STEEL BRIDGE STRUCTURE
PAINT-PREP WASHING
PROTOCOLS FOR NPDES PERMIT WA-0039039
(OCTOBER, 2010)

Cleaning of steel bridge structures in Washington State is done to allow for routine visual inspection, maintain structural integrity, and to prepare for painting. Washing and cleaning in preparation for painting is typically completed by contractors, while maintenance washing and cleaning of steel bridge structures is performed by WSDOT crews. The permit only allows paint preparatory washing above the OHWM. This protocol is specific to washing and cleaning of steel bridge structures in preparation for painting.

The water generated during the washing process that comes into contact with paint and accumulated debris (dirt, moss, sediments, bird nests and associated fecal material, marine growth, etc.) on the structures can pick up contaminants that have the potential to affect the quality of receiving waters. WSDOT's NPDES Waste Discharge Permit (#0039039) stipulates that this water discharged (wash water) from paint prep washing (high pressure, low volume) must be tested to evaluate whether the discharge of wash water represents a reasonable potential to exceed water quality standards. The permit requires that this testing be done on one bridge or transfer span each year.

The steel bridge structure to be monitored is selected by WSDOT's Bridge Preservation Office. This office should submit a list of proposed monitoring projects to WSDOT's Environmental Services Office (ESO) at the beginning of each year. The ESO will add any planned monitoring or special studies and forward the list to the Department of Ecology (Ecology) per condition S3.B of the NPDES permit. The list must be submitted at least 30 days before projects are expected to begin.

STEEL BRIDGE STRUCTURES PREPARATORY WASHING

The basic procedure to re-paint a steel bridge is to select a section of the structure and:

- Install a filter tarp underneath the area to be cleaned and painted,
- Use dry cleaning methods to remove debris and paint chips,
- Wash transfer span structures with high pressure-low volume water during the maximum daily tidal flow,
- On occasions sandblasting may be performed to remove additional rust and requires full containment. The structure them may be washed to remove blasting dust.
- Apply primer and paint.

Once completed, the tarp is moved to a different section of the steel bridge structure and the procedure is repeated. Wash water is generated when the steel bridge structure is pressure washed after the dry cleaning. Wash water falls on and filters through the tarp, eventually discharging to the area under the steel bridge structure. As will be described below, the samples

finally collected will be used to characterize this filtered discharge water resulting from the cleaning process.

The amount of time to clean and paint each section is mainly a function of the size of the area that is being worked on. However, pressure washing a section of a steel bridge structure typically is completed in a single day. Therefore, this sampling protocol is designed to be completed in one day (or night).

The methods used to collect samples of wash water will be somewhat specific to the steel bridge structure being cleaned in preparation for painting. The basic procedure is to collect samples from three different locations under the filter tarp.

Wash water will usually discharge in a single stream through low or depressed areas in the filter tarp under the section of steel bridge structure being cleaned. It is in these areas where wash water will be collected. It is recommended that the sample container used has a large opening (e.g., a five-gallon bucket) for ease of sample collection, and that the sampling areas are located under areas of the section of bridge likely to be pressure washed with a significant amount of water. Water from the sample containers will be used to fill sample bottles.

One potential difficulty related to this sampling method is that a boat or temporary work platform may be necessary to collect samples of wash water and/or grab samples of the receiving water. If a boat or work platform is needed, additional project coordination will be necessary. For instance, if a boat is used, additional logistics such as procuring a boat, finding a place to launch it, navigating the boat to the desired location, and securing the boat in one spot long enough to collect a composite sample will have to be considered.

The grab samples of receiving water can be collected directly from the receiving water using a "dip-and-take" method (see Sample Collection Section below) from the bridge or from a boat. If using a motorized boat, care should be taken that the sample is not collected down current of the boat motor.

Grab samples of the receiving water (background) should also be collected 100 to 200 feet "up current" of the project area to assess for background concentrations. Care should be taken not take background samples in areas where there are discharges from culverts or drains as these areas may have high concentrations of metals. If taking the sample 'up current" is not possible, the sample may be taken off to the sides of where the structure was painted as long as this location is outside the area of influence from washing activities. The location where the background sample is collected should be documented and included in the report.

The labeled sample bottles should be delivered to an accredited laboratory for analysis.

