activities. The process provides a basis for balancing decision uncertainty with available resources. The process is recommended for all significant data collection projects. The seven-step systematic planning process clarifies study objectives; defines the types of data needed to achieve the objectives; and establishes decision criteria for evaluating data quality. The following seven steps document the Coolwater Stream Monitoring Project's DQO process.

1. State the Problem

Indiana is required to assess the status of all waters of the state as supporting or nonsupporting for their designated use. "…surface waters of the state…will be capable of supporting" a "well-balanced, warm water aquatic community" [327 IAC 2-1-3]. However, evaluation of coolwater aquatic communities is also required. The current IBI assessment is only calibrated for warm water streams which could result in identifying false impairments.

2. Identify the Goals of the Study

The project gathers biological, chemical, and habitat data for development of a coolwater IBI for macroinvertebrate and fish communities. The goal is to test whether a statistically significant difference exists between the two IBI scores. Evaluate fish and macroinvertebrate assemblages at each site using the warm water IBI and comparing to the new coolwater IBI, once developed.

3. Identify Information Inputs

Field monitoring activities require collection of physical, chemical, biological, and habitat data. Creation of the coolwater IBI and testing the hypothesis require the data. Monitoring activities take place at target sites where the necessary landowner or property manager has granted permission to access the site. Group B. Data Generation and Acquisition describes detailed collection procedures for field measurements, chemical, biological, and habitat data.

4. Define the Boundaries of the Study

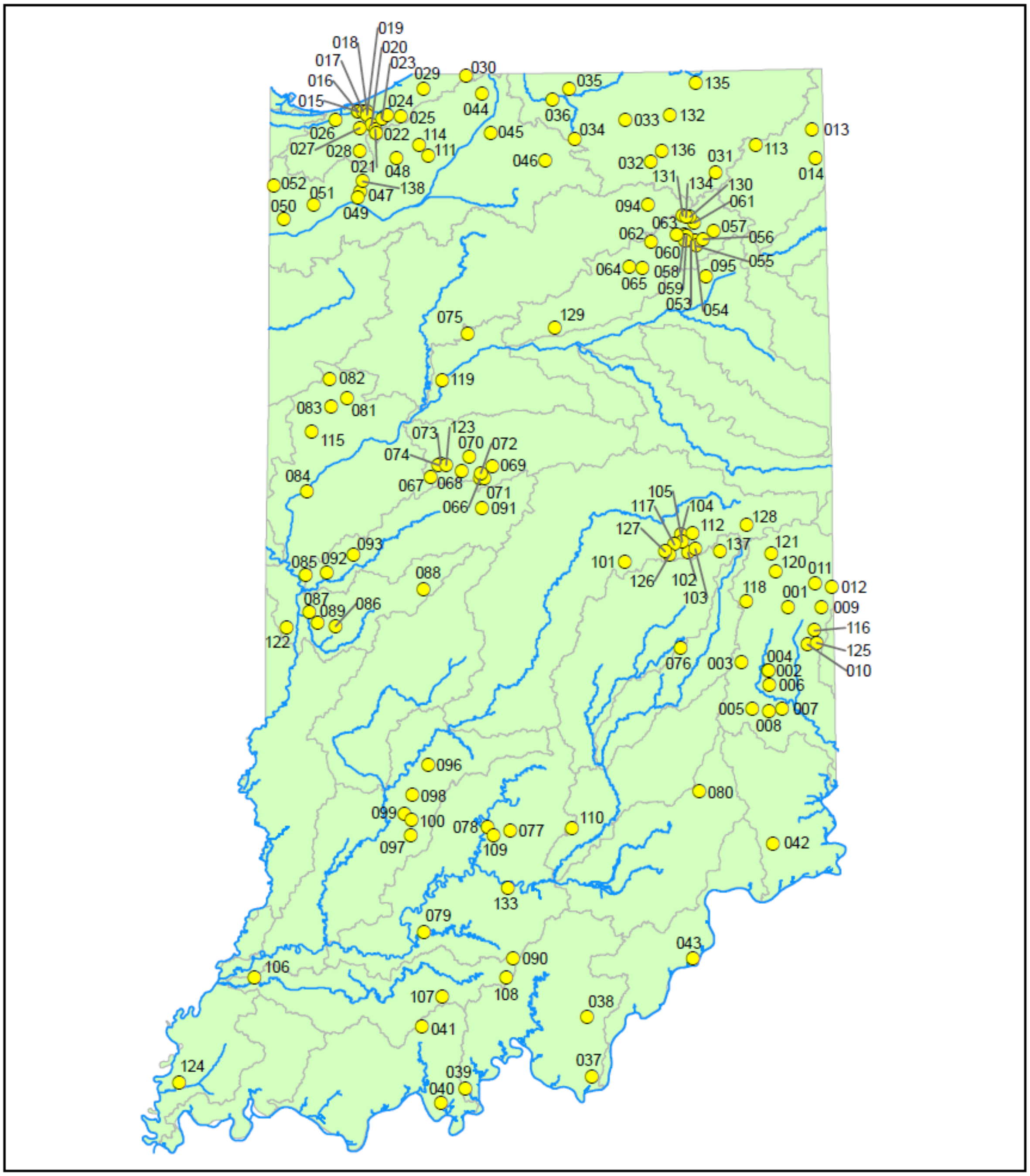
Define Indiana coolwater streams (Figure 1) geographically as within the borders of Indiana and maintaining a mean stream summer temperature less than 22 ºC. Table 2 contains the 138 potential sampling sites including the site number corresponding to the number shown in Figure 1; Assessment Information Management System (AIMS II) Station ID; and other location information. Using a random number generator, 45 randomly selected sites, with nearly an equal number of reference and stressed sites, were selected for the sampling year unless rejected or an overdraw site. An “x” in a column indicates the type of sampling media needed for collection in addition to water chemistry at each site.

5. Develop the Analytical Approach

Collect physical, chemical, and biological community samples, if the flow is not dangerous for staff to enter the stream (e.g., water levels at or below median base flow); barring any hazardous weather conditions (e.g., thunderstorms or heavy rain in the vicinity); or unexpected physical barriers to site access. The field crew chief makes the final determination as to whether a 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. Sampling may also be halted permanently if a stream goes dry or flow stops with only isolated pools.

The Indiana Integrated Water Monitoring and Assessment Report relies upon assessments of ALUS decisions. Assessments include independent evaluations of chemical and biological criteria outlined in Indiana’s 2020 Consolidated Assessment Listing Methodology (CALM) (IDEM 2020b, pp 19 – 24). Evaluate fish assemblages at each site using the warmwater IBI (Dufour 2002; Simon and Dufour 2005) and compare to the new coolwater IBI, once developed. Evaluate macroinvertebrate multihabitat samples using a statewide IBI developed for lowest practical taxonomic level identifications and compare to the new coolwater IBI, once developed. Specifically, an IBI score at a site less than 36, identifies the site as nonsupporting for ALUS. However, once developed, the new coolwater IBI requires re-evaluation of the thresholds for nonsupporting. Incorporate the ALUS status, supporting or nonsupporting, for each target site into the 2024 Indiana Integrated Water Monitoring and Assessment Report.

Figure 1. Potential Sampling Sites for the Indiana Coolwater Stream Monitoring Project.



This map is intended to serve as an aid in graphic representation only. This information is not warranted for accuracy or other purposes.

Mapped By: Michelle Ruan, Office of Water Quality
Date: March 29, 2021

Sources:
Coolwater Sampling Site Data - Obtained from the IDEM AIMS Database
Non Orthophotography Data - Obtained from the State of Indiana Geographic Information Office Library

Map Projection: UTM Zone 16 N **Map Datum:** NAD83

N W E S

0 20 40 80 Kilometers
0 20 40 80 Miles

IDEM

Legend

- Coolwater Potential Sites
- Navigable Streams
- HUC 8

Table 2. List of Potential Sites for the Indiana Coolwater Stream Monitoring Project.

