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Environmental Programs & Environmental Services

for **COLLECTION OF MACROINVERTEBRATES IN THE RIO GRANDE**

APPROVAL SIGNATURES:

Subject Matter Expert:	**Organization**	**Signature**	**Date**
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1.0 PURPOSE AND SCOPE

Local populations of aquatic macroinvertebrates (MIs) are indicator species of both good and bad quality water; they are indicators of overall aquatic conditions, quality of fisheries, chemical conditions, and associated riparian habitat. MI assemblages, quantified as “metrics” can provide an indicator of water quality within a stream system. Evaluation of the changes in the metrics over time may help in the evaluation of human-induced changes. Unlike fish, MIs cannot move around much so they are less able to escape the effects of sediment and other pollutants than diminish water quality.

The purpose of this procedure is to describe the process for the establishment, collection, and processing of MIs from artificial substrate samplers upstream and downstream of Los Alamos National Laboratory (LANL) in the Rio Grande. The reasons for choosing artificial substrates include the quantification of the sample, sample consistency from year to year, and ease of sampling in deep water.

This procedure applies to the individual(s) assigned to collect biota samples as part of the Soil, Foodstuffs and Biota (SFB) Monitoring Project, Environmental Surveillance Program.

2.0 BACKGROUND AND PRECAUTIONS

2.1 Background

This document establishes the basic requirements for establishing, collecting, and processing MI samples upstream and downstream of LANL in the Rio Grande—the main objective is to determine if there are any impacts to the Rio Grande from LANL operations. The identification of MIs within a sample is given to a well qualified analytical laboratory where taxa and individuals per taxa are analyzed. Work performed under this procedure by LANL personnel will occur only after required training to applicable documents has been completed and documented.

***This monitoring program is part of the Environmental Surveillance Program mandated by* DOE Order 450.1**.

Reference documents: “Macroinvertebrate Field and Laboratory Methods for Evaluating the Biological Integrity of Surface Waters,” EPA/600/4-90/030 and “Methods for Sampling Benthic Macroinvertebrates in Large Rivers,” National Biological Assessment and Criteria Workshop, EPA/LR101.

Macroinvertebrates—includes insects, oligochetes, leeches, molluska, crustaceans, and that are retained by the Standard No. 35 sieve (0.500 mm opening).

Samples are collected in the Rio Grande at three locations with respect to being upstream or downstream of Los Alamos National Laboratory:

- Upstream:
    1. Upstream of the Otowi Bridge to Black Mesa.
- Downstream:
    2. Downstream of the Los Alamos Canyon Confluence and,
    3. Downstream of the Chaquehui confluence near the south end of the LANL boundary.

2.2 Precautions

Individuals are required to be trained in the following prior to performing this procedure:

- First aid;
- Cardiopulmonary Resuscitation (CPR);

- General Field Safety for All Employees.
- All participants near the water must know how to swim.

A minimum of two (2) people is required to go out in the field. Do not perform work under conditions you consider unsafe. Before beginning work described in this procedure, review the hazards and safety controls in Attachment 1, Hazard Review for Macroinvertebrate Sampling.

3.0 EQUIPMENT AND TOOLS

• 15-6.5- × 11-in. stainless steel mesh cylindrical "barbeque" baskets filled with 30 2-3 in. diameter river rocks • 15- to 20-ft sections of Nylon rope • Three 5-gallon plastic buckets • Three soft scrubbing brushes • 80% ethanol • Paper towels • Chain-of-Custody (and sample description) forms • 15 t-posts and driver • 500-mL, wide-mouth poly bottles • Ice chest with ice • Full-length arm protection gloves • Funnels	• Ziplock™ bags (one- and two-gallon sizes) • Chest waders and belt • Safety glasses, hat • Three large (Turtox Bottom Kick) nets (9- × 18-in. and 0.500-mm sizes) • Three Standard No. 35 sieves (0.500 mm) • Depth measuring pole • Velocity meter • Conductivity meter • Dissolved oxygen meter • pH meter • Turbidity tube • First Aid kit, Snake-Bite kit • Water safety rope • Water safety life vests

4.0 STEP-BY-STEP PROCESS DESCRIPTION

4.1 Preparatory Activities

Field Team Leader	1.	Monitor the Rio Grande for water levels (depth and current). In general, artificial substrate samplers should be placed into the Rio Grande after the main monsoon floods that occur in July/August and the currents are no greater than 3 ft/s in the proposed sampling sites.
	2.	Since some artificial substrate samplers will be placed in the Rio Grande within the Pueblo of San Ildefonso lands, it is required that the FTL check in with the PSI Environmental Department at least <u>two weeks in advance</u> and let them know in writing about the sampling.
	3.	Conduct a hazard review in accordance with Attachment 1, Hazard Review for Macroinvertebrate Sampling.
	4.	Before leaving the field, check the condition of the vehicle and the fuel level.
	5.	Identify a Point-of-Contact to provide pertinent information of destination, expected time-in, and methods of notifying the field team.

	6.	When leaving Los Alamos County, notify the group office to place you on travel status.
	7.	Ensure you have a working cell phone.

