



US Army Corps
of Engineers®
Walla Walla District



United States
Environmental Protection Agency
Region 10

DREDGED MATERIAL MANAGEMENT PLAN AND ENVIRONMENTAL IMPACT STATEMENT

McNary Reservoir and Lower Snake River Reservoirs

APPENDIX N

Dredging Proposed for Winter 2002-2003

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**DREDGED MATERIAL MANAGEMENT PLAN
AND ENVIRONMENTAL IMPACT STATEMENT**

McNARY RESERVOIR AND LOWER SNAKE RIVER RESERVOIRS

APPENDIX N

DREDGING PROPOSED FOR WINTER 2002-2003

**U.S. Army Corps of Engineers
Walla Walla District
201 N. 3rd Avenue
Walla Walla, WA 99362**

July 2002

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for Winter 2002-2003

1.0 INTRODUCTION

This appendix describes the proposed navigation and maintenance dredging and dredged material disposal to be performed by the U.S. Army Corps of Engineers, Walla Walla District, (Corps) at various locations in the lower Snake River and the lower Clearwater River in the winter of 2002-2003. This would be the first dredging opportunity following completion of the Corps' *Dredged Material Management Plan/Environmental Impact Statement* (DMMP/EIS). The purpose of the dredging is to restore the authorized depth of the navigation channel, remove sediment from port areas, provide for recreational use, and provide for irrigation for wildlife habitat plantings.

2.0 DESCRIPTION OF DREDGING AREAS

The Corps proposes to remove accumulated sediment from up to ten different locations in Lower Granite, Little Goose, and Ice Harbor Reservoirs (plate N-1). The specific locations and quantities are described below.

The Corps plans to remove an estimated 250,500 cubic yards (cy) [191,521 cubic meters (m³)] of sediment from the federal navigation channel at the confluence of the Snake and Clearwater Rivers during the winter of 2002-2003. The area to be dredged extends from River Mile (RM) 138 on the Snake River to the confluence of the Snake and Clearwater Rivers at RM 139, then extends up the Clearwater River to just downstream of Memorial Bridge at RM 2 (plate N-2). The Corps is responsible for maintaining the federal navigation channel, which extends to within 50 feet of port structures. Dredging would be aimed at restoring the navigation channel to a depth of no more than 16 feet [4.9 meters (m)]. This includes the authorized navigation channel depth of 14 feet (4.3 m), plus 1 foot (0.3 m) of advanced measures and 1 foot (0.3 m) of overdig.

The Corps also plans to remove sediment from several other locations in the confluence area in 2002-2003. Two of these locations are port berthing areas: the Port of Clarkston at RM 139 on the Snake River and the Port of Lewiston at RM 1 to RM 1.5 on the Clearwater River (plates N-3 and N-4). The Ports of Lewiston and Clarkston are responsible for maintaining access to the port areas that are parallel to the federal navigation channel. About 9,600 cy (7,339.7 m³) of sediment would be removed from the Port of Clarkston and about 5,100 cy (3,899.2 m³) would be removed from the Port of Lewiston. Both ports would need to sign memorandums of agreement with the Corps to dredge these areas, and the ports would reimburse the Corps for the costs of dredging and disposal of the material removed from the port areas. Dredging in these areas would restore the port areas to a depth of no more than 16 feet (4.9 m).

Another port-controlled area to be dredged in 2002-2003 is the entrance to Hells Canyon Resort Marina located on the left bank of the Snake River at RM 138 (plate N-5). The marina is on land owned by the Corps but leased to the Port of Clarkston and subleased to a local operator. At the request of the Port of Clarkston, the Corps plans to remove about 3,600 cy (2,752.4 m³) of sand/silt from the marina entrance. This dredging would be included in the memorandum of agreement mentioned above.

Additional areas to be dredged in the confluence area in 2002-2003 include the Greenbelt Boat Basin at RM 139.5 on the Snake River at Clarkston and the Swallows Park swimming beach and boat launch (RM 141.7 and RM 141.9) on the Snake River at Clarkston (plates N-6 and N-7). The Greenbelt Boat Basin is located behind the Corps' Clarkston Resources Office at the confluence and is maintained by the Corps for public recreation use. Swallows Park is located upstream of the confluence and is operated and maintained by the Corps. The Corps plans to remove about 2,800 cy (2,140.8 m³) of sediment from Greenbelt Boat Basin and about 16,000 cy (12,232.9 m³) of sand/silt from the Swallows Park swimming beach and boat launch. Dredging would restore depths at Greenbelt Boat Basin, Swallows Park Swim Beach, and Swallows Park Boat Basin to 7 feet (2.1 m), 5 feet (1.5 m), and 8 feet (2.4 m), respectively.

The Corps plans to dredge several other areas outside of the confluence area in 2002-2003. Two of these are for navigation channel restoration – the downstream approach to Lower Granite Lock and Dam (Lower Granite) navigation lock (RM 107) and the downstream approach to Lower Monumental Lock and Dam (Lower Monumental) navigation lock (RM 41.5) (plates N-8 and N-9). About 4,000 cy (3,058.2 m³) of sediment would be removed from an area about 500 feet (152.4 m) long by 200 feet (61 m) wide downstream of the Lower Granite navigation lock guide wall. About 20,000 cy (15,291.1 m³) would be removed from the Lower Monumental approach. This area is about 250 feet (76.2 m) wide and extends about 4,500 feet (1,371.6 m) downstream from the navigation lock. Both navigation lock approaches would be dredged to a depth of no more than 16 feet (4.9 m). There are also two boat launch areas at two Corps recreation sites that the Corps plans to dredge: Illia boat launch at RM 104 [about 1,400 cy (1,070.4 m³)] and Willow boat launch at RM 88 [about 6 200 cy (4,740.2 m³)] (plates N-10 and N-11). Both boat basins would be dredged to a depth of no more than 8 feet (2.4 m).

Table N-1 lists the sites the Corps proposes to dredge in 2002-2003 and the estimated quantities for each.

Table N-1. Sites Proposed to be Dredged in Winter 2002-2003 and the Estimated Quantity to be Dredged from Each Site.

Site to be Dredged	Quantity to be Dredged (cubic yards)	Quantity to be Dredged (cubic meters)
Federal Navigation Channel at Confluence of Snake and Clearwater Rivers	250,500	191,521
Port of Clarkston	9,600	7,339.7
Port of Lewiston	5,100	3,899.2
Hells Canyon Resort Marina	3,600	2,752.4
Greenbelt Boat Basin	2,800	2,140.8
Swallows Park Swim Beach/Boat Basin	11,000/5,000	8,410.1/3,822.8
Lower Granite Navigation Lock Approach	4,000	3,058.2
Lower Monumental Navigation Lock Approach	20,000	15,291.1
Illia Boat Launch	1,400	1,070.4
Willow Landing Boat Launch	6,200	4,740.2
TOTAL	319,200	244,046

3.0 DREDGING METHODS

All dredging would be done using mechanical dredging methods. These would include clamshell, dragline, backhoe, or shovel/scoop. although based on previous dredging activities, the method used would probably be clamshell for most of the dredging. For the boat basins, the method would most likely be backhoe. All dredging would take place during the established in-water work window of December 15 through March 1 for the Snake and Clearwater Rivers.

In general, material would be scooped from the river bottom and loaded onto a bottom-dump barge. This process allows overspill of excess water from the barge while the barge is being loaded. The water would be discharged a minimum of 2 feet (0.6 m) below the river surface. The Corps estimates it could take about 6 to 8 hours to fill a barge. The barge would then be pushed by a tug to the disposal site. No material or water would be discharged from the barge while it is in transit. Once the barge arrives at the appropriate disposal site, it would be unloaded, then would be returned to the dredging site for additional loads. The Corps expects dredging activities to be conducted between 10 and 24 hours per day 6 to 7 days per week.

4.0 DESCRIPTION OF MATERIAL TO BE DREDGED

The type of material to be dredged depends on the location of the dredging. The Corps has developed information on the types of sediments proposed to be dredged in winter 2002-2003 and the contaminant levels in those sediments. The Corps took sediment samples from the dredging areas in June 2000 for grain size analysis and contaminant level determination (there is frequently a relationship between grain size and probability of contaminants). Chemical analyses are discussed further in Section 6.0.

The sediment samples from the main navigation channel in the confluence area contained between 85 and 90 percent sand with 10 to 15 percent silt and fines. Sediments at the Lewiston and Clarkston ports were comprised of more than 90 percent silt. The boat basins at Willow, Hells Canyon Resort Marina, and Swallows Park averaged 56 to 67 percent sand and 21 to 27 percent fines. Green Belt Boat Basin averaged 35 percent fines and 45 percent sand. Downstream lock approach sites below Lower Granite and Lower Monumental contained large rock substrate and 2 to 6 inch (5.1 to 15.2 cm) cobbles. Sediment sampling data indicate that the sediments to be dredged from the Illia Boat Launch site are variable, and include areas composed of 86 to 95 percent silt and 5 to 14 percent sand, areas composed of 11 percent gravel, 63 percent sand and 26 percent fines, and areas composed of two and three inch cobbles.

All dredging and disposal actions would take place within the established in-water work window of December 15 through March 1 for the Snake and Clearwater Rivers to avoid impacting anadromous fish. Prior to dredging, the Corps would conduct salmon redd surveys in areas likely to contain redds to ensure no redds would be disturbed by dredging or disposal. Based on previous surveys, it is anticipated that redds could possibly be found only in the dredging areas immediately downstream of the dams. These areas could include the navigation lock approaches.

5.0 DISPOSAL METHODS AND LOCATION

The Corps has identified two potential sites for beneficial use of dredged material from the proposed winter 2002-2003 operations. The primary site is located at RM 132, adjacent to the Chief Timothy HMU. Dredged material disposed of at this site would be used to develop woody riparian and shallow water habitat. This site does not currently appear to have good quality habitat for juvenile salmonid rearing. Further study is underway to verify if the site is currently being used as rearing habitat by juvenile chinook salmon. If juvenile salmonids are found to be rearing at this location in substantial numbers, the alternate discharge site would be used. The alternate site is located in Lower Granite Reservoir at RM 116. Dredged material disposed of at this site would be used to construct shallow water and mid-depth fish habitat. Proposed disposal methods for the primary and alternate site are described below. In addition, the Corps is requesting input from the Local Sediment Management Group for additional proposals for beneficial use of the dredged material. The selected beneficial use of the material would be determined prior to the signing of the Record of Decision for the DMMP/EIS.

Woody Riparian and Shallow Water Habitat Development at RM 132 Site

Inundation of the lower Snake River canyon by the Corps' reservoirs destroyed many acres of riparian habitat. The Corps is replacing riparian habitat as part of the Lower Snake River Fish and Wildlife Compensation Plan. The Corps has re-established some riparian habitat, more is needed to replace what was lost. The Corps proposes to use the material from this dredging activity to construct a planting bench and establish riparian vegetation to help mitigate the loss of the original habitat. A submerged, gently sloping bench, would be constructed adjacent to the

woody riparian bench. The submerged bench would be designed to provide shallow water habitat for juvenile salmonids.

For the 2002-2003 dredging, the Corps proposes to construct a riparian planting bench in Lower Granite Reservoir on the left bank (looking downstream) near river mile (RM) 132 (Plate N-12 and N-13). This site is located adjacent to the Chief Timothy Habitat Management Unit. The portion of the site that would be used for the 2002-2003 disposal consists of a shallow sloping bench (about 10 feet deep at maximum operating pool) extending along about 4,000 feet of shoreline. The Corps selected this site because it has high potential for woody riparian habitat development, is close to the confluence of the Snake and Clearwater Rivers (where most of the dredging would occur), would not interfere with navigation, and would not impact cultural/historic properties. This site has a capacity of approximately 550,000 cubic yards. It is anticipated that this site would be filled to about 60 percent capacity with the material dredged during the 2002 -2003 dredging activity.

Dredged material disposal at RM 132 is designed to accomplish three goals: (1) create planting zones for woody riparian habitat, (2) increase suitability and acreage of shallow water rearing habitat for Snake River fall chinook juveniles, and (3) dispose of dredged material in a beneficial manner.

Principle Environmental Concerns

Water quality impacts and impacts to aquatic organisms, in particular Endangered Species Act-listed fish, are the principle environmental concerns with disposal of the dredged material. Water quality parameters that are most likely to be affected are turbidity and ammonia, and to a lesser degree pH, dissolved oxygen, and temperature. Disposal of the silt would have the greatest impact on water quality as the fine material would be suspended in a turbidity plume and would be more likely to contain any contaminants such as ammonia.

Aquatic organism concerns, other than those related to water quality, are the impacts to all fish during construction of the planting bench and the configuration of the submerged habitat once construction is complete. During construction, fish must not be trapped and covered with the dredged material. After construction, the underwater slopes must be gently sloping and fairly smooth to facilitate rearing by juvenile fall chinook without providing hiding cover for fish that prey upon the fall chinook.

Dredged Material Types

The Corps has collected sediment samples from the areas to be dredged and identified which sites or portions of sites contain mostly silt and which ones contain mostly sand or coarser material. Dredged material from the navigation channel is expected to be predominately sand (>80%). Some cobbles and gravels would be removed from the navigation lock channels. Silt would be dredged from the recreation sites and port areas.

Proposed Development.

Dredged material placement at the Chief Timothy HMU site (plates 12a and 12b) would extend the shore riverward to create an approximately 18 acre planting bench for riparian species. The planting bench would be submerged when the water surface elevation exceeds 736 feet MSL. [The Lower Granite Reservoir minimum and maximum operating pool elevations are 733 feet above mean sea level (MSL) and 738 feet MSL, respectively]. The riparian bench would have an undulating surface to provide variable root zone conditions for planting. A shallow water habitat slope, with a footprint of approximately 16 acres, would be constructed adjacent to the bench using a slope of 10 horizontal to 1 vertical. The slope would be shaped to form a relatively smooth surface. Cross sections of the existing and proposed elevations and slopes are shown on Plate N-13.

In general, sand would be placed below the maximum operating pool elevation to form the shallow water bench and a base for the riparian embankment. Most of the riparian bench would be capped with silt. The outer slope would be at the angle of repose for the material placed (about 10 horizontal to 1 vertical), and shaped to form a relatively smooth surface. Cobbles from the dredging of the navigation lock approaches would be placed around the perimeter of the bench in a one-foot thick band to cover the maximum fluctuation in pool elevation (between elevation 732 and 736). The cobbles would provide armoring to protect the bench from wave action from the wind or passing barges/boats. Cobble placement would start at the upstream end of the bench and be tied into the existing shoreline. The band of cobbles would extend downstream until the entire bench was armored or until all of the cobbles had been used. The riparian bench surface area would vary from about 150 feet to about 400 feet wide by 4,000 feet long. The final riparian bench surface would be left in an undulating condition to provide variable root zone conditions for final planting. Final shaping of the above-water surface and planting would occur by separate contract.

Placement Methods

Placement may occur using four methods or a combination of these: bottom dumping from hopper barges, dozing the material from flat deck barges, hydraulic conveyance from a pump scow, and placement with a dragline.

Bottom dumping from hopper barges is the preferred placement method. It would result in the least turbidity, and would be the most efficient placement method (and least expensive). However, this method requires a water depth of about 8 to 10 feet, so use of this type placement method at this site could be limited. One method employed to overcome water depth would be to bottom dump in deeper water and use a dragline to move the material into the desired position.

Dredged material dozed from a flat deck barge would be similar to bottom dumping. Turbidity may be slightly higher than a bottom dump barge because material would be shoved off the barge deck in several clumps, compared to one clump from a bottom dump. While water depth may still be an issue (about 6 foot depth required), the flat deck barge could reach somewhat

shallower depths than a bottom dump barge. Moving the material a second time with a dragline would again be an option.

Hydraulic conveyance is a process of liquefying the dredged material and pumping to the desired discharge location. Depending on the material being pumped, the slurry would be about 80 percent water. This method does not have depth as a limiting factor, except that some form of underwater containment berm would need to be constructed using either bottom dumping or clamshell placement. Also, moving the floating discharge point pipeline would require a boat or crane. This method has the highest potential for turbidity and would likely require weirs between the shore and the containment berm to form cells to act as settling catchments and possibly silt fence deployment.

Dragline is a method that would employ a crane and bucket for excavation of dumped material and placement in its final location in the embankment. Material would be brought to the disposal area, and likely bottom-dumped. The dragline would be positioned to reach the dumped material, scoop it up and place it in the fill.

Placement Plan

The Corps of Engineers standard practice for contracting this type of work is to specify the environmental protection requirements and final specifications that must be met by the contractor, but let the contractor determine the exact construction methods that would be used to meet the contract requirements. Contractors are selected by lowest bid price and more restrictive placement requirements could result in higher costs. Consequently, the contract for the 2002-2003 dredging would focus on requirements (i.e., turbidity level, work window, slope of underwater fill, placement of a silt cap) rather than placement methods to allow the contractor to be as innovative as possible. Prior to any work being performed in the field, the low bid contractor would be required to submit their work execution plan, including how they intend to meet the environmental requirements. Until the contractor submits their plan, the exact placement method is uncertain.

The Corps has identified four possible placement scenarios: construction of earthen cells and hydraulic placement of material within the cell, silt curtain cells used with hydraulic placement, a combination of silt curtain and earth embankment with hydraulic placement, and placement using a bottom dump with clamshell or dragline. These are discussed below. In addition to these scenarios, it may be advantageous to raise and or lower the Lower Granite Pool during placement operations. For example, a deeper pool would allow barge access closer to shore. Lowering the pool may facilitate placement of the silt cap on the riparian bench.

Scenario 1 – Construction of earthen cells and hydraulic placement within the cells. This method employs all of the placement methods described above. First, an earth berm would be constructed along the outer edge of the disposal area. This would be accomplished using dredged material placed by pushing material off flat deck barges or bottom dump scows. A floating dragline would be set up on the inside of the earth berm. Boats would be used to

position the dragline. Once the berm was constructed to a depth that precludes placement from a flat deck barge or bottom dump scows, the dumps would be made outside of the berm. The dragline would be used to scoop the dumped material and place it on top of the berm. This would be repeated until the berm was above the water surface. Cross berms would be constructed using the dragline perpendicular to shore, between the shore and the berm. This would create containment cells. Once the containment cells were complete, all remaining dredged material would be placed hydraulically. Placement would begin at the upstream cell and work downstream. It is expected that the cells would contain any turbidity that might occur during placement. Materials used for the berm construction would be mostly sand with some gravels and cobbles intermixed. The fill inside the cells would be mostly sand up to just above the water surface. The shoreline portion of each cell, which defines the riparian bench, would then be capped with hydraulically placed silt from the recreation sites and ports.

Scenario 2 - Silt curtain cells used with hydraulic placement. This would be similar to Scenario 1, except the containment cells would be formed using a geotextile fabric draped to the river bottom to act as a silt barrier. The bottom edge would be anchored if necessary. Material would be hydraulically placed within the geotextile containment cell. Placement would proceed until material within the cell was at the existing water surface. The geotextile fabric would be moved downstream and an adjacent cell would be similarly formed. This would continue for the length of the disposal area. Once the fill has been brought up to the water surface, the shoreline portion of each cell, which defines the riparian bench, would be capped with silt material from the dredging operations. A silt fence would be installed on the fill and material would be placed hydraulically inside the silt fence.

Scenario 3 - Lower Granite pool would be raised to the maximum operating pool. Placement would be performed from flat deck barges or bottom dump scows as much as possible in the depth provided. Once the placement reached an elevation that precluded flat deck barges or bottom dump scows from placing their load, a silt curtain would be installed and a containment cell formed as discussed above. Dredged material would be placed hydraulically within the silt curtain. Once the platform within that cell reached the water surface, the silt curtain would be relocated to form the next cell. Once the fill had been brought to the water surface, the shoreline portion of each cell, which defines the riparian bench, would be capped with silt material from the dredging operations. A silt fence would be installed on the fill and silt would be placed hydraulically.

Scenario 4 - Placement using a dragline. Lower Granite pool would be raised to the maximum operating pool. A dragline would be used to dredge its way into shore, with the material side cast in the proposed disposal area. Flat deck barge or bottom dump scow placement would be performed as much as possible in the depth provided. As the bench was brought to the water surface, and depths are inadequate for dumping directly from the barge, the dumping would occur in the channel dredged by the dragline. After each dump, the dragline would excavate that material and place it in the fill. This would continue until a section of the bench was complete within the reach of the dragline. The silt cap would be similarly placed, once the riparian bench

has been brought to the water surface. A silt containment structure such as a silt fence or other barrier may be needed to prevent effluent from re-entering the river.

Final Shaping

Some underwater grading and final shaping would be required once the bench and slope was completed. This work would be performed by the dredging contractor. Shaping of the in-water slopes most likely would be by floating dragline. A boat-towed beam may also be used. Surface shaping of the capped area would be by conventional grading equipment such as a dozer, rubber tired loader, or backhoe and would be performed sometime after the placement of the dredged material was complete. Some surface undulations would be desired to provide differing root zone conditions.

Once the final shaping of the shoreline was complete, the cobbles would be placed around the perimeter of the bench. This would likely be performed using a clamshell and a flat deck barge. Cobbles would be brought by barge to the disposal site and the clamshell would lift the cobbles off the barge and place them in a band within the selected elevations along the shoreline.

Shallow Water Habitat Creation at RM 116 Site

If juvenile salmonids are found to be rearing at the Chief Timothy HMU site (RM 132) in substantial numbers, the alternate discharge site at RM 116 (plates N-13 and N-14) would be used to create shallow water habitat. The RM 116 site is a mid-depth-to-shallow bench on the left bank (looking downstream) of the Snake River just upstream of Knoxway Canyon. The Corps selected this site because it is close to the confluence (where most of the dredging would occur), could provide suitable resting/rearing habitat for juvenile salmon once the river bottom is raised, would not interfere with navigation, would not impact cultural/historic properties, and is of sufficient size to accommodate dredged material disposal for several years.

The sequence of dredged material disposal at RM 116 is designed to accomplish two goals: (1) create shallow water habitat for juvenile salmon; and (2) dispose of silt in a beneficial manner. Studies conducted by David Bennett, Ph.D. of the University of Idaho indicated that a substrate of sand, gravel, and/or cobble provided suitable habitat for juvenile salmon while a silt substrate provided no benefit (Bennett 1993b). To meet its goals while following Dr. Bennett's criteria for suitable substrate, the Corps proposes to place the dredged material in steps. The first step would be to use the silt (less than 0.2 millimeter in diameter) in a mixture with sand and gravel/cobble to fill the mid-depth portion of the site and form a base embankment. The dredged material would be placed aboard bottom dump barges and analyzed to determine the percentages of sand and silt. The barges would then proceed to the disposal area and dump the material within the designated footprint close to the shoreline to raise the river bottom to a depth of 20 feet (6.1 m) (Figure N-1).

The second step would be to place sand on top of the sand/silt embankment. A reserve area of sand would be dredged and barged to the site. The sand would be on top of the base

embankment to form a sand layer at least 10 feet (3.1 m) thick. The water depth would be about 10 feet (3.1 m) below the minimum operating pool elevation (figure N-2). The footprint of the disposal area would be sized so that the maximum amount of shallow water sandy substrate habitat would be created with the estimated quantities of material to be dredged. The third step would be to use a beam drag to flatten and level the tops of the mounds to form a flat, gently sloping (1 to 3 percent), shallow area between 10 and 12 feet (3.1 and 3.7 m) in depth (figure N-3).

There is some question of embankment stability because of the amount of silt to be incorporated in the embankment. The Corps is concerned that the silt may slump or compress, causing a loss in elevation of the finished embankment. Therefore, the Corps plans to monitor and record the amount of silt placed in the embankment. The Corps would then determine the percent silt in the base and monitor any movement of the base. Monitoring would be accomplished by taking cross-section soundings immediately after disposal is complete and again in the summer after high flows to determine if the embankment slumps or moves. The Corps would use this information to make adjustments in the percentage of silt allowable for future dredged material disposal and to determine whether or not a berm needs to be constructed around the toe of the embankment to prevent movement.

6.0 SEDIMENT CONTAMINANT ANALYSIS

In addition to sampling particle size, the Corps had a series of analyses performed on samples collected in 2000 to determine chemical content of sediments at potential dredging sites in the lower Snake River and in the confluence of the Snake and Clearwater Rivers. Chemical tests included polynuclear aromatic hydrocarbons, organophosphate pesticides, chlorinated herbicides, oil and grease, glyphosate, ampa, dioxin, and metal analysis.

