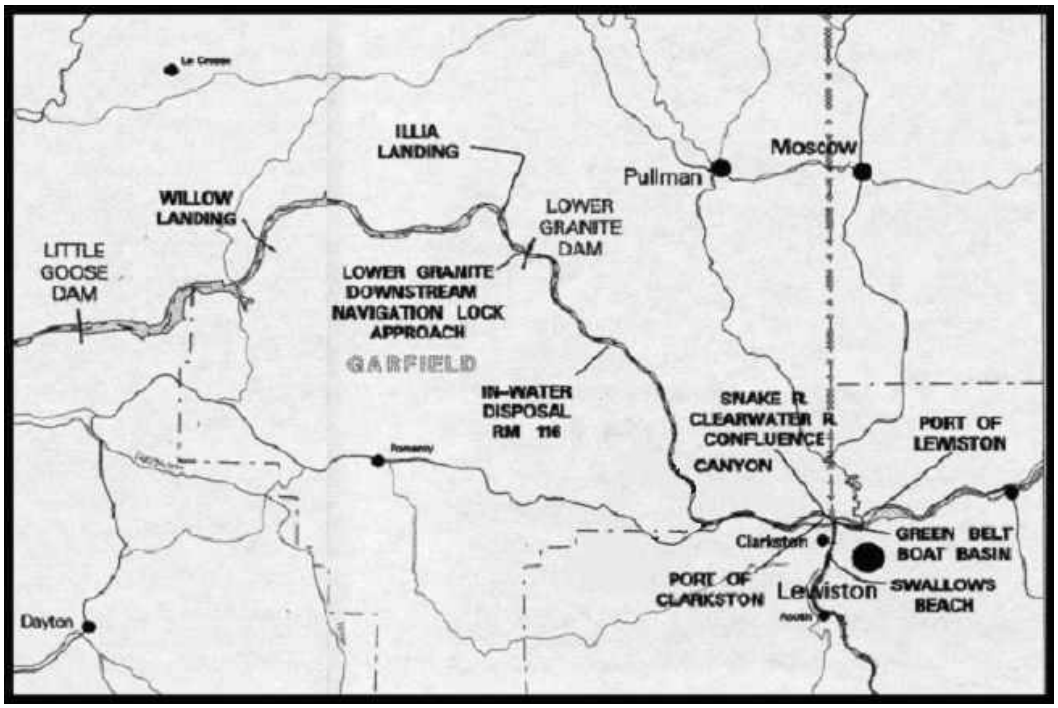
US Army Corps
of Engineers®

Lower Snake River and Clearwater River Winter 2004-2005 Maintenance Dredging

Monitoring Plan



Walla Walla District

December 2003

Winter 2004-2005 Maintenance Dredging

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1. INTRODUCTION

The Walla Walla District Corps of Engineers (Corps) intends to perform routine maintenance dredging and dredged material disposal at various locations in the lower Snake River and lower Clearwater River in Washington and Idaho. The Corps proposes to perform these activities in 2004-2005. The Corps would perform these activities during the winter in-water work window, which is currently identified as December 15 through March 1. The purpose of the dredging is to restore the authorized depth of the navigation channel, remove sediment from port areas, and provide for public use areas. Dredging would occur in the federal navigation channel at the confluence of the Snake and Clearwater Rivers, at the downstream approach to the Lower Monumental Dam and Lower Granite Dam navigation locks, at Port of Clarkston and Port of Lewiston facilities, at Willow Landing and Illia Landing boat basins in Little Goose reservoir, and at Greenbelt Boat Basin, Swallows boat basin, and Swallows Park swim beach in Lower Granite reservoir. Disposal would be in-water immediately upstream of Knoxway Canyon at RM 116. The material would be used to create a planting bench for woody riparian habitat, and shallow water and mid-depth rearing habitat for juvenile salmonid fish.

The monitoring plan for the winter maintenance dredging addresses the impacts of the dredging and disposal on water quality and on fish use (salmonids in particular) of the work areas, and determine physical stability or potential movement of the disposed material.

2. PURPOSE

The purpose of the monitoring of the dredging and disposal is to:

a. address issues related to the Endangered Species Act (ESA) consultation

b. comply with the terms and conditions of the Clean Water Act Section 401 Water Quality Certification

c. gather information for adaptive management in planning future dredging and disposal activities, and for mainstem habitat-related activities.

3. MONITORING

a. Pre-dredging

1) Redd Surveys

Redd surveys will be performed prior to dredging to determine if any fall chinook spawning has occurred in the navigation lock approaches and identify the location of the redds. The navigation lock approaches at the lower Snake River dams are periodically dredged to remove cobbles and gravels that tend to fill the navigation

channel at these locations. Threatened Snake River fall chinook salmon are known to spawn in the mainstem river using this type of substrate when other appropriate conditions are available (e.g. hyporheic flow and/or moderate water velocities). Although water velocities are typically not suitable for fall chinook spawning at the navigation lock approaches, there is the potential for these fish to build redds within the proposed dredging area. Dredging at these locations would in turn have the potential to disturb and/or harm eggs and alevins in those redds.