Site Number	StationID	Waterbody	Station Description	County	Latitude	Longitude	Sampling Year	Disturbance	Diatoms	Chlorophyl a	MHAB	Macro Methods Comparison	Fish
CW001	GMW-03-0007	Centeral Run	Willow Grove Road	Wayne	39.77077075	-85.03023591	Rejected	Stressed					
CW002	GMW040-0045	Bear Creek	Little Bear Rd	Fayette	39.53968607	-85.13223520	Rejected	Reference					
CW003	GMW-04-0013	South Branch Garrison Creek	Coletrane Road	Fayette	39.57151896	-85.25949564	2022	Stressed			x		x
CW004	GMW-04-0019	Bear Creek	Little Bear Road	Fayette	39.54112044	-85.13013588	Rejected	Reference					
CW005	GMW-05-0002	Bull Fork	Bullfork Road	Franklin	39.40167316	-85.21285429	Rejected	Reference					
CW006	GMW-06-0023	Jim Run	Jim Run Road	Franklin	39.49282962	-85.1251574	2021	Reference			x		x
CW007	GMW-06-0003	McCartys Run	St. Mary Road	Franklin	39.40027487	-85.06847893	2022	Reference			x		x
CW008	GMW-06-0006	Walnut Fork	Walnut Fork Road	Franklin	39.39195214	-85.13293675	Rejected	Reference					
CW009	GMW070-0101	Elkhorn Creek	Fouts Rd	Wayne	39.7730813	-84.87000954	Rejected	Reference					
CW010	GMW070-0107	Silver Creek	Snake Hill Road	Union	39.63623866	-84.94303897	2022	Stressed			x		x
CW011	GMW-07-0061	West Fork East Fork Whitewater River	Springwood Lake Park	Wayne	39.85623532	-84.8991736	2021	Stressed			x		x
CW012	GMW-07-0024	East Fork Whitewater River	Gravel Pit Road	Wayne	39.84304502	-84.81982749	2021	Reference			x		x
CW013	LEJ050-0066	Fish Creek	CR 775 S	Steuben	41.53554264	-84.8615255	2021	Reference			x		x
CW014	LEJ060-0015	Big Run	CR 28	Dekalb	41.42976093	-84.84616079	2022	Stressed			x		x
CW015	LMG-04-0001	East Branch Little Calumet River	Howe Road	Porter	41.62249767	-87.09461855	2021	Stressed			x		x
CW016	LMG-04-0002	Peterson Ditch	Howe Road	Porter	41.62035184	-87.0915742	2021	Stressed			x		x
CW017	LMG-04-0005	East Branch Little Calumet River	Waverly Road	Porter	41.6223008	-87.06742176	2022	Stressed			x		x
CW018	LMG-04-0006	East Branch Little Calumet River	Calumet Road	Porter	41.62137624	-87.04932031	2021	Stressed			x		x
CW019	LMG-04-0008	Coffee Creek	Coffee Creek Park	Porter	41.60890424	-87.04961369	2021	Stressed			x		x
CW020	LMG-04-0013	Coffee Creek	CR 200 E	Porter	41.571135	-87.027963	Rejected	Reference					
CW021	LMG-04-0015	Coffee Creek	Mander Road	Porter	41.55429396	-87.00693932	2022	Reference	x	x	x	x	x
CW022	LMG-04-0016	Coffee Creek	Old Suman Road	Porter	41.54204262	-87.00347998	2022	Reference			x		x
CW023	LMG-04-0024	Tributary of East Branch Little Calumet River	CR 475 E	Porter	41.593799	-86.975069	Rejected	Reference					
CW024	LMG-04-0034	Tributary of Reynolds Creek	CR 1200 N	Porter	41.60710126	-86.94802276	2022	Reference			x		x
CW025	LMG-04-0042	East Branch Little Calumet River	Holmesville Rd	Laporte	41.60234806	-86.88041445	2022	Reference	x	x	x	x	x
CW026	LMG-05-0003	Willow Creek	Clem Road	Porter	41.58827824	-87.20449828	2022	Stressed			x		x
CW027	LMG050-0042	Damon Run	CR 100 W	Porter	41.560254	-87.08568997	2022	Stressed			x		x
CW028	LMG050-0111	Beauty Creek	SR 130	Porter	41.47716711	-87.0846572	2022	Stressed			x		x
CW029	LMG070-0035	East Branch of Trail Creek	CR 700 N	Laporte	41.70647704	-86.77067289	2022	Reference			x		x
CW030	LMG100-0009	Tributary of Spring Creek	CR 1000 N	Laporte	41.75293724	-86.56044736	2021	Reference			x		x
CW031	LMJ180-0052	Rimmell Branch	500 E	Noble	41.38456221	-85.3370748	Rejected	Reference					
CW032	LMJ190-0028	Cromwell Ditch	CR 1000 E	Kosciusko	41.42725176	-85.65596237	2022	Stressed			x		x
CW033	LMJ210-0024	Rock Run Creek	CR 34	Elkhart	41.583522	-85.777096	Rejected	Stressed					
CW034	LMJ-21-0009	Wisler Ditch	CR 3	Elkhart	41.51596693	-86.02685185	Rejected	Stressed					
CW035	LMJ220-0014	Cobus Creek	David Dr.	Elkhart	41.70241842	-86.05354754	2021	Stressed			x		x
CW036	LMJ240-0040	Eller Ditch	Mariellen Ave	St. Joseph	41.66090666	-86.13584692	2022	Stressed			x		x
CW037	OBS-01-0002	Mosquito Creek	Buena Vista Road	Harrison	38.05339372	-85.99053019	2021	Reference			x		x
CW038	OBS090-0011	Crandall Branch	Angel Run Road Northeast	Harrison	38.27209378	-86.01471986	2021	Reference			x		x
CW039	OBS210-0003	Trigger Branch	Gerald Road	Perry	38.01208187	-86.58798126	2021	Reference			x		x
CW040	OLP040-0006	Tributary of Neglie Creek	Aster Road	Perry	37.95874743	-86.70083356	2021	Reference			x		x
CW041	OLP070-0014	Cyclone Branch	CR 850 South	Perry	38.241385	-86.790143	Rejected	Reference					
CW042	OML070-0019	Posky Hollow	Aberdeen Road	Switzerland	38.90133034	-85.12560123	Rejected	Reference					
CW043	OSK060-0001	Bull Creek	Blue Ridge Rd	Clark	38.48115147	-85.51374477	2022	Reference			x		x
CW044	UMK010-0029	Hooten Ditch	Early Rd	St. Joseph	41.6855848	-86.48085156	Rejected	Reference			x		x
CW045	UMK020-0015	Potato Creek	SR 4	St. Joseph	41.5377153	-86.43965343	2021	Stressed			x		x

x indicates sampling media type needed for collection. NA = sites not selected for sampling and may not have been visited for site reconnaissance

Table 2. List of Potential Sites for the Indiana Coolwater Stream Monitoring Project (cont)

Site Number	StationID	Waterbody	Station Description	County	Latitude	Longitude	Sampling Year	Disturbance	Diatoms	Chlorophyl a	MHAB	Macro Methods Comparison	Fish
CW046	UMK-03-0042	Yellow River	Shumaker Westside Park	Marshall	41.44290615	-86.17314675	2022	Stressed			x		x
CW047	UMK090-0050	Cobb Ditch	CR 50 W	Porter	41.32680652	-87.08120339	2021	Stressed			x		x
CW048	UMK-10-0028	Slocum Ditch	CR 1100 South	Laporte	41.4485897	-86.90191334	2021	Stressed			x		x
CW049	UMK-10-0009	Sandy Hook Ditch	CR 900 S	Porter	41.30234768	-87.09489621	2021	Stressed			x		x
CW050	UMK130-0047	Bruce Ditch	219th Ave.	Lake	41.22100557	-87.45506895	2021	Stressed			x		x
CW051	UMK130-0054	Bryant Ditch	189th Ave.	Lake	41.27490235	-87.30983913	2021	Stressed			x		x
CW052	UMK140-0027	Tributary of West Creek	151st Ave.	Lake	41.34492423	-87.50628424	2021	Reference			x		x
CW053	WAE010-0011	Eel River	CR 200 S	Whitley	41.13267276	-85.46290461	2021	Stressed			x		x
CW054	WAE010-0012	Mossman Ditch	Raber Mowrey Rd.	Whitley	41.13299167	-85.44564722	Rejected	Stressed					
CW055	WAE010-0014	Gangwer Ditch	Raber Rd	Whitley	41.11375624	-85.43732109	2021	Stressed			x		x
CW056	WAE010-0017	Mowrey Ditch	Lincoln Way Rd.	Whitley	41.14002222	-85.40528889	Rejected	Stressed					
CW057	WAE010-0021	Tributary of Eel River	Chapine Rd.	Whitley	41.16986111	-85.354225	Rejected	Reference					
CW058	WAE020-0042	Phillips Ditch	Old Trail Rd	Whitley	41.15558989	-85.49945683	2021	Stressed			x		x
CW059	WAE020-0043	Blue River	Whitley St.	Whitley	41.15387149	-85.48538385	2021	Stressed			x		x
CW060	WAE020-0044	Blue River	CR 200 S.	Whitley	41.13266803	-85.49447103	2022	Stressed			x		x
CW061	WAE020-0045	Cole Ditch	CR 250 N.	Whitley	41.2002127	-85.44827609	2021	Stressed			x		x
CW062	WAE030-0042	Clear Creek	CR 200 S.	Whitley	41.13299504	-85.66094003	2022	Reference	x	x	x	x	x
CW063	WAE030-0059	County Farm Ditch	Wolf Rd.	Whitley	41.15525602	-85.53457139	2022	Stressed			x		x
CW064	WAE-04-0001	Swank Creek	East Street	Wabash	41.03923252	-85.76802685	2022	Reference			x		x
CW065	WAE040-0019	Wheeler Creek	CR 500 E	Wabash	41.03770158	-85.7038943	2021	Stressed			x		x
CW066	WAW040-0007	Prairie Creek	Kelley Rd	Clinton	40.26444444	-86.50277778	Rejected	Stressed					
CW067	WAW040-0037	Anderson Ditch	CR 1000 S	Tippecanoe	40.27269567	-86.74043075	2022	Stressed			x		x
CW068	WAW040-0046	Heavilon Ditch	CR 450 W	Clinton	40.29196187	-86.58991436	2021	Stressed			x		x
CW069	WAW040-0121	Tributary of South Fork Wildcat Creek	Michigantown Road	Clinton	40.307725	-86.44349722	Rejected	Stressed					
CW070	WAW040-0123	Boyles Ditch	CR 400 N bridge	Clinton	40.34393977	-86.55395556	2022	Stressed			x		x
CW071	WAW040-0127	Mann Ditch	CR 150 South	Clinton	40.26431667	-86.48136944	Rejected	Stressed					
CW072	WAW040-0129	Tributary of Prairie Creek	North Young Street	Clinton	40.28384152	-86.49936269	2021	Stressed			x		x
CW073	WAW040-0135	Tributary of South Fork Wildcat Creek	CR 250 North	Clinton	40.32160556	-86.69184167	Rejected	Reference					
CW074	WAW040-0136	Tributary of South Fork Wildcat Creek	CR 700 South	Tippecanoe	40.3157711	-86.70247461	2022	Reference			x		x
CW075	WDE010-0008	Galbreath Ditch	CR 250 North	Cass	40.80129243	-86.56023216	2021	Reference			x		x
CW076	WEF040-0013	Mud Creek	US 52	Rush	39.62970873	-85.54871112	Rejected	Stressed					
CW077	WEL090-0013	Henderson Creek	Humpback Ridge Road	Lawrence	38.96203016	-86.36797871	2022	Reference			x		x
CW078	WEL090-0015	Wolf Creek	CR 825 N	Lawrence	38.97641779	-86.47784646	2021	Reference			x		x
CW079	WEL160-0028	Tributary of Lost River	Windom Road	Martin	38.59051313	-86.77820607	2021	Reference			x		x
CW080	WEM-04-0007	Finch Branch	CR 775 East	Jennings	39.09791152	-85.47036113	2021	Reference			x		x
CW081	WLV040-0011	Little Pine Creek	CR 300 S	Benton	40.56385562	-87.14579064	2022	Stressed			x		x
CW082	WLV040-0021	Owens Ditch	CR 500 E	Benton	40.63248924	-87.22921795	2022	Stressed			x		x
CW083	WLV040-0056	Tributary of Brown Ditch	CR 500 S	Benton	40.53021031	-87.22194056	Rejected	Stressed					
CW084	WLV080-0017	Bear Creek	Portland Arch Nature Preserve	Fountain	40.21835369	-87.33942734	2022	Reference			x		x
CW085	WLV120-0004	Jim Branch	CR 550	Parke	39.906318	-87.34030135	2021	Reference			x		x
CW086	WLV-13-0013	Williams Creek	CR 225 East	Parke	39.72050487	-87.19888329	2022	Stressed			x		x
CW087	WLV-15-0003	Rocky Run	CR 420 West	Parke	39.77088334	-87.32533279	2021	Reference			x	x	x
CW088	WLV160-0042	Lick Creek	CR 425 E	Putnam	39.85685559	-86.77780256	2022	Reference			x		x
CW089	WLV190-0020	Rock Run	SR 41	Parke	39.73047322	-87.28464233	2022	Reference			x		x
CW090	WPA-01-0009	Patoka River	CR 475 East	Orange	38.48914859	-86.36039069	2021	Reference			x		x

x indicates sampling media type needed for collection. NA = sites not selected for sampling and may not have been visited for site reconnaissance

