	<p>Hester-Dendy (H-D) Multiplate Artificial Substrate Macroinvertebrate Collection Procedure B-012-OWQ-WAP-XXX-23-T-R1 Technical Standard Operating Procedure (TSOP) Office: Office of Water Quality Branch: Watershed Assessment and Planning Branch Section: All</p> <p>Last Revised: February 28, 2023 Revision Cycle: Every 4 years Originally Effective: February 28, 2019</p>
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Purpose

This technical standard operating procedure (TSOP) describes the method for collecting benthic macroinvertebrate communities using the Hester-Dendy (H-D) multiplate artificial substrate samplers. Specifically, this TSOP covers the processes of:

- Preparation for sample collection
- Deployment and retrieval of H-D samplers
- Sample preservation
- Completion of associated data sheets and chain of custody forms
- Sample delivery

Macroinvertebrate samples are collected during low flow, from July 15 to November 15. The macroinvertebrate samples are processed and identified in the Indiana Department of Environmental Management (IDEM) laboratory located on 2525 North Shadeland Avenue, Indianapolis (Shadeland). Macroinvertebrates are bioindicators, facilitating the weight-of-evidence approach to interpretation of biomonitoring results as recommended by the U.S. Environmental Protection Agency (U.S. EPA).

Scope

This TSOP applies to agency staff in IDEM's Office of Water Quality (OWQ), Watershed Assessment and Planning Branch (WAPB) responsible for collecting macroinvertebrate community samples from rivers and streams.

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Authorizing Signatures

I approve and authorize this technical standard operating procedure:




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3-20-2023
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This technical standard operating procedure is consistent with agency requirements.



Quality Assurance Staff
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4/10/2023
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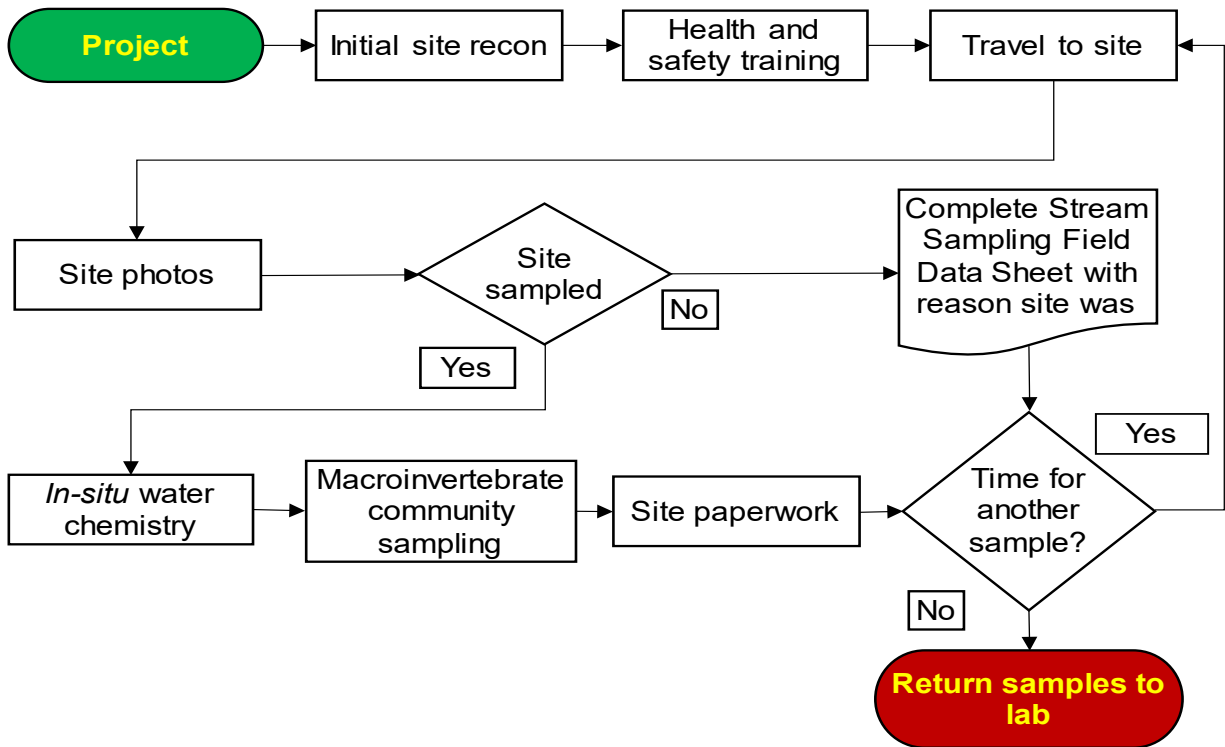
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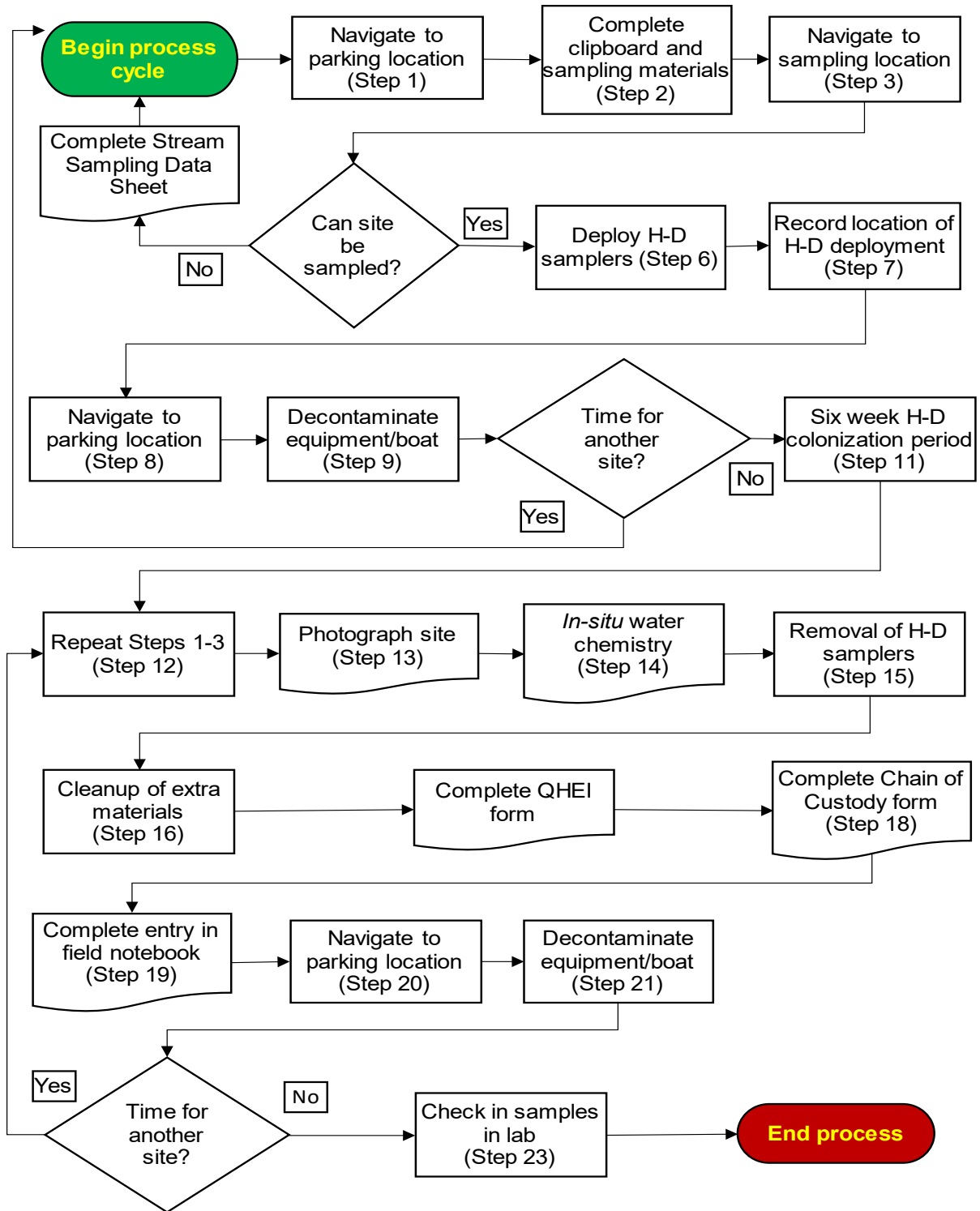
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1.0. Overview Flowchart