In an effort to avoid disturbing or harming fall chinook redds, underwater surveys of the proposed dredging sites at the navigation locks will be conducted prior to commencing dredging. For the maintenance dredging, these locations include the approaches to the locks at Lower Monumental and Lower Granite Dams. Techniques similar to those used by Battelle from 1995-1998 (Dauble 1998) will be employed. This technique used a combination of a boat mounted with an underwater camera system to look at the bottom of the river to identify redds. A search pattern was conducted in the area of interest using a systematic tracking method employing a Global Positioning System (GPS) to determine both location of the redds on the river bottom but also the position of the boat as it navigated through its search pattern.

2) Rearing Habitat Surveys

The Corps has conducted pre-dredging surveys of planned dredging and disposal sites to determine their potential usage as rearing habitat by fall Chinook. The Corps has funded multiple years of studies to determine the efficacy of in-water disposal of dredged material for creating juvenile fall Chinook resting and rearing habitat in the lower Snake River reservoirs. The results of this research showed that properly placed sand could be used to create rearing habitat with good results. These newly built shallow water areas were found to be more productive for insects, were used regularly by rearing fall chinook, minimized the presence of predators at that site, and in general made the reservoir environment more hospitable for the chinook using it.

The Corps has continued to focus on evaluating the effects of creating in-water habitat for juvenile fall Chinook. About 12 sampling sites were examined in 2002 and 2003 within Lower Granite Reservoir, primarily distributed among the areas of the Port of Wilma, Chief Timothy Habitat Management Unit (HMU), Knoxway Canyon, and Centennial Island. In addition, four backwater areas, composed of Illia landing and Willow landing in Little Goose Pool and Swallows Swim beach and Greenbelt Boat Basin in Lower Granite Reservoir were sampled.

Centennial Island was created using dredged material and was essentially the test site for much of the research regarding building habitat in the reservoir. One principle goal of the current habitat surveys is to determine the long-term biological integrity of the Centennial Island dredged material disposal site and if benefits to migrating and rearing salmonids persist 10 years after establishing the habitat. Chief Timothy HMU and Knoxway Canyon are currently being examined as disposal sites. The plan at Chief Timothy is to develop riparian habitat in a shallow water area at some time in the future,

but not as part of the 2004-2005 maintenance activities. The plan at Knoxway is to build up a riparian habitat planting bench and a shallow water sand substrate resting/rearing habitat area for juvenile fall Chinook in the winter of 2005-2005. The Port of Wilma and various other locations were examined as reference sites to compare to the proposed disposal sites. Backwater areas were examined for the presence of fall Chinook salmon, and if found, the habitat they were using.

Biological and physical parameters measured at these locations included surface sediment composition of the habitat, presence and abundance of macrophytes, predator species composition and abundance, juvenile salmonid abundance and habitat usage, and invertebrate species composition, periodicity or seasonality, and abundance. These studies included examining juvenile fish use of created habitat areas, juvenile fish use of proposed backwater dredging locations, and juvenile fish use of proposed disposal locations prior to disposal. Other aspects of the study included looking at the proposed disposal sites prior to disposal and post disposal after habitat creation to determine their long-term viability.

To compare abundance of adult and subadult fishes, sampling using beach seining and electrofishing were used. Daytime beach seining and nighttime electrofishing were conducted at previously identified sites to provide estimates of abundance of juvenile salmonid fishes and potential predators, especially northern pikeminnow and smallmouth bass. Efforts were similar to that in previous years when monitoring was conducted: three standardized beach seine hauls at each of the sites, and electrofishing along the shoreline for three individual 5-minute periods. Nighttime electrofishing was conducted using outputs of approximately 300 volts and 1-3 amps that adequately stunned fish but did not cause mortality or visual evidence of injury. Standardized beach seining was conducted similar to that done during previous monitoring. A 100 x 8 ft (30.5 x 2.4 m) seine constructed of ¼ inch (0.64 cm) knotless nylon mesh with a 8 x 8 x 8 ft (2.4 x 2.4 x 2.4 m) bag was set by positioning the seine parallel to the shoreline with 50 ft (15 m) extension ropes and then pulling in the seine perpendicular to the shoreline. This method samples approximately 0.08 acres (0.2 ha). Catches by electrofishing were expressed as numbers/5 min of electrofishing and those collected by beach seining were expressed as number/haul, similar to previous monitoring. All predator fishes were measured to total length (mm) and released alive. Beach seining and electrofishing were done at least once in April, and twice in May and June at each of the sites and at monthly intervals from July through November.

To assess fall Chinook salmon abundance, habitat utilization and migration in Lower Granite and Little Goose reservoirs, intensive standardized beach seining surveys at selected sites during April, May, June, and July and possibly August was conducted. Seining continued until no fall Chinook salmon were collected during two consecutive sampling efforts in each of the reservoirs. Seining methods were identical to those identified above. At each of the stations, determination was made of macrohabitat characteristics (depth, gradient, substrate, cover) associated with abundance of fall Chinook salmon. Sampling also occurred immediately adjacent to the Port of Wilma (RM 135.0) as this site provided a reference to the abundance of juvenile fall Chinook

salmon in the reservoir. This site had previously been identified as having consistently high fall Chinook abundance (Curet 1994; Bennett et al. 1991, 1993a, 1993b, 1995).