Results from herbicide and pesticide tests were below reportable laboratory detection testing levels. Polynuclear aromatic hydrocarbons (PAHs) and metal concentrations were below standards listed for the compounds listed in the Washington Department of Ecology Draft Sediment Standards dated June 1999. For the glyphosate tests, only one site located in the Green Belt Boat Basin at Clarkston showed glyphosate above lab detection limits at 23 parts per billion. Two other samples for glyphosate in the same boat basin came back below reportable lab detection limits. Two other samples for glyphosate in the same boat basin came back below reportable lab detection limits.

Twenty-four sites were sampled for dioxin with dioxin screen tests from the confluence of the Snake and Clearwater Rivers downstream for several miles in Lower Granite Reservoir. Chlorinated furans and dioxin congeners have been detected in the past in this area (1991, 1996, and 1998). The 2000 results showed seven sites to contain some chlorine dioxin congeners. One is at the confluence and four sites are on or near the left bank traveling downstream (RMs 139.1 and 138.4). The seven sites that tested positive on the dioxin screen were tested further with high-resolution gas chromatograph-mass spectrometric methods. Two additional duplicate samples were included. Results showed there were no concentrations of

2,3,7,8- tetrachlorodibenzo-*p*-dioxin (TCDD), considered a very potent carcinogen, according to Universal Treatment Standards. Less toxic congeners were present in small amounts (parts per trillion).

The following congeners were found at all seven sites: Octachlorodibenzodioxin (OCDD) ranging from 8.81 to 166.94 parts per trillion; 1,2,3,4,6,7, 8-Heptachlorodibenzodioxin (HpCDD) from 1.05 to 22.15 parts per trillion; 1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF) at 0.29 to 2.99 parts per trillion; and octachlorodibenzofuran (OCDF) at 0.57 to 19.61 parts per trillion. The 1,2,3,4,7,8-hexachlorodibenzofuran (HxCDF) found at four sites ranged from 0.12 to 1.15 parts per trillion. The 1,2,3,6,7,8-Hexachlorodibenzodioxin (HxCDD) found at two sites ranged from 0.42 to 1.21 parts per trillion.

Thirty-eight locations were sampled for oil and grease. Results varied from 41 to 770 parts per million. Only three of the samples exceeded 400 parts per million, and they were downstream from boat basins. The 400 parts per million is a soil criteria in Washington to determine disposition of the soil. Total organic carbon (TOC) testing was run on the oil and grease samples. The TOC was also run on the one glyphosate sample that was above detection limits. The TOCs for oil and grease averaged 1.2 percent and ranged from 0 to 5.8 percent. The TOC for the glyphosate sample was 1.6 percent. These sites all yielded concentrations of PAH chemicals below reportable lab detection limits, and oil and grease composition was probably from animal matter.

Detected concentrations of contaminants were below the screening levels prescribed in the Dredged Material Evaluation Framework: Lower Columbia River Management Area.

7.0 IMPACTS OF THE PROPOSED ACTION

7.1 Aquatic Resources

Dredging and disposal activities would have both direct and indirect impacts on aquatic species. Most of these impacts would be short-term, however some impacts are expected to be positive and long-term. Indirect effects to aquatic species are also anticipated, and most of these effects are considered positive. Most of the impacts expected to occur would be beneficial to fish and aquatic populations through the development of woody riparian habitat and creation of shallow water habitat. Any negative impacts are expected to be temporary and short-term.

7.1.1 Direct Effects

Macroinvertebrates in the removal and disposal areas would be directly impacted by the dredging activities. With the removal of the dredged material, animals of various species (oligochaetes, crayfish, etc.) would also be removed from the dredging areas and redistributed or buried during the disposal process. In addition, invertebrates at the disposal site(s) would be buried. It has been routinely shown, however, that macroinvertebrates displaced by dredged material removal aid in colonizing or supplementing existing populations at the in-water disposal sites.

Populations at the removal site also become re-colonized relatively rapidly, depending upon the season. Both locations are also influenced through the mechanism of drift (Bennett et al., 1990, 1991, 1993a, 1993b, 1995a, 1995b; Bennett and Nightingale, 1996). Dredging and disposal would cause a temporary and short-lived reduction in prey items for fish at these two locations.

Nearly all dredging would be completed mechanically using a clamshell. Due to the characteristics of this equipment, it is generally accepted that clamshell buckets are not likely to entrain fish. Specifically, the clamshell bucket descends to the substrate in an open position. The force generated by the descent drives the jaws of the bucket into the substrate. The jaws grab the sediment upon retrieval. During the descent, the bucket cannot trap or contain a mobile organism because it is totally open. Based on the operation of the clamshell dredge bucket, it has been determined that the dredging operation is not likely to entrain any fish species of concern.

Both resident and anadromous fish could use the areas upstream and downstream of the sites where dredging and disposal activities would occur. The dredging and disposal activities would not be a continuous activity confined to a single location, and fish displaced in the activity areas would be expected to return shortly after completion of the project.

7.1.2 Indirect Effects

A major indirect effect that is expected to be beneficial is the creation of woody riparian habitat and shallow water fish habitat with the dredged material. New habitat areas are expected to benefit aquatic resources through the presence of shoreline vegetation and providing nutrients and structure to the aquatic ecosystem. Created shallow-water habitat would attract resident and anadromous fish to shallower areas for rearing by creating warmer shallow water temperatures, feeding areas, and refugia. In-water disposal meant to enhance fall chinook salmon rearing areas would not only provide areas of rearing for resident and anadromous fish but would be designed to limit the habitat for adult predacious fish in the lower Snake River system. Turbidity and water quality problems are expected to have minimal impacts on aquatic life since all dredging would occur in the winter during low periods of productivity and fish abundance.

Creating more shallow water habitat could increase the availability of warmer waters in the Lower Granite Reservoir. Currently, water temperatures are below optimum throughout the growing season for all resident game fish. Higher water temperatures could enhance annual growth increments and possibly result in higher survival and higher standing crops of resident or game fish. Effects of higher water temperatures in shallow waters on anadromous salmonids are related to the date at which a threshold in water temperature is achieved. Curet (1994) reported that subyearling fall chinook salmon migrate from shallow shoreline areas to deeper waters in the spring/summer when shoreline temperatures attain 64 degrees Fahrenheit (°F) [18 degrees Celsius (°C)]. These data indicate that if water temperatures warmed earlier in the spring up to 64 °F (18 °C), growth rates of subyearling fall chinook salmon and possibly their survival might be enhanced by cueing them to out-migrate earlier in the season.

Recolonization by invertebrate species would follow completion of dredging at both the dredging and disposal areas. Increased macroinvertebrate production would occur at the dredging site locations and on the disposed material during the following growing season. These species would be available as food organisms to resident and anadromous fish in the following spring.

7.1.3 Effects by Action

Ten specific dredging activities are being proposed for 2002-2003. The impacts to aquatic species are outlined in table N-2.

Table N-2. Impacts to Aquatic Species from Specific Dredging and Disposal Activities Proposed for 2002-2003.

Site to be Dredged	Impacts to Invertebrates		Impacts to Resident Fish		Impacts to Anadromous Fish	
	Dredging	Disposal	Dredging	Disposal	Dredging	Disposal
Federal Navigation Channel at Confluence of Snake and Clearwater Rivers	A	B, C	D	C, D	D	C, D
Port of Clarkston	A	B, C	D	C, D	D	C, D
Port of Lewiston	A	B, C	D	C, D	D	C, D
Hells Canyon Resort Marina	A	B, C	D	C, D	D	C, D
Greenbelt Boat Basin	A	B, C	D	C, D	D	C, D
Swallows Park Swim Beach/Boat Basin	A	B, C	D	C, D	D	C, D
Lower Granite Navigation Lock Approach	A	B, C	D	C, D	D	C, D
Lower Monumental Navigation Lock Approach	A	B, C	D	C, D	D	C, D
Illia Boat Launch	A	B, C	D	C, D	D	C, D
Willow Landing Boat Launch	A	B, C	D	C, D	D	C, D
A - Removal of Individuals - Short-term Negative Impact B - Bury or Redistribute Organisms - Short-term Negative Impact C - Enhancement of Habitat - Long-term Benefit D - Redistribution of Individuals - Short-term Impact E - Potential Removal of Individuals - Short-term Impact						

7.1.4 Summary

Negative impacts to aquatic species as a result of dredging and disposal of material would be short-term and minor. Positive impacts are expected to be long-term and major, far outweighing the negatives. Of the negative impacts, if any, the primary effect would be the displacement of organisms during the dredging and disposal activities. However, the disposed dredged material would be used to create valuable shoreline ecosystems and be shaped to provide a relatively

smooth, sandy bottom with depths and slopes beneficial to invertebrate and fish rearing. Impacts to fish habitat are expected to be long-term and beneficial if the dredged material is placed to form shallow water habitat. Monitoring of beneficial in-water disposal sites would be conducted to confirm the effectiveness of habitat creation.

7.2 Terrestrial Resources

The proposed dredging and disposal activities would not prevent terrestrial wildlife from obtaining food from, or otherwise using the areas adjacent to, dredging and disposal activities. Dredging and disposal activities would occur within the approved in-water work window and, following dredging and disposal, wildlife would return to areas affected by these activities.

Construction activities associated with the development of woody riparian habitat at the Chief Timothy HMU site near RM 132 would have localized impacts on terrestrial resources. Adverse impacts to terrestrial wildlife would be short-term and limited to the immediate area of the construction site. The development of additional woody riparian habitat would have a long-term beneficial effect on terrestrial resources.

7.3 Cultural Resources

Corps staff for cultural resources completed a literature review of the area of potential effect and determined that cultural/historic properties are not present at the dredging and disposal locations for the 2002-2003 dredging. The Walla Walla District is, therefore, making a determination that the proposed activities would have "no potential to cause effects on historic properties," and the Corps is seeking concurrence and project clearance. Pursuant to Section 106 of the National Historic Preservation Act, the necessary project information has been provided to identified consulting parties which include the Idaho and Washington State Historic Preservation Offices, the Colville and Umatilla Tribal Historic Preservation Offices, the Nez Perce Tribe, the Yakama Indian Nation, and the Wanapum Indian community.

7.4 Water Quality

The proposed 2002-2003 dredging project is expected to have a temporary negative effect on water quality in both the Snake and Clearwater Rivers, mostly because of turbidity plumes caused by the dredging and disposal. A 404(b)(1) evaluation of the proposed 2002-2003 dredged material discharge is included as Attachment 1, and presents a detailed discussion of the anticipated water quality effects of the proposed activities.

The dredging at the ports and in the boat basins are expected to have the most impact as the sediments in these areas are expected to contain fine sediments. The Corps anticipates that dredging operations may create a detectable turbidity plume extending up to 1,000 feet (304.8 m) downstream. However, operations causing a 5-nephelometric turbidity unit (NTU) increase over background (10 percent increase when background is over 50 NTUs) at a point 300 feet (91.4 m)

downstream would not be allowed. This plume would dissipate when dredging ceases for the day or when the dredge is moved to a new location.

The dumping of the dredged material at the disposal sites is also expected to cause turbidity plumes. The plumes are expected to be of short duration as the dumping of a barge is a singular event as opposed to the continuous operation of the dredge. Previous disposal actions have shown that the material tends to stay in a clump as it drops from the barge to the riverbed, further minimizing the size of the plume. For woody riparian habitat creation, methods to minimize turbidity are presented in Section 5, above.

Dredging in the Snake River reservoirs has the potential to raise ammonia levels in the water column as ammonia is present in some of the sediments that would be dredged. Actual ammonia contamination levels that would be released into the water are site specific, dependent upon temperature and pH of the water, and vary considerably due to particle size of the material being dredged. Finer grained sediment (i.e., silt) would be expected to have higher ammonia concentrations and would be more likely to release larger amounts of ammonia into the water. The amount of ammonia that would be released is unknown. The Corps would monitor ammonia levels in the water during dredging. If the levels reached critical concentrations, the Corps would stop operations and modify dredging activities to lower the ammonia levels in the water.

Dredging the navigation channel downstream of Lower Granite and Lower Monumental Dams should have little effect on water quality as the material to be removed is expected to be river cobble 2 to 6 inches (5.1 to 15.2 cm) in diameter with few fines and possibly some larger rock up to 18 inches (45.7 cm) in diameter. Disposal of this material is also expected to have little impact, but may cause a small turbidity plume. No contaminants are anticipated.

The Corps is preparing a water quality monitoring plan for the 2002-2003 dredging and disposal activities. Various sampling activities would be included. As a possible example, water samples would be taken and turbidity measured using a nephelometer twice per day during active dredging. Samples would be taken 1 hour after dredging begins and 1 hour before dredging ends each day. Samples would be taken 300 feet (91.4 m) upstream from the dredging operation and 300 feet (91.4 m) directly downstream from the point of dredging. Two measurements would be taken at each location: 3.3 feet (1 m) below the water surface and 3.3 feet (1 m) above the river bottom. The allowable increase in turbidity at the downstream sampling point would be 5 NTUs over background when background is 50 NTUs or less, or more than a 10 percent increase in turbidity when the background is more than 50 NTUs. Background is measured 300 feet (91.4 m) upstream of the dredging operation. Immediately upon determining any exceedence of this NTU limit, the dredging operation would be altered and monitoring of turbidity would continue at the downstream location until the NTU levels returned to an acceptable limit above background. If the NTU levels did not return to an acceptable limit, dredging would stop until the NTU levels dropped, then dredging would resume.

The Corps could also set up self-contained recording devices such as YSI Sonde® water quality instruments to take hourly readings of turbidity, dissolved oxygen, pH, ammonia, and conductivity. The recording devices would be stationed 300 feet (91.4 m) upstream of the dredging operation; 300 feet (91.4 m) downstream of the dredge; upstream of the in-water disposal areas; 300 feet (91.4 m) downstream of the two shallow/mid-depth disposal sites (one recording device at each site); and 300 feet (91.4 m) downstream of the deep water site. The Corps would download the recording devices daily.

7.5 Threatened and Endangered Species

Endangered Species Act (ESA)-listed threatened and endangered species that may be found in the project area can be divided into anadromous fish, non-anadromous fish, and terrestrial species. Of the four ESA-listed anadromous fish evolutionarily significant units present in the proposed dredging areas for winter 2002-2003, one is listed as endangered (Snake River sockeye salmon) and three are listed as threatened (Snake River Fall chinook salmon, Snake River Spring/Summer chinook salmon, Snake River Basin steelhead). In the winter 2002-2003 project area, the following are also present: one non-anadromous fish listed as threatened (bull trout); three terrestrial species listed as threatened (bald eagle, Ute ladies' tresses, water howelia); and one terrestrial species proposed for listing (Spalding's silene).

The Corps has determined that the proposed dredging and disposal "may affect and would likely adversely effect" only individuals of the threatened anadromous species and has entered into formal consultation with the National Marine Fisheries Service. Actions that have the most potential to impact listed anadromous fish species include dredging of backwater areas and dredging in the tailrace areas of the dams. During the winter, dredging in backwater areas has the potential to disturb a few juvenile salmonids using these areas for overwintering habitat. However, few if any juvenile chinook salmon and steelhead are expected to use backwater areas of the Snake River during the winter and this is not expected to be a significant problem.

Dredging in the tailwater areas of the dams has the potential to disturb and destroy redds of fall chinook salmon, which sporadically spawn in the tailraces of the dams in small numbers. In an effort to avoid disturbances, underwater pre-dredging surveys would be conducted to determine if areas slated for dredging have been used for spawning by fall chinook. No Sockeye salmon would be expected to be impacted by these actions, and only a few chinook salmon or steelhead individuals are expected to be disturbed by dredging activities.

The Corps has determined that the proposed dredging and disposal activities "may affect, but are not likely to adversely affect" bull trout, bald eagles, water howelia, or Ute ladies' tresses or their habitats. The Corps has also determined the proposed activities would have "no effect" on Spalding's silene. In their letter of July 27, 2001, the U.S. Fish and Wildlife Service (USFWS) concurred with these determinations for the proposed dredging and potential in-water discharge at the RM 116 site. USFWS has been consulted regarding the proposed woody riparian habitat creation site at Chief Timothy HMU. The final findings of this consultation will be included in the Record of Decision (ROD).

The main subpopulation of bull trout associated with the four lower Snake River reservoirs spawns and rears in the Tucannon River Basin (the confluence of the Snake and Tucannon Rivers is at Snake RM 62). Migratory bull trout from the Tucannon River may be present in the main stem Snake River below Lower Granite during the winter in-water work window. A few bull trout from the Clearwater River or other tributaries could potentially be present in the vicinity of the confluence of the Snake and Clearwater Rivers. Any bull trout present in the dredging or disposal areas would be able to easily avoid the work areas. The use of mechanical dredging methods would minimize the possibility of entraining any bull trout. Maintaining turbidity at levels within state standards would also minimize impacts to bull trout.

Bald eagles are known to winter in the lower Snake River area and roost in black locust or black cottonwood trees, where available. The proposed dredging and disposal activities would have a minimal impact on bald eagles. The proposed activities do not include removal of any shoreline vegetation. The proposed development of woody riparian habitat would provide additional perch trees at RM 132. Prey species such as fish or waterfowl may be temporarily displaced, but the impacts would be short-term and localized. The dredging and disposal activities would add to the existing amount of human-generated noise and activity in the river channel and on the shoreline, but these impacts would also be short-term and localized.

Ute ladies' tresses is a lowland orchid typically occurring beside or near moderate gradient, medium-to-large streams and rivers in the transition zone between mountains and plains. It is not found along slow meandering streams out in the flats. The communities where it is often found tend to be typical of riparian habitat in the area. The species tends to occupy graminoid (grasses, rushes, and sedges) dominated openings in shrubby areas. The Corps has surveyed the woody riparian habitat development area for Ute ladies' tresses and has determined that this species would not be affected by the proposed action.

Water howelia grows in wetlands associated with ephemeral glacial pothole ponds and former river oxbows. The study area does not exhibit habitat that could be used by this species.

Spalding's silene is a flowering plant that occurs primarily within open grasslands with a minor shrub component and occasionally with scattered conifers. It is commonly found in the Idaho fescue/snowberry plant association at elevations of 1,900 to 3,050 feet (579.1 to 929.6 m), which is well above the maximum reservoir elevation of 738 feet (224.9 m) for Lower Granite Reservoir. The proposed 2002-2003 activities would have no effect on Spalding's silene as none of the activities would take place within suitable habitat for the plant species.

USFWS' concurrence with these finding regarding bull trout, bald eagle, Ute Ladies' tresses, water howelia, and Spalding's silene was received by the Corps on June 27, 2002 and is included in Appendix G of the Final DMMP/EIS.

8.0 CUMULATIVE EFFECTS

The cumulative effects analysis considered how other past and future actions, when considered in combination with the proposed dredging and disposal action presented in this appendix, could cumulatively have significant impacts on environmental resources. Other past, present, and reasonably foreseeable projects or actions that could result in cumulative impacts include past, present, and future dredging and disposal activities undertaken by the Corps, and past, present, and potential future Federal and non-federal dredging for maintenance of ports, boat basins, and other public or private facilities within the four lower Snake River reservoirs.

Cumulative effects of the proposed dredging and disposal would most likely be associated with aquatic resources. Benthic communities would continue to be displaced by the dredging activities and buried by the disposal activities. However, these communities would be expected to re-establish within 6 months to a year. The dredging and disposal would have the potential to negatively impact ESA-listed fish species, but these impacts would be minimized because few individuals of the listed species would be present during the work period. The proposed woody riparian habitat development would provide long-term benefits for terrestrial and aquatic ecosystems. In addition, the potential in-water disposal of the dredged material is expected to result in the creation of additional rearing habitat for juvenile fall chinook salmon, which may contribute to improved survival of the juveniles.

The proposed 2002-2003 dredging and dredged material management activities are not anticipated to have substantial cumulative impacts on the human and natural environment. Section 4.15 of the DMMP/EIS provides a detailed discussion of cumulative impacts associated with the overall Dredged Material Management Plan.

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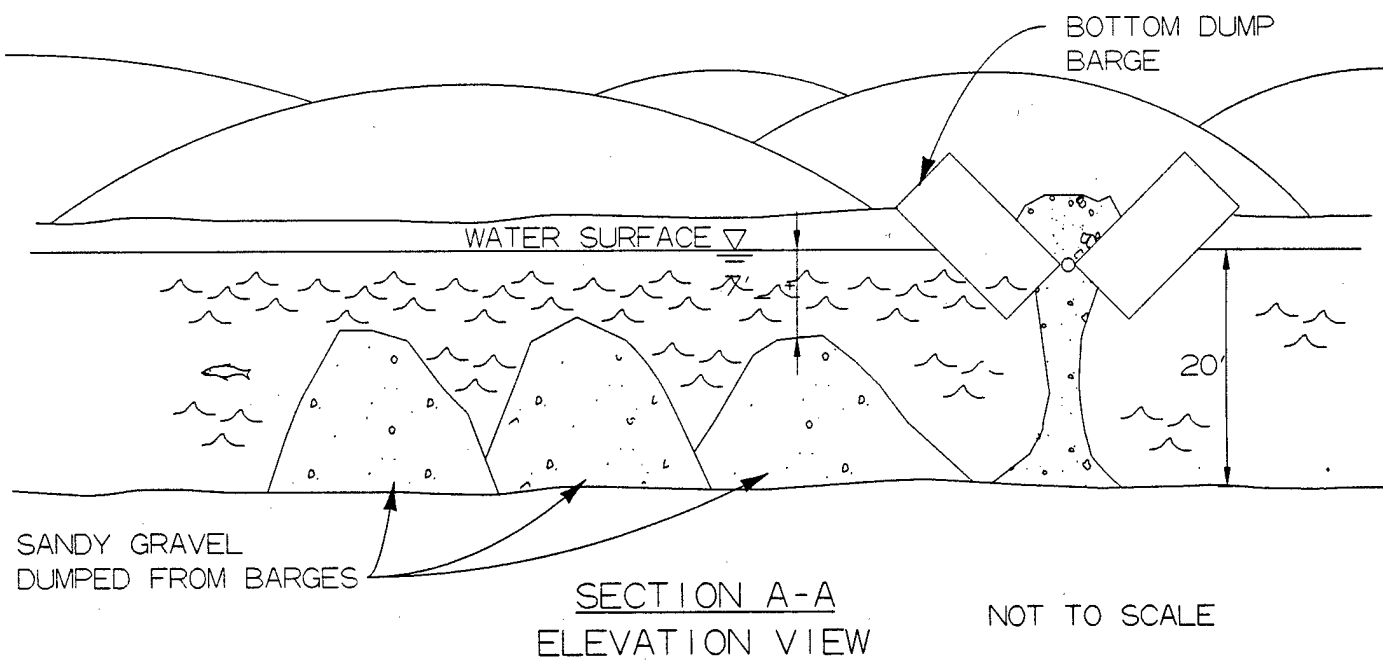
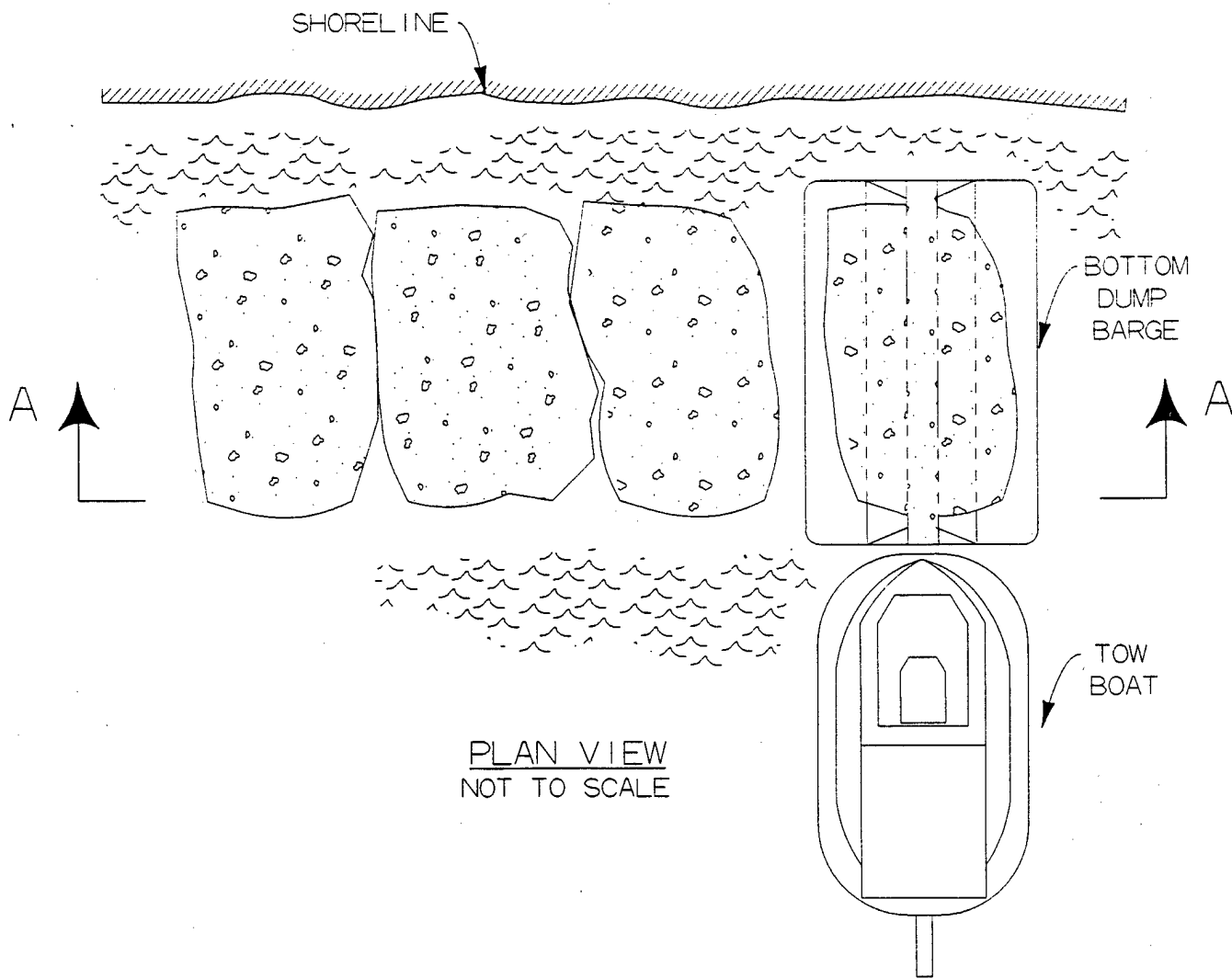
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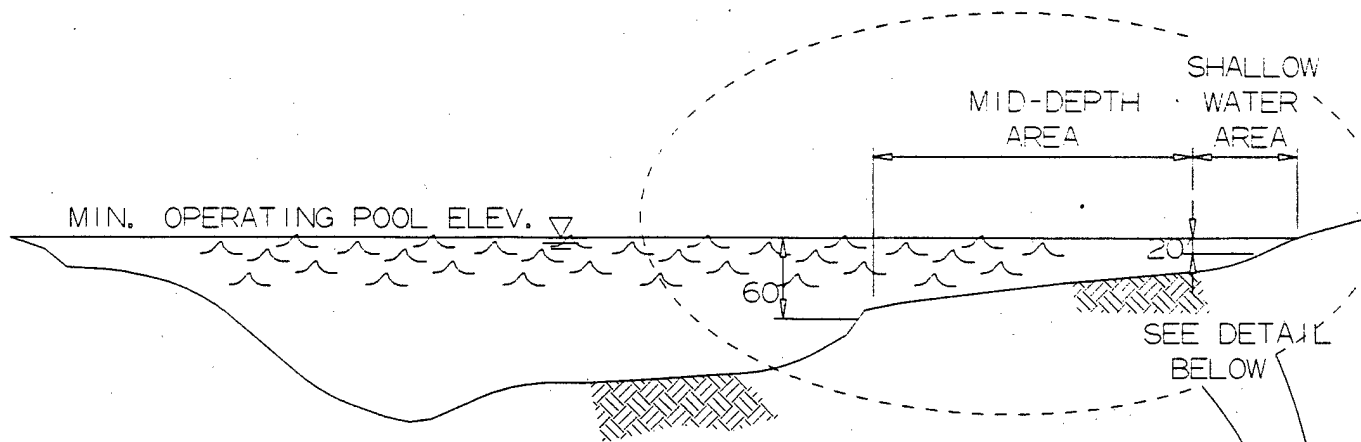
Washington Department of Ecology. June 1999. *Draft Sediment Standards*.

