APPENDIX H

STANDARD OPERATING PROCEDURES (SOP) FOR SAMPLE COLLECTION

FIELD STANDARD OPERATING PROCEDURES (FOR CLEAR CREEK TMDL PROJECT)

AT EACH STATION:

A. Record (in the field book):

1. The station location and Station ID
2. The date
3. The time the measurements are initiated and ended
4. Depth at which samples are obtained
5. The name(s) of the person(s) measuring the flow
6. The name(s) of the person(s) collecting samples
7. The total stream width
8. The maximum stream depth
9. Water appearance (For example: clear, turbid, etc.)
10. Weather (Including the number of days since rain event)
11. Biological activity (For example: algal growth, birds, fish, etc)
12. Unusual odors
13. Watershed or instream activity (For example: nearby construction, cattle, etc)

B. Collect water sample for bacteria analysis (following the procedure shown below). Note: Water samples must be collected before any other work is done at a site.
C. Collect water samples for TSS and TOC analyses.
D. Record Dissolved Oxygen, pH, Turbidity, and Conductivity using the YSI probe.
E. Test orthophosphorous concentration of the water (following the procedure shown below).
F. Test ammonia concentration of the water (following the procedure shown below).
G. Collect sediment sample for bacteria analysis (following the procedure shown below).
H. Collect sediment samples for TOC, VSS, and Total Solids analyses.
I. Take flow measurements (following one of the procedures shown below).

PROCEDURES:

B. COLLECTION OF WATER SAMPLE (AMBIENT) FOR BACTERIA ANALYSIS:

1. Label whirl-pak bags with the site/station number (Note - If collecting sample from stream and there is no WWTP discharging into the immediate area, remove thiosulfate pill from the whirl-pak bag).
2. Collect the sample of water with a sterile container at the centroid of the stream (midpoint of the portion of the stream width that contains 50 percent of the total flow).

Try to take the sample upstream of any adjacent bridge and do not collect the sample from the bank unless this is the only option without risking health or safety. Collect the sample at a depth of 0.3 m (1ft), or, for shallow streams, at roughly half the depth. Record the depth at which the sample was collected.

3. Pour the water from the sterile container into each of three whirl-pak bags. Avoid splashing the water or creating bubbles.
4. Place the whirl-pak bags into an ice chest with plenty of ice to keep the samples cool. Analyze the samples following the **IDEXX *E. Coli*/Enterococci Analysis SOP** (Note - analysis must begin within 6 to 7 hours and must be completed within 8 hours of sample collection (TCEQ Surface Water Quality Manual)).

C. COLLECTION OF SAMPLES FOR TOC/TSS ANALYSES:

(This will be determined from the specifications of the labs to which samples will be sent)

D. RECORD DISSOLVED OXYGEN, pH, TURBIDITY, AND CONDUCTIVITY:

1. Place the calibrated YSI into the stream ensuring that each of the probes is submerged (Note – YSI must be calibrated in the lab previous to measurement; the calibration process is detailed in a separate SOP calibration guide).
2. Record each of the parameters (dissolved oxygen, pH, turbidity, and conductivity) in the field log book.

E. MEASUREMENT OF ORTHOPHOSPHOROUS CONC. IN THE FIELD:

3. Collect sample of water using sterile bucket (if possible, use the same water that was collected for the bacteria analysis).
4. From the sample of water, remove 5mL and filter into orthophosphorous hach test tube.
5. Set the HACH to program 82 (to measure phosphorous concentration).
6. Blank the HACH unit.
7. Add phosphorous reagent and start HACH unit timer (2 minutes).
8. Measure the phosphorous concentration. If the phosphorous concentration is above the maximum detection limit, perform these steps again with a diluted sample: add 2.5mL of sample and 2.5mL of DI water to the test tube (or 1 to 4mL if the concentration is believed to be above the limit for a 1:2 dilution).

F. MEASUREMENT OF AMMONIA CONCENTRATIONS IN THE FIELD:

1. Collect sample of water using sterile bucket (if possible, use the same water sample that was collected for the bacteria analysis).
2. Use a sterile syringe to obtain 2mL of water and inject into an ammonia test tube.
3. Create a blank tube by adding 2mL of distilled water to a 2nd Ammonia test tube.
4. Set the HACH unit to program 66 (to measure ammonia concentration). Add two types of reagent (Cyanurate and Salicylate) to the sample and blank test tubes and set a timer for 20 minutes.
5. After 20 minutes, blank the HACH unit using the preprated blank test tube and then measure the sample ammonia concentration. Repeat with a diluted sample (Ammonia and DI water) if the sample is above the maximum detection limit.