Habitat characteristics of all sample sites were assessed. The extent of macrophyte growth associated with the in-water disposal was determined by snorkeling. The approximate area, species composition, and density of macrophyte development was assessed. The density, species composition, and standing crop of macrophytes was estimated by randomized 1 m^2 quadrant sampling. Subsampling macrophyte beds was done sufficiently (n = 15) to estimate density and standing crops with 95% confidence intervals. Dry weights of each species of macrophyte were measured in the laboratory. Sampling was conducted at the height of macrophyte growth.

Substrate sampling was conducted using a Ponar or Shipek dredge. Two samples each along the shoreline in approximately 1 m of water and approximately 15 m from shore were taken and sieved for particle size distribution and organic matter content. Substrate samples were dried at 105° C for 72 hours. Samples were separated by dry sieving into nine categories: 50.0 mm, 25 mm, 12.5 mm, 9.5 mm, 6.3 mm, 4.75 mm, 3.35 mm, 2.0 mm, and < 2.0 mm. Because fine sediment will cake upon drying, samples were "crushed" manually prior to sieving. After sieving, the weight (g) of each substrate size category was measured and expressed as a percent. Similar methods have been employed previously by Bennett et al. (1998) in their habitat characterization of fall Chinook salmon in the lower Snake River reservoirs. Also at each of the selected sites, shoreline gradient, bottom configuration (flat, undulations, dense cover, etc.) were sampled.

Benthic macroinvertebrate sampling was conducted in June and September using a Shipek dredge (1,072.5 cm^2). As in previous monitoring, 12 benthic macroinvertebrate samples were collected; four dredge hauls were collected along three evenly spaced transects. Samples were washed through a 0.595 mm sieve bucket (#30) and immediately preserved for later laboratory analysis. In the laboratory, organisms were separated into major taxonomic groups (Pennak 1987), enumerated and weighed. Wet weights were determined in a tarred container. Density and standing crops were expressed as numbers/m^2 and biomass/m^2, respectively.

A final report on the results of the sampling will be completed in early spring 2004.

b. During Dredging and Disposal Activities

1) Water Quality Monitoring

Water quality monitoring will be conducted during dredging and disposal activities to ensure the Corps is meeting the terms and conditions of the Section 401 Water Quality Certification while performing these activities. The Corps will monitor depth, turbidity, ammonia, pH, temperature, dissolved oxygen, and conductivity. Water quality monitoring will be performed before, during, and after all in-river work at each dredging site and at the disposal site.

Water quality monitoring will be performed by the Corps' dredging contractor. The contractor will be required to hire an independent water quality monitoring service to perform the monitoring. The monitoring service shall be regularly engaged in the business of water quality sampling and testing and shall have a minimum of 5 years of experience in water quality monitoring for the parameters specified using equipment and methods that meet this specification.

Water quality monitoring equipment, listed below, will be furnished by the contractor and be used for monitoring of all dredging and disposal activities:

- Depth sensor to measure exact position in the water column. The sensor shall have a range of between 0 feet and 100 feet with a resolution of 0.01 feet and a minimum accuracy of 0.4 feet.
- pH sensor accurate to 0.2 pH units with a resolution of 0.01 units
- Turbidity sensor accurate to 5% of identified range for the equipment, or 2 NTUs, whichever is greater .
- Dissolved oxygen sensor accurate to 0.2 mg/L of the "Clark" type polar graphic design.
- Specific conductance electrode to complement dissolved oxygen measurements.
- Temperature sensor accurate to 0.15 degree Celsius with a resolution of 0.1 degrees Celsius.
- Ammonia sensor accurate to +/- 2.0 mg/L.

All equipment will be calibrated prior to use and will be recalibrated at the manufacturer recommended interval for each piece of equipment and whenever there is any indication that the equipment is not performing properly. Calibration of the instruments will be in accordance with the equipment manufacturer's specifications using recognized industry standards.

Prior to commencement of any in-river dredging or disposal operations, the contractor will submit a Water Quality Monitoring Plan for approval by the Corps. The plan will include, as a minimum, the following:

- Company name, address, and phone of water quality testing service
- Water quality testing personnel resumes
- Equipment list for all water quality testing equipment and materials
- Manufacturer's specifications for each piece of water quality testing equipment to be used
- Calibration history for each piece of equipment to be used
- Detailed narrative of personnel, equipment, and activities proposed for performance of water quality monitoring.