FIGURES

- N-1 Shallow Water Disposal - Bottom Dump Process
- N-2 Shallow Mid-Depth Disposal
- N-3 Shallow Water Disposal - Drag Beam Contouring Process

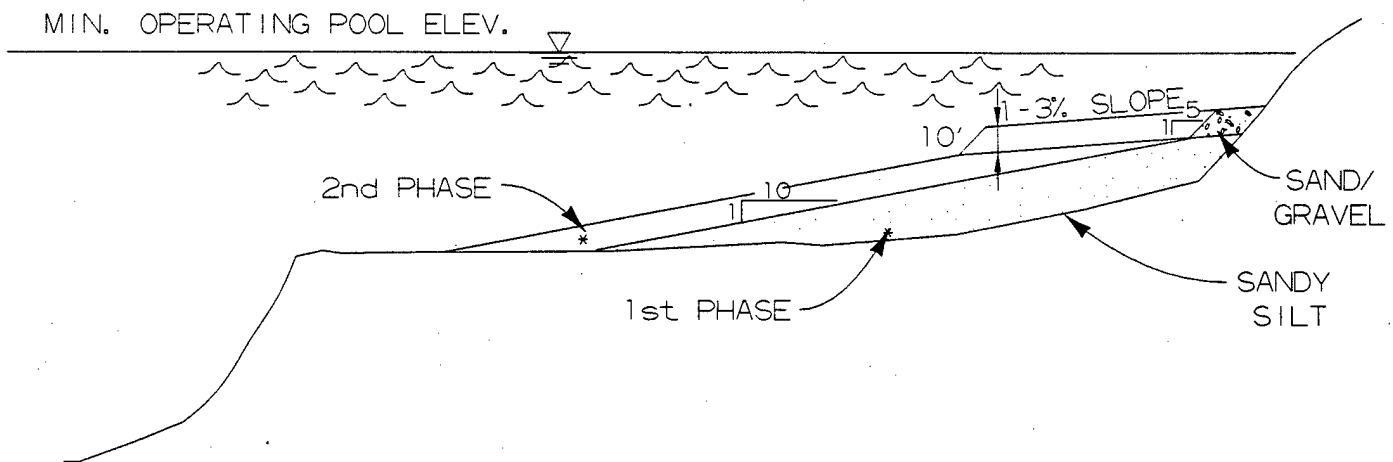


SHALLOW WATER DISPOSAL - BOTTOM DUMP PROCESS
FIGURE N-1



TYPICAL CROSS SECTION
NOT TO SCALE

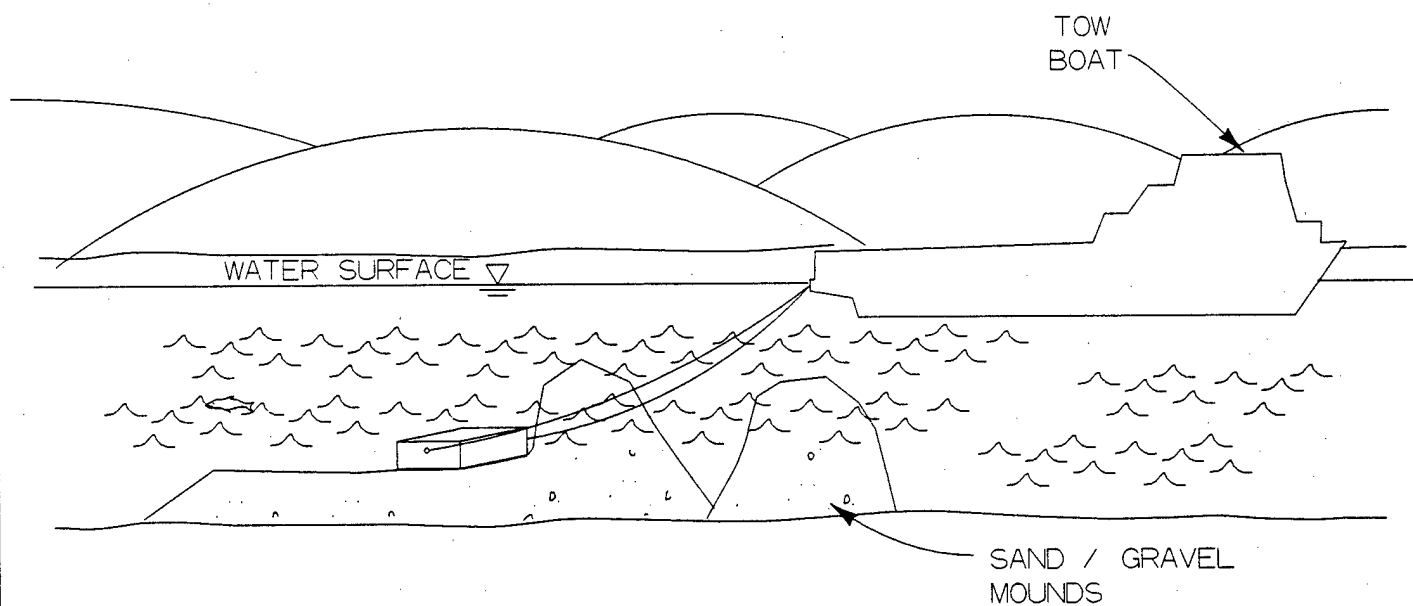
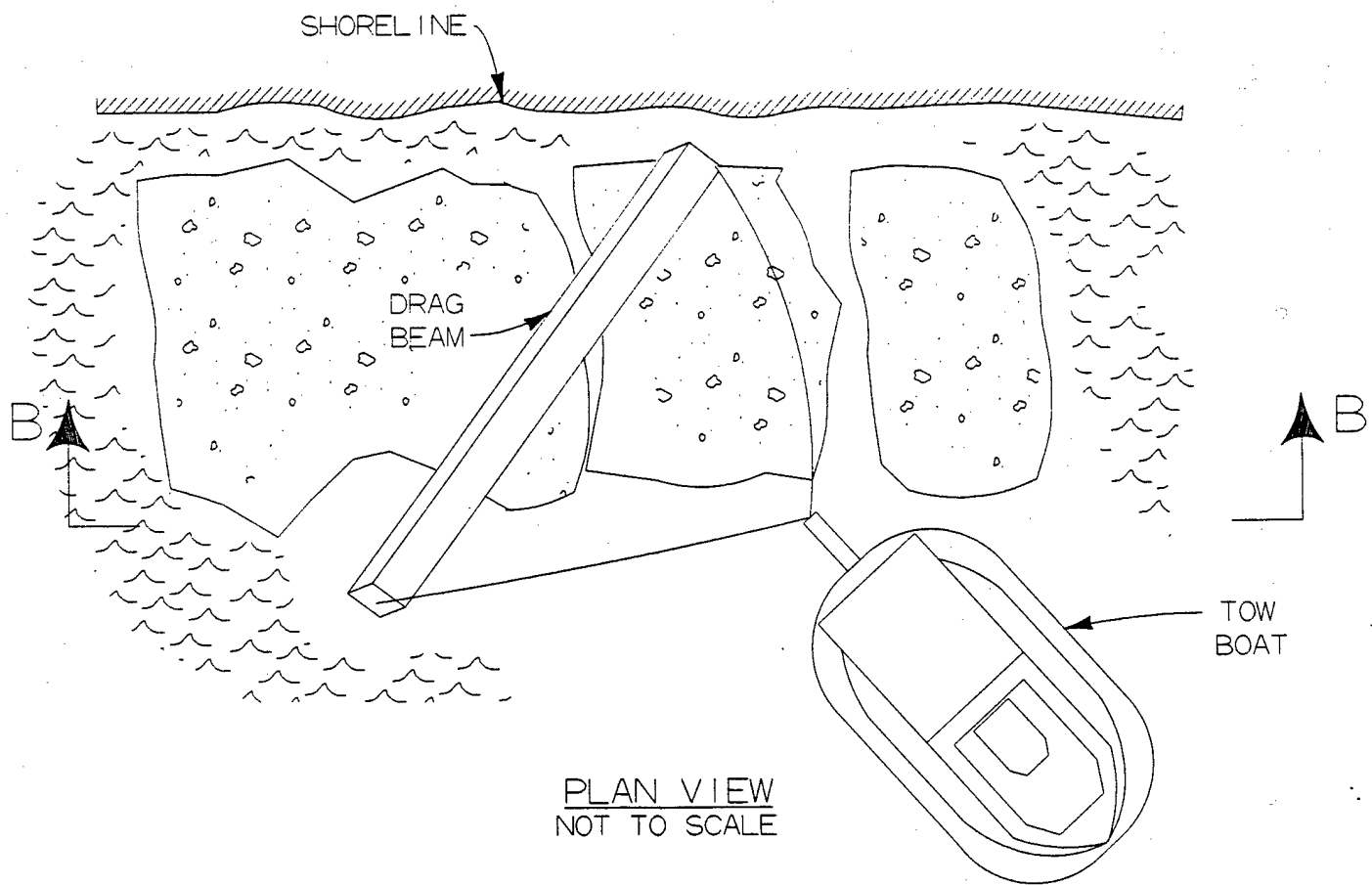
LOWER SNAKE RIVER RESERVOIR
SHALLOW & MID DEPTH DISPOSAL AREAS



DETAIL
NOT TO SCALE

PHASED DEVELOPMENT DISPOSAL AREA
SHALLOW WATER HABITAT

SHALLOW MID-DEPTH DISPOSAL
FIGURE N-2

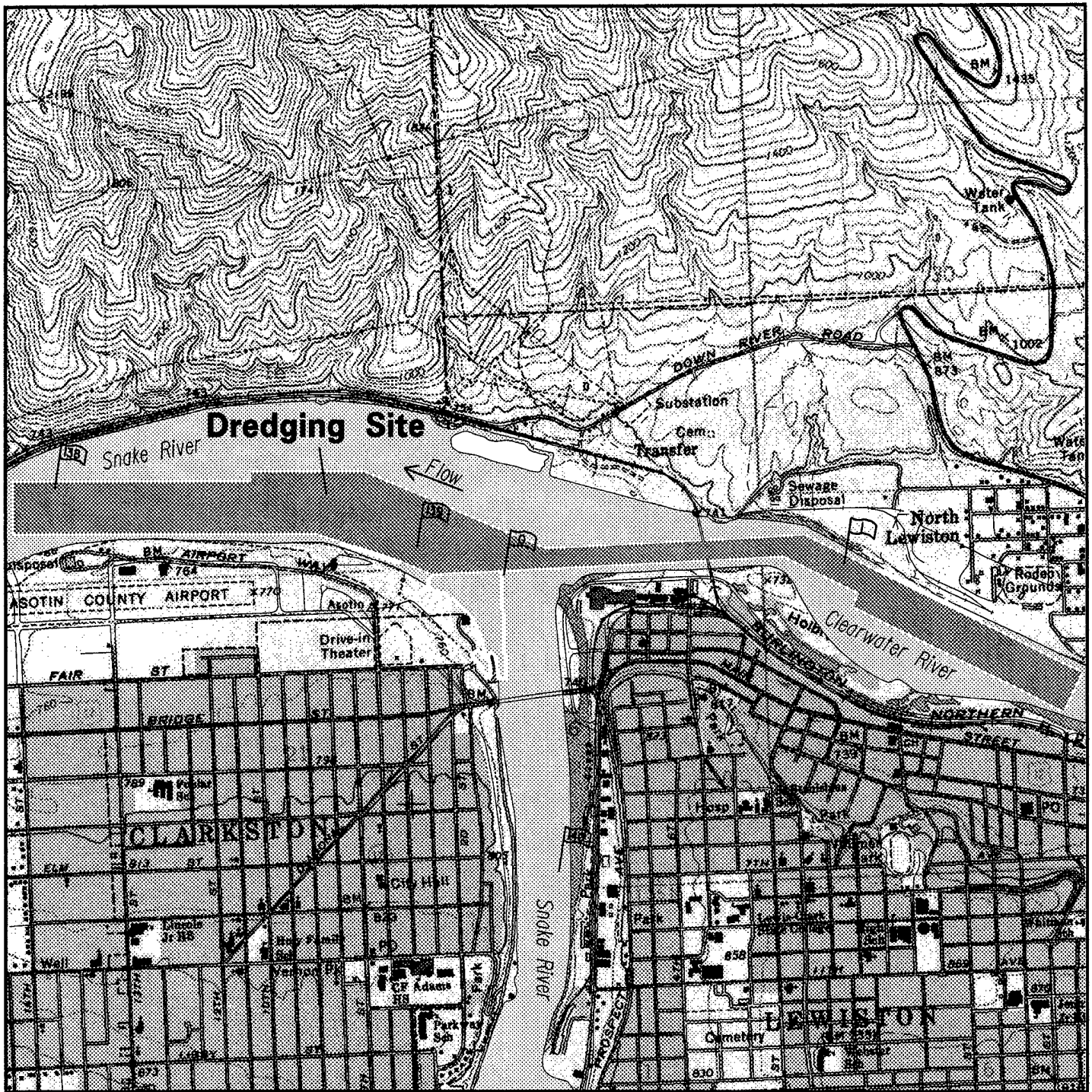


SHALLOW WATER DISPOSAL - DRAG BEAM CONTOURING PROCESS

FIGURE N-3

PLATES

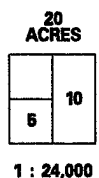
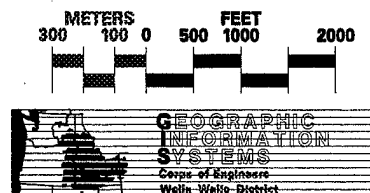
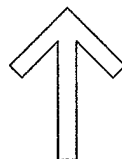
- N-1 Miscellaneous Dredging and Disposal Sites
- N-2 Snake and Clearwater Confluence Site
- N-3 Port of Clarkston Site
- N-4 Port of Lewiston Site
- N-5 Hells Canyon Marina Resort Site
- N-6 Green Belt Boat Basin Site
- N-7 Swallows Beach/Boat Ramp Site
- N-8 Lower Granite Dam Navigation Lock Site
- N-9 Lower Monumental Navigation Lock Site
- N-10 Illia Landing Boat Ramp Site
- N-11 Willow Landing Boat Ramp Site
- N-12 In-Water Disposal Site, RM 132
- N-12a In-Water Disposal Site, Chief Timothy at RM 132.0
- N-12b In-Water Disposal Site, Chief Timothy at RM 132.0
- N-13 In-Water Disposal Site, RM 116
- N-14 In-Water Disposal Site, RM 116



Sources:

Ice Harbor, Lower Monumental, Little Goose and Lower Granite Lock and Dams, Snake River, Clearwater River, Washington and Idaho, Miscellaneous Dredging Sites, Dredging Plan, 13 Aug. 2000

Clarkston, WA. USGS 7.5 Minute Quadrangle. Township 11 N, Range 46 E.

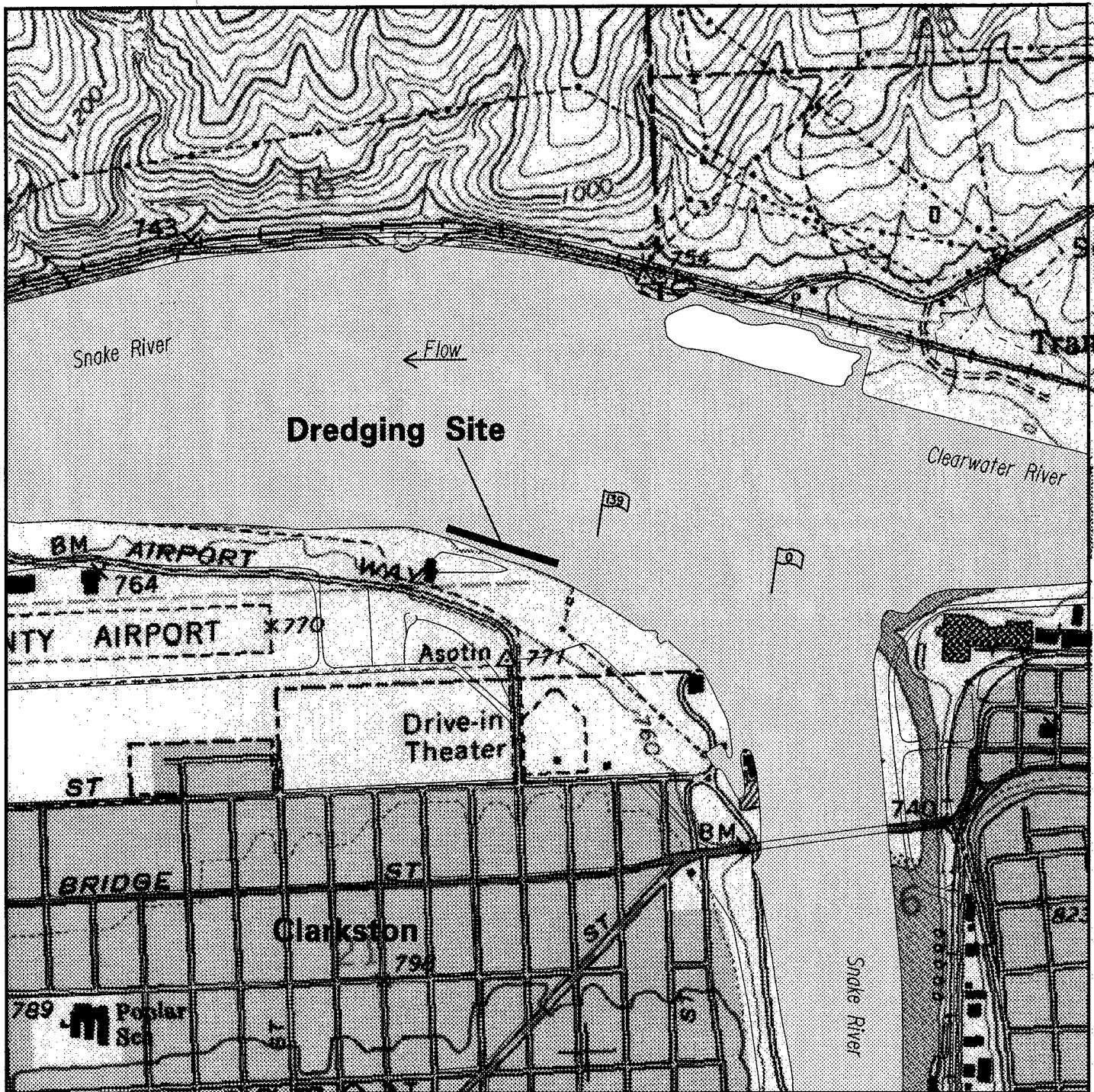


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Walla Walla District
Lower Snake River Reservoirs and McNary Reservoir
Dredged Material Management Plan

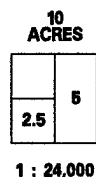
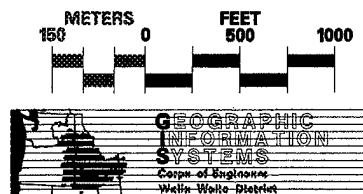
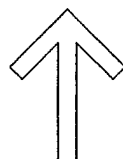
Winter 2002 – 2003 Dredging Plan
**SNAKE AND CLEARWATER
CONFLUENCE SITE**
2002

PLATE N-2



Sources:

Ice Harbor, Lower Monumental, Little Goose and Lower Granite Lock and Dams, Snake River, Clearwater River, Washington and Idaho, Miscellaneous Dredging Sites, Dredging Plan, 13 Aug. 2000.