Table 2. List of Potential Sites for the Indiana Coolwater Stream Monitoring Project (cont)

Site Number	StationID	Waterbody	Station Description	County	Latitude	Longitude	Sampling Year	Disturbance	Diatoms	Chlorophyl a	MHAB	Macro Methods Comparison	Fish
CW091	WSU010-0053	Tributary of Sugar Creek	CR 800 N	Boone	40.15546667	-86.49310278	Rejected	Reference					
CW092	WSU060-0020	West Prong Green Cr	CR 1050 North	Parke	39.918286	-87.241889	Rejected	Reference					
CW093	WSU060-0024	Tributary of Stillwater Creek	South Hollow Road	Fountain	39.98637338	-87.11224018	2021	Reference			x		x
CW094	WTI010-0006	Grassy Creek	Kyle Rd	Kosciusko	41.26885428	-85.67137842	2022	Stressed			x		x
CW095	WUW100-0009	Calf Creek	CR 300 E	Huntington	41.00086673	-85.3946454	2022	Reference			x		x
CW096	WWL020-0054	Raccoon Creek	Heddings Rd.	Owen	39.20488983	-86.75701655	2022	Reference			x		x
CW097	WWL-03-0010	Tributary of Black Ankle Creek	CR 560 E	Greene	38.94530131	-86.84048146	Rejected	Reference					
CW098	WWL-03-0018	Camp Creek	CR 515/460	Greene	39.09502225	-86.83292764	Rejected	Reference					
CW099	WWL-03-0021	Ore Branch	Private Drive Off of Ore Branch Rd	Greene	39.02743536	-86.87037436	2022	Reference			x		x
CW100	WWL-03-0033	Stalcup Branch	Slick Book Road	Greene	39.00123216	-86.83525093	2021	Reference			x		x
CW101	WWU-08-0002	Lick Creek	Lick Creek Road	Madison	39.95003076	-85.80922328	2022	Stressed			x		x
CW102	WWU-08-0004	Deer Creek	650 W	Henry	39.98356066	-85.50456768	2022	Stressed			x		x
CW103	WWU100-0047	Honey Creek & Post Ditch	CR 450 West	Henry	39.99602472	-85.47129056	Rejected	Stressed					
CW104	WWU100-0100	Fall Creek	8th St	Henry	40.04994885	-85.53696297	2021	Stressed			x		x
CW105	WWU100-0101	Deer Creek	CR 575 N	Henry	40.02229047	-85.53259769	2022	Reference			x		x
CW106; INRB21-049	WPA-08-0032	Tributary of Patoka River	CR 450 North	Gibson	38.41906188	-87.57680452	Rejected	Stressed					
CW107; INRB21-063	WPA-01-0031	Lick Fork	Harts Gravel Road	Dubois	38.34934894	-86.6921953	2021	Stressed	x		x		x
CW108; INRB21-071	WPA-01-0035	Tributary of Patoka River	CR 375 East	Orange	38.42006858	-86.39186818	2021	Reference			x		x
CW109; INRB22-001	WEL-08-0037	Brewer Branch	Jones Blvd	Lawrence	38.94545573	-86.44689126	Rejected	Reference					
CW110; INRB22-030	WEU-04-0005	Spray Creek	N CR 200 W	Jackson	38.96794036	-86.07595357	2022	Stressed	x		x		x
CW111	UMK-04-0012	Mill Creek	Long Lane	Laporte	41.45680765	-86.74789344	Rejected	Reference					
CW112	WWU100-0041	Fall Creek	CR 850 N	Henry	40.05511284	-85.4840467	2021	Reference			x		x
CW113	LEJ080-0014	Tributary of Leins Ditch	CR 12	Dekalb	41.480792	-85.13759	Rejected	Reference					
CW114	UMK030-0039	Tributary of Mill Creek	CR 500 W	Laporte	41.49693356	-86.79329403	Rejected	Reference					
CW115	WLV040-0053	Tributary of Big Pine Creek	N Rainsville Rd	Warren	40.43997793	-87.31670895	Rejected	Reference					
CW116	GMW070-0117	Silver Creek	Stout Road	Union	39.94765645	-85.38444531	2021	Reference			x		x
CW117	WWU100-0099	Mud Creek	CR 575 North	Henry	40.013258	-85.57017131	2022	Reference			x		x
CW118	GMW010-0045	Roy Run	CR 950 South	Henry	39.79891777	-85.22984484	Rejected	Reference					
CW119	WDE-03-0001	Pleasant Run	CR 550 North	Carroll	40.62655157	-86.68329732	Rejected	Reference					
CW120	GMW010-0044	Morgan Creek	Gilmer Road	Wayne	39.90770387	-85.08523294	2022	Reference			x		x
CW121	GMW-01-0005	Martindale Creek	Charles Road	Wayne	39.97170552	-85.10363691	NA	Reference					
CW122	WLV200-0002	Tributary of Norton Creek	CR 1150 South	Vermillion	39.715569	-87.433286	NA	Reference					
CW123	WAW040-0134	Tributary of S Fork Wildcat Creek	CR 200 North	Clinton	40.31571917	-86.66653556	NA	Reference					
CW124	WLW-07-0003	Fun Creek	Smith School Road	Posey	38.03119414	-87.92570276	2022	Reference			x		x
CW125	GMW-07-0017	Hanna Creek	CR 50 North	Union	39.63943077	-84.89730404	NA	Reference					
CW126	WWU100-0089	Lick Creek	CR 400 East	Madison	39.97531965	-85.59542687	2021	Reference			x		x
CW127	WWU100-0086	Fort Ditch	CR 300 East	Madison	39.9880575	-85.61450778	NA	Reference					
CW128	WWU010-0037	Little Stoney Creek	CR 875 East	Delaware	40.08040297	-85.22127026	NA	Reference					
CW129	WAE070-0012	Tributary of Eel River	CR 400 North	Miami	40.819977	-86.134572	NA	Reference					
CW130	WAE020-0032	Tributary of Cole Ditch	CR 400 North	Whitley	41.22182454	-85.46814003	2022	Reference	x	x	x	x	x
CW131	WAE-01-0023	Blue Babe Branch	Dygert Nature Preserve	Whitley	41.22503339	-85.50329177	2021	Reference			x		x
CW132	LMJ140-0119	Tributary of Little Elkhart River	CR 300 South	Lagrange	41.5969324	-85.55686432	Rejected	Reference					
CW133; INRB22-032	WEL-03-0001	Fishing Creek	Lawrenceport Road	Lawrence	38.74986085	-86.38270414	NA	Reference					
CW134	WAE020-0033	Cole Ditch	CR 400 North	Whitley	41.22193037	-85.48620329	NA	Stressed					
CW135	LMJ120-0041	Pigeon River	SR 9	Lagrange	41.715912	-85.427577	Rejected	Stressed					
CW136	LMJ190-0025	Elkhart River	Ligonier WWTP Park	Noble	41.46760082	-85.5997325	2022	Stressed			x		x
CW137	WED010-0047	Big Blue River	CR 300 North	Henry	39.9847715	-85.35127738	2022	Stressed			x		x
CW138	UMK090-0063	Cob Ditch	CR 450 South	Porter	41.36355696	-87.07129219	NA	Stressed					

x indicates sampling media type needed for collection. NA = sites not selected for sampling and may not have been visited for site reconnaissance.

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, results in more confidence in the ALUS assessment.

Site specific ALUS assessments include program specific controls to identify the introduction of errors. The controls include water chemistry blanks and duplicates; biological site revisits or duplicates; and laboratory controls through verification of species identifications described in field procedure manuals and standard operating procedures (SOP) (IDEM 1992a, 1992b, 1992c, 2015a, 2018b, 2018c, 2019a, 2019c, 2020c, 2020d).

Quality assurance (QA) and quality control (QC) processes detect deficiencies in the data collection as set forth in QAPPs (IDEM 2017a, 2020a). The QAPPs require all contract laboratories to adhere to rigorous standards during sample analyses and to provide good quality usable data. WAPB chemists review laboratory analytical results for data quality. Do not use any data flagged “Rejected”, due to analytical problems or errors, for water quality assessment decisions. Use of any data flagged “Estimated” is on a case-by-case basis with a note 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 (IDEM 2017a, Table D3-1: Data Qualifiers and Flags p 184) and Biological and Habitat QAPP (IDEM 2020a, pp 32-36). The Surface Water QAPP (IDEM 2017a, Table A7-1: Precision and Accuracy Goals for Data Acceptability by Matrix pp 61 – 63 and Table B2.1.1.8-2: Field Parameters p 117) provide precision and accuracy goals with acceptance limits for applicable analytical methods. Further, in response to consistent “Rejected” data, conduct investigations to determine the source of error. Sample collection and preparation field techniques, and laboratory procedures are subject to evaluation by both the WAPB QA manager and project manager in troubleshooting error introduced throughout the entire data collection process. Every other year, audit staff field techniques. Implement corrective actions upon determining the source of error per the QAPPs (IDEM 2017a p 179, IDEM 2020a pp 10, 13-15, 18, 30-31, 36).