2.0. Procedure

2.1. Procedural Flowchart



2.2. Procedural Steps

- Step 1. Using a handheld Global Positioning System (GPS) unit, Indiana Gazetteer, or site-specific maps (Appendix 1), the field crew drives to the designated parking location as described on the Site Reconnaissance Form (Appendix 2).
- Step 2. The crew chief:
- A. Affixes the site folder, containing the site maps (Appendix 1), Site Reconnaissance Form (Appendix 2), Stream Sampling Field Data Sheet (Appendix 3), OWQ Biological Qualitative Habitat Evaluation Index (QHEI) (Appendix 4); Original Photographic Image Chain of Custody (Appendix 5); and OWQ Chain of Custody Form (Appendix 6) to the clipboard.
 - B. Using the Macroinvertebrate H-D Sampling Load List (Appendix 7), check to make sure that all equipment necessary to deploy the H-D samplers is present and secured for transport to the sampling site.
- Step 3. Using the handheld GPS unit and the Site Reconnaissance Form, the field crew proceeds to the sampling site with the clipboard, H-D samplers, and any other necessary equipment. OWQ typically employs H-D samplers on larger streams and rivers, fourth order or greater, which are often nonwadeable. In these instances, a boat or canoe may be needed to reach the designated site and conduct H-D sampler deployment and retrieval.
- Step 4. Upon arrival at the sampling site, the crew chief determines if an H-D sampler can be deployed at the site. To be sampled, water must be present in 50% of the stream reach, defined as 15 times the average wetted width of the stream. Sampling will be postponed, if the stream flow is dangerous for staff to enter or any hazardous weather conditions exist. Flow is considered dangerous at flood stages, so staff will use best professional judgement following or during a high water event.
- A. If the site cannot be sampled, proceed to Step 5.
 - B. If the site can be sampled, proceed to Step 6.
- Step 5. If the H-D sampler cannot be deployed:
- A. Take a photograph, which illustrates why the site was rejected.
 - B. Complete the following portions of the Stream Sampling Field Data Sheet (Appendix 3):
 1. Sample Collectors
 2. Date
 3. Time

4. Check one of the following boxes under “Sample Taken?”:
 - Stream Dry
 - Owner Refused Access
 - Frozen
 - Other” (if “Other”, describe the reason the sample could not be collected in the “Special Notes” area of the Stream Sampling Field Data Sheet).
 - C. Record photographs’ metadata on the Photographic Image Chain of Custody (Appendix 5).
 - D. Make an entry for the site in the field notebook (Appendix 8) with the reason the H-D sampler could not be deployed.
The crew chief and field crew return to the vehicle. If time allows travel to the next site, repeat the process starting with Step 1.
- Step 6. Using best professional judgement, the crew chief determines the optimal location in the stream to deploy the H-D samplers. The optimal deployment location should be located:
- A. In a run habitat rather than a riffle or pool habitat (Ohio EPA 2015). Preferably in an area of the stream with a minimum velocity of 0.3 ft/s and an optimal velocity between 0.7 to 1.5 ft/s.
 - B. At a depth between one to three meters and on a flat bottom with gravel/rock substrate (see Section 2.3.C., Interferences).
 - C. See Appendix 9 for details on the construction and attachment of H-D samplers.
 1. A nylon rope is attached to a float and to the concrete block. At least 2 meters of slack should allow for location of the float if the water levels are elevated during retrieval. (Figure 1.)
 2. If possible, the H-D samplers should also be tied to the nearest tree on the shore or to a log snag in the stream to provide additional security and mark with survey marking paint or tape. (Figure 2.)



Figure 1. Attaching H-D samplers to concrete block.



Figure 2. Attaching floats to line tied around block holding H-D samplers.

Step 7. The field crew takes a GPS reading at the H-D sampler deployment location (IDEM 2022, 2023a). The deployment location is marked

on the aerial maps (Appendix 1) and any pertinent information (i.e., distance from shore, depth of deployment, additional attachment points) along with a description and sketch of the deployment site is recorded on the site reconnaissance sheet (Appendix 2) and in the field notebook (Appendix 8). The field crew takes pictures of the deployment site and records the metadata on the Original Photographic Image Chain of Custody (Appendix 5).

- Step 8. The crew chief and field crew leave the site and navigate to the field vehicle parking location.
- Step 9. Crew members brush off mud and vegetation from field equipment (e.g., nets, buckets, boots) and decontaminate using a 3% bleach solution following each sampling run or between sampling sites any time:
- A. Equipment is being used in a different 8-digit Hydrologic Unit Code.
 - B. Viruses (e.g., viral hemorrhagic septicemia) have been detected in the area.
 - C. Entering Indiana Department of Natural Resources interested lands or National Parks.
- If the equipment is allowed to sit and dry for five or more days, decontamination is not necessary.
- Step 10. The crew chief determines whether sufficient time remains to deploy another H-D sampler.
- A. If sufficient time remains, return to Step 1 to repeat the process.
 - B. If insufficient time remains to deploy another H-D sampler or all H-D samplers for the project have been deployed, the crew chief and field crew return to the field lodgings or to the IDEM Shadeland office.
- Step 11. Macroinvertebrates are allowed to colonize the H-D samplers for six weeks following deployment. Then the samplers are recovered. Prior to recovery, the crew chief consults U.S. Geological Survey stream gages (<https://waterdata.usgs.gov/in/nwis/rt>) to determine whether current water levels at the deployment site are similar to levels when the H-D samplers were deployed. Recovery may be delayed by one to two weeks to allow for stream flows to decrease if their current height would reduce chances of H-D sampler recovery.
- Step 12. The field crew repeats Steps 1, 2, and 3 to navigate to the sample site. GPS readings and deployment notes taken in Step 7 are used to locate the H-D samplers. Then proceed with Step 13.

- Step 13. Upon locating the H-D sampler, the field crew takes a digital photograph of the upstream and downstream stream reaches, and the area where the H-D sampler is located. Record the photographs' metadata on the Original Photographic Image Chain of Custody (Appendix 5). Unusual conditions at the site possibly affecting water quality include algal blooms, dead fish, and modifications of the bank or stream, all of which are photographed and recorded.
- Step 14. Prior to the collection of the H-D samplers, a member of the field crew measures *in-situ* water chemistry parameters with a data sonde and collects a water sample for onsite turbidity (IDEM 2020). Record the information on the Stream Sampling Field Data Sheet (Appendix 3).
- Step 15. The crew chief:
- A. Lifts the block and H-D samplers by the rope attached to the float. Try to minimize disturbances as much as possible to prevent dislodging macroinvertebrates.
 - B. Quickly sets the block and H-D samplers in a tray or tub on a stable surface such as the deck of the boat.
 - C. Cuts the H-D samplers free from the concrete block and each sampler is placed in a 500 μm (No. 35) sieve.
 - D. Places each individual H-D sampler into a Whirl-Pak bag.
 - E. Writes a sample label on Write-in-the-Rain paper for each bag and adds the label to each bag. The label lists:
 1. The AA/AB/AC Number
 2. Macro sample number
 3. Stream
 4. Location
 5. Crew chief initials
 6. Sample date
 - F. Fills the Whirl-Pak bag 2/3 full of ~80% isopropyl alcohol and seals the bag.
 - G. Writes the same sample label information on the outside of the Whirl-Pak bag.
 - H. Places the entire Whirl-Pak bag inside a 1-gallon resealable plastic food storage bag (i.e., Ziploc bag).
 - I. Stores the food storage bag in a plastic tote.
- Step 16. Remove and dispose any remaining materials used to attach the H-D samplers to the block such as zip ties, twine, or rope. Rinse off