Monitoring locations for all parameters will follow the specifications in the Washington Administrative Code (WAC) 173-201A and the ESA consultation with NOAA Fisheries. In general, monitoring will be performed at a point 300 feet upstream of the work areas to determine background levels and at points 300, 600, and (if

specified) 1,200 feet downstream of the work areas to determine water quality effects. For dredging activities, distances will be measured from the clamshell bucket, +/- 30 feet, when the swing arm is pointing downstream. Monitoring stations will have to be relocated each time the dredge shifts anchor points downstream or upstream. For disposal activities, distances will be measured from the point of discharge, +/- 30 feet. Should the contractor elect to construct containment cells for the discharge, distances would be measured from the upstream and downstream walls of the active containment cell. Background monitoring will be performed at a distance from shore recommended by the water quality testing service unless otherwise specified. Downstream monitoring will be centered in the dilution zone to the extent practicable. Monitors will take readings at depths of 3 feet below the water surface and 3 feet above the river bottom unless otherwise specified. The readings from the two depths will be averaged to get a single reading for that station. Specific locations of monitoring stations are listed below:

- Navigation lock approach dredging
  One station 300 feet upstream of dredging activity for background
  For background when dredging within 300 feet of the upstream end of the navigation lock approach, one station adjacent to the dam inside the navigation guidewall
  One station 300 feet downstream
  One station 600 feet downstream

- Navigation channel dredging including Port of Lewiston and Port of Clarkston
  For dredging in the Clearwater River to point N 417,651/E 2,873,899 at the confluence of the Snake and Clearwater rivers (see Figure 1), one station 300 feet upstream in the Clearwater River for background
  For dredging in the Snake River up to 300 feet downstream of point N 417,651/E 2,873,899, one station 300 feet upstream in the Clearwater River and one station 300 feet upstream in the Snake River. Use the station with the higher readings as background.
  For dredging in the Snake River 300 or more feet downstream of point N 417,651/E 2,873,899, one station 300 feet upstream in the Snake River for background
  One station 300 feet downstream
  One station 600 feet downstream
  When dredging within the port areas, one additional station 1,200 feet downstream

- Boat basins (Willow Landing, Illia Landing, Greenbelt, and Swallows)
  One station in the main river channel 300 feet upstream of entrance to boat basin for background
  One station in the center of the boat basin taking readings 3 feet from water surface only
  One station at the entrance to the boat basin taking readings 3 feet from the water surface only
  One station in the main river channel 300 feet downstream from entrance to boat basin
  For Greenbelt boat basin only, one additional station in the main river channel 600 feet downstream from entrance to boat basin

- Swallows Swim Beach
  One station in main river channel 300 feet upstream of upriver entrance for background
  One station in center of swim area 3 feet from water surface only
  One station at downriver exit 3 feet from water surface only
  One station in main river channel 300 feet downstream from downriver exit

- Disposal area
  One station 300 feet upstream, not to exceed 500 feet from shore for background
  One station 300 feet downstream
  One station 600 feet downstream
  One station 1,200 feet downstream

Timing of sampling will be as follows:

- For one hour prior to work each day at each dredging location and at the disposal site, pre-activity levels will be measured. Readings will be taken every 5 minutes. Additional pre-activity levels will be measured when work has stopped for more than one day, as necessary, to determine pre-activity levels prior to commencement of work at the site.

- During all turbidity creating activities, near real-time water quality monitoring will be performed. Equipment will be set up in a manner to allow the results to be monitored by the Corps and the contractor. Readings will be taken every 5 minutes.

- For one hour following completion of the work at each dredging site, and the disposal site, post-activity levels will be measured. Readings will be taken every 5 minutes.

Following completion of all dredging and disposal activities, the contractor will submit a final water quality monitoring report, prepared by the independent water quality testing service. The report will contain all data collected during dredging and disposal operations and will be prepared using the most current version of Microsoft Excel spreadsheet software, unless otherwise approved. The format of data in the report will be recommended by the independent testing service and approved by the Corps. The location and date of sampling will be included for all data in the report. The final report will be submitted in both electronic form on CD's and as hard copies.

2) Lamprey Monitoring

Although there is currently limited data regarding lamprey, the Corps realizes that dredging sand and silt from the Lower Snake River and McNary reservoirs has the potential to entrain Pacific Lamprey ammocoetes (juveniles residing in sedimentary material). Although Pacific Lamprey are not currently listed under the endangered species act, reduced counts of returning adult fish at Bonneville Dam in recent years indicate that their listing under the Endangered Species Act may be warranted in the near future. In an effort to determine the possible impacts of dredging and disposal on

juvenile lamprey in the future, the Corps will perform some limited monitoring of dredged material for lamprey ammocoetes.

a) Federal Navigation Channel Dredging

There is currently no plan to monitor the dredging operations in the main navigation channel and ports. Lamprey ammocoetes are typically found in backwater sediments and not in the active river channel (thalweg), therefore young lamprey would not be expected to be found in the main navigation channel or port areas.

b) Backwater Dredging

On the first day of dredging at the Illia Boat Launch, Willow Landing, Swallows Swim Beach, Swallows Boat Basin, and Greenbelt Boat Basin, a Corps biologist and/or a contracted biologist will be on site to examine samples of sediment from the dredging operation. The contractor will be required to notify the Corps of the intended start date at each boat basin 48 hours prior to starting dredging at the boat basin. Sampling will be conducted on the first day of dredging at each location. Five 5-gallon buckets will be taken from the dredging implement (e.g. clamshell bucket, backhoe shovel, et cetera) during course of the day by the dredging contractor, and given to the biologist at the given site. The biologist will then sieve through the dredged material in an effort to determine the presence or absence of juvenile lamprey.