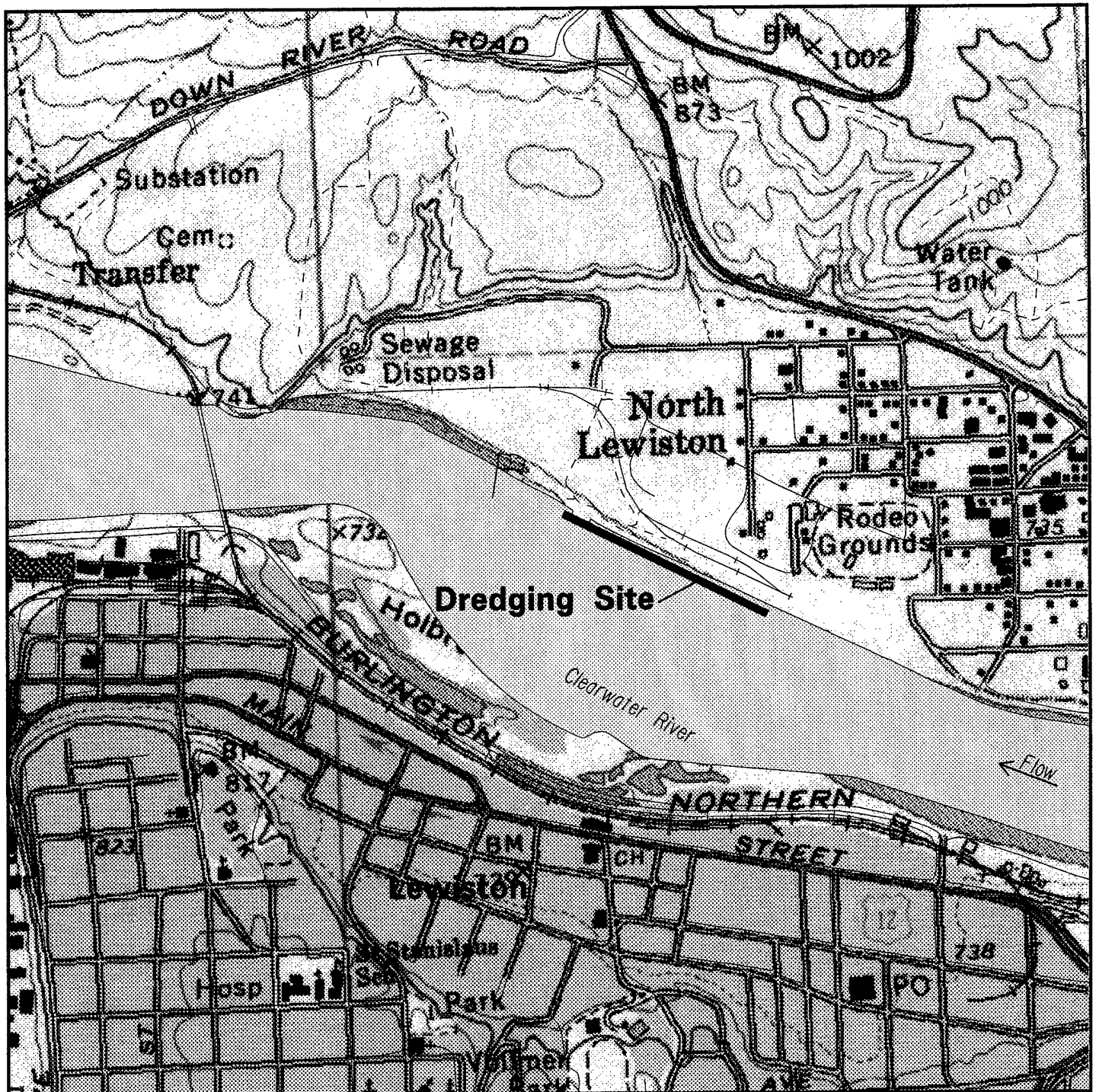


Clarkston, WA. USGS 7.5 Minute Quadrangle, Township 11 N, Range 46 E

Walla Walla District
Lower Snake River Reservoirs and McNary Reservoir
Dredged Material Management Plan

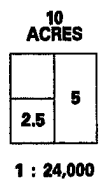
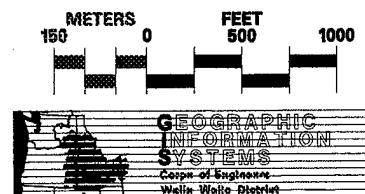
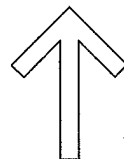
Winter 2002 – 2003 Dredging Plan

PORT OF CLARKSTON SITE
2002
PLATE N-3



Sources:

Ice Harbor, Lower Monumental, Little Goose and Lower Granite Lock and Dams, Snake River, Clearwater River, Washington and Idaho, Miscellaneous Dredging Sites, Dredging Plan, 13 Aug. 2000.

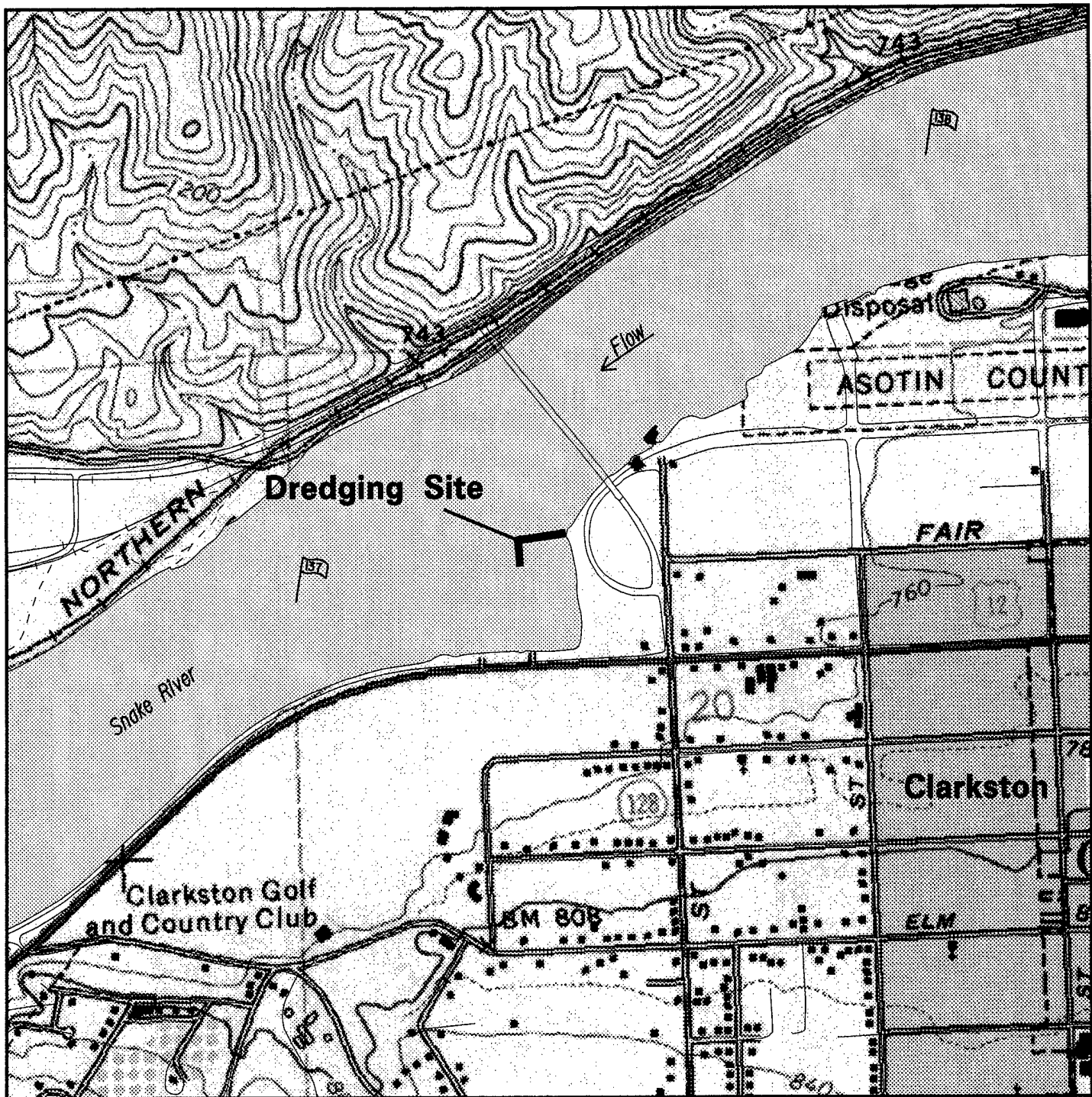


Clarkston, WA. USGS 7.5 Minute Quadrangle, Township 11 N, Range 46 E.

Walla Walla District
Lower Snake River Reservoirs and McNary Reservoir
Dredged Material Management Plan

Winter 2002 – 2003 Dredging Plan

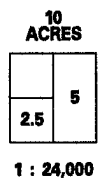
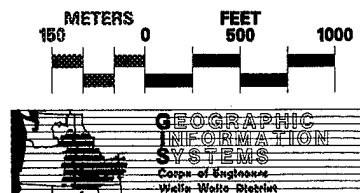
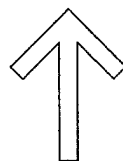
**PORT OF
LEWISTON SITE**
2002
PLATE N-4



Sources:

Ice Harbor, Lower Monumental, Little Goose and Lower Granite Lock and Dams, Snake River, Clearwater River, Washington and Idaho, Miscellaneous Dredging Sites, Dredging Plan, 13 Aug. 2000.

Clarkston, WA. USGS 7.5 Minute Quadrangle, Township 11 N, Range 46 E.



Walla Walla District

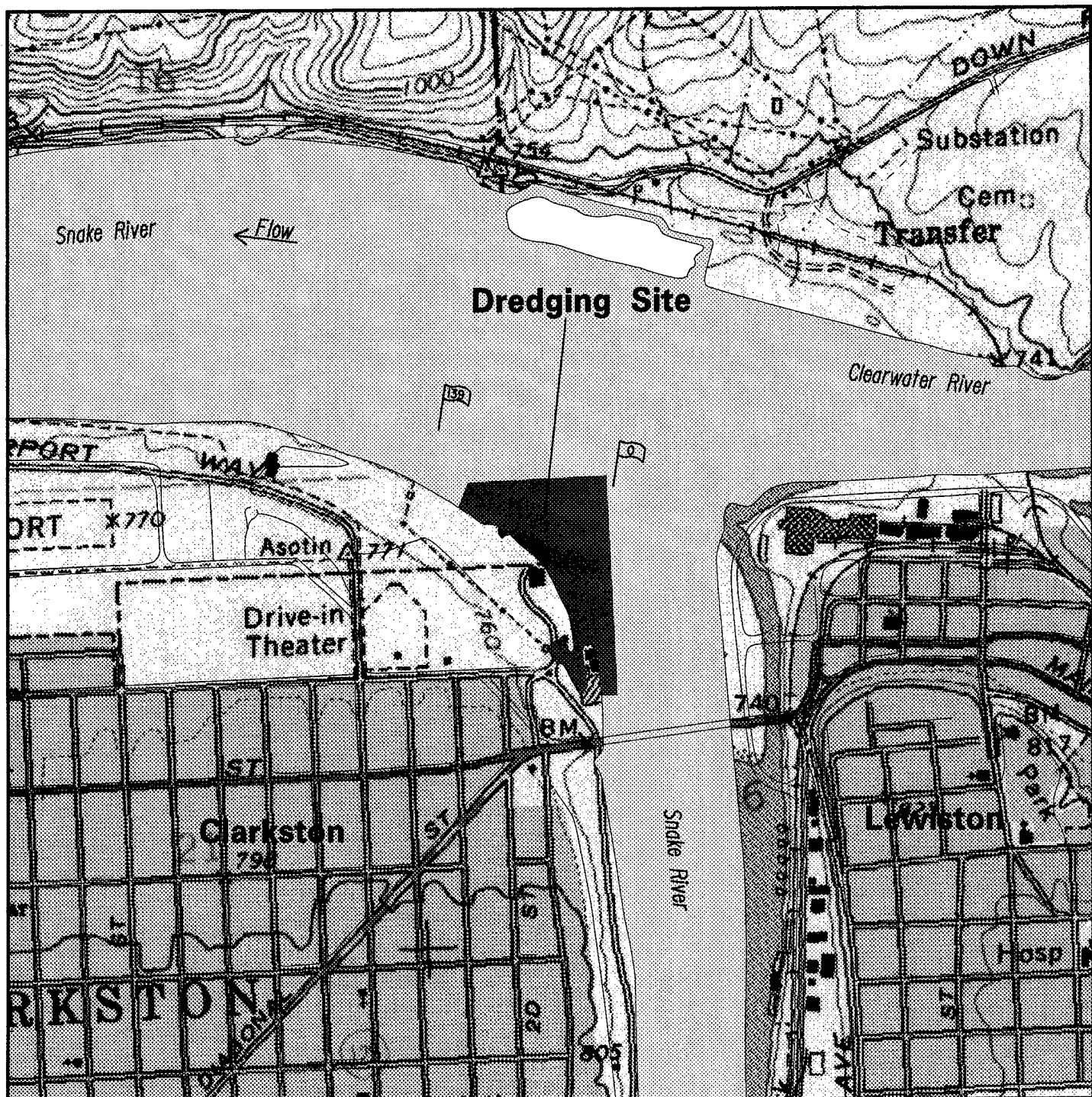
Lower Snake River Reservoirs and McNary Reservoir
Dredged Material Management Plan

Winter 2002 – 2003 Dredging Plan

**HELLS CANYON
MARINA RESORT SITE**

2002

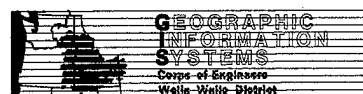
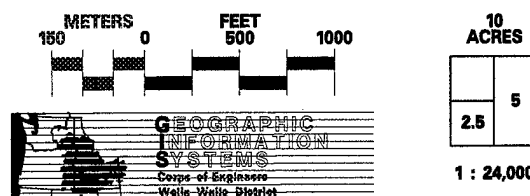
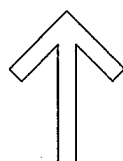
PLATE N-5



Sources:

Ice Harbor, Lower Monumental, Little Goose and Lower Granite Lock and Dams, Snake River, Clearwater River, Washington and Idaho, Miscellaneous Dredging Sites, Dredging Plan, 13 Aug. 2000.

Clarkston, WA. USGS 7.5 Minute Quadrangle, Township 11 N, Range 46 E.



Walla Walla District

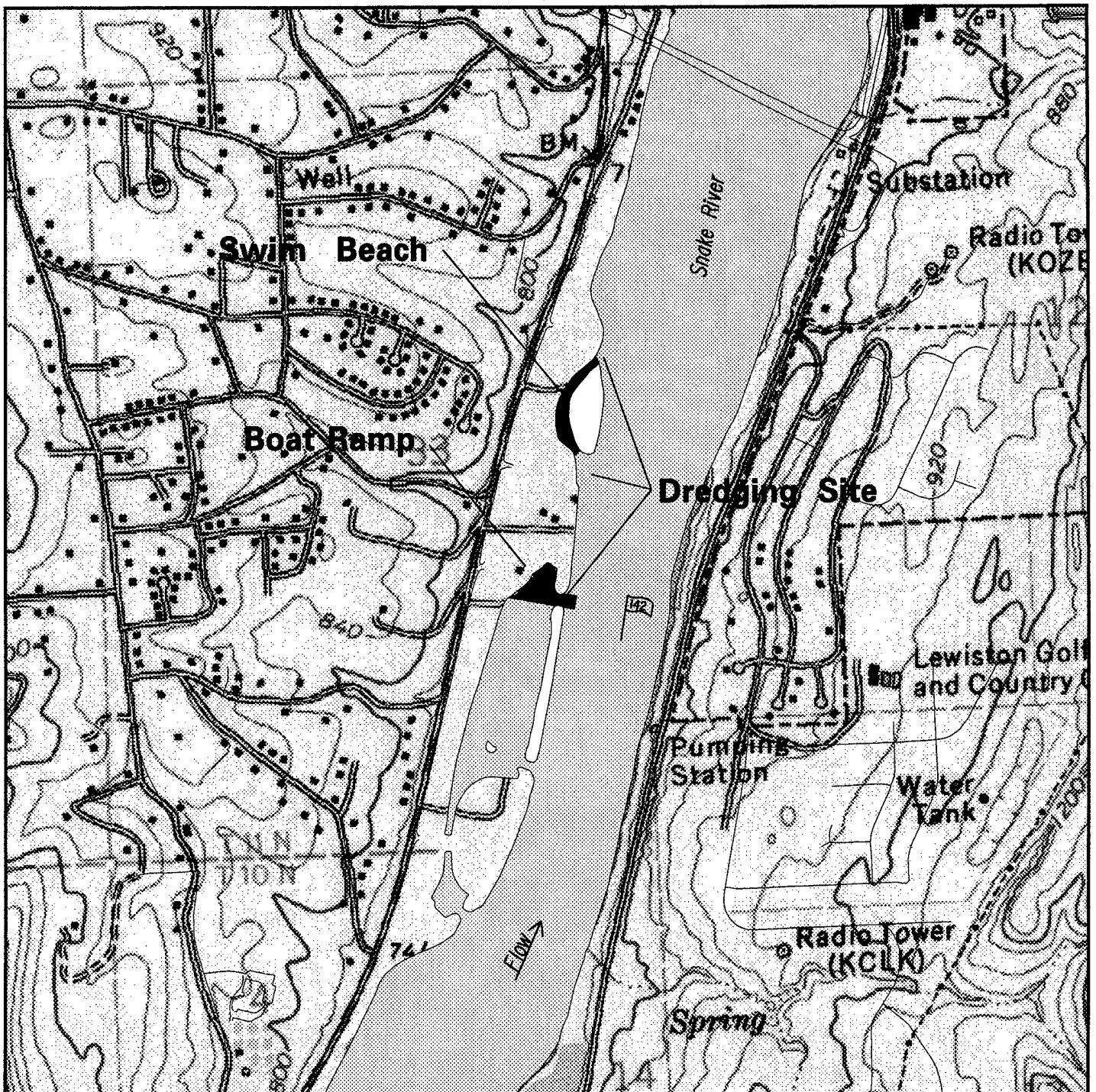
Lower Snake River Reservoirs and McNary Reservoir
Dredged Material Management Plan

Winter 2002 – 2003 Dredging Plan

**GREEN BELT
BOAT BASIN SITE**

2002

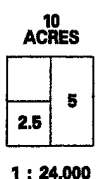
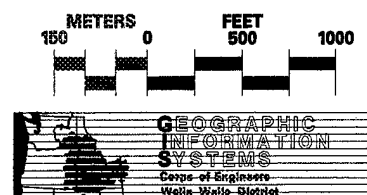
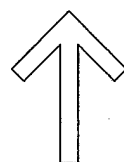
PLATE N-6



Sources:

Ice Harbor, Lower Monumental, Little
Goose and Lower Granite Lock and
Dams, Snake River, Clearwater River,
Washington and Idaho, Miscellaneous
Dredging Sites, Dredging Plan,
13 Aug. 2000

Clarkston, WA. USGS 7.5 Minute
Quadrangle, Township 11 N, Range 46 E



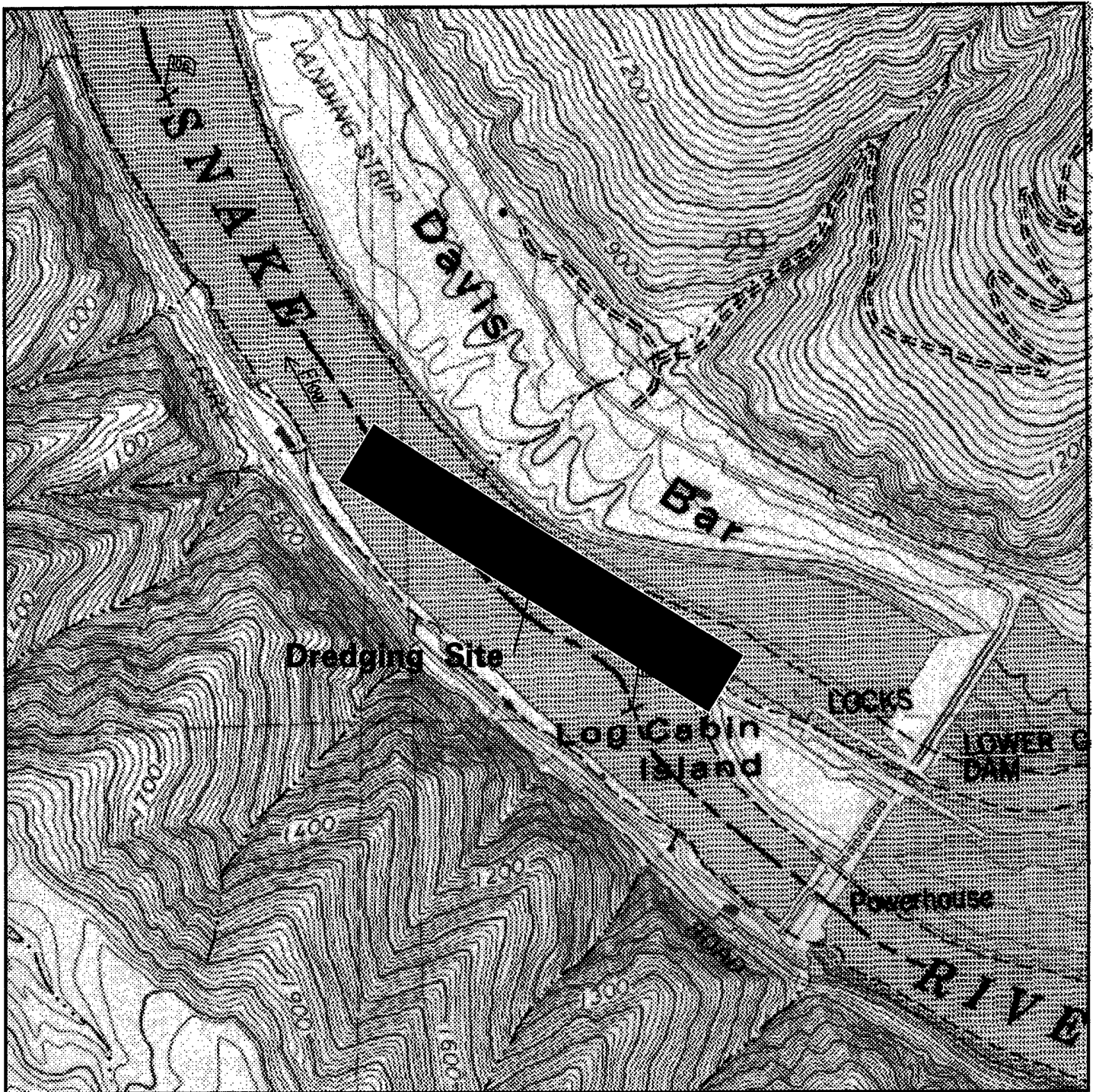
Walla Walla District
Lower Snake River Reservoirs and McNary Reservoir
Dredged Material Management Plan

Winter 2002 – 2003 Dredging Plan

**SWALLOWS BEACH/
BOAT RAMP SITE**

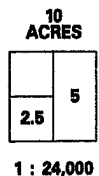
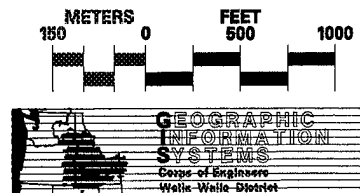
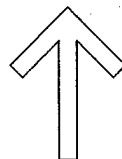
2002

PLATE N-7



Sources:

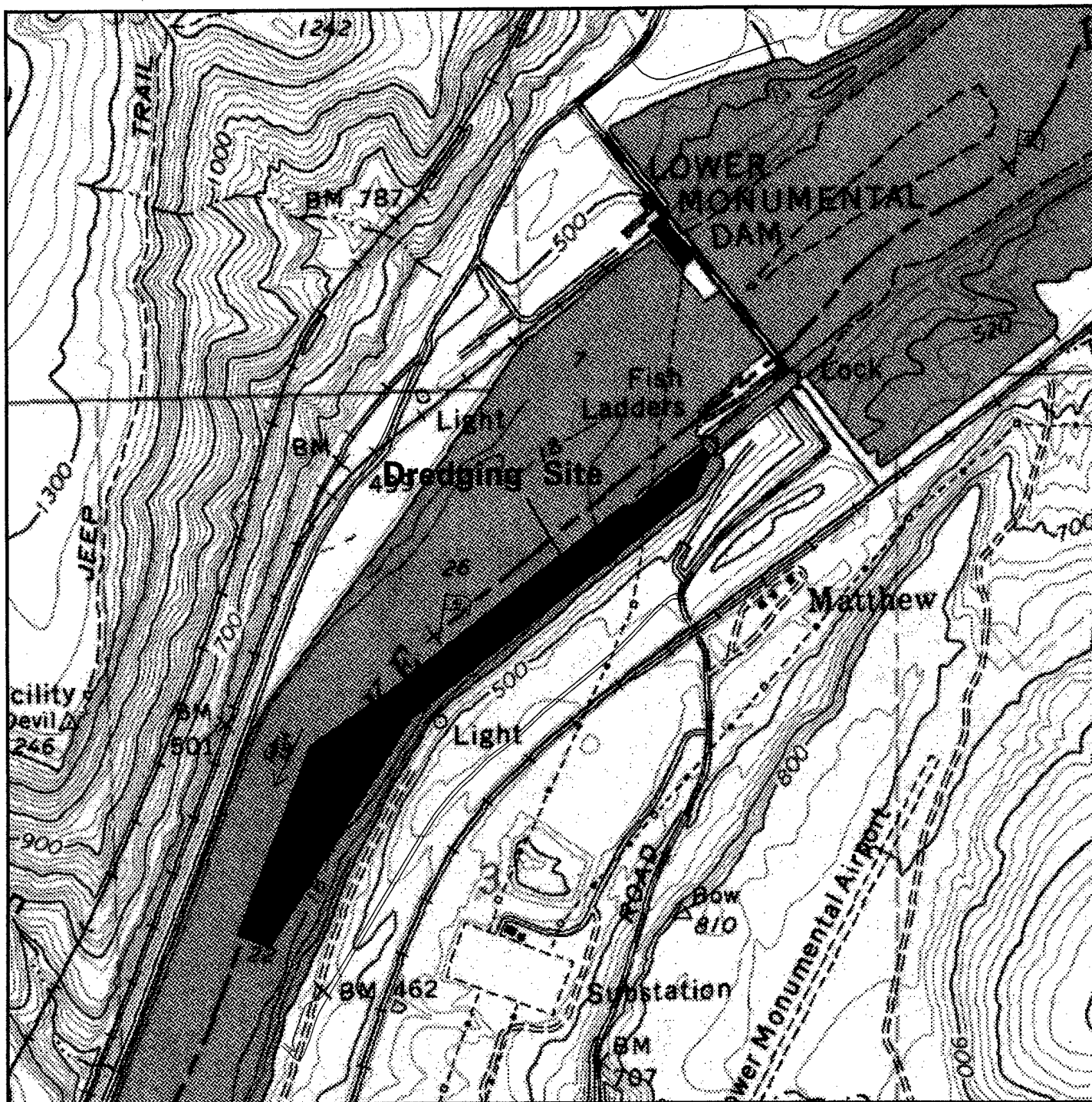
Ice Harbor, Lower Monumental, Little Goose and Lower Granite Lock and Dams, Snake River, Clearwater River, Washington and Idaho, Miscellaneous Dredging Sites, Dredging Plan, 13 Aug. 2000.