- the sieve, tray or tub, and cement block in ambient stream water to remove any macroinvertebrates or excess deposits of sand or silt.
- Step 17. The sample collector completes the QHEI form (Appendix 4) for the site. (See IDEM 2023b for instructions on how to fill out the QHEI form.)
- Step 18. The crew chief completes the OWQ Chain of Custody Form (Appendix 6) which includes the macroinvertebrate sample number, AA/AB/AC number, number of sample containers, and date and time the sample was collected.
- Step 19. The crew chief makes an entry in the field notebook (see Appendix 8) listing:
- A. The same information found on the sample labels.
 - B. The H-D sampler location in the stream.
 - C. Position of the H-D sampler relative to the GPS site location.
 - D. Any other pertinent information such as modifications made to the sample method or the presence and species (if known) of any freshwater mussels (Unionidae) encountered.
- Step 20. The crew chief checks to ensure that all macroinvertebrate samples are properly labeled, all site forms completed, and all sampling equipment is stored in the boat. The crew chief and field crew leave the site and navigate to the field vehicle parking location.
- Step 21. Crew members brush off mud and vegetation from field equipment (e.g., nets, buckets, boots) and decontaminate using a 3% bleach solution following each sampling run or between sampling sites:
- A. Any time that equipment is being used in a different 8-digit Hydrologic Unit Code.
 - B. When viruses (e.g., viral hemorrhagic septicemia) have been detected in the area.
 - C. When entering Indiana Department of Natural Resources interested lands or National Parks.
- If the equipment is allowed to sit and dry for five or more days, decontamination is not necessary.
- Step 22. The crew chief determines whether sufficient time remains to deploy another H-D sampler.
- A. If sufficient time remains, return to Step 12 to repeat the process.
 - B. If insufficient time remains to deploy another H-D sampler or all H-D samplers for the project have been deployed, the crew chief and field crew return to the field lodgings or to the IDEM Shadeland office.

- Step 23. Upon arrival at the IDEM Shadeland branch office:
- A. The field crew collected macroinvertebrate samples are placed in Room 125 for temporary storage.
 - B. The crew chief:
 1. Signs the top of the OWQ Chain of Custody Form (Appendix 6) certifying the samples were collected by or in the crew chief's presence.
 2. Enters the date the samples were brought into the IDEM Shadeland branch office.
 3. Checks the type of samples collected ("macro").
 - C. The lab custodian:
 - Checks to make sure the information on the sample labels inside the sample containers match the information on the OWQ Chain of Custody Forms.
 - Enters the date and time the samples entered the IDEM Shadeland branch office room number.
 - Places a check certifying the samples are present and accounted.
 - D. The crew chief and lab custodian complete the form by signing their names in the appropriate "Relinquished by" and "Received by" sections, and entering the time and date the samples were transferred.
 - E. The samples are then placed in a flammable cabinet in Room 125 until they are ready to be processed.

2.3. Related Technical Issues

- A. Health and Safety Warnings
 1. Safety issues are the responsibility of all crew members. However, any questions in the field should be directed to the crew chief. The crew chief is responsible for the completion of all work listed in the TSOP, the health and safety aspects of the sampling event, and successful interactions with landowners and members of the public.
 2. Due to the remoteness of the sampling sites and the possibility of a medical emergency, all field staff are required to complete basic first aid and cardiopulmonary resuscitation training.
 3. New hires or those changing job responsibilities without the minimum four-hour training must be accompanied in the field by a staff member who has met the requirements of the branch health and safety training. According to the memorandum "Change in status of Watershed Assessment and Planning Branch (WAPB)

staff in accordance with the agency training policy” dated November 29, 2010, OWQ WAPB staff are exempt from initial and annual training requirements set forth in Section 6.0 of IDEM Health and Safety Training Policy (IDEM 2010). The memorandum also states, “as an alternative to the training requirements of the policy, the branch will conduct in-service training at a minimum of four hours per year on topics directly related to duties performed by staff.”

4. Due to the remoteness of sampling sites and the possibility of a medical emergency, sampling on surface waters requires increased safety consciousness of staff members. The use of specialized equipment is also required. Thus, staff will comply with the IDEM Personal Protective Equipment (PPE) Policy (IDEM 2008). If an injury or illness arises in the field, staff will follow the IDEM Injury and/or Illness Resulting from Occupational Exposure Policy (IDEM 2016).
5. To prevent drowning during sample collection, staff will wear appropriate clothing and personal protective equipment when operating boats or sampling in deep water or swift currents. According to the memorandum “Use of Personal Flotation Devices (PFDs) by branch staff” dated February 29, 2000, staff must wear U.S. Coast Guard approved Type I, II, or III PFDs whenever:
 - a. Planned work requires entering the water and the maximum water depth at any place at the work site is over their knee. Note: that this depth depends on individual staff, but it will usually be between 12 to 20 inches or 300 to 500 mm).
 - b. Staff in a watercraft of any kind which is launched, retrieved, or operating on the water.
 - c. Staff must work from structures without guardrails and near water where the water depth is 3 feet or more.
6. Additional requirements to prevent drowning are required, when work is being done in boats 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 certified strobe light.
7. Field staff collecting *in-situ* water chemistry measurements and macroinvertebrate multihabitat samples will follow policies and procedures in the Water Chemistry Field Sampling Procedures (IDEM 2020), IDEM Hazard Communication (HazCom) Plan (IDEM

- 2019), and Office of Water Quality Watershed Assessment and Planning Branch Laboratory Safety Plan (IDEM 2021).
8. Before using isopropyl alcohol, review the safety data sheet (SDS) stored in the macroinvertebrate laboratory in the IDEM Shadeland office and be sure to wear required PPE.
 - a. Isopropyl alcohol poses the following health hazards:
 - i. Combustible liquid
 - ii. Harmful to eyes, skin, and internal organs. Suspected of causing genetic defects
 - iii. May cause cancer (International Agency for Research on Cancer Group 1 carcinogen)
 - iv. Harmful to aquatic life
 - b. Required PPE:
 - i. Chemical resistant latex or nitrile gloves
 - ii. Protective eyewear (safety glasses or goggles)
 - iii. Face shield
 9. Per recommendations of the IDEM Health and Safety office (IDEM 2010), when heat index temperatures reach 100°F, field work should be reduced to a 50% work and 50% rest schedule. Heat index temperatures above 105°F require suspension of field work, until heat index temperatures decrease to below 105°F.
 10. Due to the hazards presented by thorns, nettles, poison ivy, contaminants in the water, and from abrasions that may result from boulders and logs in the stream, all field crew members should wear chest or hip waders when conducting field sampling activities.
 11. Bleach hazards and safety:
 - a. Review the appropriate SDS before working with bleach and use appropriate PPE (safety glasses and gloves).
 - b. 1:32 dilution (bleach: water) for 3% solution using 6% concentration of household bleach.
 - c. Vapor may cause severe irritation or damage to eyes and skin.
 - d. Harmful if swallowed.
 - e. Corrodes metals.
 - f. Will fade colors and break down cloth fibers.
 - g. If in an opaque container, diluted bleach will last 1 month.
 - h. If exposed to sunlight or air, it will only last 5 days.
 - i. Keep out of lakes, streams, or ponds; stand at least 50 meters from any natural water source.

B. Cautions

1. In Step 6, prevent population bias by not placing the H-D block directly on fine sediment where muck or shifting sand may bury the block and samplers.
2. In Step 7, prevent loss of data by documenting accurate GPS coordinates, good photos, and detail on the maps to ensure successful retrieval of the H-D samplers after the six-week colonization period.
3. In Step 15, to prevent population bias, use extreme care when retrieving the H-D samplers to reduce the number of macroinvertebrates dislodged as the samplers are lifted to the water's surface.
4. In Step 15, to prevent invalidating data, make sure that the sample number, site information, and date collected written on the sample label, the data sheets, field notebook, and Chain of Custody form match and are correct. The sample label is placed inside and written on the Whirl-Pak bag.
5. In Step 15, to prevent bias of the data, make sure there are no macroinvertebrates left in the sieve, tray, or tub which could be introduced into the next sample.