3) Endangered Species Monitoring

During dredging and disposal activities, the Corps will monitor for sick, injured, or dead fish species listed as threatened or endangered. To do this the Corps will have the dredging contractor monitor the waters surrounding the dredging and disposal activities as well as periodically checking the hold of the barges as the barges are being filled. If the contractor finds a sick, injured, or dead specimen, he will contact the Corps, who will then contact the Vancouver Field Office of NOAA Fisheries Law Enforcement for further instructions.

c. Post-dredging and Disposal

Monitoring performed within 6 months of completing dredging and disposal activities will consist of sediment sampling by the dredging contractor at the disposal area to determine grain size composition of the materials and to verify the in-place conditions of the sediments. For the woody riparian planting bench, this sampling will occur after the sediments consolidate enough to allow equipment to travel across the surface of the disposal area. For the underwater portion of the site, this sampling will occur anytime starting one day after the last deposit of dredged material and will be completed prior to the end of the in-water work window (March 1). The contractor will have until July 31, 2004 to complete the sampling of the upland portion of the site. Grain size analysis will be completed by August 31, 2004.

Sediment samples will be taken by the contractor using vibracore drilling. Prior to starting work the contractor will submit a plan for drilling, sampling, testing, and safety. The plan will include, but not be limited to, a description of the equipment and sampling tools that will be used and a plan detailing the location and depths of each vibracore. This submittal will also include a statement of the prior experience of the persons designated to perform the work specified. The contractor will submit complete, legible copies of drilling logs and records to the Corps upon completion of the work. The contractor will also submit all non-tested core samples and a compilation of all sample descriptions, photographs, and analyses in a complete, legible format.

The contractor will place the samples in wide-mouth jars with a 1-pint capacity and moisture-tight screw tops. Printed or type-written, fade resistant and waterproof labels will be affixed to the outside of each jar and will contain the following information: Project, Location, Hole No., Station, Jar No., Top elevation of hole, Depth of sample, and Description of material.

Vibracoring will be performed in accordance with ASTM D 4823 using a minimum 3.0-inch inside diameter. Samples will extend from the surface of the new embankment to the original ground surface elevation. All samples will be obtained using vibracoring devices complete with graph-type depth and rate of penetration recorder. The coring device will recover a minimum of 80 percent of all material penetrated to be an acceptable boring. The vibracoring device will be collected and retained. The liners will be cut in five-foot sections and sealed at both ends and marked to indicate hole number, top and bottom elevations, and location. The sample liners must be stored in a vertical position and must be transported in a vertical position. The liners must be handled and stored in such a manner that a minimum of disturbance of the contained sediments occurs.

Samples will be obtained to the original ground surface elevation. When located over a boring site, the contractor will make every reasonable effort to reach the required depth or to reach penetration refusal. Penetration refusal will be considered when less than one foot of advance is accomplished after five minutes of vibration with vibrating type coring tool. When advancing the sampling device and refusal is reached at depths less than designated, the contractor will be required to continue sampling by a combination of vibration and jetting. Where it is determined that refusal is not due to obstruction, the partially filled core liner will be removed and a new one jetted. Jetting will be required to return the core pipe to the depth of previous refusal whereupon jetting will be ceased and additional vibration sampling will be commenced. This process will be repeated as many times as required to obtain the designated depth. However, generally three attempts is the maximum required.

The contractor will submit a plan, to be approved by the Corps, showing the locations and depths of all borings. Before each vibracore is taken, the exact position and the water depth at that point will be recorded. Water depths will be obtained by a fathometer capable of resolution to the nearest tenth of a foot. The fathometer will be calibrated by the bar check method at the beginning and end of each day's work. The positioning of

the vessel relative to the sample site locations will meet reasonable standards outlined in the Corps of Engineers Hydrographic Surveying Manual, EM 1110-2-1003 for Class 1 surveys. All elevations and depths will be referenced to the National Geodetic Vertical Datum adjustment of 1929 (NGVD29). All horizontal positions will be referenced to the Washington Coordinate System (WCS), South Zone, North American Datum adjustment of 1927 (NAD27).

Sampling will commence on the line perpendicular to the shoreline at 100 feet downstream from the upstream edge of the disposal area (Figure 2). Core samples will be taken along this line as follows:

Core A – riparian bench midpoint
Core B – resting/rearing habitat midpoint
Core C – midpoint of the embankment slope

In general, this alignment and array of holes will be repeated at an evenly spaced interval, about 200 feet apart, along the length of the embankment so the last line will be at the point 100 feet upstream of the downstream edge of the disposal area. Two holes may be located in the embankment slope on the downstream edge of the disposal area.