Evaluate sites as supporting or nonsupporting following the decision-making processes described in Indiana’s 2020 CALM (IDEM 2020b) and against the water quality criteria shown in Table 3.

Table 3. Water Quality Criteria [327 IAC 2-1-6]

Parameter	Level	Criterion
Dissolved metals (Cd, Cr III, Cr VI, Cu, Pb, Ni, Zn	Calculate based on hardness	CAC
Dissolved arsenic III	190 µg/L	CAC
Ammonia nitrogen	Calculate based on pH and temperature	CAC
Chloride	Calculated based on hardness and sulfate	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 imprinted.
pH	6.0 – 9.0 SU	Must remain between 6.0 and 9.0 SU except for daily fluctuations exceeding 9.0 due to photosynthetic activity
Nitrogen, Nitrate + Nitrite	10 mg/L	Human Health Criteria at point of drinking water intake
Sulfate	Calculate based on hardness and chloride	In all waters outside the mixing zone
Dissolved solids	750 mg/L	Not-to-Exceed at point of drinking water intake

CAC = Chronic Aquatic Criterion, SU = Standard Units
*Waters protected for cold water fish include those waters designated by the Indiana Department of Natural Resources (IN DNR) for put-and-take trout fishing, as well as salmonid waters listed in 327 IAC 2-1.5-5.

In addition to the physical and chemical criteria listed in Table 3, evaluate data for several nutrient parameters against the benchmarks listed 2020 CALM (IDEM 2020b).

- Total phosphorus (TP)
  - One or more measurements greater than 0.3 mg/L
- Nitrogen (measured as nitrate + nitrite)
  - One or more measurements greater than 10.0 mg/L
- Dissolved Oxygen (DO)
  - Any measurement less than 4.0 mg/L
  - Any measurements consistently at or close to the standard, range 4.0 – 5.0 mg/L
  - Any DO percent saturation measurement greater than 125%
- pH
  - Any measurement greater than 9.0 SU

- Measurements consistently at or close to the standard, range 8.7 – 9.0 SU

Assuming a minimum of three sampling events, if two or more of the benchmarks are met on the same date, classify the waterbody as nonsupporting due to nutrients.

Indiana narrative biological criteria [327 IAC 2-1-3] states "(2) All waters, except [limited use waters] will be capable of supporting: (A) a well-balanced, warm water aquatic community." The water quality standard definition of a "well-balanced aquatic community" is "[327 IAC 2-1-9] (59)] an aquatic community which: (A) is diverse in species composition; (B) contains several different trophic levels; and (C) is not composed mainly of pollution tolerant species." An interpretation or translation of narrative biological criteria into numeric criteria is: A stream segment is nonsupporting for ALUS 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" CALM (IDEM 2020b).

For each site sampled, report warm water and coolwater IBI assessments to U.S. EPA in the 2024 update of Indiana's Integrated Water Monitoring and Assessment Report. Use site-specific data to classify associated assessment units into one of five major categories in the state's Consolidated 303(d) list. Category definitions are available in Indiana's CALM (IDEM 2020b, pp 49-50).

7. Develop the Plan for Obtaining Data

Deploy temperature loggers according to Tetra Tech, working with IDEM and the U.S. EPA, selected stream sites. Site selection is based on IDEM's monitoring capacity and coolwater stream status. Coolwater stream status identification requires conducting a preliminary analysis to associate observed stream temperature with biological assemblage thermal characteristics and modeled or predicted stream temperatures. A disturbance gradient is also determined for each coolwater site through evaluation of land use and other anthropogenic impacts such as road crossings, point source impacts, and population density.

IDEM staff deploy the loggers April – May 2021 and begin collecting biological and chemical samples, along with habitat observations through October 2022. Staff download temperature logger data approximately every other month and provide to Tetra Tech for compilation and verification of the new monitoring data and continuous monitoring summaries. Tetra Tech incorporates the new data into their database to use for new macroinvertebrate and fish communities IBI metric development.

A.5. Training and Staffing Requirements

Table 4. Project Roles, Experience, and Training

Role	Required Training or Experience	Responsibilities	Training References
Project manager	- AIMS II Database experience -Demonstrated experience in project management and QA/QC procedures	-Establish project in the AIMS II database. -Oversee development of project WP. -Oversee entry and QC of field data. -Query data from AIMS II to determine results not meeting water quality criteria.	-AIMS II Database User Guide -IDEM 2017a, 2020a, 2020b -U.S. EPA 2006
Field crew chief – biological community sampling	-At least one year of experience in sampling methodology and taxonomy of aquatic communities in the region -Annual review of the Principles and Techniques of Electrofishing -Annual review of relevant safety procedures -Annual review of relevant SOP documents for field operations -Audit of sampling methods once per two-year period	-Complete field data sheets. -Ensure taxonomic accuracy -Ensure sampling efficiency and representation -Track voucher specimens -Overall operation of the field crew when remote from central office -Ensure staff's adherence to safety and field SOP procedures. -Ensure multiprobe analyzers are calibrated weekly prior to field sampling activities. -Ensure field sampling equipment is functioning properly and loaded into field vehicles prior to field sampling activities.	-Dufour 2002 -IDEM 1992a, 1992b, 1992c, 2010a, 2010b, 2015b, 2017b, 2018a, 2019a, 2019b, 2019c, 2020a, 2020c, 2020d -Simon and Dufour, 1998, 2005 - Xylem 2020
Field crew members – biological community sampling	-Completion of hands-on training for sampling methodology prior to participation in field sampling activities -A review of the Principles and Techniques of Electrofishing -A review of relevant safety procedures -A review of 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 1992a, 1992b, 1992c, 2010a, 2010b, 2015b, 2017b 2018a, 2019a, 2019b, 2019c, 2020a, 2020c, 2020d - Xylem 2020
Field crew chief – water chemistry or algal sampling	-At least one year of experience in sampling methodology	-Complete field data sheets.	-IDEM 1997, 2010a, 2010b, 2015a, 2015b, 2017b, 2018b,

Role	Required Training or Experience	Responsibilities	Training References
	-Annual review of relevant safety procedures -Annual of review relevant SOP documents for field operations - Audit of sampling methods once per two-year period	-Ensure sampling efficiency and representation. -Ensure overall operation of the field crew when remote from central office. -Ensure adherence to safety and field SOP procedures by staff. -Ensure multiprobe analyzers are calibrated weekly prior to field sampling activities. -Ensure field sampling equipment is functioning properly and loaded into field vehicles prior to field sampling activities.	2020a, 2020c, 2020d - Xylem 2020
Field crew members – water chemistry or algal sampling	-Completion of hands-on training for sampling methodology prior to participation in field sampling activities -A review of relevant safety procedures -A review of 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 1997, 2010a, 2010b, 2015a, 2015b, 2017b, 2018b, 2020a, 2020c, 2020d - Xylem 2020
Laboratory supervisor – biological community sample processing	-At least one year of experience in taxonomy of aquatic communities in the region -Annual review of relevant safety procedures -Annual review of relevant SOP documents for laboratory operations	-Ensure adherence to safety and SOP procedures by laboratory staff. -Assist with identification of fish or macroinvertebrate specimens. -Verify taxonomic accuracy of samples. - Track voucher specimens. -Check QC calculations on data sheets for completeness. -Ensure correct entry of data into AIMS II.	-IDEM 1992c, 2004, 2010a, 2010b, 2018, 2020a -AIMS II Database User Guide
Laboratory staff – biological community sample processing	-Completion of hands-on training for laboratory sample processing methodology prior to participation in laboratory sample processing activities -Annual review of relevant safety procedures and	-Adhere to safety and SOP procedures. -Follow laboratory supervisor directions while processing samples. -Identify fish or macroinvertebrate specimens.	-IDEM 1992c, 2004, 2010a, 2010b, 2018, 2020a -AIMS II Database User Guide

Role	Required Training or Experience	Responsibilities	Training References
	relevant SOP documents for laboratory operations	-Perform necessary calculations on data. -Enter field sheets.	
Laboratory supervisor – water chemistry or algal sample processing	-Annual review of relevant safety procedures -Annual review of relevant SOP documents for field operations	-Ensure adherence to safety and SOP procedures by laboratory staff. -Ensure completion of laboratory data sheets. -Check data for completeness. -Perform all necessary calculations on the data. -Ensure data are entered into AIMS II Data Base.	-IDEM 2010a, 2010b, 2015a, 2020a -AIMS II Database User Guide
QA 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 WP. -Review data collected by field sampling crews for completeness and accuracy. -Perform a data quality analysis of project generated data. - Assign data quality levels based on the data quality analysis. -Import data into the AIMS II database. -Ensure field sampling methodology audits are completed according to WAPB procedures.	-IDEM 2017a, 2018, 2020a -U.S. EPA 2006 -AIMS II Database User Guide

B. Data Generation and Acquisition

B.1. Sampling Sites and Sampling Design

Site selection criteria are historical IDEM sites having coolwater taxa, a mean stream summer temperature less than 22 ºC, and categorization as reference or stressed based on disturbance variables and GIS analyses (identifying canals and pipes, point sources, % urban and agriculture land use categories, road density and crossings, % developed imperviousness, mine locations, dam locations, and 2000 Census data).

Conduct site reconnaissance activities in-house and through physical site visits. In-house activities 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 include property owner consultations; verification of the site's status (approved or rejected, Table 2); confirmation and documentation of access routes; and determination of equipment needed to properly sample the site.