C. Interferences

Heavy rains of more than one or two inches may scour the stream substrate, burying the H-D samplers. These increased flows may also move H-D samplers downstream, if it is not securely attached to an anchor point (i.e., shoreline tree or instream snag). Increased stream flow may make it difficult to find the float attached to the sampler, if there is inadequate slack in the rope or reference points used to mark the H-D sampler location are obscured.

Worn or frayed plates should not be used when constructing H-D samplers.

To ensure successful retrieval of H-D samplers:

1. In rural or rarely visited stream segments, conspicuously mark the samplers.
2. In urban or high-traffic stream segments, it may be preferable to attach the sampler to a secure anchor point without a float, because conspicuous markings may increase the risk of vandalism.

See 2.3.B for other possible interferences.

D. Calibration

None of the macroinvertebrate sampling equipment requires calibration.

- E. Troubleshooting
 - Not applicable.

3.0. Roles

3.1. Responsibilities

- A. Project manager
 - 1. Prints the QHEI and field data sheets on “Rite in the Rain” copier paper to ensure data will not be lost due to weather or splashing of water during deployment or retrieval of H-D samplers.
- B. Crew chief
 - 1. Completes *In-situ* water chemistry measurements training.
 - 2. Completes boat safety and operation training.
 - 3. Prepares for sample collection.
 - 4. Collects macroinvertebrates.
 - 5. Subsamples macroinvertebrates.
 - 6. Completes QHEI forms.
 - 7. Reviews all field data sheets and chain of custody forms.
 - 8. Relinquishes H-D samples to lab custodian.
- C. Field crew members
 - 1. Complete *In-situ* water chemistry measurements training.
 - 2. Complete boat safety and operation training.
 - 3. Prepare for sample collection.
 - 4. Collect macroinvertebrates.
 - 5. Subsample macroinvertebrates.
 - 6. Collect and record *In-situ* water chemistry measurements.
 - 7. Complete field data sheets and chain of custody forms.
- D. Lab Custodian
 - 1. Receives the macroinvertebrate H-D samples from the crew chief.
 - 2. Places samples in storage in IDEM Shadeland Macroinvertebrate Laboratory (Room 125).

3.2. Training requirements

- A. Boat safety and operation training
 - 1. Crew chief
 - 2. Field crew
- B. Preparation for sample collection
 - 1. Crew chief
 - 2. Field crew

- C. Field collection of macroinvertebrates
 - 1. Crew chief
 - 2. Field crew
- D. Completion of field data sheets and chain of custody forms
 - 1. Crew chief
 - 2. Field crew
- E. *In-situ* water chemistry measurements
 - 1. Crew chief
 - 2. Field crew
- F. Assessment Information Management System (AIMS) database management.
 - 1. Project manager

4.0. Required Forms, Equipment, or Software List

4.1. Forms

- A. Site Reconnaissance Form (Appendix 2)
- B. Stream Sampling Field Data Sheet (Appendix 3)
- C. OWQ Biological QHEI (Qualitative Habitat Evaluation Index) (Appendix 4)
- D. Original Photographic Image Chain of Custody (Appendix 5)
- E. OWQ Chain of Custody Form (Appendix 6)
- F. Field notebook (Appendix 8)

4.2. Equipment

- A. U.S. Coast Guard approved Type I, II or III PFD
- B. Safety glasses
- C. First aid kit
- D. Nitrile gloves
- E. Lab safety can – stainless steel, 1 gallon
- F. Data sonde
- G. GPS unit
- H. Rangefinder
- I. No. 35 Sieve - No. 35 U.S. Standard Testing Sieve, mesh size of 500 μm (0.0197 inches)
- J. Forceps - 4A or fine-tip forceps
- K. 14-Plate Square Hester-Dendy Artificial Substrate Samplers (HD)
- L. 4" standard concrete block
- M. Galvanized bailing wire, 14 gauge or larger

- N. Cable ties, 8 inch
- O. Standard PVC sponge floats, 3 inch by 1 1/2 inch
- P. Braided nylon seine twine, green, size 18
- Q. Whirl-Pak Bags, 1650 ml, 55 oz.
- R. 1-gallon freezer bags
- S. 2-gallon freezer bags
- T. Survey marking paint
- U. Wire cutters
- V. Knife
- W. Pliers
- X. Heavy leather gloves or work gloves
- Y. Sharpie pen
- Z. Pencil

Fluids

- A. Eye wash solution
- B. 80% isopropyl alcohol
- C. SDS for isopropyl alcohol
- D. 3% bleach solution
- E. SDS for bleach solution

Additional Equipment when Boating

- A. U.S. Coast Guard approved Type IV-Throwable for Boating
- B. High intensity whistle
- C. Safety of Life at Sea certified strobe light
- D. Boat box with key, safety lanyard, flashlight, tools, etc.
- E. Gas can for boat motor
- F. Fire extinguisher

4.3. Software

- A. AIMS database

5.0. Records Management

5.1. Site Reconnaissance Form

- A. The original hard copy is kept in the site folder and stored in a file cabinet in the WAPB library at the IDEM Shadeland office. A copy is made for crew chief and field crew to navigate to the sampling location.
- B. Information recorded on the Site Reconnaissance Form is entered into the AIMS database.

- C. The original hard copy is retained until it is scanned and uploaded to AIMS database or the Virtual File Cabinet (VFC), after which it will be recycled.
- 5.2. Stream Sampling Field Data Sheet
- A. After the sampling trip is scheduled in the AIMS database, the Stream Sampling Field Data Sheet will be printed on Rite-in-the-Rain paper and placed in each sampling site folder.
 - B. Information recorded on the Stream Sampling Field Data Sheet is entered into the AIMS database, followed by quality control (QC) of the data entered by two WAPB staff members. The final QC will be performed by a full-time WAPB staff member experienced with *in-situ* water chemistry data.
 - C. The original hard copy is retained until it is scanned and uploaded to AIMS database or VFC, after which it will be recycled.
- 5.3. OWQ Biological Qualitative Habitat Evaluation Index (QHEI)
- A. Blank QHEI data sheets will be copied onto Rite-in-the-Rain paper and placed in each sampling site folder.
 - B. Information recorded on the QHEI Form is entered into the AIMS database, followed by QC of the data entered by two WAPB staff members. The final QC will be performed by a full-time WAPB staff member experienced with QHEI data.
 - C. The original hard copy is retained until it is scanned and uploaded to AIMS database or VFC, after which it will be recycled.
- 5.4. Original Photographic Image Chain of Custody Form
- A. Blank Photographic Image Chain of Custody forms will be copied onto Rite-in-the-Rain paper for crew chief and crew members to complete in the field.
 - B. After completion of weekly field sampling activities, the Original Photographic Image Chain of Custody is used to properly label photos. Downloaded JPEG images are renamed in the following format: the JPEG is labeled with a three-digit U.S. EPA site identification number; the direction of, upstream (US) or downstream (DS); initials of the photographer; and date as MMDDYY (i.e., 001US TED 073118).
 - C. The original hard copy is retained until it is scanned and uploaded to AIMS database or VFC, after which it will be recycled.
- 5.5. OWQ Chain of Custody Form
- A. Blank OWQ Chain of Custody Forms will be copied onto Rite-in-the-Rain paper for crew chief and crew members to complete in the field.

- B. After completion of weekly field sampling activities, the OWQ Chain of Custody Form is used by the laboratory custodian to check in samples prior to long-term storage.
- C. After macroinvertebrate samples have been checked in and stored, the OWQ Chain of Custody Form is scanned into a pdf format and renamed in the following format: MM-DD-YYYY + crew chief's initials + Field COC (for example: 07-15-2018_PDM_Field COC). The file is saved at the following location:
S:\IGCN\OWQ\WSP\OWM\RANDOM\Corvallis2018\Chain of Custody\Field Chain of Custody
- Note: "Corvallis2018" can be changed to the current project/year in which field sampling activities are being conducted.
- D. The original hard copy is retained until it is scanned and uploaded to AIMS database or VFC, after which it will be recycled.