The wash water composite samples will be analyzed for total and dissolved copper, lead, and zinc. One composite sample of the wash water from preparatory washing will also be analyzed for acute toxicity to zooplankton (*Ceriodaphnia dubia, Daphnia pulex,* or *Daphnia magna*) and to Fathead minnow (*Pimephales promelas*).

FIELD PREPARATION

It is critical to coordinate with the lab that will perform the testing to insure the amount of volume required is collected and whether or not the samples need to be preserved or filtered in the field.

- Order supplies from laboratory. The order should include (assumes three sample locations under the filter tarp, one from the receiving water, and one extra bottle for backup/field duplicate):
  - Five (5) - 500 ml bottles preserved with HNO_3 (preservative only necessary if lab requires for testing).
  - Five (5) – 500 ml bottles preserved with H_2SO_4 (preservative only necessary of lab requires for testing).
  - Five (5) - 500 ml bottles without any preservative.
  - One (1) – 10 L (2.5 gallon) container.
  - Labels for bottles
  - Chain of custody form.
  - Dilute (10%) HCl in a squirt bottle for container washing.
  - Deionized distilled water in a squirt bottle for container rinsing.
  - Filtering system, if lab requires certain samples filtered in the field.

- Collect the following equipment:
  - Four (4) cleaned five-gallon buckets with lids and handles
  - Field notebook and monitoring form (See attached example)
  - Camera
  - Sharpie/pencils
  - Pre-labeled sample bottles
  - Small funnel for filling containers and sample bottles
  - Three (3) large cooler(s) with ice
  - Bubble wrap
  - Safety equipment (gloves, goggles, reflective raingear, hardhat, earplugs, work boots, flashlight, personal flotation device if applicable)

- Put on safety goggle and gloves, and rinse sample buckets with a 10% HCl solution and then rinse with deionized water, and cover with plastic lids to prevent contamination. (Note: Use new buckets or clean and scrub the buckets with soap and hot water before rinsing with 10% HCl solution). The rinsate may be disposed of in a sink.
- Sample bottles should be organized and labeled (for example, Lewis and Clark Bridge, Site #1, date, analytes). Sample bottles should also be labeled as to the timing and location of the sample.
- Call the contracted laboratory and coordinate sample pick-up or delivery. Samples should be received by the laboratory within 36 hours of collection.

Sample Collection

The following procedure should be implemented during steel bridge structure paint prep activities:

- Select three sampling locations under the filter tarp along the section of the steel bridge structure being pressure washed. They should be in areas likely to receive a significant amount of wash water (e.g. directly under vertical support structures or in areas with heavy buildup of debris), and where water would be expected to flow through the tarp (e.g., "low" spots where water will collect and flow through). Depending on where pressure washing is being conducted, it may be necessary to use a boat or temporary work platform to collect samples.
- Use a bucket to collect discharge under the filter tarp. This is done by placing or holding the bucket under the discharge stream. Once the bucket is approximately ¾ full, use a funnel to fill a 10-L pre-labeled container. This water will be analyzed for acute toxicity to waterfleas (Daphnia) and Fathead minnows, and should be place on ice (i.e., maintained at 4°C) immediately after collection. If necessary, fill the bucket again with effluent discharge to for filling the sample bottles to test for the other analytes.
- Use buckets to collect discharge from two additional locations of the preparatory washing activity and follow the process outlined above.
- Collect a grab sample from the receiving water from an "up current" location. Select a location 100 to 200 feet "up current" of the steel bridge structure, and away from the shoreline where any culverts or outfalls may be located for collecting samples from the receiving water. The sample should be taken on the same day that the wash water collection is being performed.
- If a boat is used or the receiving water is "wadeable", use a "dip-and-take" method to directly fill each sample bottle. Using this method, simply submerge the sample bottle below the surface of the water until the bottle is full. Place lid on bucket to prevent contamination. If in a boat with a motor, do not collect your sample downstream of the motor.
- Complete all fields on chain of custody.

Sample Preparation

Verify with the lab performing the analysis the actual quantities of effluent needed to perform each of the tests. Also verify whether any samples need to be filtered in the field, or placed in containers with preservatives. These requirements are typically dependent on how long it will take to deliver the samples to the lab for processing.