Determine precise coordinates for each approved target site using an agency approved handheld Global Positioning System (GPS) unit which can verify horizontal precision within 5 meters or less, described in Global Positioning System (GPS) Data Creation (IDEM 2015b). Visit all sites at least once during site reconnaissance to determine target or nontarget status (backwater, physical barrier, etc.). Although 8 weeks is the maximum time allotted for site reconnaissance field work (site reconnaissance activities Section A. Project Management, QAPP Element A.4.), most work is usually completed in a 4-week period dependent upon weather, driving time to sites, and other unforeseeable constraints. If possible, seek the remaining landowner permissions with phone calls from the office. If permission to visit a site is granted before the 8-week deadline, a day or overnight trip may be required to determine access routes, equipment, and more accurate GPS coordinates. Upon reaching the deadline, enter the Reconnaissance Decision as "No, Other" into the database for sites not accessible through bridge right-of-way and appearing as "target" from the nearest bridge. In the Comments field enter the following text "Unable to contact landowner by deadline" along with the date and initials of the person entering the data. Record the decision in the Reconnaissance Decision area on the IDEM Site Reconnaissance Form (Attachment 1).

Table 2 lists the potential sampling sites generated for the Coolwater Stream Monitoring project. Figure 1 depicts potential sampling sites and approximate locations.

B.2. Sampling Methods and Sample Handling

1. Water Chemistry Sampling

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

2. Algal Sampling

For coolwater sites also selected for reference or probabilistic sampling (Table 2 includes sites with overlapping projects), one team consisting of two staff collects diatoms and chlorophyll *a* at reference sites from the periphyton community during the third round of water chemistry in September or October. Sampling for a typical site, including all the parameters, requires approximately 2.5 hours of effort. Use the Algal Biomass Lab Datasheet (Attachment 3) and Probabilistic Monitoring Section Physical Description of Stream Site Form (Attachment 4) to record information regarding substrates sampled for periphyton and physical parameters of the stream sampling area. Phytoplankton and Periphyton Field Collection Procedures (IDEM 2018b) describes methods used in algal community sampling. Processing and Identification of Diatom Samples (IDEM 2015a) describes the methods used in diatom identification and enumeration.

3. Fish Community Sampling

Use standardized electrofishing methodologies to perform fish community sampling. The method depends upon stream size and site accessibility. Perform fish assemblage assessments 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, per Fish Community Field Collection Procedures (IDEM 2018a). Attempt to sample all available habitat types (i.e., pools, shallows). Procedures for Completing the Qualitative Habitat Evaluation Index (IDEM 2019c, pp 10 – 11) contains more potential habitat types. Ensure adequate fish community representation within the sample reach during the sampling event. Utilize an electrofisher included in the following list: Smith-Root LR-24 or LR-20B Series or Midwest Lake Electrofishing Systems (MLES) Infinity XStream backpack electrofishers; or MLES Infinity Control Box with MLES junction box and rattail 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) (IDEM 1992a, 1992b, 1992c, 2018a).

Avoid sample collections during high flow or turbid conditions due to 1) low collection rates resulting in nonrepresentative samples and 2) safety considerations for the sampling team. Avoid sample collection during late autumn due to the cooler water temperatures, which may affect the responsiveness of some species to the electrical field. The lack of responsiveness can result in nonrepresentative samples of the stream's fish assemblage, Fish Community Field Collection Procedures (IDEM 2018a).

Collect fish using dip nets with fiberglass handles and netting of 1/8-inch bag mesh. Sort fish, collected in the sampling reach, by species into baskets or buckets. Do not retain young-of-the-year fish less than 20 millimeters (mm) total length in the community sample (IDEM 2018a).

For each field taxonomist (generally the crew leader), retain a complete set of fish vouchers 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 completing the fish community datasheet, preserve one to two positively identified individuals small enough to fit in a 2000 mL jar, per new species encountered, in 3.7% formaldehyde solution to serve as representative fish vouchers. If a specimen is too large to preserve, take a photo of key characteristics (e.g., fin shape, size, body coloration) for later examination (IDEM 2018a). Also, prior to beginning sampling, 10% of the sites are randomly selected for revisit sampling (IDEM 2020a). Preserve or photograph a few representative individuals of all species found at the revisit site to serve as vouchers. Prior to field work review the taxonomic characteristics of possible species encountered in the basin of interest. If a fish specimen cannot be positively identified in the field, consider preserving a voucher (i.e., those co-occurring like the Striped and Common Shiners or are difficult to identify when immature); individuals appearing to be hybrids or have unusual anomalies; dead specimens valuable taxonomically for undescribed taxa (e.g., Red Shiner or Jade Darter); life history studies; or research projects, per Fish Community Field Collection Procedures (IDEM 2018a).

Record data for nonpreserved fish on the IDEM Fish Collection Data Sheet (Attachment 5) and include 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). Upon completion of recording data, release specimens within the sampling reach from which specimens were collected. Record data following laboratory taxonomic identification of preserved fish specimens, per Fish Community Field Collection Procedures (IDEM 2018a).

4. Macroinvertebrate Community Sampling

Collect aquatic benthic macroinvertebrate samples using a modification of the U.S. EPA Rapid Bioassessment Protocol multihabitat (MHAB) approach and a D-frame dip net, per Multi-habitat (MHAB) Macroinvertebrate Collection (IDEM 2019a). The IDEM MHAB approach (IDEM 2019a) is composed of a 1-minute kick sample within a riffle or run; and a 50-meter sweep sample of additional instream habitats. Define the sampled 50-meter length of the riparian corridor at each site using a tape measure or rangefinder. If the stream is too deep to wade, use a boat to sample the best available habitat along the shoreline of the 50-meter zone. Combine the 1-minute kick, if collected, and 50-meter sweep samples in a bucket of water. Elutriate the sample through a U.S. standard number 35 (500 µm) sieve a minimum of five times to remove all rocks, gravel, sand, and large pieces of organic debris. Transfer the remaining sample from the sieve to a white plastic tray. The collector, while still onsite, conducts a 15-minute pick of macroinvertebrates at a single organism rate with an effort to pick for maximum organism diversity and relative abundance. Accomplish by turning and examination of the entire sample in the tray. Preserve the resulting picked sample in 80% isopropyl alcohol and return to the laboratory for identification at the lowest practical taxonomic level (usually genus or species level, if possible). Retain voucher specimens for at least 5 years. Before leaving the site, complete an IDEM OWQ Macroinvertebrate Header Form (Attachment 6) for the sample (IDEM 2019b).

5. Habitat Assessments

Complete habitat assessments immediately following macroinvertebrate and fish community sample collections at each site using a slightly modified version of the Ohio Environmental Protection Agency (OHEPA) QHEI, 2006 edition (Rankin 1995; OHEPA 2006). Complete a separate QHEI (Attachment 7) for each sample type, since the sampling reach lengths may differ (i.e., 50 meters for macroinvertebrates and between 50 and 500 meters for fish). Procedures for Completing the Qualitative Habitat Evaluation Index (IDEM 2019c) describes the method for completing the QHEI (Attachment 7).

6. Field Parameter Measurements

Measure dissolved oxygen, pH, water temperature, specific conductance, and dissolved oxygen percent saturation with a data sonde during each sampling event, regardless of the sample type collected. Perform measurement procedures and operation of the data sonde according to the manufacturers' manuals (Xylem 2020), Calibration of YSI Multiparameter Data Sondes (IDEM 2020c), and Water Chemistry Field Sampling Procedures (IDEM 2020d). Measure turbidity with a Hach turbidity kit and record the meter number in the comments under the field parameter measurements. If a Hach turbidity kit is not available, record the data sonde measurement for turbidity and note in the comments. Record all field parameter measurements and weather codes on the IDEM Stream Sampling Field Data Sheet (Attachment 2) and include other sampling observations. Take digital photos upstream and downstream of the site during each sampling event, per Phytoplankton and Periphyton Field Collection Procedures (IDEM 2018b).

7. Continuous Water Temperature Data Logger Measurements

Deploy an Onset HOBO® Pendant® MX2201 Water Temperature Data Logger in April (and May if necessary) in a representative location, within the targeted stream segment of 90 coolwater sample sites. The logger records temperature measurements at 30-minute intervals. With stainless steel wire and heavy-duty zip ties, attach a programmed and calibrated data logger to an appropriate size block (dependent on the minimum depth of the stream) and secure the block to a tree, root mass, or bridge pylon with heavy-duty stainless-steel cable. Some sites may have two temperature data loggers deployed on separate blocks if the streambed load (sand or silt) looks unstable or a likelihood of possible vandalism at a public site. Place in a calm glide portion of the stream segment with a water depth of between 0.3 and 1.0 meters. Do not place the data logger directly below a riffle, a turbulent run, or in a deep pool. For very shallow streams, necessity may require placing the block in a pool to keep the temperature data logger submerged. Place, as near as possible in channel's cross-sectional center. In addition to tying a float to the block, determine the GPS coordinates of each data logger's exact placement point using an agency approved handheld GPS unit which can verify horizontal precision within 5 meters or less, per Global Position System (GPS) Data Creation (IDEM 2015b). Take at least one photograph or digital image of the placement point in relation to the stream reach documenting location and stream flow conditions, to the extent possible. Record in-situ water quality measurements for each data logger deployment and when downloading data every other month. Offload data as a CSV file using Onset HOBOmobile® for IOS and then send to IDEM staff via email. Subsequently, upload the time-series data sets to AIMS II and provide to Tetra Tech. In October 2022, return the data logger to the WAPB calibration room at the Western Select Property IDEM OWQ laboratory.

B.3. Analytical Methods

Table 5 lists the field parameters, respective test method, and IDEM quantification limits. Table 6 lists the algal parameters, test method, and IDEM quantification limits. Table 7 shows water chemistry sample container, preservative, and holding time requirements (all samples iced to 4 °C). Table 8 lists numerous parameters (priority metals, anions or physical, and nutrients or organic), and respective test methods, IDEM reporting limits, and laboratory reporting limits. The IDEM OWQ Chain of Custody Form (Attachment 8) and the 2021-2022 Water Sample Analysis Request Form (Attachment 9) accompany each sample set through the analytical process.

B.4. Quality Control and Custody Requirements

Follow QA protocols in the Surface Water QAPP (IDEM 2017a, B5 p 170) and Biological and Habitat QAPP (IDEM 2020a, B.5 p 27).