5.6. Field notebook

- A. After completion of weekly field sampling activities, the field notebook entries for the week are scanned into a pdf format and renamed in the following format: MM-DD-YYYY + crew chief's initials + Macro Field Notebook (for example: 07-15-2018_PDM_Macro Field Notebook). The file is saved at the following location:
S:\IGCN\OWQ\WSP\OWM\RANDOM\Corvallis2018\Chain of Custody\Field Notebook
- Note: "Corvallis2018" can be changed to the current project/year in which field sampling activities are being conducted.
- B. When not in use, the field notebook is kept in the IDEM Shadeland Macroinvertebrate Laboratory for review, in perpetuity.

5.7. AIMS Database

- A. <http://aims.idem.in.gov/AIMS/Pages/Login/>

6.0. Definitions

- 6.1. AIMS Sample Numbers (AA/AB/AC)– A number assigned to each individual watershed sampling event conducted by Indiana Department of Environmental Management (IDEM) field crews. This number is used to identify the sampling event in the Assessment Information Management System database (AIMS database).
- 6.2. "Agency staff" – Agency staff member who works a regular work schedule, alternative work schedule, or nonstandard work schedule; individual who is employed by the agency on a full-time, part-time, temporary,

intermittent, or hourly basis; or an individual who contracts with the agency for personal services.

- 6.3. “Ambient” – Surrounding environmental conditions.
- 6.4. “Assessment Information Management System database (AIMS database)” – IDEM database containing information related to water chemistry; aquatic habitat; macroinvertebrate, fish, and algae communities; fish tissue analyses; sediments; and *E. coli* bacteria data collected by agency staff from watershed sampling events.
- 6.5. “Chain of custody (COC)” – The records documenting the possession of samples or photographs from the time they are obtained until they are stored, disposed of, or shipped off site (Appendix 7, 8).
- 6.6. “Crew chief” – The agency staff person who leads a field crew when conducting field sampling activities.
- 6.7. “Field crew” – The team of agency staff who conducts field sampling activities. Field crews must contain at least one full-time agency staff member from the Probabilistic or Targeted Monitoring Sections in the crew chief position and one or more full-time IDEM staff or Governor’s Summer Interns or compensated interns.
- 6.8. “Gazetteer” – A geographical dictionary or directory listing cities, towns, rivers, mountains, and other geographic features along with the exact location of these features.
- 6.9. "Indiana Department of Environmental Management (IDEM)" - An agency of Indiana State Government whose mission is to implement federal and state regulations to protect human health and the environment while allowing the environmentally sound operations of industrial, agricultural, commercial, and government activities vital to a prosperous economy.
- 6.10. "Macroinvertebrate"- Aquatic animals which lack a backbone, are visible without a microscope, and spend some period of their lives in or around water.
- 6.11. "Macroinvertebrate Sample Number" - An identification number used to identify a macroinvertebrate sample. The macroinvertebrate sample number is constructed by combining the last two digits of the year, the two digit designation for the month, the two digit designation for the day, the number of the Field Notebook used by the crew leader to record the sampling event, and a two digit number indicating the order in which the current sample was collected on that day. For example, the fourth sample collected by the field crew using Field Notebook #3 on July 15, 2018,

would read: MHAB 180715304 ("18" =2018, "07" = July, "15" = 15th day of the month, "3" = Field Notebook #3, "04" = fourth sampled collected that day). The macroinvertebrate sample number does not take precedence over the "AA/AB/AC Number".

- 6.12. "Office of Water Quality (OWQ)" - The Office of Water Quality within the IDEM.
- 6.13. "Quality assurance (QA)" – An integrated system of management activities involving planning, implementation, documentation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client.
- 6.14. "Quality control (QC)" –The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality. In other words, QC involves measuring the "thing produced" against a standard to ensure it is a quality product that meets the identified need.
- 6.15. "Reconnaissance" – Obtaining information about a site through visual observations and investigating routes to safely access the site, as well as gathering property owner information and access permission.
- 6.16. "Safety data sheet (SDS)" – A sheet containing data regarding the properties of a particular substance or product. It is information intended to provide workers and emergency staff with procedures for handling or working with a particular substance or product in a safe manner.
- 6.17. "Site folder" – A folder for a specific site that contains all pertinent paperwork concerning the site. Site Reconnaissance Forms, all field data sheets including those for water chemistry, algal biomass, fish community, macroinvertebrate community, chain of custody forms, etc. are all stored in this folder which is in a file cabinet in the WAPB office area at the IDEM Shadeland office.
- 6.18. "Site number" – The designated program area specific numeral given to an environmental location of interest.
- 6.19. "Site Reconnaissance Form" – Form used to gather information such as landowner, equipment needed to complete sampling, and the access route to take to the site (Appendix 3).
- 6.20. "Substrate" – The material that composes the stream bed.

- 6.21. "Technical standard operating procedure (TSOP)" – A standard operating procedure that involves environmental data generation, manipulation, or compilation of an analytical process.
- 6.22. "Virtual File Cabinet (VFC)" - The agency's electronic digital image document repository system, that stores, files, indexes, redacts, reassembles, and securely accesses electronic documents of all types both received and created by the various program areas within the agency.

7.0. Quality Assurance and Quality Control

- 7.1. Quality control of macroinvertebrate community sampling using H-D samplers is documented by QC checks of methodology used for determining the proper deployment location and careful retrieval of H-D samplers. To measure the precision, or reproducibility, of the sampling methodology to produce a similar macroinvertebrate assemblage, a duplicate set of H-D samplers will be deployed at ten percent of the sites sampled. These duplicate samples are selected before field sampling begins by having the AIMS database randomly create n duplicate samples (where $n = 10\%$ of sites rounded to the nearest whole number) for a project. The duplicate sample (consisting of three H-D samplers attached to a concrete block) is deployed during the same sampling event in an area of the stream that contains habitat like that used for the original sample. The duplicate sample receives separate AA/AB/AC number and macroinvertebrate sample numbers. The reproducibility of the H-D sampling method as employed by the sample collector is measured by the relative percent difference (RPD) between the number of macroinvertebrate taxa collected in the normal and duplicate samples where:

$$RPD = \left(\frac{|S - D|}{(S + D)/2} \right) \times 100$$

Where:

S = the number of taxa collected in the original sample

D = the number of taxa collected in the duplicate sample.

- 7.2. If the RPD is greater than 25%, corrective action should be taken through calibration of sampling crews sampling methodology to ensure each crew is applying the methodology correctly. Field audits will occur every two years for each staff member deploying and retrieving H-D samplers to

ensure procedures are followed in this TSOP. The RPD is also calculated for each duplicate sites QHEI score, which may help to provide an explanation for any observed differences in the RPD for number of collected taxa.

- 7.3. All sample labels must be accurately and thoroughly completed, including sample numbers, date, stream name, and sampling location. After collecting and preserving the H-D samplers, all equipment that has come in contact with the samples must be cleaned thoroughly to ensure additional macroinvertebrates are not included in the next sampling event. OWQ Chain of Custody Forms are filled out in the field to document the collection and transfer to the IDEM laboratories. Upon arrival at the laboratories, samples are checked in by the lab custodian. Once the macroinvertebrate H-D samplers are in storage, there is another OWQ Chain of Custody Form to document when the sample is removed from storage to be processed and identified.