Almota, WA. USGS 7.5 Minute
Quadrangle, Township 14 N, Range 43 E

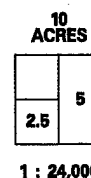
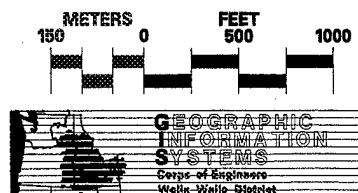
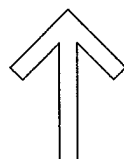
Walla Walla District
Lower Snake River Reservoirs and McNary Reservoir
Dredged Material Management Plan

Winter 2002 – 2003 Dredging Plan
**LOWER GRANITE DAM
NAVIGATION LOCK SITE**



Sources:

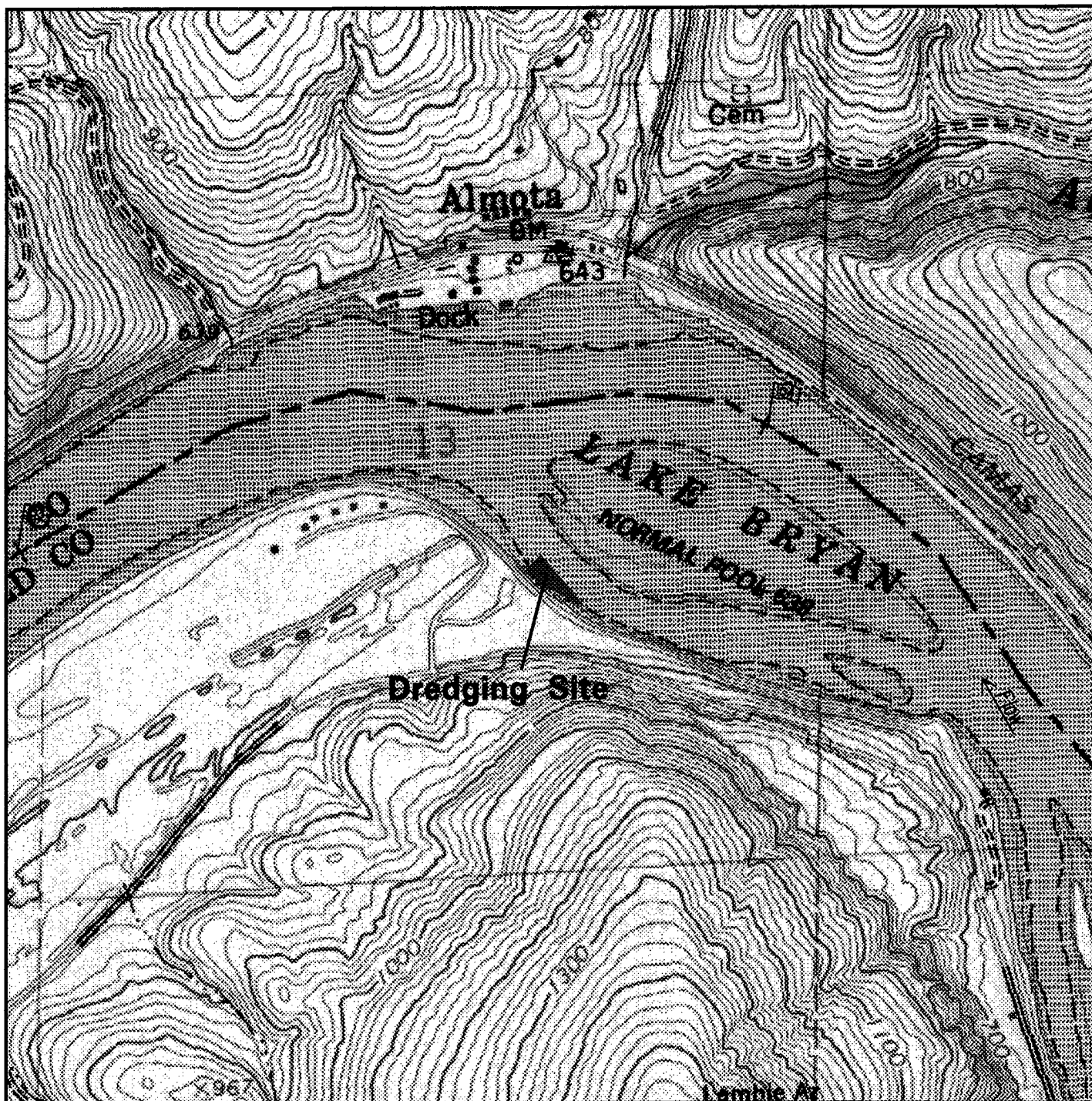
Ice Harbor, Lower Monumental, Little Goose and Lower Granite Lock and Dams, Snake River, Clearwater River, Washington and Idaho, Miscellaneous Dredging Sites, Dredging Plan, 13 Aug. 2000.



Lower Monumental Dam, WA. USGS
7.5 Minute Quadrangle, Township 12 N
Range 34 E.

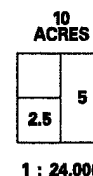
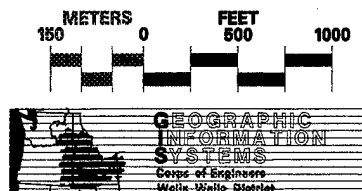
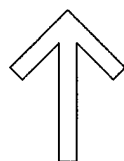
Walla Walla District
Lower Snake River Reservoirs and McNary Reservoir
Dredged Material Management Plan

Winter 2002 – 2003 Dredging Plan
**LOWER MONUMENTAL
NAVIGATION LOCK SITE**



Sources:

Ice Harbor, Lower Monumental, Little Goose and Lower Granite Lock and Dams, Snake River, Clearwater River, Washington and Idaho, Miscellaneous Dredging Sites, Dredging Plan, 13 Aug. 2000.



Almota, WA. USGS 7.5 Minute Quadrangle, Township 14, Range 43 E.

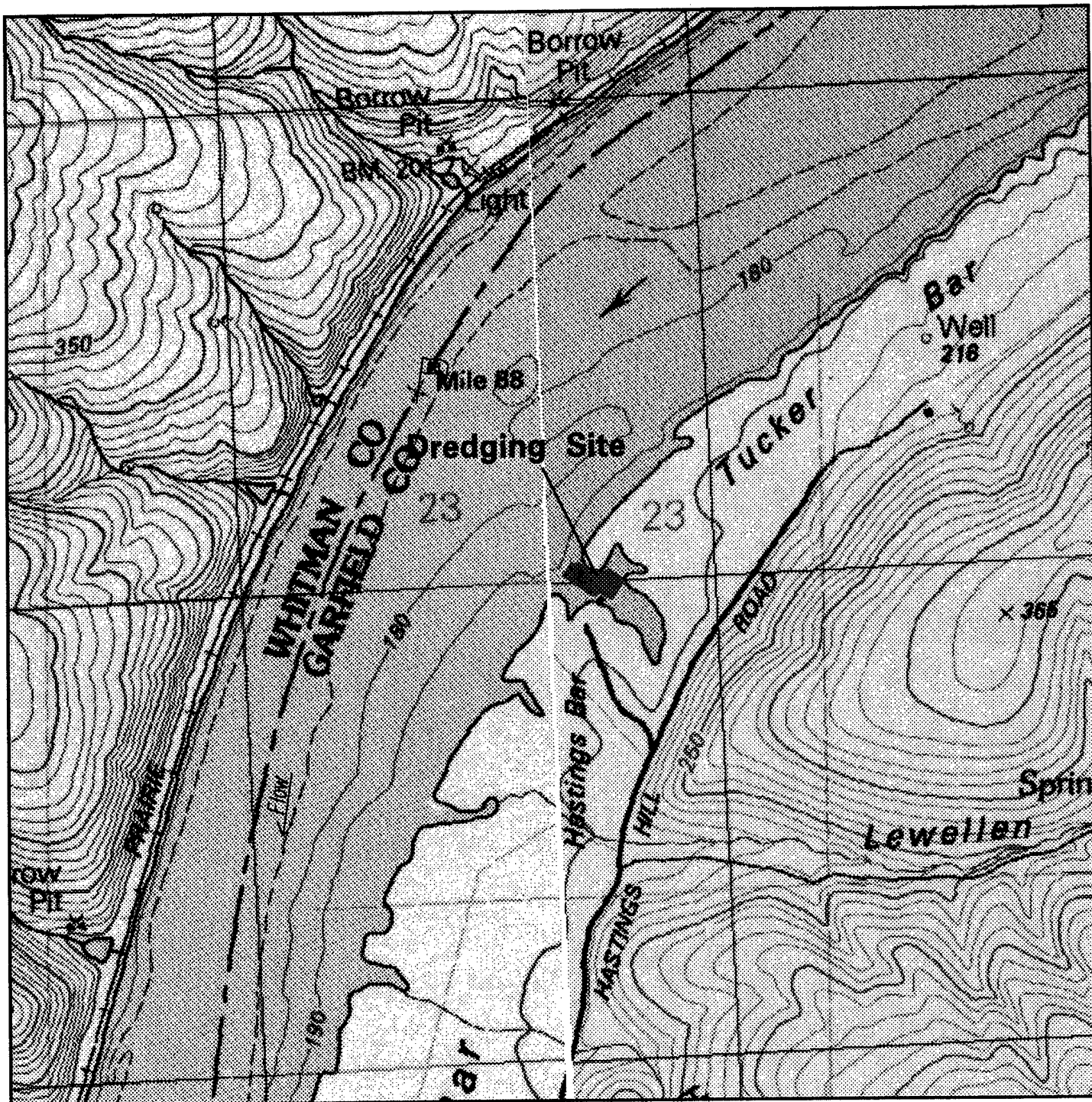
Walla Walla District
Lower Snake River Reservoirs and McNary Reservoir
Dredged Material Management Plan

Winter 2002 – 2003 Dredging Plan

**ILLIA LANDING
BOAT RAMP SITE**

2002

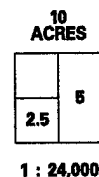
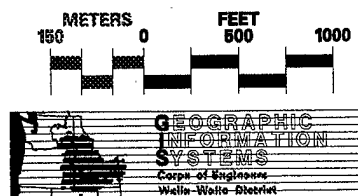
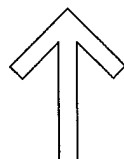
PLATE N-10



Sources:

Ice Harbor, Lower Monumental, Little Goose and Lower Granite Lock and Dams, Snake River, Clearwater River, Washington and Idaho, Miscellaneous Dredging Sites, Dredging Plan, 13 Aug. 2000.

Central Ferry and Ping, WA. USGS
7.5 Minute Quadrangles, Township 14 N,
Range 40 E.



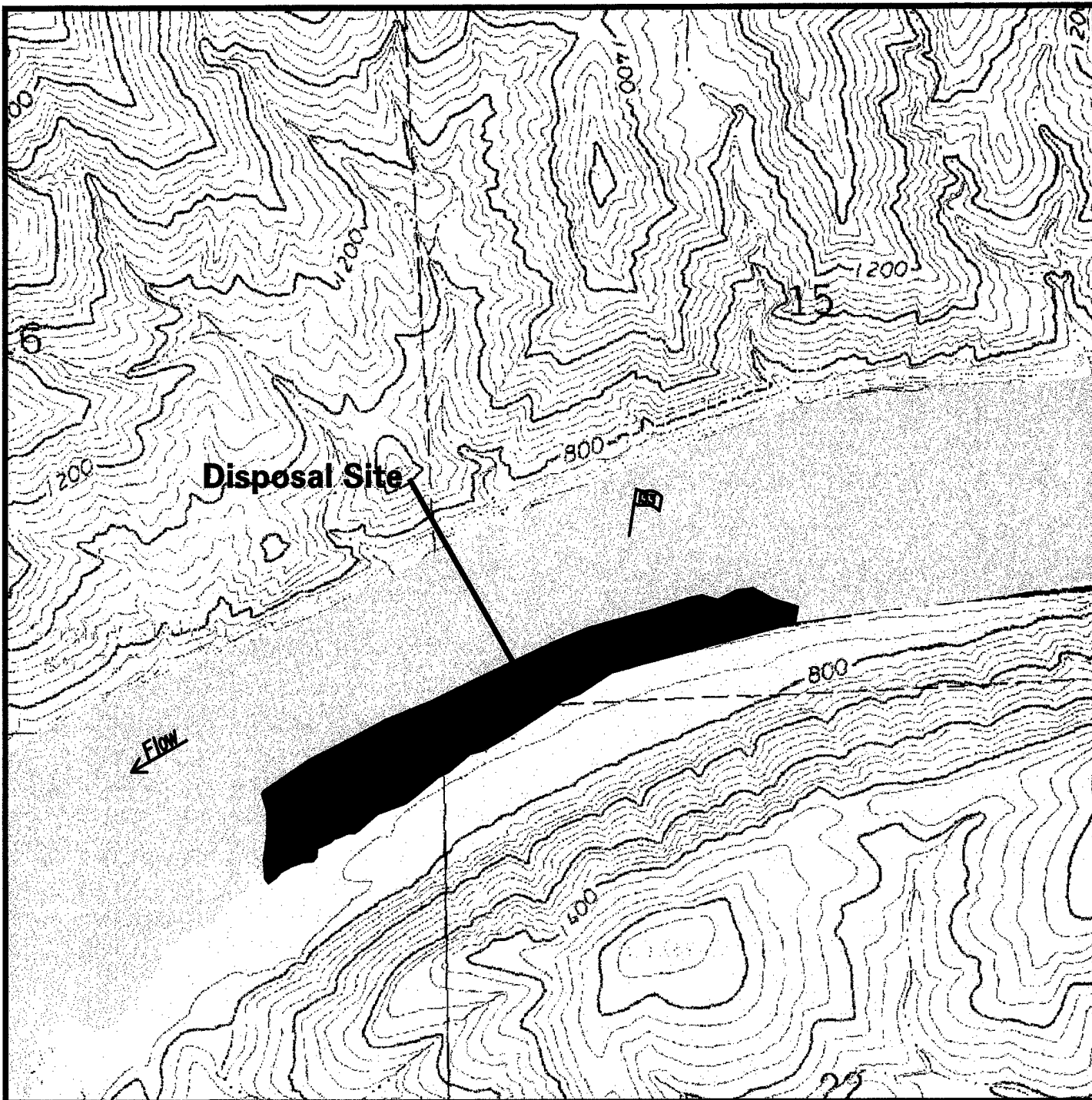
Walla Walla District
Lower Snake River Reservoirs and McNary Reservoir
Dredged Material Management Plan

Winter 2002 – 2003 Dredging Plan

**WILLOW LANDING
BOAT RAMP SITE**

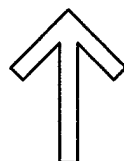
2002

PLATE N-11

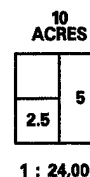
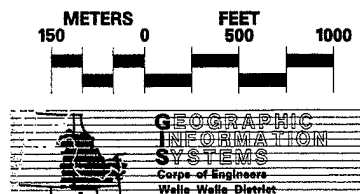


Sources:

Ice Harbor, Lower Monumental, Little
Goose and Lower Granite Lock and
Dams, Snake River, Clearwater River,
Washington and Idaho, Miscellaneous
Dredging Sites, Dredging Plan,
13 Aug. 2000.



Silcott Island, WA. USGS 7.5 Minute
Quadrangle, Township 10 N, Range 45 E.



Walla Walla District

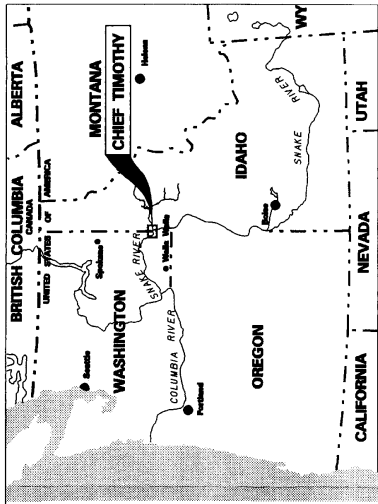
Lower Snake River Reservoirs and McNary Reservoir
Dredged Material Management Plan

Winter 2002 – 2003 Dredging Plan

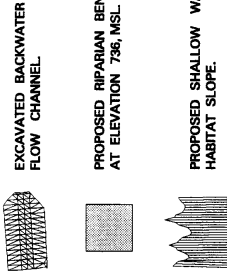
**IN-WATER DISPOSAL
SITE, RM 132**

2002

PLATE N-12



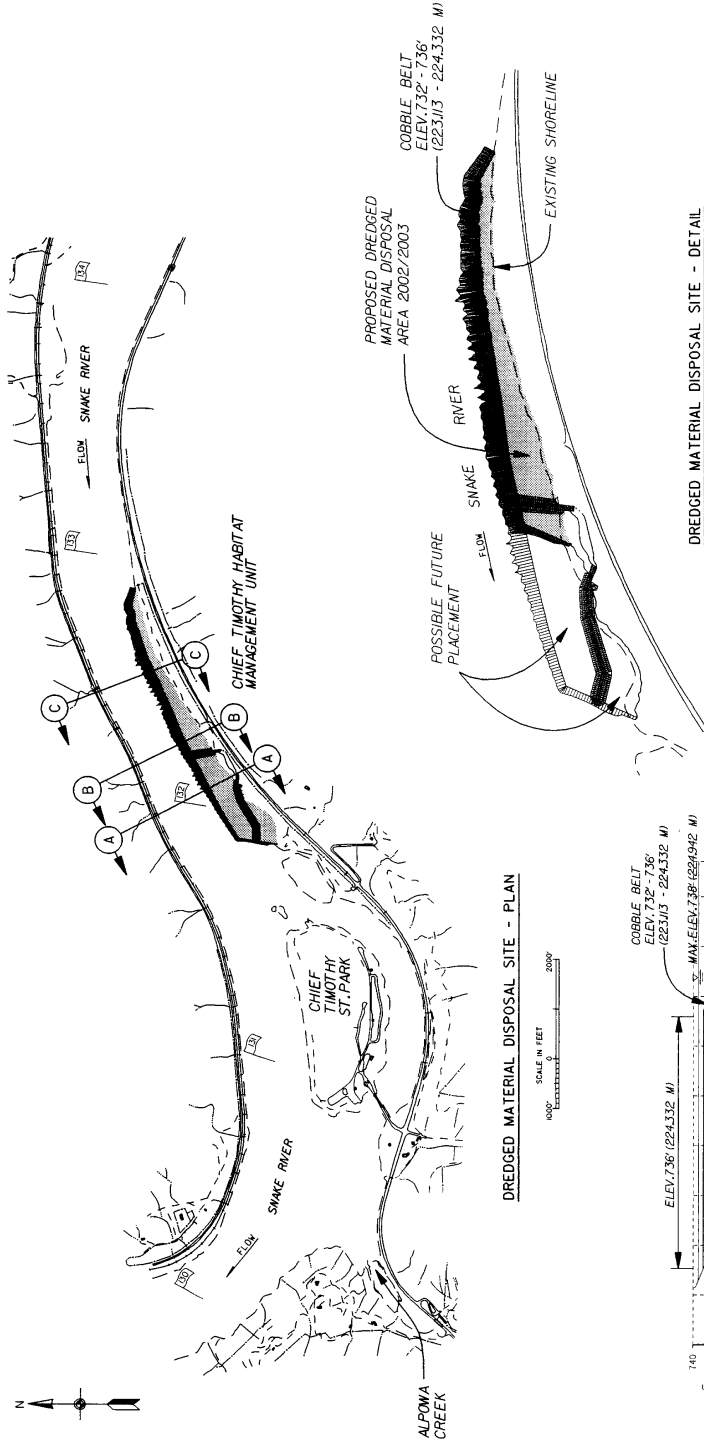
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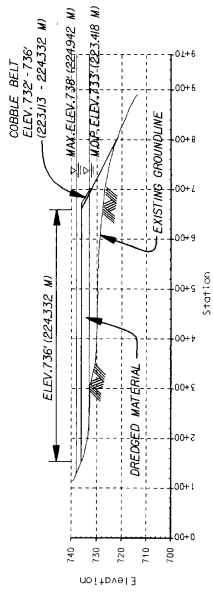
Walla Walla District Lower Snake River Reservoirs and McNary Reservoir Dredged Material Management Plan Winter 2002 - 2003 Dredging Plan **IN-WATER DISPOSAL SITE** **CHIEF TIMOTHY AT RM 132.0**

DATE: 12-14-2003 14:00
BY: E.C. [Signature]

PLATE N-12a



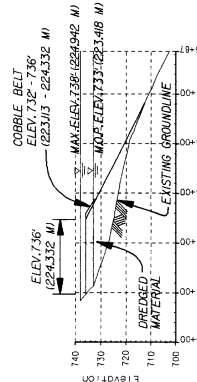
DREDGED MATERIAL DISPOSAL SITE - PLAN



SECTION A



SECTION B



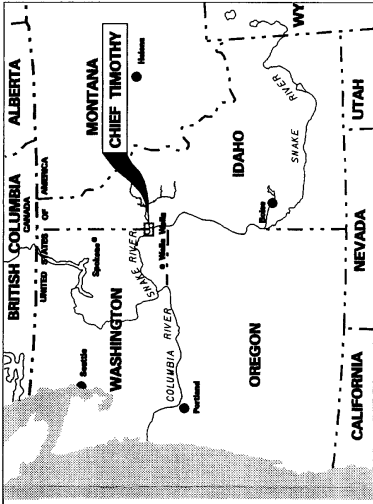
SECTION C

NOTE: 1. MDP REFERS TO MINIMUM OPERATING POOL.