1. Water Chemistry Data

Use sample bottles and preservatives certified for purity. Sample collection procedures include the container, preservative used for each parameter, and holding times adhering to U.S. EPA requirements for water chemistry testing (Table 7). Collect field duplicates, and matrix spike and matrix spike duplicates (MS/MSD) at the rate of one per sample analysis set or one per every 20 samples, whichever is greater. The AIMS database randomly selects and assigns the field duplicate and MS/MSD sites for each trip. Additionally, take field blank samples using American Society for Testing and Materials (ASTM) D1193-91 Type I water at a rate of one set per sampling crew each week of sampling activity. Pace Analytical Services, Inc (Indianapolis, Indiana) processes all samples collected for water chemistry analysis, following the specifications set forth in Request for Proposals 16-074 (IDEM 2016b).

Table 5. Field Parameters showing method and IDEM quantification limit.

Parameters	Method	IDEM Quantification Limit
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 [1]	0.05 mg/L
pH (data sonde)	U.S. EPA 150.2	0.10 SU
pH (field pH meter)	SM 4500H-B [1]	0.10 SU
Specific conductance (data sonde)	SM 2510B	1.00 µmhos/cm
Temperature (data sonde)	SM 2550B(2)	0.1 °C
Temperature (field meter)	SM 2550B(2) [1]	0.1 °C
Turbidity (data sonde)	SM 2130B	0.02 NTU [2]
Turbidity (Hach™ turbidity kit)	U.S. EPA 180.1	0.05 NTU [2]

[1] Method used for field calibration check
[2] NTU = Nephelometric Turbidity Unit(s)
SM = Standard Method

Table 6. Algal Parameters showing method and IDEM quantification limit.

Algal Parameter	Method	IDEM Quantification Limit
Periphyton (Uncorrected; Non-Acidification Method) Chlorophyll *a* – attached	Modified U.S. EPA 445.0	0.3 µg/L

Table 7. Water Chemistry Sample Container, Preservative, and Holding Time Requirements.

Parameter	Container	Preservative	Holding Time
[1,2] Alkalinity as $CaCO_3$*	1 L, HDPE[4], narrow mouth	None	14 days
[3] Ammonia-N**	1 L, glass, amber Boston round	H_2SO_4 < pH 2	28 days
[1]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
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
[1,5]Solids (all forms)*	1 L, HDPE, narrow mouth	None	7 days
[1]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

[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 200.7	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	2
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	1

Nutrients/Organic			
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
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

2. Algal Community Data

Record excessive algal conditions, when an algal bloom is observed on the water's surface or in the water column. Staff are not calibrated on this rating. The decision as to the severity of the bloom is based on best professional judgement. An algal mat on the surface of the water or a bloom giving the water the appearance of green paint justifies a decision of excessive algal conditions.

To decrease the potential for cross contamination and bias of algal samples, clean all sample contact equipment after sampling completion at a given site. Clean with detergent and rinse with ASTM D1193-91 Type III water. Accurately and thoroughly complete all sample labels, include AIMS II sample numbers, date, stream name, and sampling location.

Complete Chain of Custody forms in the field to document the collection and transfer of samples to the laboratory. Upon arrival at the laboratory, the laboratory manager checks in the samples. Another Chain of Custody form for diatom samples documents when a sample is removed from storage, processed, and made into a permanent mount.

View analysis methods for chlorophyll *a* in Table 6. The IDEM WAPB Algal Laboratory processes samples. Use the modified U.S. EPA Method 445.0, to determine the total chlorophyll *a* value. Measure the "uncorrected" total chlorophyll *a* value fluorometrically via a set of very narrow bandpass excitation and emission filters specific to chlorophyll *a*. The modified method does not detect pheophytin concentration, and the method is not impacted by other chlorophyll *a* degradation products which may be prevalent in inland waters. Run blank filters for periphyton and seston chlorophyll *a*. Process all chlorophyll *a* filters in triplicate for QC purposes. Process three filters from the same sample per analysis method. Analyze ten percent of replicate field samples at a separate laboratory (TBD).

Document both field and laboratory data QC checks from the diatom sampling, enumeration, and identification project. Processing and Identification of Diatom Samples (IDEM 2015a, p 22) describes QA/QC protocols. The Department of Biological and Environmental Sciences of Georgia College and State University (Milledgeville, Georgia) verifies at least ten percent of the diatom samples (IDEM 2020a) by following the specifications set forth in IDEM 2015a.

3. Fish Community Data

Perform fish community sampling revisits at a rate of 10 percent of the total fish community sites sampled, approximately nine, Fish Community Field Collection Procedures (IDEM 2018a). Perform revisit sampling with at least two weeks of recovery between the initial and revisit sampling events. Perform fish community revisit sampling and habitat assessment with either a partial or complete change in field team members (IDEM 2018a). Use the resulting IBI and QHEI total scores between the initial visit and the revisit to evaluate precision (IDEM 2020a). Track samples from the field to the laboratory using the IDEM OWQ Chain of Custody Form (Attachment 8). Regionally recognized non-IDEM freshwater fish taxonomists (e.g., Brant Fisher, Nongame Aquatic Biologist, IN DNR) may verify fish taxonomic identifications made by IDEM laboratory staff. For all raw data: 1) check for completeness; 2) utilize to calculate derived data (i.e., total weight of all specimens of a taxon), which is entered into the AIMS II database; and 3) check again for data entry errors.

4. Macroinvertebrate Community Data

Collect duplicate macroinvertebrate field samples at sites randomly selected prior to the beginning of the field season. Duplicate samples occur at a rate of 10 percent of the total macroinvertebrate community sites sampled, approximately nine. The same team member, performing the original sample, performs the macroinvertebrate community and corresponding habitat assessment. Conduct the duplicate sampling immediately after collecting the initial sample. Use the resulting IBI and QHEI total scores between the normal and duplicate samples to evaluate precision (IDEM 2020a). Track samples from the field to the laboratory with the IDEM OWQ Chain of Custody Form (Attachment 8). The IDEM macroinvertebrate laboratory supervisor maintains laboratory identifications and QA/QC of taxonomic work including checks on the first five samples of the year regardless of the project plus 10% of the total samples for each taxonomist. An outside taxonomist verifies 10% of the initial samples taken at sites where duplicate samples were collected per Multihabitat (MHAB) Macroinvertebrate Collection (IDEM 2019a).

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

Calibrate the data sonde immediately prior to each week’s sampling per Calibration of YSI Multiparameter Data Sondes (IDEM 2020c). Conduct the dissolved oxygen component of the calibration procedure using the air calibration method. Record, maintain, store, and archive calibration results and drift values in the calibration laboratories at the WAPB facility. The drift value is the difference between two successive calibrations. Field parameter calibrations conform to the procedures described in the instrument user’s manuals (IDEM 2020c). Field check the unit for accuracy once during the week by comparison with an YSI D.O. meter (IDEM 2020c), Hach turbidity meter, and Oakton pH and temperature meters (IDEM 2020d). Record weekly field calibrations in the field calibrations portion of IDEM Stream Sampling Field Data Sheet (Attachment 2) and enter in AIMS II database. Also, at field sites where the dissolved oxygen concentration is 4.0 mg/L or less, use the YSI D.O. meter readings to confirm the measurement.

The Onset HOBO® Pendant® MX2201 Water Temperature Data Logger calibration and maintenance procedures follow the HOBO® Pendant® MX Temp (MX2201) and Temp/Light (MX2202) Logger manuals (Onset 2020).

Collect in-situ water chemistry field data using calibrated or standardized equipment. Perform calculations in the field or later at the office. Detection limits and ranges are set for each analysis. Perform QA checks on information for field or laboratory results to assess project precision, accuracy, and completeness, as described in the Surface Water QAPP (IDEM 2017a Section C1.1 on p 176).

Phytoplankton and Periphyton Field Collection Procedures (IDEM 2018b) describes the equipment required for the collection of periphyton. None of the equipment requires calibration. Equipment is field tested ensuring capability to appropriately remove periphyton from different types of substrate (rocks, sticks, sand, or silt).

Use a Turner Designs Trilogy Laboratory Fluorometer with the Chlorophyll α Non-Acidification Bandpass Filter Module to determine chlorophyll *a* concentration. Calibrate the instruments according to manufacturers' and methods' specifications at the beginning of the sampling season and as needed. Perform calibration verification checks during each analysis.

Processing and Identification of Diatom Samples (IDEM 2015a) describes the equipment required for the preparation of permanent diatom mounts. Other than the micropipetter, none of the laboratory equipment requires calibration. Check and calibrate the micropipetter according to manufacturer's specifications, as necessary.

Use a Nikon differential interference contrast (DIC) microscope, and Nikon Elements D camera and imaging system for identification and enumeration of diatoms. Branch staff calibrate the ocular reticle in the microscope. Calibrate the ocular reticle at each magnification with a stage micrometer. If the microscope is moved to a new location, check the calibration again.

C. Assessment and Oversight

C.1. Assessments and Response Actions

Conduct performance and system audits to ensure good quality data. Field and laboratory performance checks include:

- Precision measurements by relative percent difference (RPD) of field and laboratory duplicates per Surface Water QAPP (IDEM 2017a, pp 56, 61 – 63).
- Accuracy measurements by percent of recovery of MS/MSD samples analyzed in the laboratory (IDEM 2017a, pp 58, 61 – 63).
- Completeness measurements by the percent of planned samples collected, analyzed, reported, and usable (IDEM 2017a, 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 revisit sites (IDEM 2020a, pp 9-10)
- RPD for number of taxa for macroinvertebrate duplicate samples (IDEM 2020a, p 13)
- RPD for number of taxa for diatom duplicate samples (IDEM 2020a, p 17)
- 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)
- Diatoms (IDEM 2020a, p 18)
- PDE and PSE for macroinvertebrates (IDEM 2020a, pp 14-16)

IDEM WAPB staff conduct field audits every other year to ensure sampling activities adhere to approved SOPs. WAPB QA staff conduct systematic audits to include all WAPB staff engaged in field sampling activities. QA staff, trained in the associated sampling SOPs and in the processes related to conducting an audit, evaluate WAPB field staff involved with sample collection and preparation. QA staff produce an evaluation report documenting each audit for review by field staff audited and WAPB management. As a result of the audit process, communicate corrective actions to field staff who will implement the corrections per Surface Water QAPP (IDEM 2017a, pp 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, IDEM QA staff annually review performance studies conducted by the contract laboratories. The audit includes any or all the operational QC elements of the laboratory's QA system. All applicable elements of the QAPP and the laboratory contract requirements are addressed including, but not limited to, sampling handling, sample analysis, record keeping, preventative maintenance, proficiency testing, staff requirements, training, and workload. (IDEM 2017a, pp 177-178)

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

C.2. Data Quality Assessment Levels

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

D. Data Validation and Usability

QA reports to management, and data validation and usability are also important components of the QAPP ensuring good quality data. Should problems arise and require investigation and correction, submit a QA audit report to the QA manager and project manager for review. The following steps ensure data meet the project DQO and allow assessment by users:

- Reduce (Convert raw analytical data into final results in proper reporting units.)
- Validate (Qualify data based on the performance of field and laboratory QC measures incorporated into the sampling and analysis procedures.)
- Report (Completely document the calibration, analysis, QC measures, and calculations.)