8.0. References

- 8.1. Indiana Codes (IC) or Indiana Administrative Codes (IAC)
 - A. [IC 14-8-2-27, Boundary waters.](#)
- 8.2. Agency Policies
 - A. IDEM. 2000. Use of Personal Flotation Devices (PFDs) by Branch Personnel. Watershed Assessment and Planning Branch, Office of Water Quality Indiana Department of Environmental Management, Indianapolis, Indiana.
 - B. 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.
 - C. IDEM. 2010. [IDEM Health and Safety Training Policy](#), revised October 1 2010. A-030-OEA-10-P-R2. Office of External Affairs, Indiana Department of Environmental Management, Indianapolis, Indiana.
 - D. IDEM. 2016. [Injury and/or Illness Resulting from Occupational Exposure](#), revised February 12, 2016. A-034-AW-16-P-R3. Office of the Commissioner, Indiana Department of Environmental Management, Indianapolis, Indiana.
 - E. IDEM. 2019. [IDEM Hazard Communication \(HazCom\) Plan](#). IDEM, Office of Program Support, Indianapolis, Indiana.

F. IDEM. 2021. [Office of Water Quality Watershed Assessment and Planning Branch Laboratory Safety Plan](#). IDEM, Office of Program Support, Indianapolis, Indiana.

8.3. Agency Standard Operating Procedures

A. IDEM. 2020. [Water Chemistry Field Sampling Procedures](#). B-015-OWQ-WAP-XXX-20-T-R0. Office of Water Quality, Watershed Assessment and Planning Branch. Indianapolis, Indiana.

B. IDEM. 2022. [Global Positioning System \(GPS\) Data Creation Technical Standard Operating Procedure](#). B-001-OWQ-WAP-XXX-22-T-R0. Watershed Assessment and Planning Branch, Office of Water Quality. Indianapolis, Indiana.

C. IDEM. 2023a. [Global Navigational Satellite System \(GNSS\) R1 Unit User Instructions](#) Technical Standard Operating Procedure. B-055-OWQ-WAP-XXX-23-T-R0. Watershed Assessment and Planning Branch, Office of Water Quality. Indianapolis, Indiana.

D. IDEM. 2023b. [Procedures for Completing the Qualitative Habitat Evaluation Index](#). February 28, 2023. B-003-OWQ-WAP-XX-23-T-R2. Office of Water Quality, Watershed Assessment and Planning Branch. Indianapolis, Indiana.

8.4. Other Guidance

A. Hester, F.E. and J.S. Dendy. 1962. A multiple-plate sampler for aquatic macroinvertebrates. Transactions of the American Fisheries Society. 91(4): 420–421.

B. Ohio EPA. 2015. [Ohio Environmental Protection Agency. 2015. Biological Criteria for the Protection of Aquatic Life: Volume III. Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities](#). Division of Surface Water, Ecological Assessment Section, Columbus, Ohio.

C. Indiana Department of Natural Resources free [Online Boating Safety Course](#) provided by the BoatUS Foundation.

9.0. Appendices

Appendix 1 – Site Reconnaissance Aerial Map

Appendix 2 – Site Reconnaissance Form

Appendix 3 – Stream Sampling Field Data Sheet

Appendix 4 – OWQ Biological QHEI (Qualitative Habitat Evaluation Index)

Appendix 5 – Original Photographic Image Chain of Custody Form

Appendix 6 – OWQ Chain of Custody Form

Appendix 7 – Macroinvertebrate Hester-Dendy Sampling Load List

Appendix 8 – Field Notebook Examples

Appendix 9 – Construction of Hester-Dendy Samplers

Appendix 1– Site Reconnaissance Aerial Map



Appendix 2 –Site Reconnaissance Form



Site Reconnaissance Form

EPA Site Identifier	Rank
Recon #:	
Trip #:	

Site Number: Stream: County:

Location Description:

Reconnaissance Data Collected

Recon Date		Crew Members	
<input type="text"/>		<input type="text"/>	
Avg. Width (m)	Avg. Depth (m)	Max. Depth (m)	Nearest Town
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Water Present?	Site Wadeable?	Riffle/Run Present?	Road/Public Access Possible?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Site Impacted by Livestock?	Collect Sediment?	Gauge Present?	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Landowner/Contact Information

First Name		Last Name	
<input type="text"/>		<input type="text"/>	
Street Address			
<input type="text"/>			
City		State	Zip
<input type="text"/>		<input type="text"/>	<input type="text"/>
Telephone		E-Mail Address	
<input type="text"/>		<input type="text"/>	
Pamphlet Distributed?	Please Call In Advance?	Results Requested?	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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 <input type="text"/> <input type="text"/> <input type="text"/>

Circle Equipment Needed Backpack Boat Towbarge Longline Scanoes Seine Weighed Handline Waders Gill Net
--

Comments

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

Appendix 3 – Stream Sampling Field Data Sheet

IDEM Stream Sampling Field Data Sheet										Analysis Set #	EPA Site ID	Rank
Sample #		Site #		Sample Medium				Sample Type		Duplicate Sample #		
Stream Name:					River Mile:			County:				
Site Description:												
Survey Crew Chief	Sample Collectors				Sample Collected		HydroLab #	Water Depth/Gage Ht (ft)	Water Flow (cfs/Sec)	Flow Estimated?	Algas?	Aquatic Life?
	1	2	3	4	Date	Time						
Sample Taken?			Allquots			Water Flow Type			Water Appearance			Canopy Closed %
<input type="checkbox"/> Yes <input type="checkbox"/> No; Frozen			<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4	<input type="checkbox"/> Riffle <input type="checkbox"/> Dry <input type="checkbox"/> Stagnant			<input type="checkbox"/> Clear <input type="checkbox"/> Green <input type="checkbox"/> Sheen	<input type="checkbox"/> 0-20% <input type="checkbox"/> 60-80%				
<input type="checkbox"/> No; Stream Dry <input type="checkbox"/> No; Other			<input type="checkbox"/> 6 <input type="checkbox"/> 8 <input type="checkbox"/> 12 <input type="checkbox"/> 24	<input type="checkbox"/> Pool <input type="checkbox"/> Run <input type="checkbox"/> Flood			<input type="checkbox"/> Murky <input type="checkbox"/> Black <input type="checkbox"/> Other	<input type="checkbox"/> 20-40% <input type="checkbox"/> 80-100%				
<input type="checkbox"/> No; Owner refused Access			<input type="checkbox"/> 48 <input type="checkbox"/> 72 <input type="checkbox"/> All-Flow	<input type="checkbox"/> Glide <input type="checkbox"/> Eddy <input type="checkbox"/> Other			<input type="checkbox"/> Brown <input type="checkbox"/> Gray (Septic/Sewage)	<input type="checkbox"/> 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 (µmhos/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																	
Comments																	

Measurement Flags < > E R	<	< Min. Meter Measurement	Weather Code Definitions			
	>	> Max. Meter Measurement	SC	WD	WS	AT
	E	Estimated (See Comments)	Sky Conditions	Wind Direction	Wind Strength	Air Temp
	R	Rejected (See Comments)				

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	Bottle Types
				GC General Chemistry: Ice	2000P 2000mL Plastic, Narrow Mouth
				Nx Nutrients: H2SO4	1000P 1000mL Plastic, Narrow Mouth
				Metals Metals: HNO3	500P 500mL Plastic, Narrow Mouth
				CN Cyanide: NaOH	250P 250mL Plastic, Narrow Mouth
				O&G Oil & Grease: H2SO4	1000G 1000mL Glass, Narrow Mouth
				Toxics Toxics: Ice	500G 500mL Glass, Wide Mouth
				Ecol Bacteriology: Ice	250G 250mL Glass, Wide Mouth
				VOA Volatile Organics: HCl & Thiosulfate	125G 125mL Glass, Wide Mouth
				Pest Pesticides: Ice	40GV 40mL Glass Vial
				Phen Phenols: H2SO4	120PB 120mL Plastic (Bacteria Only)
				Sed Sediment: Ice	1000PF 1000mL Plastic, Coming Filter
				Gly Glyphosate: Thiosulfate	500PF 500mL Plastic, Coming Filter
				Hg Mercury(1631): HCl	60P 60mL Plastic
				CrS Chromium(VI)(1636): NaOH	250T 250mL Teflon
				MeHg Methyl Mercury(1630): HCl	500T 500mL Teflon
					125T 125mL Teflon