4.2 Placing Samplers in the Rio Grande

Sampler	1.	All safety and health procedures should be in place and employed as per Attachment 1, Hazard Review for Macroinvertebrate Sampling.
	2.	At each of the three major sampling locations, locate five potential sites within the reach that contain similar habitats—slow moving waters (0.2 to 3ft/s), pools, sediment dominated bottoms, and snag debris (overhanging grasses, weeds, trees, logs, etc.).
	3.	At each site, insert a t-post at the two or three foot depth. Attach a rock basket to the t-post in a vertical position so that the bottom of the basket is about ½ of foot above the river bottom. (Note: If there are great fluctuations in water levels then a float attached to the rock basket and t-post with a ring may be employed.) Attach a safety rope to the t-post and tie to a tree branch or rebar inserted on shore. A LANL “Do not Disturb” sign should be fixed onto the t-post.
	4.	Fill in the sample location et al. data in Appendix 2 after week three. Take temperature, EC, DO, and turbidity readings according to the manufactures instructions directly upstream and at the same depth as the rock baskets.

4.3 Collecting and Processing Samplers from the Rio Grande

Sampler	1.	Allow the rock baskets to colonize for a period of six weeks (42 days). If at all possible, try to collect all of the samples within a two day period.
	2.	Upon retrieval, approach the rock basket(s) from downstream. Untie the tie wire holding the rock basket from the t-post. With one hand on the rock basket tie wire and the other hand holding a (Turtox) kick net, quickly lift and enclose the net around the rock basket and lift the basket out of the water. (Note: the basket is mostly supported by the person holding the basket rather than the net supporting the weight of the basket. The net is placed around the basket for the sole purpose of retaining any organisms that may fall from the basket during recovery).
	3.	Disassemble the rock basket and scrub each rock with a soft-bristle brush into a 5 gallon plastic bucket that is partially filled with water. Empty contents of the net into the bucket.
	4.	Pour the contents of the bucket through a Standard No. 35 (0.500 mm) sieve. Rinse bucket until clean. Remove all vegetation and small rocks from sieve. Wash the contents of the sieve into a labeled wide mouth 500 mL poly bottle with water and place bottle into a cooled ice chest. At the laboratory discard the water and fix with 80% ethanol. (Note: a large funnel may be used to help pour the contents of the sieve into the bottle).
	5.	After a 24-hour period, decant the old ethanol and replace with a fresh mixture.

4.4 Maintaining Custody of Samples

Sampler	1.	Document chain-of-custody for all samples used to demonstrate compliance.
	2.	Verify the possession and handling of samples is traceable at all times. [NOTE: A sample is considered in custody if it is one of the following: • In one's physical possession; • In one's view after being in one's physical possession; • In one's physical possession and then locked up so that no one can tamper with it; or • Kept in a secure area where access is restricted to authorized and accountable personnel only. A secured area is an area that is locked (e.g., a room, cooler, vehicle, or refrigerator).
	3.	If the area cannot be secured, use a custody seal to secure the area or the sample container.

4.5 Transferring Custody of Samples

Sampler	1.	Whenever samples are transferred into the custody of another person or organization, complete the "relinquished by/received by" and "date" sections of the form. [NOTE: These sections of the form must provide a complete history of custody of the samples from collection to transfer to the analytical laboratory.}
Analytical Laboratory	2.	Transfer samples with COC to the analytical laboratory for analysis. Requested analysis should include the identification of taxa (order, family, genus, and species) and number of individuals per taxa plus the following metrics: species richness, Shannon diversity, evenness, E richness, P richness, T richness, %EPT, % Tolerant species, Hilsenhoff's Biotic Index (HBI) (tolerance to organic pollution).

4.6 Broken Chain-of-Custody

FTL	1.	Whenever there is a break in the chain-of-custody of a sample, document the failure by initiating a deficiency report in accordance with ISD 322-4, *Issues and Corrective Action Management Process*.
	2.	Document the occurrence, evaluate the potential impact (if any) on the samples, and propose a fix to prevent recurrence.
	3.	If the area cannot be secured, use a custody seal to secure the area or the sample container.

4.7 Emergency Actions to Take in the Event of Control Failure

FTL	1.	Perform First Aid as appropriate. An injury could necessitate calling 911.
	2.	For all injuries, see that the injured person is taken to Occupational medicine (only if immediate medical attention is not required) or to the nearest hospital.
	3.	Notify the individual's supervisor and group office as soon as possible.

4.8 Records

FTL	1.	Submit the following records generated by this procedure to the Principal Investigator: • Completed Chain of Custody form. • Sample location information.
	2.	The records need to be submitted to the RPF in accordance with EP-DIR-SOP-4004, *Record Transmittal and Retrieval Process*.

5.0 ATTACHMENTS

Attachment 1 Hazard Review for Macroinvertebrate Sampling (Page 1)

Attachment 2 Physical Characterization/Water Quality Field Data Sheets (Page 1 & 2)

6.0 REVISION HISTORY

Revision No. *[Enter current revision number, beginning with Rev.0]*	Effective Date *[DCC inserts effective date for revision]*	Description of Changes *[List specific changes made since the previous revision]*	Type of Change *[Technical (T) or Editorial (E)]*
0	July 21, 2009	New Document	T/E

Click here for "Required Read" credit.