The following procedures can be completed on-site or at a more convenient location (Note: The 10-L container for toxicity testing has already been filled on-site, placed in a cooler with ice, and simply needs to be shipped to the laboratory with the rest of the samples once they are prepared unless you are using different laboratories for metals analysis and toxicity testing):

- Select the 1st sample bucket collected from the wash water (after passing through the #100 sieve tarp) and swirl gently to ensure sample is well-mixed

- Using a small funnel, carefully pour water from the bucket into the sample bottles. Fill to approximately the "shoulder" of the sample bottle. Fill pre-labeled sample bottles as follows:
    1. One (1) 500 ml bottle with no preservative (for dissolved copper, lead, and zinc)
    2. One (1) 500 ml bottle preserved with HNO_3, if required by lab for total copper, lead, and zinc.
    3. One (1) 500 ml bottle preserved with H_2SO_4, for hardness. Verify with the lab is sample needs to be preserved with H_2SO_4. .
- Repeat above steps for the remaining samples, including water collected from the receiving water at a location 100' to 200' from the painting location.
- An additional set of sample bottles are filled from one of the composite samples. These will serve as a field duplicates.
- Wrap samples in bubble wrap and place in cooler(s) with ice (i.e., maintained at 4°C).
- Fill out a chain-of-custody form (see example attached to this appendix)
- Ship or deliver cooler(s) with 10-L container and sample bottles to the laboratory. Include chain-of-custody form with cooler(s). Select appropriate shipping option to ensure that the cooler(s) arrive at the laboratory no later than 36 hours after sample collection (see Laboratory Procedures below)

Laboratory Procedures for All Testing

Analytical parameters and methods, detection limits, preservation methods, and holding times for samples collected during monitoring are summarized in Table 1. The laboratory selected must be registered or accredited under the provisions of, Accreditation of Environmental Laboratories, Chapter 173-50 WAC. Any toxicity testing will be done in accordance with Ecology's Publication no. WA-R-95-80 (Revised December 2008) *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*, also known as Ecology's WET testing. The laboratory will also be responsible for internal QA checks.

TABLE 1. PARAMETERS AND SAMPLE ANALYTICAL METHODS.

Parameter	Method Type	Method Number	Detection Limit(1)	Holding Time
Hardness (Freshwater only) Wash water	Color/auto or Titr/EDTA	EPA 130.1 or 130.2	2 mg/L	6 months
Total and Dissolved Copper Wash Water & Receiving Water	ICP/Mass Spectrometry	200.8(3)	0.4 µg/L	6 months
Total and Dissolved Lead Wash water & Receiving Water			0.1 µg/L	
Total and Dissolved Zinc Wash Water & Receiving Water			0.5 µg/L	

Acute Toxicity – Freshwater *Ceriodaphnia dubia, Daphnia pulex,* or *Daphnia magna* Wash Water	48-hour static test	EPA 821-R-02-012& Ecology WET Test(5)	Not applicable	36 hours
Acute Toxicity – Freshwater *Pimephales promelas* Wash Water	96-hour static-renewal test	EPA 821-R-02-012& Ecology WET Test(5)		

(1) mg/L = milligrams/liter
μg/L = micrograms/liter

(2) APHA Standard Methods, 1992.

(3) U.S. Environmental Protection Agency (EPA) Publication EPA/600/R-94-111.

(4) *Menidia beryllina* may be used in lieu of *Americamysis bahia* with written permission from Ecology.

(5) Ecology's Publication no. WA-R-95-80 (Revised December 2008) *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*

Final Report for All Sampling Projects

Submit monitoring report, including test results, to the Statewide Permit Coordinator at ESO upon completion of the monitoring effort. The Statewide Permit Coordinator will be responsible for submitting the report to the Department of Ecology.

Reports for preparatory washing shall include the applicable items listed in the NPDES permit under Section S2.A.1 & 2 which include:

- The date, including year, and time of day samples were collected
- The location where sample was collected (both effluent and background samples)
- The total volume of water discharged to surface waters, reported in gallons
- The number of hours spent actually washing the structure
- The specific detection limits provided to the lab for analysis (provided in table above)
- Copies of any field notes

The attached monitoring forms can be used in the field to insure all the necessary information is collected and documented.

Consider For All Reports:

Include an aerial photograph showing the location of the bridge, painting locations, and sampling locations if at all possible. Consider taking photographs of the work area, BMPs used including sieve tarp or full containment system, preparatory washing being performed, monitoring being performed, etc. These photographs are very beneficial when included in the report and will provide Ecology and ESO with a clear understanding of the work/monitoring performed under this permit.