The contractor will provide a qualified, licensed geologist or engineer experienced in subsurface exploration to oversee all drilling, sampling, and field testing and laboratory analysis operations. Analysis will include qualitative description of material within the core, located by distance from the top of the core. Cores will be split and photographed. Three representative continuous pint-jar samples will be taken from each core section from each boring. The samples from not less than one-third of the cores will be sieved. Those core samples to be sieved will constitute an even distribution over the entire area. The samples from the remaining cores will be provided to the Corps. One gradation test per sample will be performed in accordance with ASTM D 422. Testing will be performed by an approved commercial testing laboratory or by the contractor, subject to approval. In addition the contractor will provide copies of the original raw laboratory work sheets generated from each sieve analysis. These data sheets will be included in the final report.

The contractor will be responsible for preserving all samples in good condition. Samples will be kept from freezing and from undue exposure to the weather, and will keep all descriptive labels and designations on sample jars, tubes, and boxes clean and legible until final delivery of samples to, and acceptance by, the Corps.

The contractor will keep accurate records of all work accomplished under this contract. Separate records will be made for each hole. The following information will be included in the records for each hole:

- Hole number or designation, elevation of top of boring, and position coordinates.

- Feet of penetration of vibracore boring.

- Core recovery in feet.

- Times of start and completion of hole.

- Measured water depth, time, and date. Water depths will be obtained by a fathometer. The fathometer will be calibrated by the bar check method at the beginning and end of each day's work.

- Make and manufacturer's model designation of vibracore drilling equipment.

- Penetration Records: Continuous record of penetration versus time relationships for each hole. In addition, the time of penetration for each one-foot increment will be calculated and presented in tabulated form in each boring for the entire length of penetration.

- Boring Logs, Sieve Analysis Results, Photographs, Raw Laboratory Work Sheets.

4. MONITORING CRITERIA AND SUBSEQUENT ACTIONS

Data collected during monitoring will be used to make decisions prior to and during dredging and disposal, and for adaptive management for future dredging and disposal activities. Below are descriptions of the criteria the Corps is using for its monitoring and the actions the Corps will take based on the results of the monitoring.

a. Redd Surveys

If a redd is found in the proposed dredging footprint, the Corps will either modify the dredging footprint to avoid the redd, or postpone dredging to a later date after emergence of young fish from the redd. The Corps will also discuss the results of the pre-dredging research with the NOAA Fisheries personnel prior to initiating dredging.

b. Rearing Habitat Surveys

1) Long Term Viability of Habitat

If shallow water habitat that was created using in-water disposal of dredged material (specifically Centennial Island) is found to be no longer beneficial to juvenile salmonids, indicating that as a long-term solution, in-water disposal is not a valid method, alternatives to in-water disposal to create juvenile salmonid habitat may need to be examined for future dredging. Discussions will be held with NOAA Fisheries regarding the results of the research conducted and cooperative decisions including adaptive management that would be needed.

2) Current Rearing Habitat Usage

If more than 20 endangered juvenile salmonids or other endangered fish are found to inhabit any of the proposed disposal sites during one sampling period, the site for disposal will need to be re-examined, with an attempt to choose a site that would be less detrimental to the specific species found. Discussions will be held with NOAA Fisheries regarding the results of the research conducted and cooperative decisions including adaptive management would be needed.

3) Backwater Habitat Usage

If any endangered salmonids or other endangered fish are found inhabiting backwater areas prior to dredging, the site for dredging will need to be re-examined, with an attempt to choose an in water work window that would be less detrimental to those species (e.g. summer window when water temperatures would be high enough to preclude usage of the area by salmonids). Prior to proceeding with dredging or disposal to occur at that location, discussions will be held with NOAA Fisheries regarding the results of the research conducted and cooperative decisions including adaptive management would be needed at this time.

c. Water Quality

1) Turbidity

Turbidity created by in-river activities and measured in nephelometric turbidity units (NTU) will be maintained below the following limits:

a) 5 NTU's above background for background levels 50 NTU's or less
b) Maximum 10% increase when background is more than 50 NTU's

The contractor will notify the Corps within 2 hours each time the turbidity exceeds the action level specified at any monitoring station except for those located within the boat basins, within Swallows swim beach, at the entrance to the boat basins, and at the downriver exit for Swallows swim beach. All exceedences will be noted in the contractor's daily quality control record. The contractor will, immediately upon determining any exceedence of the NTU limits (except at the boat basins and Swallows swim beach monitoring stations mentioned above), alter the dredging operation and continue monitoring turbidity at the downstream location until the NTU levels return to an acceptable limit above background. If the NTU levels do not return to an acceptable limit, the contractor will halt operation and wait for the NTU levels to drop before resuming dredging. If the contractor fails or refuses to act promptly, the Corps may issue an order stopping all or part of the work until satisfactory corrective action has been taken.

2) Ammonia

The contractor will prepare computations for the one-hour average of the ammonia concentrations at each monitoring station at all dredging and disposal locations. These averages will be continuously updated as new data is recorded.