DATE: 12-14-2003 14:00
BY: E.C. [Signature]

DATE: 12-14-2003 14:00
BY: E.C. [Signature]

DATE: 12-14-2003 14:00
BY: E.C. [Signature]



LEGEND:

- EXCAVATED BACKWATER FLOW CHANNEL
- PROPOSED RIPARIAN BENCH AT ELEVATION 736, MSL
- PROPOSED SHALLOW WATER HABITAT SLOPE
- PROPOSED COBBLE LAYER



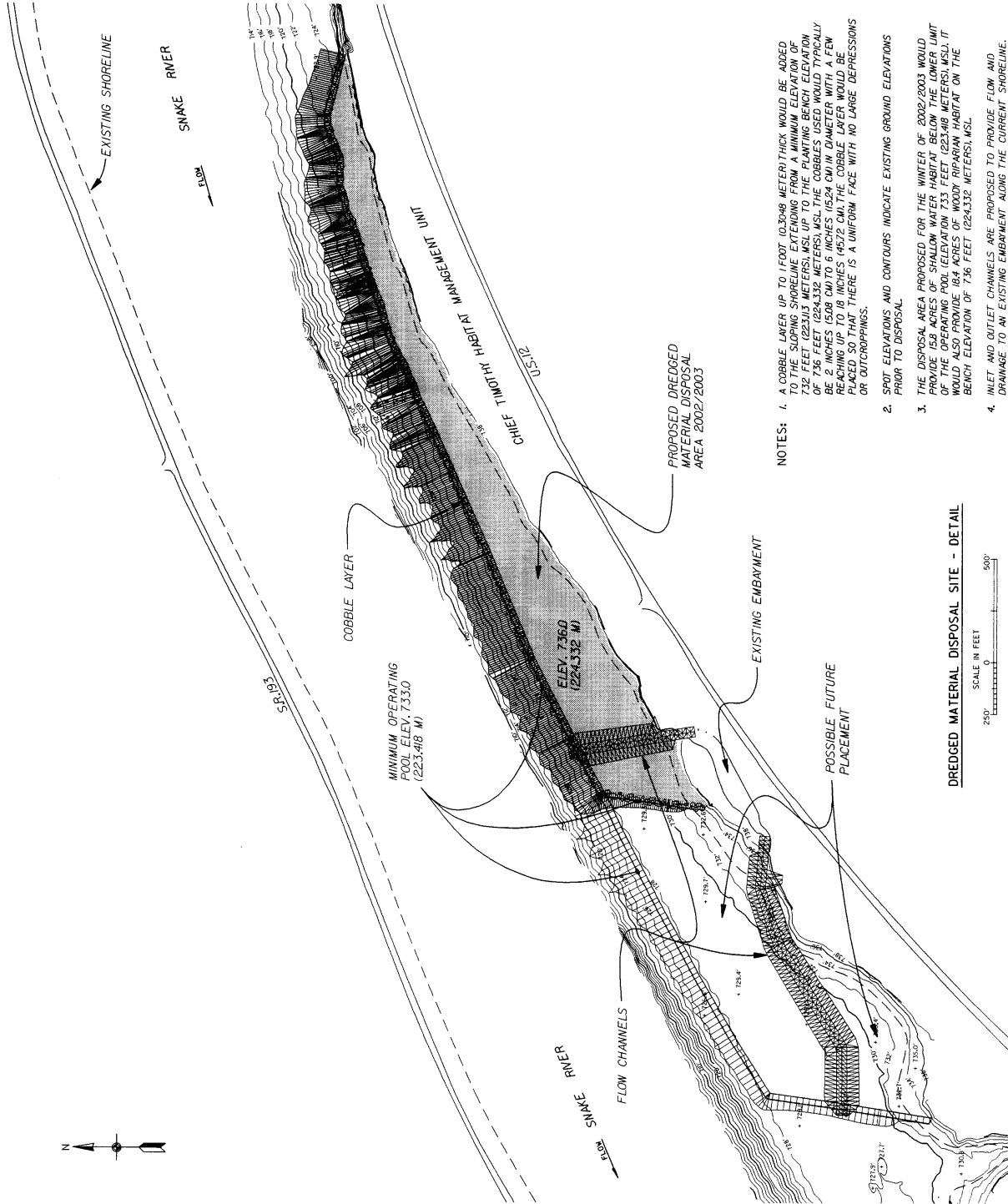
Walla Walla District Lower Snake River Reservoirs and McNary Reservoir Dredged Material Management Plan Winter 2002 - 2003 Dredging Plan **IN-WATER DISPOSAL SITE** **CHIEF TIMOTHY AT RM 132.0**

DATE: 12-JUN-2003 14:08
FILE: C:\Walla\reservoirs\plan\Walla\Plate-2.dgn

05 Conversions George Hordan CENW-PJ-EC 05 Applications Coordinator Blaise Grabin CENW-PJ-EC

Data Entry & Graphic Assembly: Bob Meyer CENW-ED-0-SCJ

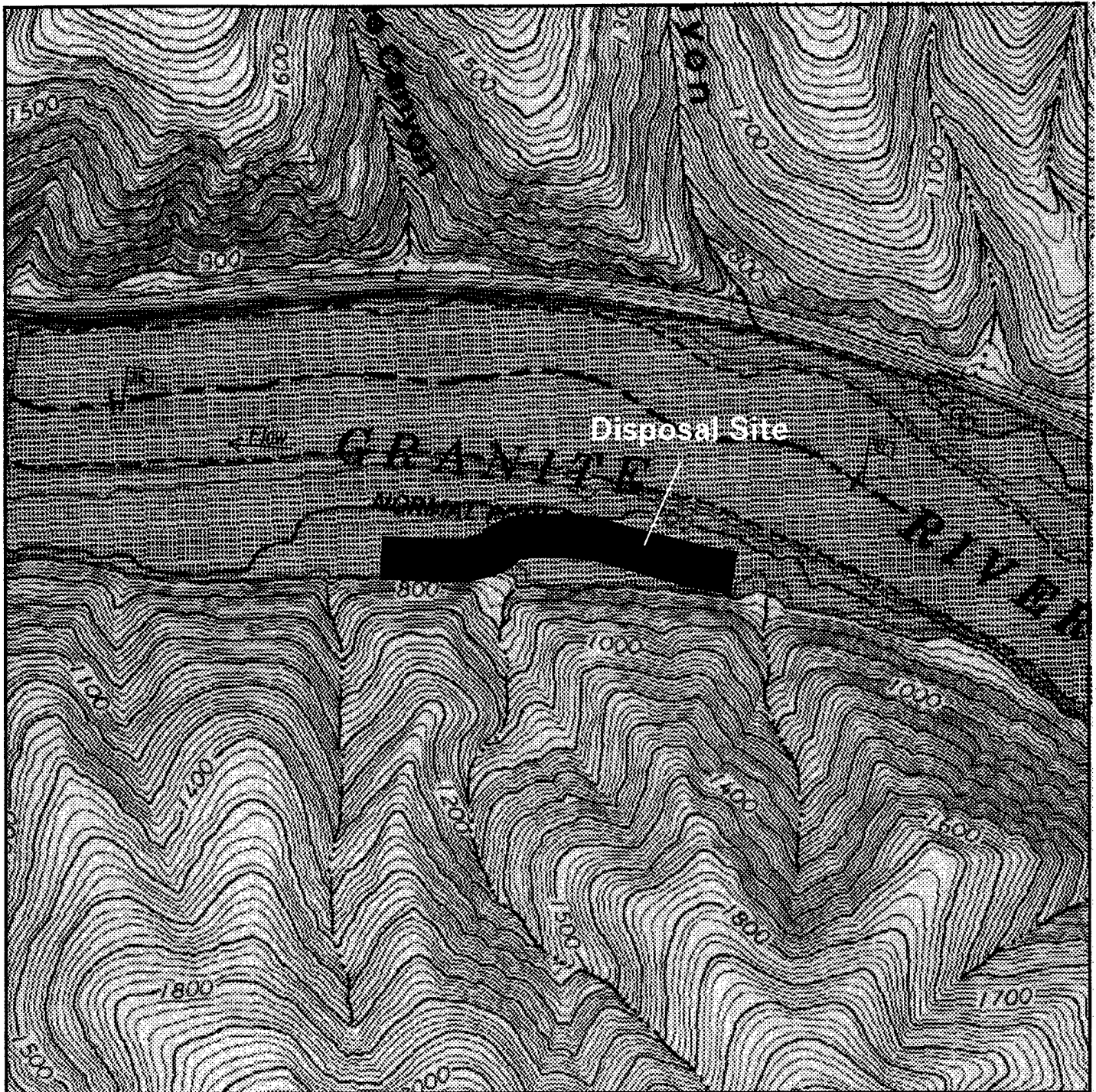
PLATE N-12b



- NOTES:
1. A COBBLE LAYER UP TO 1 FOOT (0.3048 METER) THICK WOULD BE ADDED TO THE SLOPING SHORELINE EXTENDING FROM A MINIMUM ELEVATION OF 732 FEET (222.813 M) TO THE EXISTING BENCH ELEVATION OF 736 FEET (224.332 M). THE COBBLE LAYER WOULD BE 2 INCHES (50.8 CM) TO 6 INCHES (152.4 CM) IN DIAMETER WITH A FEW REACHING UP TO 18 INCHES (457.2 CM). THE COBBLE LAYER WOULD BE PLACED SO THAT THERE IS A UNIFORM FACE WITH NO LARGE DEPRESSIONS OR OUTCROPPINGS.
 2. SPOT ELEVATIONS AND CONTOURS INDICATE EXISTING GROUND ELEVATIONS PRIOR TO DISPOSAL.
 3. THE DISPOSAL AREA PROPOSED FOR THE WINTER OF 2002/2003 WOULD PROVIDE 6.8 ACRES OF SHALLOW WATER HABITAT BELOW THE LOWER LIMIT OF THE OPERATING POOL ELEVATION 733 FEET (223.416 METERS, MSL). IT WOULD ALSO PROVIDE 16.4 ACRES OF WOODY RIPARIAN HABITAT ON THE BENCH ELEVATION OF 736 FEET (224.332 METERS, MSL).
 4. INLET AND OUTLET CHANNELS ARE PROPOSED TO PROVIDE FLOW AND DRAINAGE TO AN EXISTING EMBAYMENT ALONG THE CURRENT SHORELINE. MINIMUM ELEVATIONS IN THESE CHANNELS WOULD BE NO HIGHER THAN 731 FEET (222.808 METERS, MSL) TO PREVENT FISH ENTRAPMENT.

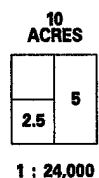
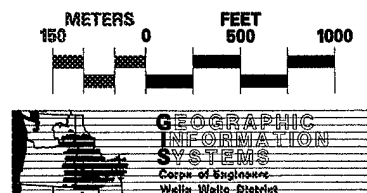
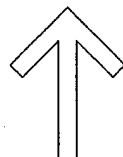
DREDGED MATERIAL DISPOSAL SITE - DETAIL

SCALE IN FEET
0 250 500



Sources:

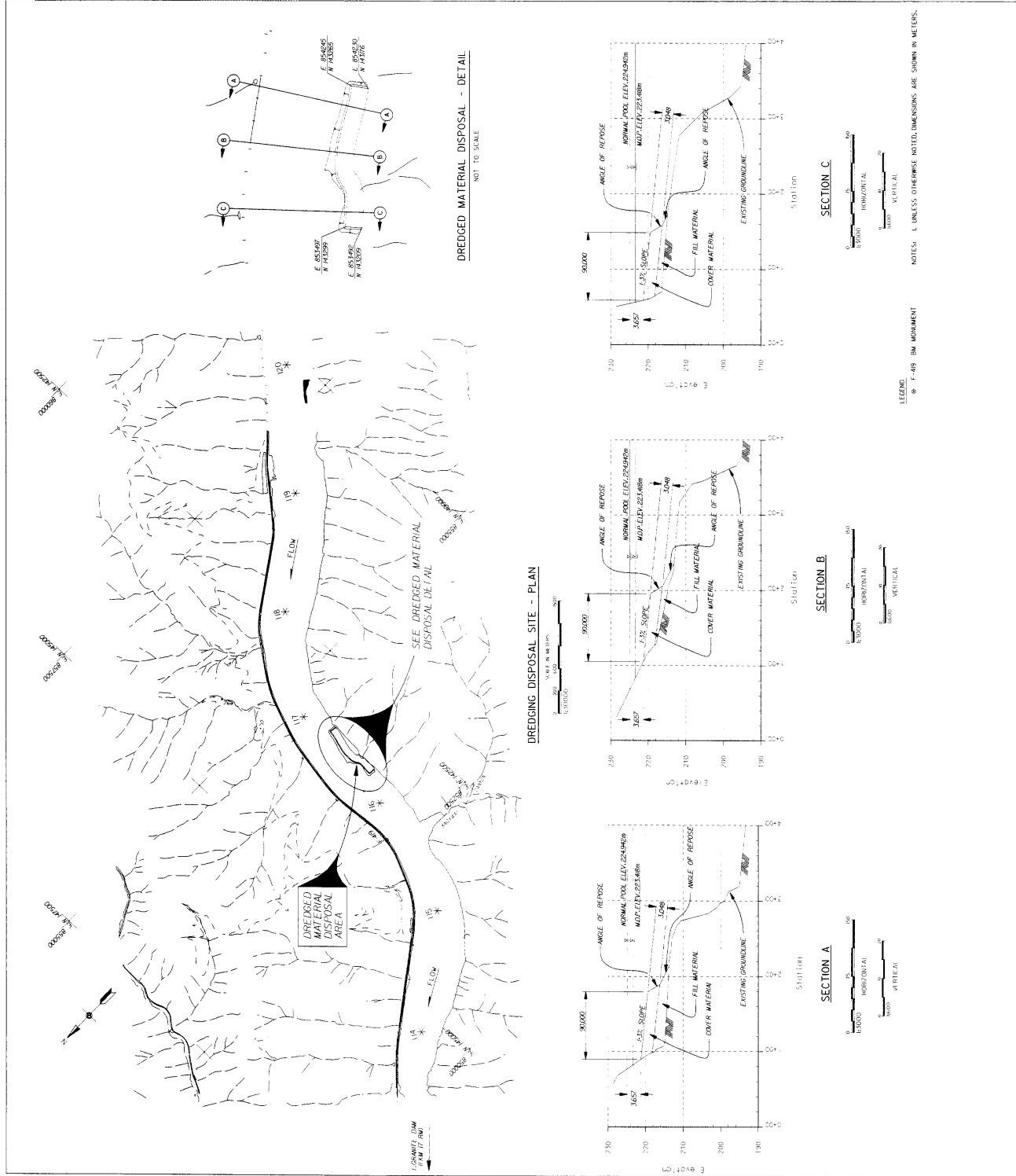
Ice Harbor, Lower Monumental, Little Goose and Lower Granite Lock and Dams, Snake River, Clearwater River, Washington and Idaho, Miscellaneous Dredging Sites, Dredging Plan, 13 Aug. 2000.



Granite Point, WA. USGS 7.5 Minute Quadrangle, Township 13 N, Range 44 E.

Walla Walla District
Lower Snake River Reservoirs and McNary Reservoir
Dredged Material Management Plan

Winter 2002 – 2003 Dredging Plan
**IN-WATER DISPOSAL
SITE, RM 116**



**GEOGRAPHIC
INFORMATION
SYSTEMS**
Corps of Engineers
U.S. Army
Washington, D.C.

Walla Walla District
Lower Snake River Reservoirs and McNary Reservoir
Dredged Material Management Plan

IN-WATER DISPOSAL

SITE, RM 116

Winter 2002 – 2003 Dredging Plan

PLATE N-14

4 MAY 2002 10:42

PLATE N-14

PLOTTED: 14-MAY-2002 10:42

**DREDGED MATERIAL MANAGEMENT PLAN
AND ENVIRONMENTAL IMPACT STATEMENT**

McNARY RESERVOIR AND LOWER SNAKE RIVER RESERVOIRS

**ATTACHMENT 1, APPENDIX N
Clean Water Act Section 404(b)(1) Evaluation
Proposed In-Water Discharges for Winter 2002-2003**

**U.S. Army Corps of Engineers
Walla Walla District
201 North 3rd Avenue
Walla Walla, WA 99362**

July 2002

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1.0 PROJECT DESCRIPTION

1.1 Location

Dredging activities for winter 2002-2003 are proposed at ten locations in the Lower Granite and Little Goose Reservoirs on the lower Snake River. Specific locations are listed in section 1.4.1 of this attachment. Two potential locations in Lower Granite Reservoir have been identified for in-water discharge of the dredged materials. The proposed discharge sites include a primary site, located at the Chief Timothy Habitat Management Unit (HMU) at River Mile (RM) 132, and an alternate site, located at RM 116. Locations of the proposed discharge sites are described further in section 1.5.1 of this attachment.

1.2 General Description

This 404(b)(1) Evaluation addresses water quality impacts of the proposed in-water discharge of dredged material from dredging operations proposed for winter 2002-2003. This is the first dredging proposed following completion of the Dredged Material Management Plan and Environmental Impact Statement: McNary Reservoir and Lower Snake River Reservoirs (DMMP). The following is a brief description of the development of the DMMP, which covers dredging activities to be conducted over a 20-year period.

Construction of the Snake River and Columbia River dams altered the character of the natural river from free flowing to impounded waters, resulting in continual deposition of sedimentary material in the lower velocity areas of the system. Accumulated sediment interferes with navigation, reduces flood protection, and impacts aquatic habitat. The DMMP is a 20-year plan proposed by the Walla Walla District Corps of Engineers (Corps) to conduct navigation and maintenance dredging on the lower Snake River, mid-Columbia River, and at the mouth of the Clearwater River.

The DMMP was developed to direct a course of action for managing the removal and disposal of sediment over the next 20 years. More specifically, the purpose of the DMMP is threefold:

1. To develop and evaluate alternative programs to maintain the authorized navigation channel and certain publicly owned facilities in the lower Snake River and McNary reservoirs for the next 20 years;
2. To develop and evaluate alternative measures to maintain the flow conveyance of the Lower Granite Reservoir for the remaining economic life of the project (through 2074); and
3. To develop and evaluate alternative programs of managing dredged material in a cost-effective, environmentally acceptable, and, wherever possible, beneficial manner.

An ecological analysis of management alternatives proposed to address the sedimentation problems is presented in the DMMP. Twelve sediment management alternatives were initially considered. Criteria used to evaluate the alternatives included aspects of the life cycle of migrating salmonids and resident fishes, their food production, and maintaining the biological integrity of the reservoir ecosystems. A ranking matrix was developed to compare the management alternatives. Criteria used in the matrix to evaluate management alternatives are

related to aspects of the life cycle of migrating salmonids and resident fishes, their food production, and maintaining the biological integrity of the five reservoir ecosystems. The three management alternatives with the greatest benefit were selected for further consideration along with a "no action" alternative. A detailed analysis of environmental effects of the four alternatives is presented in the DMMP.

"Alternative 4 - Maintenance Dredging With Beneficial Use of Dredged Material and a 3-Foot (0.9-m) Levee Raise" was selected as the preferred alternative, or Recommended Plan, for long-term management of dredging. As explained in the DMMP, Alternative 4 most completely and efficiently meets the project purpose and need at the least cost, while presenting potential environmental impacts that are no greater, and often less, than other alternatives considered. The Recommended Plan represents the greatest beneficial use of dredged material that can be implemented on a programmatic basis at this time, and provides the most flexibility for identifying, evaluating, and potentially implementing beneficial uses of dredged material.

Potential beneficial uses that may be considered include:

- Fish habitat.
- Woody riparian habitat.
- Fill for levee improvements.
- Hanford remediation and closure activities capping material.
- Potting soil.
- Fill for port facilities.
- Fill on non-Federal lands.
- Fill for roadway projects.
- Bank stabilization

The first dredging activity under the DMMP is currently proposed for winter 2002-2003. Dredging is proposed at ten sites, including approximately three miles of the main navigation channel, two port berthing areas, five recreational facilities, and downstream approaches to two navigational locks.

The proposed beneficial use of the dredged material from these sites is to create woody riparian and shallow water fish habitat at the Chief Timothy site (RM 132) or to create shallow and mid-depth fish habitat at RM 116. Upland disposal of dredged material may also occur if feasible requests for beneficial use of the material are received, or if dredged material is not suitable for in-water use. Upland disposal sites are not included in the 404(b)(1) Evaluation, which is only applicable to in-water discharges.

1.3 Authority and Purpose

The portion of the Columbia-Snake Rivers navigation system addressed in the DMMP was authorized by the Rivers and Harbors Act of 1945 (Public Law 79-14, 79th Congress, 1st Session) and approved March 2, 1945, in accordance with House Document 704, 75th Congress, 3rd Session. This portion of the navigation system includes the following projects:

- McNary Lock and Dam (McNary) – Lake Wallula, Columbia and Snake Rivers, Oregon and Washington
- Ice Harbor Lock and Dam (Ice Harbor) – Lake Sacajawea, Snake River, Washington
- Lower Monumental Lock and Dam (Lower Monumental) – Lake Herbert G. West, Snake River, Washington
- Little Goose Lock and Dam (Little Goose) – Lake Bryan, Snake River, Washington
- Lower Granite Lock and Dam (Lower Granite) – Lower Granite Lake, Snake River, Washington and Idaho

Each of these projects is authorized to provide slackwater navigation, including locks and a 14-foot- (4.3 m-) deep channel. Additionally, although not part of the DMMP each project is authorized to provide hydroelectric power generation, irrigation, recreation, and wildlife habitat. Historically, the Corps has dredged accumulated sediments from the navigation channel and the other facilities noted above in order to maintain their operational capacities.

The purpose of this 404(b)(1) Evaluation is to demonstrate that the in-water discharge proposed for winter 2002-2003 would not have an unacceptable adverse impact on the chemical, physical, and biological integrity of waters of the United States, either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern.

1.4 General Description of Dredged or Fill Material

1.4.1 Source of Material

During the proposed 2002-2003 dredging cycle, material would be obtained from dredging in the following areas.

- Federal navigation channel at the confluence of the Snake and Clearwater Rivers, from RM 138 on the Snake River to RM 2 on the Clearwater River (Plate N-2).
- Port of Clarkston berthing area at RM 139 on the Snake River (Plate N-3).
- Port of Lewiston berthing area between RM 1 and RM 1.5 on the Clearwater River (Plate N-4).
- Entrance to Hells Canyon Resort Marina at RM 138 on the Snake River (Plate N-5).
- Green Belt Boat Basin at RM 139.5 on the Snake River (Plate N-6).
- Swallows Park swimming beach and boat launch at RM 141.7 and RM 141.9 on the Snake River (Plate N-7).
- Downstream approach to Lower Granite Navigation Lock at RM 107 (Plate N-8).
- Downstream approach to Lower Monumental Navigation Lock at RM 41.5 (Plate N-9).
- Illia boat launch at RM 104 in Little Goose Reservoir (Plate N-10).
- Willow boat launch at RM 88 in Little Goose Reservoir (Plate N-11).

1.4.2 General Characteristics of Materials

In general, materials to be dredged would be composed mostly of sediments containing a mixture of silt, sand, gravel, cobbles, and/or rock. Dredged materials will vary with location. Materials

to be dredged have been analyzed for grain size distribution and selected chemical parameters. Results of these analyses are described in subsequent sections of this evaluation.

1.4.3 Quantity of Material

During winter 2002-2003, a total of 319,200 cubic yards (244,046 cubic meters) of material is proposed to be dredged from ten sites. Quantities to be dredged from each site are presented in Table 1-1. The majority of the material, 250,500 cubic yards (191,521 cubic meters), is proposed to be dredged from the Federal navigation channel in the Snake and Clearwater Rivers confluence area.

Table 1-1. Sites Proposed to be Dredged in Winter 2002-2003 and the Estimated Quantity to be Dredged from Each Site.

Site to be Dredged	Quantity to be Dredged (cubic yards)	Quantity to be Dredged (cubic meters)
Federal Navigation Channel at Confluence of Snake and Clearwater Rivers	250,500	191,521
Port of Clarkston	9,600	7,339.7
Port of Lewiston	5,100	3,899.2
Hells Canyon Resort Marina	3,600	2,752.4
Green Belt Boat Basin	2,800	2,140.8
Swallows Park Swim Beach/Boat Basin	11,000/5,000	8,410.1/3 822.8
Lower Granite Navigation Lock Approach	4,000	3,058.2
Lower Monumental Navigation Lock Approach	20,000	15,291.1
Illia Boat Launch	1,400	1,070.4
Willow Landing Boat Launch	6,200	4,740.2
TOTAL	319,200	244,046

1.5 Description of Proposed Discharge Sites

1.5.1 Location

There are two proposed in-water discharge/habitat development sites for the proposed winter 2002-2003 dredging activities. The primary site is located at RM 132 in Lower Granite Reservoir, adjacent to the Chief Timothy HMU on the left bank (looking downstream). Dredged material disposed of at this site would be used to develop woody riparian and shallow water habitat. The location of this site is shown on Plates N-12 through N-14. The Corps selected this site because it has a high potential for woody riparian habitat development, is close to the confluence of the Snake and Clearwater Rivers (where most of the dredging would occur), would not interfere with navigation, and would not impact cultural/historic properties. This site does not currently appear to have good quality habitat for juvenile salmonid rearing. Further study is underway to verify if the site is currently being used as rearing habitat by juvenile chinook salmon. If juvenile salmonids are found to be rearing at this location in substantial numbers, the alternate discharge site will be used.