D.1. Quality Assurance, Data Qualifiers, and Flags

Use the various data qualifiers and flags for QA and validation of the data found in the Surface Water QAPP (IDEM 2017a pp 184 – 185) and Biological and Habitat QAPP (IDEM 2020a pp 33-34).

D.2. Reconciliation with User Requirements

Qualify the environmental project data, each lab or field result, usability per Surface Water QAPP (IDEM 2017a p 184) and Biological and Habitat QAPP (IDEM 2020a pp 35-36). Categorize data in one or more of the following classifications.

- Acceptable Data
- Enforcement Capable Results
- Estimated Data
- Rejected Data

D.3. Information, Data, and Reports

Record 2021 and 2022 data collected in the AIMS II database. Present the data in two compilation summaries. The first summary uses a general compilation of the 2021 and 2022 Coolwater Project field and water chemistry data in the 2024 Indiana Integrated Water Monitoring and Assessment Report. The second summary is a database report format containing biological results and habitat evaluations for the Integrated Report and for individual site folders. Maintain all site folders at the WAPB facility until uploaded into the IDEM Virtual File Cabinet. All data and reports are 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

Project laboratory analysis and data reporting complies with the Surface Water QAPP (IDEM 2017a), Request for Proposals 16-074 (IDEM 2016b), the Biological and Habitat QAPP (IDEM 2020a), and the IDEM 2018 Quality Management Plan (IDEM 2018).

The following labs perform analytical tests:

- General chemistry, nutrients, and total and dissolved metals – Pace Analytical Services in Indianapolis, Indiana (accreditation in Appendix 1)
- Collection and analysis of all periphyton samples for Chlorophyll *a* and slide mount diatoms – IDEM staff
- Diatom identification and enumeration – Department of Biological and Environmental Sciences, Georgia College and State University
- Collection and analysis of all macroinvertebrate samples – IDEM staff
- Validation of 10% of macroinvertebrate samples – Rhithron Associates, Inc.
- Collection and analysis of all fish samples – IDEM staff

The anticipated budget for the project's laboratory costs is outlined in Table 9.

Table 9. Total Estimated Laboratory Cost for the Project.

Analysis	Number of Samples Collected	Laboratory	Estimated Cost
General chemistry, nutrients, total and dissolved metals	3 times @ 90 sites + 20 duplicates + 20 field blanks + 20 MS/MSD (1 per sample week) = 290 samples for general chemistry, 310 samples for nutrients; 310 samples for total and dissolved metals (average 14 samples per analysis set)	Pace Analytical Services 7726 Moller Road. Indianapolis, Indiana 46268	$127,000
Diatom identification and enumeration	1 time @ 6 sites + 1 duplicate (1 per sample week) = 7 samples	Department of Biological and Environmental Sciences Georgia College and State University 320 S. Wayne St. Milledgeville, Georgia 31061	$840 (this cost is included in the Probabilistic and Reference Site Projects, not here)
Macroinvertebrate identification	1 time @ 45 sites + 5 duplicates = 50 samples in 2021; 1 time @ 45 sites + 5 duplicates = 50 samples in 2022; 100 samples total; 10 samples (10%) sent out for verification	Rhithron Associates, Inc. 33 Fort Missoula Road Missoula, Montana 59804	$2,300
		Total	$129,300

D.5. Reference Manuals and Personnel Safety

Table 10. Personnel Safety and Reference Manuals

Role	Required Training or Experience	Training References	Training Notes
All staff participating in field activities	-Basic First Aid and Cardiopulmonary Resuscitation (CPR)	-A minimum of 4 hours in-service training provided by WAPB (IDEM 2010a)	-Staff lacking 4 hours of in-service training or appropriate certification are accompanied in the field at all times by WAPB staff meeting the Health and Safety Training requirements
	-Personal Protective Equipment (PPE) Policy -Personal Flotation Devices (PFD)	-IDEM 2008 -February 29, 2000 WAPB internal memorandum regarding use of approved PFDs	-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 staff in the watercraft must wear a high intensity whistle and Safety of Life at Sea (SOLAS) certified strobe light.

References

*Documents may be inspected at the Watershed Assessment and Planning Branch office, located at 2525 North Shadeland Avenue Suite 100, Indianapolis, Indiana.

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(U.S. EPA and USGS 2005). National Hydrography Dataset Plus – NHD Plus. Edition 1. Horizon Systems Corporation.

(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 Title 327 Water Pollution Control Division, Article 2. Water Quality Standards. Last updated February 12, 2020.

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(IDEM 1992b), revision 1. Section 11, Standard Operating Procedures, Appendices of Operational Equipment Manuals and Procedures. Biological Studies Section, Surveillance and Standards Branch, Office of Water Management, Indiana Department of Environmental Management, Indianapolis, Indiana.*

(IDEM 1992c), revision 1. Section 2, Biological Studies Section Hazards Communications Manual (List of Contents). Biological Studies Section, Surveillance and Standards Branch, OWM, IDEM, Indianapolis, Indiana.*

(IDEM 1997). Water Quality Surveys Section Laboratory and Field Hazard Communication Plan Supplement. IDEM 032/02/018/1998, Revised October 1998. Assessment Branch, Indiana Department of Environmental Management, Indianapolis, Indiana.*

(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. Indiana Department of Environmental Management, Indianapolis, Indiana.*

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

(IDEM 2015a). Processing and Identification of Diatom Samples. B-002-OWQ-WAP-TGM-15-T-R0. Office of Water Quality, Watershed Assessment and Planning Branch. Indianapolis, Indiana.*

(IDEM 2015b). Global Positioning System (GPS) Data Creation Technical Standard Operating Procedure. B-001-OWQ-WAP-XXX-15-T-R0. Office of Water Quality, Watershed Assessment and Planning Branch. Indianapolis, Indiana.*

(IDEM 2016b). Request for Proposals 16-074, Solicitation for Analyses. Indiana Department of Environmental Management. Indiana Department of Administration. Indianapolis, Indiana.*

(IDEM 2017a). Quality Assurance Project Plan for Indiana Surface Water Programs, Revision 4. B-001-OWQ-WAP-XX-16-Q-R4. Indiana Department of Environmental Management, Office of Water Quality, Watershed Assessment and Planning Branch. Indianapolis, Indiana.

(IDEM 2017b). Nutrients/Diel Dissolved Oxygen Pilot Study: Sampling Work Plan 2017. B-033-OWQ-WAP-PRB-17-W-R0. Office of Water Quality, Watershed Assessment and Planning Branch. Indianapolis, Indiana.

(IDEM 2018). IDEM 2018 Quality Management Plan. Indiana Department of Environmental Management, Indiana Government Center North, 100 N. Senate Ave., Indianapolis, Indiana, 46204.

(IDEM 2018a). Fish Community Field Collection Procedures. B-009-OWQ-WAP-XXX-18-T-R0. Office of Water Quality, Watershed Assessment and Planning Branch. Indianapolis, Indiana.

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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 A ddress

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

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

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 (cm^2)	

Area Scrape (Using SG-32)

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

Petri Dish

Number of Discrete Samples (n):	
Total Area of One Sampler (a):	19.01 cm^2
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 Physical Description of Stream Site Form (front)

Revised 4/20/12

Probabilistic Monitoring Section Physical Description of Stream Site

Stream :____________________ **AIMS #**_______________ **Program #:**________

Date: __________ **Time:** __________ **Crew Chief:**________________ **Crew**________

General Stream Description:

____

____

____

____

____

Characteristics at the site and immediately upstream (check All that apply).

Outer Riparian Zone
L R
☐ ☐ Agricultural Row crop
☐ ☐ Agricultural Pasture
☐ ☐ Devoid of Vegetation
☐ ☐ Fallow
☐ ☐ Forested
☐ ☐ Residential
☐ ☐ Commercial/Industrial
☐ ☐ Weeds and Scrub
☐ ☐ Other ________________

Inner Riparian Zone (L R)	L.Width(m)	R.Width(m)
☐ ☐ Agricultural Rowcrop	_____	_____
☐ ☐ Agricultural Pasture	_____	_____
☐ ☐ Devoid of Vegetation	_____	_____
☐ ☐ Fallow	_____	_____
☐ ☐ Forest	_____	_____
☐ ☐ Residential	_____	_____
☐ ☐ Commercial/Industrial	_____	_____
☐ ☐ Treeline	_____	_____
☐ ☐ Weeds and Scrub		
☐ ☐ Other __________	_____	_____

Flow above site
☐ Riffle
☐ Pool
☐ Eddy
☐ Run
☐ Glide
☐ Other ______________

Flow at site
☐ Riffle
☐ Pool
☐ Eddy
☐ Run
☐ Glide
☐ Other ______________

Substrate (if visable)
☐ Cobble
☐ Boulder
☐ Sand
☐ Muck
☐ Silt
☐ Gravel
☐ Bedrock
☐ Other ______________

Characteristics at site and immediately upstream (check ONE).