Data Entered By: _____ QC1: _____
 QC2: _____

Stream Sampling Field Data Sheet

Appendix 4 – Biological Qualitative Habitat Evaluation Index (QHEI) (front)

OWQ Biological QHEI (Qualitative Habitat Evaluation Index)

	Sample #	bioSample #	Stream Name	Location
Surveyor	Sample Date	County	Macro Sample Type	<input type="checkbox"/> Habitat Complete
				QHEI Score: <input type="text"/>

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

BEST TYPES PREDOMINANT		OTHER TYPES PREDOMINANT		ORIGIN		QUALITY	
<input type="checkbox"/> BLDR/SLABS [10]	<input type="checkbox"/> PRESENT P/G R/R	<input type="checkbox"/> HARDPAN [4]	<input type="checkbox"/> PRESENT P/G R/R	<input type="checkbox"/> LIMESTONE [1]	<input type="checkbox"/> SILT	<input type="checkbox"/> HEAVY [-2]	Substrate <input type="text"/> Maximum 20
<input type="checkbox"/> BOULDER [9]	<input type="checkbox"/>	<input type="checkbox"/> DETRITUS [3]	<input type="checkbox"/>	<input type="checkbox"/> TILLS [1]	<input type="checkbox"/> T	<input type="checkbox"/> MODERATE [-1]	
<input type="checkbox"/> COBBLE [8]	<input type="checkbox"/>	<input type="checkbox"/> MUCK [2]	<input type="checkbox"/>	<input type="checkbox"/> WETLANDS [0]	<input type="checkbox"/> M	<input type="checkbox"/> NORMAL [0]	
<input type="checkbox"/> GRAVEL [7]	<input type="checkbox"/>	<input type="checkbox"/> SILT [2]	<input type="checkbox"/>	<input type="checkbox"/> HARDPAN [0]	<input type="checkbox"/> M	<input type="checkbox"/> FREE [1]	Substrate <input type="text"/> Maximum 20
<input type="checkbox"/> SAND [6]	<input type="checkbox"/>	<input type="checkbox"/> ARTIFICIAL [0]	<input type="checkbox"/>	<input type="checkbox"/> SANDSTONE [0]	<input type="checkbox"/> M	<input type="checkbox"/> EXTENSIVE [-2]	
<input type="checkbox"/> BEDROCK [5]	<input type="checkbox"/>	(Score natural substrates; ignore sludge from point-sources)		<input type="checkbox"/> RIP/RAP [0]	<input type="checkbox"/> M	<input type="checkbox"/> MODERATE [-1]	
NUMBER OF BEST TYPES: <input type="checkbox"/> 4 or more [2]				<input type="checkbox"/> LACUSTRINE [0]	<input type="checkbox"/> M	<input type="checkbox"/> NORMAL [0]	Substrate <input type="text"/> Maximum 20
<input type="checkbox"/> 3 or less [0]				<input type="checkbox"/> SHALE [-1]	<input type="checkbox"/> M	<input type="checkbox"/> NONE [1]	
				<input type="checkbox"/> COAL FINES [-2]	<input type="checkbox"/> M		

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.)

<input type="checkbox"/> UNDERCUT BANKS [1]	<input type="checkbox"/> POOLS >70cm [2]	<input type="checkbox"/> OXBOWS, BACKWATERS [1]	AMOUNT Check ONE (Or 2 & average) <input type="checkbox"/> EXTENSIVE > 75% [11] <input type="checkbox"/> MODERATE 25 - 75% [7] <input type="checkbox"/> SPARSE 5 - < 25% [3] <input type="checkbox"/> NEARLY ABSENT < 5% [1] Cover <input type="text"/> Maximum 20
<input type="checkbox"/> OVERHANGING VEGETATION [1]	<input type="checkbox"/> ROOTWADS [1]	<input type="checkbox"/> AQUATIC MACROPHYTES [1]	
<input type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> BOULDERS [1]	<input type="checkbox"/> LOGS OR WOODY DEBRIS [1]	
<input type="checkbox"/> ROOTMATS [1]			

Comments

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

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	Channel <input type="text"/> Maximum 20
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	
<input type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input type="checkbox"/> RECOVERED [4]	<input type="checkbox"/> MODERATE [2]	
<input type="checkbox"/> LOW [2]	<input type="checkbox"/> FAIR [3]	<input type="checkbox"/> RECOVERING [3]	<input type="checkbox"/> LOW [1]	
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		

Comments

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

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

Comments

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

MAXIMUM DEPTH	CHANNEL WIDTH	CURRENT VELOCITY	Recreation Potential
Check ONE (ONLY!)	Check ONE (Or 2 & average)	Check ALL that apply	(Check one and comment on back)
<input type="checkbox"/> > 1m [6]	<input type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> TORRENTIAL [-1]	<input type="checkbox"/> Primary Contact
<input type="checkbox"/> 0.7 - < 1m [4]	<input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input type="checkbox"/> VERY FAST [1]	<input type="checkbox"/> Secondary Contact
<input type="checkbox"/> 0.4 - < 0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE WIDTH [0]	<input type="checkbox"/> FAST [1]	Pool/ Current <input type="text"/> Maximum 12
<input type="checkbox"/> 0.2 - < 0.4m [1]		<input type="checkbox"/> MODERATE [1]	
<input type="checkbox"/> < 0.2m [0] [metric = 0]		<input type="checkbox"/> INTERSTITIAL [-1]	
		<input type="checkbox"/> INTERMITTENT [-2]	
		<input type="checkbox"/> EDDIES [1]	
		Indicate for reach – pools and riffles.	

Comments

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

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
<input type="checkbox"/> BEST AREAS > 10cm [2]	<input type="checkbox"/> MAXIMUM > 50cm [2]	<input type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]
<input type="checkbox"/> BEST AREAS 5 - 10cm [1]	<input type="checkbox"/> MAXIMUM < 50cm [1]	<input type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input type="checkbox"/> LOW [1]
<input type="checkbox"/> BEST AREAS < 5cm [metric = 0]		<input type="checkbox"/> UNSTABLE (e.g., Fine Gravel, Sand) [0]	<input type="checkbox"/> MODERATE [0]
			<input type="checkbox"/> EXTENSIVE [-1]
			Riffle/ Run <input type="text"/> Maximum 8

Comments

6] GRADIENT (ft/mi)	<input type="checkbox"/> VERY LOW - LOW [2-4]	% POOL: <input type="text"/>	% GLIDE: <input type="text"/>	Gradient <input type="text"/> Maximum 10
DRAINAGE AREA (mi ²)	<input type="checkbox"/> MODERATE [6 - 10]	% RUN: <input type="text"/>	% RIFFLE: <input type="text"/>	
	<input type="checkbox"/> HIGH - VERY HIGH [10 - 6]			

Entered _____ QC1 _____ QC2 _____

IDEM 02/01/2023

Appendix 4 –Biological Qualitative Habitat Evaluation Index (QHEI) (back)



OWQ Biological QHEI (Qualitative Habitat Evaluation Index)

COMMENT _____

A-CANOPY

- >85% - Open
- 55% - <85%
- 30% - <55%
- 10% - <30%
- <10% - Closed

B-AESTHETICS

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

C-RECREATION

- Area
- Depth
- Pool: > 100 ft² > 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 H₂O Tile H₂O 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	%	%	%	%
	X	X	X	

Stream Width (m):

Stream Drawing:

Appendix 5 – Original Photographic Image Chain of Custody Form

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF WATER QUALITY/ WATERSHED ASSESSMENT AND PLANNING BRANCH
Original Photographic Image Chain of Custody

CERTIFICATION: I certify that the following original photography images were taken by me or were later formally transferred to my custody and have been in my possession since that time. Date:	Print Name:	DOCUMENT RETENTION This document must be retained as future verification of authenticity of the following original photographic images.
	Signature:	