The one-hour average ammonia concentration at the monitoring stations (except the boat basins and Swallows swim beach stations mentioned in section 4.c.1) above) will not exceed the Environmental Protection Agency (EPA) prescribed acute limits with salmonids as shown in Table 1.

Table 1 – EPA pH-dependent acute limits of ammonia with salmonids present

PH	**Total Ammonia (mg N/liter)**	**pH**	**Total Ammonia (mg N/liter)**
6.5	32.61	7.8	8.11
6.6	31.28	7.9	6.77
6.7	29.76	8.0	5.62
6.8	28.05	8.1	4.64
6.9	26.15	8.2	3.83
7.0	24.10	8.3	3.15
7.1	21.94	8.4	2.59
7.2	19.73	8.5	2.14
7.3	17.51	8.6	1.77
7.4	15.34	8.7	1.47
7.5	13.28	8.8	1.23
7.6	11.37	8.9	1.04
7.7	9.64	9.0	0.88

Derived from USEPA 1999. 1999 Update of Ambient Water Quality Criteria for Ammonia

The contractor will notify the Corps within 2 hours each time the one-hour average total ammonia concentration exceeds the acute limits specified. If the concentrations of ammonia exceed the acute limits, modification of the dredging or disposal operations will occur in a manner similar to those outlined for turbidity. Such modifications may include slowing dredging operations to reduce total turbidity and ammonia suspension. If altering of the dredging or disposal activity is determined to have no effect on lowering the concentration of ammonia, the contractor will cease operations and consult with the Corps regarding how to proceed. If modifications were ineffective it may be necessary to isolate the dredging within a physical barrier.

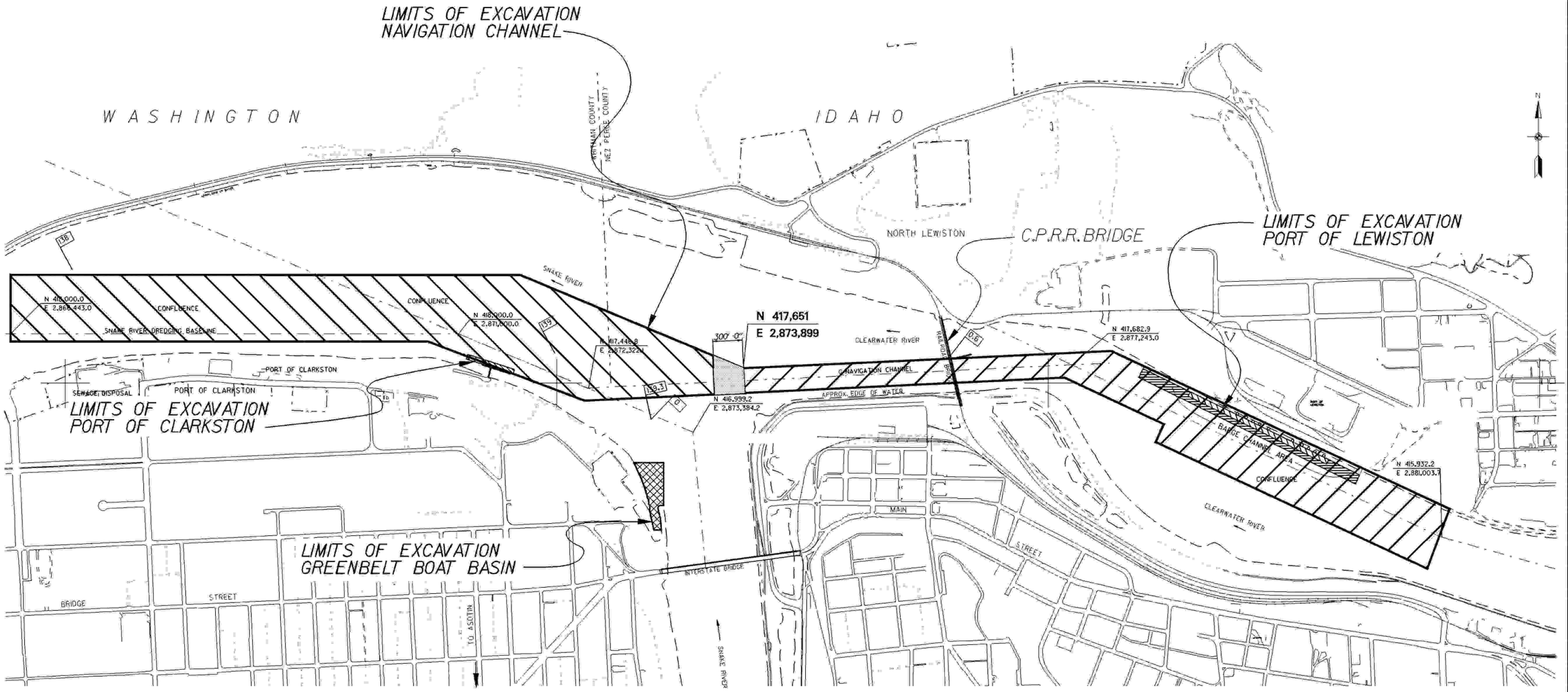
d. Lamprey Monitoring

If juvenile lamprey are found in the dredged material, samples will be collected and sent to an expert in the field of lamprey identification. This may require a genetic analysis to determine the species, whether Western Brook, River or Pacific lamprey or

other analysis of morphological characteristics. If Pacific lamprey are found in the dredging areas, the Corps would determine if further investigations into lamprey abundance and the potential impacts of dredging and disposal would be warranted.