Water Description
☐ Clear
☐ Grey (Septic)
☐ Murky
☐ Black
☐ Brown
☐ Green
☐ Other ______________

Sinuosity of Channel
☐ High
☐ Moderate
☐ Low
☐ Channelized

Discharge Pipe Present
☐ No
☐ Yes
If yes, Effluent Flowing?
☐ No
☐ Yes
Description of Effluent ______

Continued on back

Attachment 4. IDEM Physical Description of Stream Site Form (back)

Revised 4/20/12

Stream Bank

Functional Slope:	Bank Erosion:	
L R	L R	Percent Canopy Closed: ______
☐ ☐ 0-30°	☐ ☐ Low	Stream Stage 1-5 (Low-High): ______
☐ ☐ 31-50°	☐ ☐ Moderate	
☐ ☐ 51-70°	☐ ☐ High	Velocity of Stream 1-5 (Slow-Fast): ______
☐ ☐ 71-90°		

Visible Stream Degradation? ☐ Yes ☐ No

Description: ____

Aquatic Life Observed? ☐ Yes ☐ No

Description: ____

Algae Observed? ☐ Yes ☐ No

Description: ____

Rooted Macrophytes Observed? ☐ Yes ☐ No

Description: ____

Additional Comments:

____
____
____
____

Follow Up Date:______ Time:______ Crew Chief:______ Crew:______

____
____
____
____

Follow Up Date:______ Time:______ Crew Chief:______ Crew:______

____
____
____
____

Photography Date:______ Time:______ Number(s):______; ______;______

Notes (include items relevant for determining scale – items of known measurement, etc.)

____
____
____

Attachment 5. 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 5. 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 6. IDEM OWQ Macroinvertebrate Header

Office of Water Quality: Macroinvertebrate Header

L-Site	Stream Name	Location	County	Surveyor

Sample Date	Sample #	Macro#	# Containers

☐ **Habitat Complete** ☐ **Sample Quality Rejected**

Macro Sample Type:
☐ Black Light ☐ Kick
☐ CPOM ☐ MHAB
☐ Hester-Dendy ☐ Qualitative

☐ Normal ___________
☐ Duplicate ___________
☐ Replicate ___________

Macro Sub Sample (Field or Lab): _______________

Macro Reach Sampled (m): ____________________

Riparian Zone/Instream Features

Watershed Erosion:
☐ Heavy
☐ Moderate
☐ None

Watershed NPS Pollution:
☐ No Evidence
☐ Obvious Sources
☐ Some Potential Sources

Stream Depth Riffle (m):	Stream Depth Run (m):	Stream Depth Pool (m):

Distances Riffle-Riffle (m):	Distances Bend-Bend (m):

Stream Width (m):	High Water Mark (m):

Stream Type:
☐ Cold
☐ Warm

Turbidity (Est):
☐ Clear ☐ Slightly Turbid
☐ Opaque ☐ Turbid

☐ **Channelization** ☐ **Dam Present**

Predominant Surrounding Land Use: ☐ Forest ☐ Field/Pasture ☐ Agricultural ☐ Residential ☐ Commercial ☐ Industrial
Other ____________________

Sediment

Sediment Odors: ☐ Normal ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Anaerobic ☐ None Other ____________

Sediment Deposits: ☐ Sludge ☐ Sawdust ☐ Paper Fiber ☐ Sand ☐ Relic Shells Other ____________

Sediment Oils: ☐ Absent ☐ Moderate ☐ Profuse ☐ Slight

☐ Are the undersides of stones, which are not deeply embedded, black?

Substrate Components

(Note: Select from 0%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, or 100% for each inorganic/ organic substrate component)

Inorganic Substrate Components (% Diameter)						
Bedrock	Boulder (>10 in)	Cobble (2.5-10 in)	Gravel (0.1-2.5 in)	Sand (gritty)	Silt	Clay (slick)

Organic Substrate Components (% Type)			
Detritus (sticks, wood)	Detritus (CPOM)	Muck/Mud (black, fine FPOM)	Marl(gray w/ shell fragments)

Water Quality

Water Odors: ☐ Normal ☐ Sewage ☐ Petroleum ☐ Chemical ☐ None Other ____________

Water Surface Oils: ☐ Slick ☐ Sheen ☐ Glob ☐ Flocks ☐ None

IDEM 03/8/18

Attachment 7. 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

BEST TYPES (PREDOMINANT / PRESENT P/G R/R)
- ☐☐ BLDR/SLABS [10] ☐☐
- ☐☐ BOULDER [9] ☐☐
- ☐☐ COBBLE [8] ☐☐
- ☐☐ GRAVEL [7] ☐☐
- ☐☐ SAND [6] ☐☐
- ☐☐ BEDROCK [5] ☐☐

OTHER TYPES (PREDOMINANT / PRESENT P/G R/R)
- ☐☐ HARDPAN [4] ☐☐
- ☐☐ DETRITUS [3] ☐☐
- ☐☐ MUCK [2] ☐☐
- ☐☐ SILT [2] ☐☐
- ☐☐ ARTIFICIAL [0] ☐☐

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

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

ORIGIN Check ONE (Or 2 & average)
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ☐ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTRINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY

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

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

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

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

Cover ☐ Maximum 20

Comments

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

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

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

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

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

Channel ☐ 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

EROSION (L R)
- ☐☐ NONE/LITTLE [3]
- ☐☐ MODERATE [2]
- ☐☐ HEAVY/SEVERE [1]

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

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

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

Riparian ☐ Maximum 10

Comments

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

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

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

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

Indicate for reach – pools and riffles.

Recreation Potential (Check one and comment on back)
- ☐ Primary Contact
- ☐ Secondary Contact

Pool/Current ☐ Maximum 12

Comments

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:

☐ NO RIFFLE [metric = 0]

RIFFLE DEPTH
- ☐ BEST AREAS > 10cm [2]
- ☐ BEST AREAS 5 - 10cm [1]
- ☐ BEST AREAS < 5 cm [metric = 0]

RUN DEPTH
- ☐ MAXIMUM > 50cm [2]
- ☐ MAXIMUM < 50cm [1]

RIFFLE/RUN SUBSTRATE Check ONE (Or 2 & average)
- ☐ STABLE (e.g., Cobble, Boulder) [2]
- ☐ MOD. STABLE (e.g., Large Gravel) [1]
- ☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE/RUN EMBEDDEDNESS
- ☐ NONE [2]
- ☐ LOW [1]
- ☐ MODERATE [0]
- ☐ EXTENSIVE [-1]

Riffle/Run ☐ Maximum 8

Comments

6] *GRADIENT* (ft/mi)

DRAINAGE AREA (mi²)

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

%POOL: ☐ **%GLIDE:** ☐

%RUN: ☐ **%RIFFLE:** ☐

Gradient ☐ Maximum 10

Entered ______________ QC1 ______________ QC2 ______________ IDEM 02/28/2018

Attachment 7 IDEM OWQ Biological QHEI (back)

IDEM

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 Drawing:

IDEM 02/28/2018

Attachment 8. IDEM OWQ Chain of Custody Form

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 9. Coolwater Stream Water Sample Analysis Request Form

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

Water Sample Analysis Request

Project Name: 2021 Coolwater IBI **Composite** ☐ **Grab** ☒

OWQ Sample Set	21SPW	IDEM Sample Nos.	
Crew Chief	Maddie Genco	Lab Sample Nos.	
Collection Date	, 2021	Lab Delivery Date	

Anions and Physical Parameters			
Parameter	Test Method	Total	Dissolved
Alkalinity (as $CaCO_3$)	310.2	☒ **	☐
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)	**200.7**	☒	☒
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	SM4500NH3-G	☒	☐
$CBOD_5$	SM5210B	☐	
Total Kjeldahl Nitrogen (TKN)	SM4500N(Org)	☒	☐
Nitrogen, Nitrate + Nitrite as N	353.2	☒	☐
Total Phosphorus	365.1	☒	☐
TOC	SM 5310C	☒	☐
COD	410.4	☒	☐
Cyanide (Total)	335.4	☐	☐
Cyanide (Free)	SM4500CN-I	☐ *	☐
Cyanide (Amenable)	SM4500CN-G	☐ *	☐
Sulfide, Total	376.2	☐	☐

RFP 16-74 Contract Number:	018620 (Pace-Indy) PO # 0020000887-9 (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

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: 5/1/2021

Expiration Date: 4/30/2022

Director
Office of Laboratory Services

Certification Section Chief
Office of Laboratory Services

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

Division of Environment
Kansas Health and Environmental Laboratories
Environmental Laboratory Improvement Program
6810 SE Dwight Street
Topeka, KS 66620-0001

Kansas
Department of Health and Environment

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

Lee A. Norman, M.D., 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: 5/1/2021 Accreditation End: 4/30/2022

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 120.1	
Conductivity	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
Iron	KS
Lead	KS
Magnesium	KS
Manganese	KS

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

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)***	
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 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

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

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)***	
Cyanide	KS
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

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 (cont)

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

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
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

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

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

	Primary AB
Naphthalene	KS
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

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

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)***	
Dimethyl phthalate	KS
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 2510 B-2011	
Conductivity	KS
Method SM 2540 B-2011	
Residue-total	KS

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

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 SM 2540 C-2011	
Residue-filterable (TDS)	KS
Method SM 2540 D-2011	
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

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

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

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

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

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

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

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 (cont)

EPA Number: ***IN00043*** **Scope of Accreditation for Certification Number: E-10177** Page 10 of 26

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

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

EPA Number: ***IN00043*** **Scope of Accreditation for Certification Number: E-10177** Page 11 of 26

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

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 (cont)

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

Pace Analytical Services, Inc - Indianapolis IN

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

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

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

	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

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

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

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

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-Nitrosomethylethalamine	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

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

	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

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

Pace Analytical Services, Inc - Indianapolis IN

	Primary AB
Program/Matrix: ***RCRA (Non Potable Water)***	
Methane	KS

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

Pace Analytical Services, Inc - Indianapolis IN

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

	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
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

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

	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

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

EPA Number: ***IN00043*** **Scope of Accreditation for Certification Number: E-10177** Page 20 of 26

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

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

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)***	
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

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

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

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

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

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

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

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

EPA Number: ***IN00043*** **Scope of Accreditation for Certification Number:** **E-10177** Page 24 of 26

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

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

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-Nitrosomethylethalamine	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

Appendix 1. Pace Laboratory Inc., Indianapolis: Accreditation Documents (cont)

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)***	
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