Site Identification Number, Subject of Photograph, Initials of Photographer)	Photo No.	Date & Time Taken	Photographer Name	Digital Storage Media (floppy, CD, etc)	Folder Name (for digital only)
Example: 17W001 LongnoseGar KRW	2	6/26/2017 16:00	KRW	Shared (\state.in.us\file1\IDEM) (S.)	S:\IGCM\OWQ\WSP\OWMB\Biological Studies\Measure W2017\Pictures

Previous Transfer Record: (if applicable)

Comments:

Transfer of Custody- I certify receipt of the above photographic images	Date	Time
Relinquished by:		
Received By:		
Relinquished by:		
Received By:		

Appendix 7 – Macroinvertebrate Hester-Dendy Sampling Load List (front)

Macroinvertebrate Hester-Dendy Sampling Load List

Macroinvertebrate Field Equipment:

14-plate square Hester-Dendy samplers *
4" standard concrete blocks *
Galvanized bailing wire *
8" cable ties *
Standard PVC sponge floats (3" x 1.5") *
Braided nylon seine twine (size 18) *
Survey marking paint *
Wire cutters
Pliers
Knife or shears
Heavy leather work gloves
Plastic tray or tote **
U.S. Standard No. 35 (500 micrometer) sieve **
Whirl-Pak bags (1650 ml, 55 oz.) **
1- and 2-gallon freezer bags **
1-gallon lab safety can of 95% Isopropyl Alcohol **
Forceps (2) **
Field notebook
Clipboard with paperwork/forms:
 Site Reconnaissance form
 Stream Sampling Field Data Sheet
 QHEI form
 Label paper
 Sample Chain of Custody form
 Photo Chain of Custody form
 First Report of Injury form
 Scientific Collectors Permit
Pencils and sharpener
Sharpies

Chemical/Physical Field Equipment:

Datasonde (with extra batteries)
DO Meter
Turbidimeter and vial
Temperature/pH probe
Safety glasses
Nitrile gloves
Densiometer
Field Cell Phone (with car charger)

GPS (with car charger and extra batteries)
Rangefinder
50 meter Tape Measure

Canoe/Boat Equipment:

Throw cushion and bag
Paddles
Rope
Carabiners (2)
Canoe
Canoe racks or foam blocks
Canoe tiedowns
Canoe lock (overnights only)
Boat box (with safety lanyard, flashlight, tools, etc.)
Boat motor gas (possibly 2-cycle oil)
Funnel
2 inch ball hitch
Padlock and key
Boat Pouch

Vehicle Equipment:

Eyewash bottles
Hand sanitizer
Mosquito repellent
Technu (poison ivy treatment)
First aid kit
Goggles
Fire extinguisher
Spare tire and jack
Jumper cables
Flashlight
Emergency roadside triangles
Square point shovel
Winch controller and anchor
Machete and sheath
Cable ties
Duct tape
Paper towels
Toolbox
Water cooler
Gazetteer
Vehicle Binder

Appendix 7 – Macroinvertebrate Hester-Dendy Sampling Load List (back)

Personal Equipment:

Waders and boots

PFD with whistle

Business cards

Water bottle

Hat

Change of clothes

Polarized sunglasses

* Required for Hester-Dendy deployment

** Required for Hester-Dendy retrieval

Appendix 8 – Field Notebook Examples

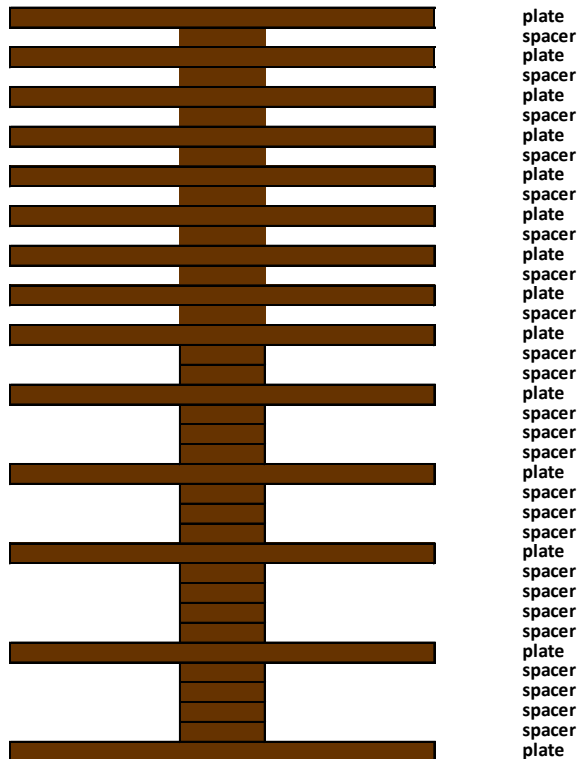
PROJECT		Continued From Page	
AB13672	Grand Calumet River, US of TN St. (USS Transect #6)	Lake Co.	
130923308	16:05; No ripple, 50m MHAB taken on right bank	Site 15	
AB	(Dup) Grand Calumet River, US of TN St. (USS Transect #6)	Lake Co.	
130923309	16:05; No ripple, 50m MHAB taken on right bank		
AB13695	Grand Calumet River, US of TN St. (USS Transect #6)	Lake Co.	
130923310		16:05	Site 15
AB	1st set of HDs taken from right bank		
130923311			
AB			
130923312	2nd set of HDs taken from left bank		
AB			
130923313			
AB			
130923314			
AB			
130923315			
AB13674	Grand Calumet Lagoons, West Basin - West End	Lake Co.	Site 17
130924301	10:50; No ripple, 50m MHAB taken on right (N) bank		
AB13697	Grand Calumet Lagoons, West Basin - West End,	Lake Co.	Site 17
130924302		10:50	
AB	1st set of HDs taken from right (N) bank		
130924303			
AB			
130924304	2nd set of HDs taken from left (S) - middle bank		
AB			
130924305			
AB			
130924306			
AB			
130924307			
AB13679	Grand Calumet Lagoons, West Basin - East End	Lake Co.	Site 18
130924308	14:35; No ripple, 50m MHAB taken on left (S) bank		

Continued on Page

Appendix 9 – Construction of Hester-Dendy Samplers

As originally described by Hester and Dendy (1962), the multi-plate sampler consists of eight 3-inch square plates and seven 1-inch square plates of 1/8 inch-thick tempered hardboard (“Masonite”) with a hole drilled through the center of each plate. The plates are alternately threaded onto an eyebolt and secured with two nuts and present an area of about 1 square foot for macroinvertebrate colonization (Hester and Dendy 1962). Various organizations have modified the shape of the plates (square vs. round), the number of plates and spacers used in each sampler, and the number of individual samplers that are grouped together in one location. IDEM uses a Hester-Dendy sampler that consists of 14-square plates with eight single spacers, one set of two spacers, two sets of three spacers, and two sets of four spacers. The plates used to construct the Hester-Dendy samplers may be reused multiple times but should be discarded if they break or begin fraying or are used in areas of high sediment contamination. Hester-Dendy samplers should be constructed in the office prior to travelling to the sampling site.

Figure 1. Illustration of IDEM Hester-Dendy sampler modification.



Hester-Dendy samplers are attached either to 8”x8”x16” or 4”x8”x16” concrete blocks used as anchors. The 4”x8”x16” blocks offer a lower profile and may be more appropriate in streams with increased water velocity while 8”x8”x16” blocks may be more useful in slower streams or where there may be concerns about silt or sand

accumulating around the samplers. Galvanized steel wire is strung through the openings and wrapped around the top of the concrete blocks several times to provide a secure anchor point for the Hester-Dendy samplers. The wire should be wrapped around the concrete blocks in the office prior to traveling to the sampling site.

Once the crew chief determines the location where the Hester-Dendy samplers will be deployed, three samplers are attached to the concrete block using two 8" cable ties strung through the eyebolt of each sampler and around the steel wire on the concrete block. Nylon ropes that are used for the floats or to attach the samplers to an anchor point on the shore should also be attached to the steel wire.