e. Core Sampling

The results of the core sampling of the disposal site will be used with other future monitoring of the disposal site to assess slope stability and long-term structural stability of the disposal area. Future monitoring will include soundings at the disposal area to determine river bottom elevations. Changes in elevations would indicate movement of material. The Corps will compare the core sampling records to the locations of material movement to determine the composition of the dredged material (i.e. percent sand vs. percent silt) disposed at that location. Based on the results of the comparison, the Corps may modify its disposal plans for future dredging. Modifications could include altering the percent of silt in in-water disposal areas, or constructing a berm of sand or cobble at the toe of the disposal area slope.



LEGEND

- CLEARWATER RIVER TO BE USED AS BACKGROUND FOR TURBIDITY MONITORING
- MONITOR TURBIDITY OF SNAKE AND CLEARWATER RIVERS- HIGHER READING TO BE USED AS BACKGROUND FOR TURBIDITY MONITORING
- SNAKE RIVER TO BE USED AS BACKGROUND FOR TURBIDITY MONITORING

LOCATION MAP

SCALE IN FEET
500' 0 500'

E 2,877,000.00
N 4212,500.00

FIGURE 1

Winter Maintenance Dredging 2004-2005
Snake R./Clearwater R. Confluence
Turbidity Monitoring

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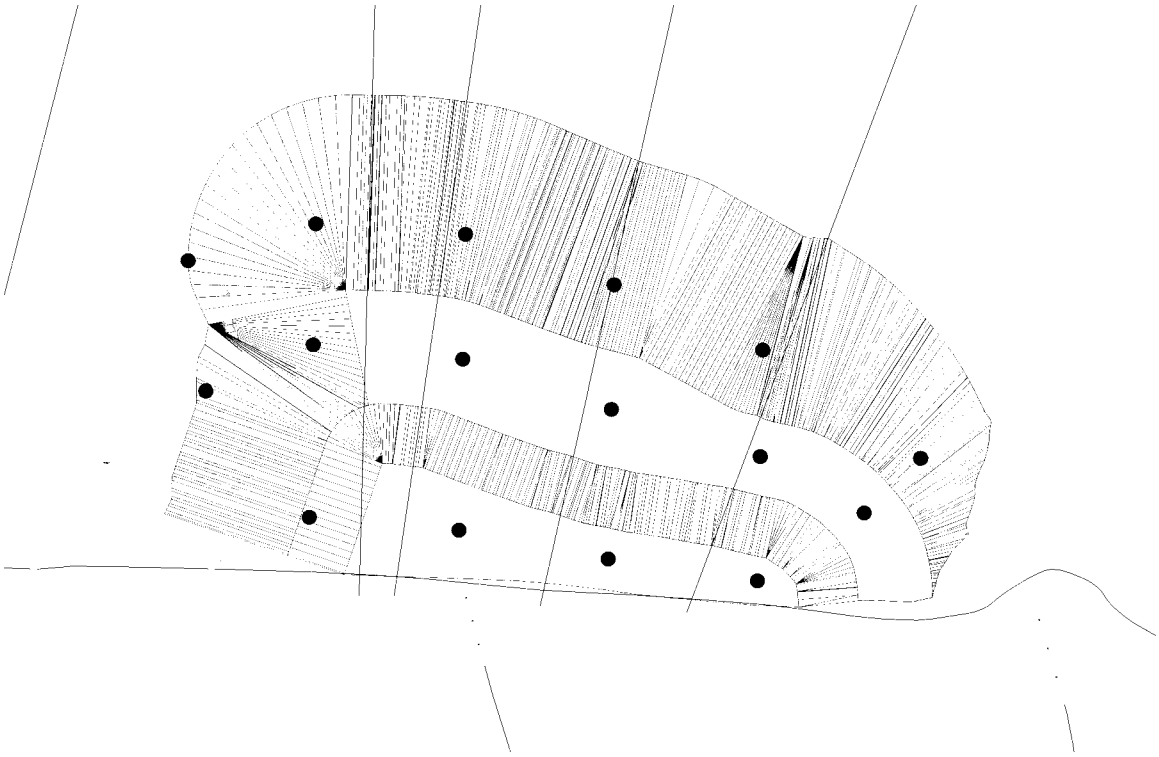

• = Vibracore sampling location

Lower Snake River and Clearwater River
Winter Maintenance Dredging 2004-2005

RM 116 Disposal Site
Vibracore Sampling Locations

Figure 2