The alternate site is located in Lower Granite Reservoir at RM 116. This site is a mid- to shallow depth bench on the left bank (looking downstream) of the Snake River just upstream of Knoxway Canyon. Dredged material disposed of at this site would be used to construct shallow and mid-depth fish habitat. The location of this site is shown on Plates N-15 and N-16. The Corps selected this site because it is close to the confluence (where most of the dredging would occur), has potential to provide suitable resting/rearing habitat for juvenile salmon once the river bottom is raised, would not interfere with navigation, would not impact cultural/historic properties, and is of sufficient size to accommodate dredged material disposal for several years.

1.5.2 Size

The Chief Timothy HMU site at RM 132 site has a total capacity of approximately 550,000 cubic yards. It is anticipated that this site would be filled to about 60 percent capacity with the material dredged during winter 2002-2003. The proposed discharge would be used to create approximately 34.2 acres of habitat, including a 18.4 acre riparian habitat bench and 15.8 acres of shallow water habitat. The riparian bench would vary from about 150 feet to 400 feet wide by 4,000 feet long.

The alternate discharge site at RM 116 has a total capacity of approximately 3 million cubic yards. When the site is filled to capacity approximately 44 acres of shallow water and mid-depth fish habitat would be created. The site would be filled to about 10 percent capacity with the material dredged during winter 2002-2003. Approximately 20 acres of shallow water and 5 acres of mid-depth fish habitat would be created by the winter 2002-2003 project.

1.5.3 Type of Site

The Chief Timothy HMU site at RM 132 is currently an unconfined, open water site. An existing embayment is located adjacent to the site.

The RM 116 site is an unconfined, open water site near the confluence of Knoxway Canyon and the Snake River. Based on aerial photographs (circa 1958) the proposed disposal site is on ground that, prior to the creation of Lower Granite Reservoir, was positioned on an upland section of the floodplain, above the 100-year floodplain. The disposal site was an orchard with grass and forb coverage that was also used for livestock grazing. A road was located between the site and the river. Riverward of the road lay a long, linear, sandy shoreline along the water's edge, connected to large sandbars downriver of the canyon mouth. In later aerial photographs (circa 1974) vegetation and structures had been removed in preparation for reservoir fill. Based on aerial photography and personal observations in 1992 during the experimental physical drawdown test of the Lower Granite Reservoir, the exposed underwater section of mid-depth bench was completely covered with silt and fine sand deposition due to low velocities; however, heavier sand was deposited on the larger opposing bar on the sharper inside bend of the river. Evidence of the road and orchard observed earlier was no longer visible. The site is currently a mid- to shallow depth bench with a thick silt layer, which has been accumulating at about 2 inches (5.1 cm) per year for 25 years [approximately 4 feet (1.2 m)] over a sand base (less than 20 percent composition).

1.5.4 Types of Habitat

Further information regarding existing habitat types at the Chief Timothy HMU site (RM 132) is currently being collected by the Corps.

Based on review of historic aerial photographs, the RM 116 site was likely good habitat for spawning and rearing of anadromous salmonids from the 1910s through the 1960s. While there was evidence of human disturbance in the area (e.g. the existence of an orchard with grass and forb coverage that was also used for livestock grazing), the site was near a long, linear, sandy shoreline along the water's edge connected to large sandbars downriver. By the mid 1970s, vegetation and structures had been removed in preparation for reservoir fill, and habitat quality appeared to have degraded to poor for salmonid spawning and fair for rearing. During the drawdown test in 1992 the disposal site was observed to be completely covered with silt and fine sand, and therefore, habitat quality was likely inadequate for spawning or rearing. Habitat suitability at the site is currently poor for rearing and overwintering due to the thick silt layer, and habitat suitable for spawning is nonexistent.

1.5.5 Timing and Duration of Discharge

Proposed in-water work will be conducted during the time period prescribed by applicable regulatory agencies. This time period has been selected to avoid migrations of anadromous salmonids, thus minimizing impacts to these fish. The current in-water work window is December 15 through March 1 for the lower Snake River.

1.6 Description of Disposal Method

Chief Timothy HMU Site at RM 132

Placement of materials may occur using one or a combination of four methods: bottom dumping from hopper barges, dozing the material from flat deck barges, hydraulic conveyance from a pump scow, and placement with a dragline.

Bottom dumping from hopper barges is the preferred placement method, because it would result in the least release of turbidity and would be the most efficient, least expensive placement method. However, this method requires a water depth of about 8 to 10 feet, so use of this type of placement method at this site could be limited. One method employed to overcome water shallowness would be to bottom dump in deeper water and use a dragline to move the material into the desired position.

Dredged material dozed from a flat deck barge would be similar to bottom dumping. Turbidity may be slightly higher than using a bottom dump barge, because material would be shoved off the barge deck in several clumps, compared to one clump from a bottom dump. While water depth would still be an issue (about a 6 foot depth is required), the flat deck barge could reach shallower depths than a bottom dump barge. Moving the material a second time with a dragline would be an option for this method also.

Hydraulic conveyance is a process of liquefying the dredged material and pumping to the desired discharge location. Depending on the material being pumped, the slurry would be about 80 percent water. This method does not have depth as a limiting factor, except that some form of underwater containment berm would need to be constructed using either bottom dumping or clamshell placement. Also, moving the floating discharge point pipeline would require a boat or crane. This method has the highest potential for turbidity, would likely require weirs between the shore and the containment berm to form cells to act as settling catchments, and would possibly require silt fence deployment.

Dragline is a method that would employ a crane and bucket for excavation of dumped material and placement in its final location in the embankment. Material would be brought to the disposal area, and likely bottom-dumped. The dragline would be positioned to reach the dumped material, scoop it up and place it in the fill.

The Corps of Engineers standard practice for contracting this type of work is to specify the environmental protection requirements and final specifications that must be met by the contractor, but let the contractor determine the exact construction methods that would be used to meet the contract requirements. Contractors are selected by lowest bid price and more restrictive placement requirements could result in higher costs. Consequently, the contract for the 2002-2003 dredging would focus on requirements (i.e. turbidity level, work window, slope of underwater fill, placement of a silt cap) rather than placement methods to allow the contractor to be as innovative as possible. Prior to any work being performed in the field, the low bid contractor would be required to submit their work execution plan, including how they intend to meet the environmental requirements. Until the contractor submits their plan, the exact placement method is uncertain.

The Corps has identified four possible placement scenarios: construction of earthen cells and hydraulic placement of material within the cell, silt curtain cells used with hydraulic placement, a combination of silt curtain and earth embankment with hydraulic placement, and placement using a bottom dump with clamshell or dragline. These are discussed below. One, or a combination of these methods may be used to construct the habitat. In addition to these scenarios, it may be advantageous to raise and/or lower the Lower Granite Pool during placement operations. For example, a deeper pool would allow barge access closer to shore. Lowering the pool may facilitate placement of the silt cap on the riparian bench.

Scenario 1 – Construction of earthen cells and hydraulic placement within the cells. This method employs all of the placement methods described above. First, an earth berm would be constructed along the outer edge of the disposal area. This would be formed by pushing dredged material off flat deck barges or bottom dump scows. A floating dragline would be set up on the inside of the earth berm. Boats would be used to position the dragline. Once the berm was constructed to a depth that precluded placement from a flat deck barge or bottom dump scows, the dumps would be made outside of the berm. The dragline would be used to scoop the dumped material and place it on top of the berm. This would be repeated until the berm was above the water surface. Cross berms would be constructed using the dragline perpendicular to shore, between the shore and the berm. This would create containment cells. Once the containment

cells were complete, all remaining dredged material would be placed hydraulically. Placement would begin at the upstream cell and work downstream. It is expected that the cells would contain any turbidity that might occur during placement. Materials used for the berm construction would be mostly sand with some gravel and cobbles intermixed. The fill inside the cells would be mostly sand up to just above the water surface. The shoreline portion of each cell, which will define the riparian bench, would then be capped with hydraulically placed silt from the recreation sites and ports.

Scenario 2 - Silt curtain cells used with hydraulic placement. This would be similar to Scenario 1, except the containment cells would be formed using a geotextile fabric draped to the river bottom to act as a silt barrier. The bottom edge would be anchored if necessary. Material would be hydraulically placed within the geotextile containment cell. Placement would proceed until material within the cell was at the existing water surface. The geotextile fabric would be moved downstream and an adjacent cell would be similarly formed. This would continue for the length of the disposal area. Once the fill had been brought up to the water surface, the shoreline portion of each cell, which will define the riparian bench, would be capped with silt material from the dredging operations. A silt fence would be installed on the fill, and material would be placed hydraulically inside the silt fence.

Scenario 3 - Lower Granite pool would be raised to the maximum operating pool. Placement would be performed from flat deck barges or bottom dump scows as much as possible in the depth provided. Once the placement had reached an elevation that could not be accessed by flat deck barges or bottom dump scows, a silt curtain would be installed and a containment cell formed as discussed above. Dredged material would be placed hydraulically within the silt curtain. Once the platform within that cell reached the water surface, the silt curtain would be relocated to form the next cell. Once the fill had been brought to the water surface, the shoreline portion of each cell, which defined the riparian bench, would be capped with silt material from the dredging operations. A silt fence would be installed on the fill and silt would be placed hydraulically.

Scenario 4 - Placement using a dragline. Lower Granite pool would be raised to its maximum operating pool elevation. A dragline would dredge its way into shore, with the material side cast in the proposed disposal area. Flat deck barge or bottom dump scow placement would be performed as much as possible in the depth provided. As the bench grows higher and the water depth becomes inadequate for dumping directly from the barge, the dumping would occur in the channel dredged by the dragline. After each dump, the dragline would excavate that material and place it in the fill. This would continue until a section of the bench was complete within the reach of the dragline. Once the riparian bench had been brought to the water surface, the silt cap would be placed as in the scenarios described above. A silt containment structure such as a silt fence or other barrier may be needed to prevent effluent from re-entering the river.

For all four scenarios, some underwater grading and final shaping would be required once the bench and slope are completed. This would be performed by the dredging contractor. Shaping of the in-water slopes most likely would be by floating dragline. A boat-towed beam may also be used. Surface shaping of the capped area would be by conventional grading equipment such as a dozer, rubber tired loader, or backhoe and would be performed sometime after the placement

of the dredged material was complete. Some surface undulations would be desired to provide differing root zone conditions.

Once the final shaping of the shoreline was complete, the cobbles would be placed around the perimeter of the bench. This would likely be performed using a clamshell and a flat deck barge. Cobbles would be brought by barge to the disposal site and the clamshell would lift the cobbles off the barge and place them in a band within the selected elevations along the shoreline.

RM 116 Site

The sequence of dredged material disposal at RM 116 was designed to accomplish two goals: (1) create shallow water habitat for juvenile salmon; and (2) dispose of silt in a beneficial manner. Studies conducted by David Bennett, Ph.D. of the University of Idaho indicated that a substrate of sand, gravel, and/or cobble provided suitable habitat for juvenile salmon while a silt substrate provided no benefit. To meet its goals while following Dr. Bennett's criteria for suitable substrate, the Corps proposes to place the dredged material in steps. The first step would be to use the silt (less than 0.2 millimeter in diameter) in a mixture with sand and gravel/cobble to fill the mid-depth portion of the site and form a base embankment. The dredged material would be placed aboard bottom dump barges and analyzed to determine the percentages of sand and silt. The barges would then proceed to the disposal area and dump the material within the designated footprint close to the shoreline to raise the river bottom to a depth of 20 feet (6.1 m) (plate N-16 and figure N-1). The second step would be to place sand on top of the sand/silt embankment.

A reserve area of sand would be dredged and barged to dump the sand on top of the base embankment so a layer of sand at least 10 feet (3.1 m) thick would cover the embankment, and the water depth would be about 10 feet (3.1 m) deep, as measured at minimum operating pool (figure N-2). The footprint of the disposal area would be sized so that the maximum amount of shallow water sandy substrate habitat would be created with the estimated quantities of material to be dredged. The third step would be to use a beam drag to flatten and level the tops of the mounds to form a flat, gently sloping (3 to 5 percent), shallow area between 10 and 12 feet (3.1 and 3.7 m) in depth (figure N-3).

2.0 FACTUAL DETERMINATIONS

2.1 Physical Substrate Determinations

2.1.1 Substrate Elevation and Slope

The Chief Timothy HMU site at RM 132 currently consists of a shallow sloping bench, about 10 feet below the maximum operating pool depth. The proposed in-water placement would extend the shore riverward to create a planting bench for riparian species. The planting bench would be submerged when the water surface elevation exceeds 736 feet above mean sea level (MSL). (The Lower Granite Reservoir minimum and maximum operating pool elevations are 733 feet MSL and 738 feet MSL, respectively). The riparian bench would have an undulating surface to provide variable root zone conditions for planting. A shallow water habitat slope would be constructed adjacent to the bench, using a slope of 10 horizontal to 1 vertical. The slope would be shaped to form a relatively smooth surface. Cross sections of the existing and proposed elevations and slopes are shown on Plate N-12.

At the RM 116 site, the existing substrate elevation is typically more than 25 feet below the minimum operating pool elevation. The existing substrate slope ranges from approximately 16 to 60 percent near shore and approximately 1 to 4 percent on the existing bench. The proposed in-water discharge would raise the substrate elevation to create a shallow water bench. The bench would be shaped to form a flat, gently sloping (1 to 3 percent), shallow area, which would typically be 10 to 12 feet below the minimum operating pool elevation. An adjoining mid-depth slope, approximately 25 feet to 35 feet below the minimum operating pool would also be created at the base of the shallow water bench. Cross sections of the existing and proposed slopes and elevations are shown on Plate N-14.

2.1.2 Sediment Type

The Corps collected sediment samples from the Chief Timothy HMU site at RM 132 in April 2002. The samples were visually observed to be composed of silt with some organic matter (wood particles). Laboratory grain size analyses are being conducted on these samples to confirm the visual observations.

The RM 116 site is located in a low velocity area which has been accumulating sediment since the filling of Lower Granite Reservoir at an estimated rate of 2 inches (5.1 cm) per year. The substrate at this site was visually inspected in 1992 during a reservoir drawdown test. The substrate was observed to be primarily silt. Approximately 4 feet (1.2 m) of silt are estimated to cover the bottom of the existing mid- to shallow depth bench.

Sediment samples were collected from the proposed material sources in June 2000. The results of grain size analyses conducted on these samples are as follows.

- Samples collected from the main navigation channel in the Snake and Clearwater Rivers confluence area contained 85-90% sand and 10-15% fines. The navigation channel would provide approximately 78% of the material to be discharged in winter 2002-2003.

- Samples collected from the Lewiston and Clarkston ports were comprised of over 90% silt. These ports would provide approximately 5% of the material to be discharged in winter 2002-2003.
- Samples collected from the Hells Canyon Resort Marina, Swallows Park, and the Willow boat launch averaged between 56 and 67% sand and 21 to 27% fines. These sources would provide approximately 8% of the material to be discharged in winter 2002-2003.
- Samples collected from the Green Belt Boat Basin averaged 45% sand and 35% fines. This source would provide approximately 1% of the material to be discharged in winter 2002-2003.
- The downstream lock approach sites at Lower Granite and Lower Monumental consist of large rock substrate and 2 to 6 inch cobbles. The lock approaches would provide approximately 8% of the material to be discharged in winter 2002-2003.
- Sampling data indicate that the sediments to be dredged from the Illia Boat Launch site are variable, and include areas composed of 86-95% silt and 5-14% sand, areas composed of approximately 11% gravel, 63% sand and 26 % fines, and areas composed of two and three inch cobbles. This source would provide less than 0.5% of the material to be discharged in winter 2002-2003.

The overall composition of the sediments to be dredged is expected to be less than 30% silt, and includes materials which will be suitable to provide improved substrate conditions for aquatic organisms.

2.1.3 Dredged/Fill Material Movement

At the Chief Timothy HMU site (RM 132) materials used to construct the in-water embankment would consist of sand with minimal amounts of silt. Silt materials would be placed on top of the sand, above the water surface, to create a rooting zone for riparian plants. Cobbles would be used to armor the upstream end of the embankment to minimize wave erosion. The site would be monitored after construction to determine if the embankment slumps or moves. Monitoring would be accomplished by taking cross-section soundings immediately after disposal was complete and again in the summer after high flows.

At the RM 116 site, the Corps will monitor and record the amount of silt placed in in-water embankments. The Corps would then determine the percent silt in the base and monitor any movement of the base. Monitoring would be accomplished by taking cross-section soundings immediately after disposal was complete and again in the summer after high flows to determine if the embankment slumps or moves. The Corps would use this information to make adjustments in the percentage of silt allowable for future in-water embankment construction and to determine whether or not a berm needed to be constructed around the toe of the embankment to prevent movement.

2.1.4 Physical Effects on Benthos

Benthic organisms at both proposed in-water disposal sites would be buried by discharge activities. However, the shallow water and mid-depth habitat created is expected to be conducive to recolonization by benthic organisms from adjacent areas.

2.1.5 Other Effects

Other effects on the physical substrate are not anticipated.

2.1.6 Actions Taken to Minimize Impacts

- Alterations to substrate elevation and slope are designed to provide woody riparian and/or shallow water habitat and are not considered to be adverse impacts.
- Changes in the substrate sediment type are designed to provide woody riparian and/or shallow water habitat and are not considered to be adverse impacts.
- Dredged/fill material movement will be minimized by armoring selected portions of the RM 132 site with cobbles. Dredged/fill material movement will be monitored at the RM 132 and RM 116 with cross section soundings. Information gathered from this monitoring will be used, if applicable, to improve in-water placement strategies for future projects over the life of the DMMP.
- Physical effects on benthos will be minimized by limiting discharges to a localized area, which is small relative to the reservoir system.
- Physical effects on benthos within the project site will be mitigated by the shallow water and mid-depth habitat created by the in-water discharge.

2.2 Water Circulation, Fluctuation and Salinity Determinations

2.2.1 Water

2.2.1.1 Conductivity

Between October 1997 and September 1998, the average conductivity in samples collected from the lower Snake River between river mile 6 and river mile 129 ranged from 68 micro-ohms (μ ohms) to 363 μ ohms. Effects of the in-water discharge of dredged material on conductivity are expected to be localized, short-term, and minimal.

2.2.1.2 Water Chemistry

The availability of site-specific background water chemistry at the in-water disposal sites is limited. A summary of available water quality data from the lower Snake River and mid-Columbia River is included in Appendix H of the DMMP.

To minimize the potential for impacts to water chemistry, materials have been screened for selected chemicals prior to dredging. Also, turbidity will be regulated and monitored during in-water discharges. Thus, the effects of in-water discharge on water chemistry are expected to be localized, short-term, and minimal.

2.2.1.3 Temperature

Water temperature in the lower Snake River varies with time of year and location. Generally, water temperature is lower in the winter months of January and February, increases slowly during spring runoff (March to May), increases more rapidly in late spring until mid-summer (June to early August), plateaus through mid-September, then decreases steadily through January. Temperature data collected from the tailrace at Lower Granite dam are presented in Appendix H of the DMMP. In 2000, the average monthly temperature measured between December and March ranged from 39.7 °F (4.3 °C) to 47.3 °F (8.5 °C). The average monthly temperature measured between April and November ranged from 51.3 (10.7 °C) to 69.4 °F (20.8 °C). Temperature data from the proposed discharge sites are not available.

In-water discharges will be conducted during the in-water work window, when water temperature is relatively low. The creation of shallow water habitat may result in a localized increase in water temperature at the disposal site. However, the area affected will be small relative to the reservoir system. The proposed in-water discharges are not expected to result in long-term impacts to the overall water temperature of the reservoir.

2.2.1.4 Clarity

Between March and October 1997, clarity was measured in the lower Snake River between river mile 6 and river mile 140. The average Secchi transparency ranged from 1.1 to 2.5 meters and the photic zone ranged from 3.3 to 5.5 meters.

The in-water discharge and shaping of the dredged material at the disposal sites is expected to result in localized turbidity plumes. Operations causing a 5-nephelometric turbidity unit (NTU) increase over background (or 10 percent increase when background is over 50 NTUs) at a point 300 feet (91.4 m) downstream of the project site will not be allowed. Turbidity will be monitored during in-water discharge and construction of woody riparian and fish habitat to ensure that this restriction is not violated.

Localized, short-term effects on water clarity are expected within the in-water discharge site and mixing zone. These effects are expected to dissipate quickly after habitat construction is completed. Long-term effects on water clarity are not anticipated.

2.2.1.5 Color

Water color is defined as the true and apparent color by a chroma analysis and is measured only after all turbidity is removed. Color in water may result from the presence of natural metallic ions (iron and manganese are the most common colorants in natural water), humus, plankton, weeds, and wastes. Excessive color affects both domestic and commercial uses and may require removal.

A high resolution (upper end) scanning spectrophotometer or tintometer is required to measure true and apparent color. Actual true and apparent color is poorly understood in the Snake River basin. Currently, no credible data exists. Potential impacts to color are expected to be minimal.

2.2.1.6 Odor

The Corps has not conducted standardized odor tests on the Snake River; therefore data are not available. Changes in odor are not anticipated in association with this project. However, unusual odors detected during construction would be investigated.

2.2.1.7 Taste

Taste test data approved by the American Society for Testing and Materials (ASTM) or the U.S. Environmental Protection Agency (EPA) are not available. Any potential changes in taste would likely be associated with suspension of sediments. Because turbidity increases would be localized and short-term, any change in taste would also be localized and of short duration.

2.2.1.8 Dissolved Gas Levels

Background dissolved oxygen data collected from the lower Snake River and mid-Columbia River are summarized in Appendix H of the DMMP. Resuspension of sediments during in-water discharge and habitat construction may cause a localized, short-term decrease in dissolved oxygen levels.

Dissolved gas supersaturation has been one of the major water quality concerns in the Columbia River Basin, including the Snake River, since the 1960s. Dissolved gas supersaturation is caused when water passing through a dam's spillway carries trapped air deep into the waters of the plunge pool, increasing pressure and causing the air to dissolve into the water. Most spillway discharges affecting dissolved gas levels occur during spring runoff between the months of March and June. The proposed in-water discharges will occur during the in-water work window (December 15 through March 1) and are not expected to increase dissolved gas levels.

2.2.1.9 Nutrients

Nitrogen and phosphorus data collected from the lower Snake River and mid-Columbia River between June and October 1997 is summarized in Appendix H of the DMMP. Total nitrogen concentrations ranged from 0.3 mg/L to 1.1 mg/L. Nitrate was the prevalent form of nitrogen in background water samples. Phosphorus concentrations in the lower Snake River impoundments

ranged from 0.03 mg/L to 0.07 mg/L. These concentrations indicate that the reservoirs are generally eutrophic.

The discharge of dredged material has the potential to increase nitrate and phosphorus levels. However, because the discharges will be conducted during winter months and during months of low productivity, impacts resulting from increased nutrient levels are expected to be localized and of short duration.

Ammonia is present in some of the sediments that are proposed to be used for in-water fill. The amount of ammonia that would be released into the water is site specific, dependent upon temperature and pH of the water, and varies with the particle size of the material being dredged. Finer grained sediment (*i.e.*, silt) would be expected to have higher ammonia concentrations and would be more likely to release larger amounts of ammonia into the water.

Ammonia concentrations will be monitored during in-water disposal and habitat construction activities. If the levels reach critical concentrations, in-water disposal or construction methods will be modified to reduce the effects. Because construction will be managed to minimize increases in ammonia concentrations, effects are expected to be localized and short-term.

2.2.1.10 Eutrophication

The proposed in-water discharge and habitat construction are expected to have localized, short-term effects on nutrient concentrations. Long-term effects resulting in increased eutrophication are not anticipated.

2.2.1.11 Others

Other water quality effects are not anticipated.