G. COLLECTION OF SEDIMENT SAMPLE FOR BACTERIA ANALYSIS:

1. Identify locations from which to sample. The samples will be collected as a composite of sediment from just below the edges of the water surface along each bank.
2. Collect the sediment from the bank with a sterile trowel paying careful attention to reduce disturbance of fine sediments as much as possible.
3. When necessary, collect the sediments located at the midpoint of the stream using sterilized PVC pipe:
    a. Choose the size and diameter pipe that best fits the type of sediment and the depth of the stream at the location. Note - use pipe with smaller diameter for sandy sediment types since these sediments are more difficult to retain in the pipe; use larger diameter to obtain sample that will be more difficult to remove from the pipe – usually clays and sediments. In addition, shorter pipes are easier to manipulate in shallow streams while longer pipes will often need to be used when sampling in deeper waters or from bridges.
    b. Push the pipe at a 45 degree or smaller angle with the horizon several inches (preferably 3 to 4 inches) into the sediment. Bacterial concentrations in the sediment decrease with depth and the best representations of bacteria loads to water from the sediment are found at the sediment and water interface.
    c. Cover the end that is facing upward with a stopper or by hand.
    d. Remove the PVC pipe from the sediment checking to make sure that sediment has been lodged and remains in the pipe.
    e. Remove the sediment from the pipe by releasing the stopper, removing your hand, or with a spatula or similar device and place into sterile wide mouth glass container.
    Note: the PVC pipes will be sterilized after use in the field or in the lab by removing excess sediment with water and a pipe cleaner and then sequentially dipping into bleach-water and then sodium thiosulfate solutions.
4. Collect sediment from roughly the midpoint of the bank and the stream midpoint using either the PVC pipe or a spatula/trowel.

5. Place the sediment collected from each source into a bucket and into a labeled wide mouth glass container (or, if possible, directly into the wide mouth container). Place a comparable amount of sediment from each of the sources into the wide mouth glass container, as these will be composite samples. Mix the samples thoroughly before distribution into any containers.
6. Place glass container into the ice chest to keep cool.
7. Analyze the sediment for bacteria (analysis must begin within 8 hours of sample collection) following the guidelines for the lab standard operating procedures.

H. COLLECTION OF SEDIMENT FOR TOC/VSS/TOTAL SOLIDS ANALYSES

1. Collect one glass bottle of water for TOC analysis and add sulfuric acid for preservation (28 day holding time).
2. Collect one plastic bottle of water for TSS analysis (7 day holding time).
3. Collect one plastic bottle half full with sediment for Volatile Solids and % Moisture Analysis (7 day holding time).

I. FLOW MEASUREMENT:

Check to see if Marsh McBirney can be used. This requires the ability to set up the velocity measurement device from a bridge above the site or have a person enter the stream and station the device

If Marsh McBirney can be used from bridge:

1. Measure the stream width from waters edge to waters edge.
2. Refer to "Procedure for Interval Calculation" (shown below in Note 1) to calculate the number of intervals at which the velocity must be measured. The measurements will be made at the midpoints of each interval (i.e. for 0.5 foot intervals the first measurement will be made at 0.25 feet from the bank, the second will be made at 0.75 feet, third at 1.25, etc.).
3. Set up the Marsh McBirney measurement device on the bridge. Attach the sensor to the bullet and the crank to the support.
4. Lower the bullet until the bullet hits the top of the stream and record the distance reading shown on the crank dial.
5. Lower the bullet until the bullet hits the stream bottom and record the distance reading shown on the dial.
6. Calculate the number of reading that are required by using the "Procedure for Depth Interval Calculation" (shown below in Note 2).
7. Record the velocity values for each of the depths allowing the gauge to stabilize (allow a minimum period of 20 seconds before taking the measurement) once it is adjusted to each

new position. Record the locations (depth and horizontal distance from bank) of each of the measurements

8. Move the Marsh McBirney sensor to the next horizontal location.
9. Repeat these steps at each horizontal location: At each horizontal location repeat the "Procedure for Depth Interval Calculation" (shown below) to determine the number of required depth readings. Record the velocity value after the gauge stabilizes (allow a minimum period of 20 seconds before taking the measurement). Record the locations (depth and horizontal distance from bank) of each of the measurements.

If Marsh McBirney must be deployed on foot:

1. Measure the stream width.
2. Attach the Marsh McBirney device to the rod.
3. Refer to Note 1 to calculate the number of intervals at which the velocity must be measured. The measurements will be made at the midpoints of each interval (i.e. for 0.5 foot intervals the first measurement will be made at 0.25 feet from the bank, the second will be made at 0.75 feet, third at 1.25, etc.).
4. At each horizontal location determine the number of readings that need to be taken (refer to Note 2, below).
5. Take measurements while standing a minimum of 1.5 feet downstream or to the side of the velocity sensor. Face the sensor perpendicular to the cross section that has been measured (rather than parallel to the direction of flow).
6. Record the velocity value after the gauge stabilizes (all of the black bars on the display have had a chance to display (they will then reset)) and record the locations (depth and horizontal distance from bank) of each of the measurements.

Note1: Procedure for Width Interval Calculation: If the stream width is:
0 to 5 ft – Take readings along the width at 0.5 foot intervals
5 to 10 ft – Take readings at a minimum of 10 locations
10 to 20 ft – Split the stream width so that 20 to 30 locations are recorded.
Use intervals of equal length unless obstruction prevents an accurate reading.

Note 2: Procedure for Depth Interval Calculation: If the stream depth is:
Less than 2.5ft – Take one reading at 60% of the elevation
Greater than 2.5 ft – Take two readings at each width interval at 20% and 80% of the elevation

To use RiverCat:

1. Set up the equipment and the computer program.
2. Attach the RiverCat to the kayak.
3. Perform calibration procedure.

4. Start the computer program, wait at the starting point for 10 seconds (try to keep the RiverCat as still as possible), and row slowly across the creek in a straight line perpendicular to the direction of flow. Once the RiverCat is unable to take additional measurements (because of depth requirements), stop, remain stable for 10 seconds and stop the computer program.
5. Return to the original bank following the procedure outlined in step 4.
6. Repeat steps 4 and 5 to collect two to three complete cross sections (from bank to opposite bank back to original bank).