ATTACHMENT 1

SOP-5247,R.0

HAZARD REVIEW FOR MACROINVERTEBRATE SAMPLING (PAGE 1)

Records Use only

Work Tasks/Steps	Hazards, Concerns, and Potential Accidents; Likelihood/Severity	Controls, Preventive Measures (e.g., safety equipment, administrative controls, etc.)	Hazard Level (from IMP 300-00-00, Hazard Grading Matrix)
Preparatory Activities • Travel to sampling sites in the field.	Vehicular traffic Various field and outdoor hazards such as seasonal heat and cold extremes, wind, sun exposure, lighting, insects, reptiles, slips, falls, brush.	At least two persons should be involved in all field trips. Train to "General Field Safety for all Employees". Wear Seat belts and obey all traffic signs. Communication equipment required. Wear PPE: eye protection, toe protection, long pants, long-sleeve shirt, sun and insect protection. A snake bite kit should be carried on all field trips.	Low
• Monitoring river flows and collecting river data	Falling into river from bank.	Two man rule. Know how to swim. Use safety pole. Wear PPE. If contact is made with river water, immediately wash with soap and water or wipe with ethyl alcohol wipes.	
Placing Samplers in the Rio Grande	Inserting t-posts and handling heavy rock baskets	Use proper lifting techniques and steel toe shoes to and from locations. Careful footing should be observed. (Use t-post in the river as tool to avoid slipping)	Low
	River water exposure (human sewage wastes, pathogens, toxic pollutants)	Wear full length arm gloves when placing samplers into river. Avoid splashing. Immediately wash with soap and clean water or with ethyl alcohol wipes if exposed to river water. Tetanus, hepatitis, typhoid fever, and polio immunizations must be up to date.	
	Broken glass or barbed wire in river bottom	Do not venture into the water without foot protection. Carry first aid kit into field.	
	Falling in River	Two man rule. All field personnel should know how to swim. Chest waders should always be worn with a belt to prevent them from filling with water in case of a fall. A life jacket at dangerous wading stations is advisable because of the possibility of sliding into deep holes. Don't venture deeper than three feet and attach safety rope to waist.	

ATTACHMENT 1	
SOP-5247,R.0 (cont'd) **HAZARD REVIEW FOR MACROINVERTEBRATE SAMPLING**	Records Use only

Collecting and Processing Samplers from the Rio Grande	Handling heavy rock baskets	Use proper lifting techniques and steel toe shoes to and from locations.	Low
	River water exposure (human sewage wastes, pathogens, toxic pollutants)	Wear full length arm gloves when retrieving and processing samplers. Avoid splashing. Immediately wash with soap and clean water or with ethyl alcohol wipes if exposed to river water. Tetanus, hepatitis, typhoid fever, and polio shots must be up to date.	
	Broken glass or barbed wire in river bottom	Always wear foot protection in water. Carry first aid kit into field.	
	Falling in River	Two man rule. All field personnel should know how to swim. Chest waders should always be worn with a belt to prevent them from filling with water in case of a fall. A life jacket at dangerous wading stations is advisable because of the possibility of sliding into deep holes. Don't venture deeper than three feet and attach safety rope to waist.	
	Chemical exposure to ethanol	Wear chemical resistant gloves when processing samples.	

Wastes or Residual Materials

None generated.

Emergency Actions to Take in Event of Control Failure

For all injuries, provide first aid and see that injured person is taken to Occupational Medicine (only if immediate medical attention is not required) or the nearest hospital. Notify supervisor and group office as soon as possible.

ATTACHMENT 2	
SOP-5247, R0 **PHYSICAL CHARACTERIZATION / WATER QUALITY FIELD DATA SHEETS**	Records Use only
REFERENCE: RAPID BIOASSESSMENT PROTOCOLS FOR USE IN STREAMS AND WADEABLE RIVERS EPA 841-B-99-002	

STREAM NAME: RIO GRANDE	DATE AND TIME:
LOCATION (Circle one): Upstream Reach (PSI), Downstream Reach (Los Alamos Canyon) OR (Chaquehui Canyon)	
SITE NUMBER (Circle one) (1 most upstream, 2, 3, 4, 5 most downstream) and GPS coordinates: Y (Northing) =	X (Easting) =
PRINCIPAL INVESTIGATORS: Philip Fresquez, WES-EDA	
FORM COMPLETED BY (Circle one): Louie Naranjo, Rhonda Robinson, Sherri Sherwoods Other(s) (Name):	
WEATHER CONDITIONS:	
SITE LOCATION MAP	

ATTACHMENT 2	
SOP-5247,R.0 (cont'd) **PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEETS**	Records Use only Los Alamos NATIONAL LABORATORY EST.1943

WATERSHED FEATURES	
RIPARIAN VEGETATION	
SEDIMENT/SUBSTRATE	
WATER QUALITY	Temperature °C Conductivity Dissolved Oxygen pH Turbidity (Suspended sediment) Current Velocity