2.2.2 Current Patterns and Circulation

2.2.2.1 Current Patterns and Flow

Existing data on current and flow patterns at the proposed in-water disposal sites are not available.

The creation of woody riparian habitat and shallow to mid-depth fish habitat may affect current patterns and flow at the in-water disposal sites. However, these changes are expected to be beneficial to salmonids and other organisms.

2.2.2.2 Velocity

Velocity within the proposed discharge sites varies with depth and location. Data collected from the RM 132 discharge site in April 2002 indicate the velocities within approximately 200 feet of the existing shoreline are less than 0.5 feet per second (fps). The measured velocities generally

increase with distance from shore. Velocities measured approximately 530 feet from shore range from 0.8 to 1.4 fps.

Existing velocity data at the proposed RM 116 in-water discharge site are not available.

The creation of woody riparian habitat and shallow to mid-depth fish habitat may affect velocity at the in-water disposal sites. However, these changes are expected to be beneficial to salmonids and other organisms.

2.2.2.3 Stratification

Thermal stratification has not been observed at potential in-water disposal sites and is not expected to occur as a result of in-water disposal for the creation of woody riparian and/or fish habitat.

2.2.2.4 Hydrologic Regime

In-water disposal for the creation of woody riparian and/or fish habitat is not expected to affect the hydrologic regime. Changes in hydrologic regime are most likely to occur in response to changing weather patterns or changes in the overall management of flows within the lower Snake River system.

2.2.3 Normal Water Level Fluctuations

Normal water level fluctuations in the reservoirs are controlled at the dams. In-water disposal for the creation of woody riparian and/or fish habitat is not expected to have a significant effect on water level fluctuations. Proposed discharges will be designed to prevent the creation of standing water bodies in areas of normally fluctuating water levels.

At the Chief Timothy HMU site (RM 132) inlet and outlet channels are proposed to provide flow and drainage to an existing embayment. Such features are not present at the RM 116 site.

2.2.4 Salinity Gradients

The proposed discharge sites are located in a freshwater system. Because brackish and saline waters are not present, salinity gradients are not an issue for this evaluation.

2.2.5 Actions Taken to Minimize Impacts

- During in-water discharges for construction of woody riparian and/or fish habitat, turbidity and other selected water quality parameters will be monitored to ensure that applicable regulatory limits are not exceeded at the mixing zone boundary. Parameters to be monitored will be determined through consultation with the Washington Department of Ecology. The Corps is prepared to monitor turbidity, ammonia, and other parameters as prescribed.

- If the applicable turbidity limit is exceeded at the mixing zone boundary, the in-water work will be stopped and disposal/construction methods will be modified to reduce the impact.
- Effects on current patterns and circulation are designed to develop woody riparian and/or fish habitat and are not considered to be adverse impacts.
- Normal water level fluctuations are controlled at the existing dams and will be maintained by designing in-water discharges to prevent the creation of standing water bodies.

2.3 Suspended Particulate/Turbidity Determinations

2.3.1 Expected Changes in Suspended Particulates and Turbidity Levels in the Vicinity of the Disposal Site

Background turbidity data collected from the lower Snake River in 1999 indicated that turbidity was lowest at the confluence of the Snake and Clearwater Rivers and increased farther downstream in the Snake River. Median turbidity values ranged from 2 to 4 NTUs in the Snake River, well below Washington's 25-NTU background action limit. These measurements did not include sampling during periods of heavy runoff or heavy storm non-point source water discharge.

Washington regulations specify that turbidity shall neither exceed 5 NTUs over background levels when the background level is 50 NTUs or less nor have more than a 10 percent increase when background is more than 50 NTUs.

In-water disposal for construction of woody riparian and/or fish habitat is expected to result in a localized, short-term increase in turbidity. Turbidity will be monitored during disposal and construction activities to ensure that regulatory limits are not exceeded at the mixing zone boundary [300 feet (91.4 m) downstream].

2.3.2 Effects on Chemical and Physical Properties of the Water Column

2.3.2.1 Light Penetration

Light penetration within the project site and mixing zone boundary would be reduced during disposal and construction activities. The effects are expected to be localized and short-term.

2.3.2.2 Dissolved Oxygen

Dissolved oxygen may be reduced during disposal and construction activities. The effects are expected to be limited to the project site and mixing zone. Dissolved oxygen levels are not expected to decrease below 5 mg/L, which is generally accepted to be the minimum concentration required for higher forms of aquatic life. The effects are also expected to be short-

term. The work will be conducted during the in-water work window, when water temperatures are relatively cool and the solubility of oxygen is higher.

2.3.2.3 Toxic Metals and Organics

Materials to be dredged were sampled and analyzed in 2000 for metals and organics, including polynuclear aromatic hydrocarbons, organophosphate pesticides, chlorinated herbicides, oil and grease, glyphosate, AMPA, and dioxin. Detected concentrations of these materials were below the screening levels prescribed in the Dredged Material Evaluation Framework: Lower Columbia River Management Area.

2.3.2.4 Pathogens

Anthropogenic sources of pathogenic organisms are not known to exist at the proposed dredging sites.

2.3.2.5 Aesthetics

Turbidity plumes associated with the proposed discharge may have a localized, short-term aesthetic impact. The impact would occur during the winter, when human use of the reservoir is minimal. The creation of woody riparian and fish habitat is expected to provide long-term aesthetic benefits.

2.3.2.6 Others

Other effects are not anticipated.

2.3.3 Effects on Biota

2.3.3.1 Primary Production, Photosynthesis

Increased turbidity is expected to have a short-term negative effect on primary production within the project site and mixing zone [300 feet (91.4 m) downstream]. The effect would be localized and limited to the duration of the in-water discharge and habitat construction. The impact would not effect a significant percentage of the reservoir system's primary production.

2.3.3.2 Suspension/Filter Feeders

Increased turbidity is expected to have a short-term negative effect on suspension feeders within the project site and mixing zone [300 feet (91.4 m) downstream]. The effect would be localized and limited to the duration of the in-water discharge and habitat construction. The impact would not effect a significant percentage of the reservoir system's suspension feeders.

2.3.3.3 Sight Feeders

Increased turbidity is expected to have a short-term negative effect on resident sight feeders within the project site and mixing zone [300 feet (91.4 m) downstream]. The effect would be localized and limited to the duration of the in-water discharge and habitat construction. The impact would occur during the in-water work window, which would minimize the number of salmonids present. The impact would not affect a significant percentage of the reservoir system's sight feeders.

2.3.4 Actions Taken to Minimize Impacts

- Expected changes in suspended particulate and turbidity levels will be minimized by managing and monitoring discharges to ensure that applicable regulatory limits are not exceeded at the mixing zone boundary [300 feet (91.4 m) downstream]. If regulatory limits are exceeded, the in-water work will be stopped and discharge/construction methods will be modified to reduce the impact.
- Effects on the chemical and physical properties of the water column will be minimized by chemical and physical screening of potential discharge materials. Sediments to be dredged were evaluated for grain size distribution and selected chemical parameters. Results were evaluated to determine that the sediments are suitable for the proposed in-water discharge.
- Effects on Endangered Species Act (ESA)-listed anadromous fish will be minimized by restricting discharges to the in-water work window, which is currently December 15 through March 1 in the lower Snake River.
- Working during the in-water work window when water temperatures are lower will also decrease the risk of aquatic organisms' exposure to ammonia.
- Effects on biota will also be minimized by limiting discharges to a small area relative to the reservoir system.
- Materials discharged will be used to construct woody riparian habitat and shallow to mid-depth fish habitat. The long-term benefits of the improved habitat will mitigate for the localized, short-term impacts to biota described above.

2.4 Contaminant Determinations

The purpose of contaminant determinations is to determine the degree to which the proposed discharges will introduce, relocate, or increase contaminants. Under the general framework of Section 404 of the Clean Water Act, testing of dredged material is conducted to assist in making factual determinations regarding the effect of the discharge on the aquatic ecosystem.

The Corps had a series of analyses performed on samples collected in 2000 to determine chemical content of sediments at potential dredging sites in the lower Snake River and at the

confluence of the Snake and Clearwater Rivers. Chemical tests included polynuclear aromatic hydrocarbons, organophosphate pesticides, chlorinated herbicides, oil and grease, glyphosate, aminomethylphosphonic acid (AMPA), dioxin, and metal analysis.

Results from herbicide and pesticide tests were below reportable laboratory detection testing levels. Polynuclear aromatic hydrocarbons (PAHs) and metal concentrations were below standards listed for the compounds listed in the Washington Department of Ecology Draft Sediment Standards dated June 1999. For the glyphosate tests, only one site located in the Green Belt Boat Basin at Clarkston showed glyphosate above lab detection limits at 23 parts per billion. Two other samples for glyphosate in the same boat basin came back below reportable lab detection limits. Two other samples for glyphosate in the same boat basin came back below reportable lab detection limits. This compound is highly soluble and should biodegrade.

Twenty-four sites were sampled for dioxin with dioxin screen tests from the confluence of the Snake and Clearwater Rivers downstream for several miles in Lower Granite Reservoir. Chlorinated furans and dioxin congeners have been detected in the past in this area (1991, 1996, and 1998). The 2000 results showed seven sites had sediments that contained some chlorine dioxin congeners. One is at the confluence and four sites are on or near the left bank traveling downstream (RM 139.1 and RM 138.4). The seven sites that tested positive on the dioxin screen were tested further with high-resolution gas chromatograph-mass spectrometric methods. Two additional duplicate samples were included. Results showed there were no concentrations of 2,3,7,8- tetrachlorodibenzo-*p*-dioxin (TCDD), considered a very potent carcinogen, according to Universal Treatment Standards. Less toxic congeners were present in small amounts (parts per trillion).

The following congeners were found at all seven sites: Octachlorodibenzodioxin (OCDD) ranging from 8.81 to 166.94 parts per trillion; 1,2,3,4,6,7, 8-Heptachlorodibenzodioxin (HpCDD) from 1.05 to 22.15 parts per trillion; 1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF) at 0.29 to 2.99 parts per trillion; and octachlorodibenzofuran (OCDF) at 0.57 to 19.61 parts per trillion. The 1,2,3,4,7,8-hexachlorodibenzofuran (HxCDF) found at four sites ranged from 0.12 to 1.15 parts per trillion. The 1,2,3,6,7,8-Hexachlorodibenzodioxin (HxCDD) found at two sites ranged from 0.42 to 1.21 parts per trillion.

Thirty-eight locations were sampled for oil and grease. Results varied from 41 to 770 parts per million. Only three of the samples exceeded 400 parts per million, and they were downstream from boat basins. The 400 parts per million is a soil criteria in Washington to determine disposition of the soil. Total organic carbon (TOC) testing was run on the oil and grease samples. The TOC was also run on the glyphosate sample that was above detection limits. The TOC for oil and grease averaged 1.2 percent and ranged from 0 to 5.8 percent. The TOC for the glyphosate sample was 1.6 percent. These sites all yielded concentrations of PAH chemicals below reportable lab detection limits, and oil and grease composition was probably from animal matter.

Detected concentrations of contaminants were below the screening levels prescribed in the Dredged Material Evaluation Framework: Lower Columbia River Management Area.

2.5 Aquatic Ecosystem and Organism Determinations

2.5.1 Effects on Plankton

Most phytoplankton and zooplankton populations would be in the resting stage during the winter months of the in-water work window. The localized, short-term impacts of the in-water discharge and habitat construction are not expected to have a significant effect on plankton populations.

2.5.2 Effects on Benthos

Benthic organisms would be buried or displaced by the in-water discharge. However, the shallow and mid-depth habitats created are expected to provide a suitable substrate for recolonization by organisms from adjacent benthic communities.

2.5.3 Effects on Nekton

The in-water work window is timed to avoid migrations of anadromous salmonids and minimize the number of salmonids present in the project area during in-water work. Swimming organisms that are present during the in-water discharge would likely be displaced, but may also be incidentally destroyed by construction activities. The localized, short-term impacts of the in-water discharge are not expected to have a significant effect on nekton populations. The shallow water and mid-depth habitat created is expected to provide long-term benefits for salmonids and other nekton.

2.5.4 Effects on Aquatic Food Web

Because most of the spring and summer dominant species of plankton are in the resting stage during the winter in-water work window, impacts to the spring and summer food web are not expected.

The winter months have a different food web than the spring, summer, and fall months. Because most freshwater aquatic organisms are poikilothermic, the bioenergetics of the system slow down in parallel to the decrease in temperature. Some organisms feed very little in the winter and live off stored fat reserves. Aquatic insects do feed and rely on detritus for food sources. The winter phytoplankton species are relatively unstudied. Because the impacts of the in-water discharges are limited to the project site and mixing zone, significant impacts to the winter food web outside of the project site are not expected.

2.5.5 Effects on Special Aquatic Sites

A wetland is located adjacent to the Chief Timothy HMU site at RM 132. However, the proposed discharge footprint has been designed to avoid filling the wetland or affecting the inflow and outflow of water to the wetland.

Wetlands are not present at the RM 116 site. Sanctuaries and refuges, mud flats, vegetated shallows, coral reefs, and riffle and pool complexes are not present at either of the proposed discharge sites.

2.5.6 Threatened and Endangered Species

The Endangered Species Act (ESA) establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants and the preservation of the ecosystems on which they rely. Section 7 of the ESA requires Federal agencies to consult with the U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS) as necessary to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy critical habitat. It also requires that Federal agencies prepare Biological Assessments (BAs) of the potential effects of major construction actions on listed species.

Several species listed as threatened or endangered under the ESA may be found in the lower Snake River reservoirs. Listings of endangered species were obtained from the NMFS and U.S. Fish and Wildlife Service (USFWS). Habitat requirements, timing of occurrence, and the potential location of listed species relative to the dredging and disposal sites were determined. A potential impact determination was made based on the likelihood of ESA-listed individuals being present or if required habitat was in the project vicinity. If no individuals were likely to be present or no habitat existed, a "no effect" determination was made. If habitat was available, but because of timing of the project the species would not be present, a determination of "may affect but not likely to adversely affect" was made. If habitat was available and individuals could be present, a determination of "may affect and likely to adversely affect" was made. Biological Assessments (BAs) were prepared and sent to both the NMFS and USFWS. Copies of the BAs can be found in Appendices F and G of the DMMP. USFWS' concurrence with the Corps' BA on bull trout, bald eagle, Ute ladies' tresses, water howelia, and Spalding's silene was received on June 27, 2002, and is included in Appendix G of the Final DMMP/EIS.

Both proposed discharge sites are designed to develop habitat that will provide long-term benefits for threatened and endangered anadromous fish. The Corps is conducting a survey at the Chief Timothy RM 132 site, prior to use of the area for disposal, to determine if the area is currently being used by ESA species. If the survey results in a determination that the area proposed for disposal is important to ESA species, disposal would be done exclusively at the RM 116 site.

USFWS has concurred with the findings of the BA with respect to the programmatic DMMP and the proposed discharge site at RM 116. The USFWS and NMFS are currently reviewing data regarding the proposed discharge site at RM 132. The final findings of these agencies regarding the proposed winter 2002-2003 work are included in Appendices F and G.

2.5.7 Other Wildlife

The project reservoirs provide essential habitat for numerous birds, reptiles, amphibians, small mammals, bats, and big game animals. They generally are dependent on tree-shrub riparian

habitat associated with the project reservoirs. In general, riparian and wetland areas support higher population densities and species numbers than dryland shrub-steppe, talus, cliff, and/or grassland habitat, which are also prevalent along the project reservoirs. Habitats associated with the river generally support trees or dense grass-forb cover that provide more structurally complex areas and more abundant forage resources than adjacent uplands.

Inundation of the lower Snake and mid-Columbia Rivers following dam construction between the early 1950s and 1975 eliminated most of the woody riparian habitat that was in the area at that time. Since inundation, the shorelines with adequate hydrology have re-established a portion of this riparian community. Due to the lack of suitable hydrology and land management practices of the time, the riparian habitat is now highly discontinuous and dominated by exotic species of vegetation, such as the Russian Olive. Additional riparian habitats have been developed through the establishment of intensive HMUs. Thus, wildlife generally associated with riparian habitats tends to be concentrated in these HMUs and in the natural vegetation along major tributaries.

Adverse effects on other wildlife are not anticipated. The addition of riparian and shallow water habitat is expected to benefit other wildlife by providing cover and food.

2.5.8 Actions to Minimize Impacts

- Effects on plankton will be minimized by restricting discharges to the in-water work window, when the majority of plankton populations are in a resting stage.
- Effects on plankton will also be minimized by limiting discharges to a small area relative to the size of the reservoir system. In-water work will be conducted and monitored to ensure that direct impacts caused by an increase in turbidity are limited to the project site and mixing zone.
- Effects on benthos will be minimized by limiting discharges to a small area relative to the size of the reservoir system.
- Effects on ESA-listed salmonids will be minimized by restricting discharges to the in-water work window, which is timed to avoid migrations of anadromous salmonids and minimize the number of salmonids present in the project area during in-water work.
- Effects on nekton will be minimized by limiting discharges to a small area relative to the reservoir system. In-water work will be conducted and monitored to ensure that direct impacts caused by an increase in turbidity are limited to the project site and mixing zone.
- Impacts to the aquatic food web will be minimized by restricting discharges to the winter in-water work window, because this minimizes impacts to spring and summer plankton populations that are an important segment of the aquatic food web.
- Impacts to the aquatic food web will also be minimized by limiting discharges to a small area relative to the size of the reservoir system

- Impacts to special aquatic sites are not anticipated. Special aquatic sites are not present at the Chief Timothy HMU (RM 132) site or the RM 116 site.
- Impacts to threatened and endangered species will be minimized by restricting discharges to the in-water work window, which is timed to avoid migrations of anadromous salmonids and minimize the number of salmonids present in the project area during in-water work.
- Adverse impacts to other wildlife are not anticipated. Other wildlife are expected to benefit from the development of woody riparian and shallow water fish habitat.
- Potential short-term, localized impacts to plankton, benthos, nekton, the aquatic food web, and threatened and endangered species will be mitigated by the long-term benefits created by development of woody riparian and shallow water habitat.

2.6 Proposed Disposal Site Determinations

2.6.1 Mixing Zone Determination

Historically, a mixing zone extending 300 feet (91.4 m) downstream from the project site has been used for in-water disposal projects in the DMMP area. A mixing zone extending 300 feet (91.4 m) downstream of the discharge site is proposed for the purpose of turbidity regulation and monitoring at the Chief Timothy HMU (RM 132) site and RM 116 site.

2.6.2 Determination of Compliance with Applicable Water Quality Standards

Section 401 of the Clean Water Act requires that applicants requesting a Federal license or permit to conduct activities that may result in a discharge in waters of the United States, provide, to the licensing or remitting agency, a certification from the State that any such discharge complies with applicable provisions of the Clean Water Act and state water quality standards. This 404(b)(1) Evaluation and a request for Section 401 water quality certification will be submitted to the Washington Department of Ecology.

2.6.3 Potential Effects of Human Use Characteristic

2.6.3.1 Municipal and Private Water Supply

Municipal and public water supply intakes are not located in the vicinity of the proposed discharge sites at RM 132 and RM 116.

2.6.3.2 Recreational and Commercial Fisheries

Commercial fishing is not conducted in the vicinity of the proposed sites. Recreational fishing for Snake River steelhead and resident fish does occur in the vicinity. In-water disposal and habitat construction activities may have a localized, short-term impact on recreational fishing in

the immediate vicinity of the construction site. Short-term impacts will be minimized by restricting work to the in-water work window, which is not during a period of high recreational use. The creation of shallow water and mid-depth fish habitat is expected to have a long-term beneficial effect on recreational fisheries.

Tribal fisheries are present within Lower Granite Reservoir. Numerous aquatic species, including salmonids, Pacific lamprey, sturgeon, whitefish, and sculpin, retain cultural significance to tribes. Federally recognized tribes have the right to set their own priorities and develop and manage tribal resources within the Federal government framework. Tribal interests and rights are viewed by tribes and traditional communities with the spatial context of tribal ceded lands, traditional native homelands, and places traditionally used by native peoples. Of particular concern to tribes are the potential impacts of water resource management on anadromous fish runs and associated aquatic habitats, and tribal rights to fish for ceremonial, subsistence, and commercial needs.

Short-term impacts to tribal fisheries will be minimized by restricting work to the in-water work window, which is designated to reduce impacts to anadromous salmonids. The creation of shallow water rearing habitat is expected to have a long-term beneficial effect on tribal fisheries.

2.6.3.3 Water Related Recreation

The lower Snake River provides an important recreational resource for the region. There are numerous recreational facilities lining the shores of Lower Granite Reservoir. Recreational activities take place throughout the year, with the highest activity levels during late spring, summer, and early autumn. Boating, swimming, fishing, camping, picnicking, hiking, and wildlife observation are common recreational activities on or adjacent to the reservoir.

Recreational facilities such as boat ramps or developed swimming beaches are not present at the proposed discharge sites at RM 132 and RM 116. Recreational activities may occur in the vicinity of the proposed discharge sites throughout the year, however, recreational use is lower during the in-water work window than the rest of the year. In-water disposal and habitat construction is expected to have a minor, localized, short-term effect on recreational activities. The creation of woody riparian and/or fish habitat is expected to have indirect, long-term, beneficial effects on recreation by providing enhanced hunting, fishing, and/or wildlife viewing opportunities.

2.6.3.4 Aesthetics

The lower Snake River system is located in an arid region with surrounding open and agricultural landscapes interspersed with urban, suburban, and industrial land uses. The river provides a visual break in an otherwise arid landscape with often dramatic, steep surrounding hillsides and canyons, making it an important aesthetic feature. Many of the recreational facilities that have been developed along the lower Snake River take advantage of the scenic qualities of this landscape.

People viewing the aesthetic resources of the project area include highway/roadway travelers, recreational users of the river and surrounding lands, and local residents. The aesthetic values of the river and surrounding landscapes vary based on the viewers' perspectives and values. Highway travelers tend to view the resources as they are traveling on roadways through the area. These travelers tend to view the resources at a distance, generally from an automobile and generally at high rates of speed. Recreational users, such as boaters, campers, swimmers, and fishermen, tend to view the resources for longer periods of time due to the fact that they are involved in recreational activities that are dependent on the river setting.

The disposal site at RM 116 is somewhat remote and therefore the number of people viewing the site would be limited. During construction, barges placing material at the site would be visible to recreational users on the river and roadway travelers using an existing county road on the opposite side of the canyon from the disposal site. All of the material placed at this location would be located in-water below the minimum operating pool for Lower Granite Reservoir. Therefore nothing would be visible after construction is complete.

In-water disposal and habitat construction activities proposed at the RM 132 Chief Timothy site would have localized, short-term, adverse impacts on aesthetics. However, the creation of woody riparian and or shallow-water habitat is expected to provide long-term aesthetic benefits. During construction, barges and other construction equipment would be visible to travelers on U.S. Highway 12, recreational users on the river and at Chief Timothy State Park, and nearby property owners near Alpowa Creek. After construction, there may be some limited short-term impacts to these same groups while the vegetation is established. Over the long-term (after the riparian vegetation has become firmly established) it is unlikely that any of these groups would be able to identify any significant adverse aesthetic impacts.

2.6.3.5 Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves

The RM 132 site is located at the Chief Timothy HMU and is adjacent to Chief Timothy State Park. National Seashores, Wilderness Areas, and Wild and Scenic Rivers are not located near RM 132.

The RM 116 site is not located in or adjacent to such areas.

The proposed in-water discharge and habitat construction activities at the RM 132 site may have localized, short-term impacts on Chief Timothy HMU and State Park. However, the creation of woody riparian and/or shallow-water habitat is expected to provide long-term benefits to these areas.

2.7 Determination of Cumulative Effects on the Aquatic Ecosystem

Cumulative effects of the proposed in-water disposal activities would most likely be associated with aquatic resources. Benthic communities would continue to be displaced by the dredging activities and buried by the disposal activities. However, these communities would be expected to re-establish within six months to a year. The dredging and disposal would have the potential

to negatively impact ESA-listed fish species, but these impacts would be minimized because few individuals of the listed species would be present during the work period. The in-water disposals of the dredged material are designed to create woody riparian habitat and/or shallow water fish habitat. The additional habitat is expected to provide long-term cumulative benefits for the aquatic ecosystem.

2.8 Determination of Secondary Effects on the Aquatic Ecosystem

Secondary effects, such as water level fluctuations, septic tank leaching, and surface runoff from residential or commercial development on fill, are not expected to be associated with the proposed in-water disposal and habitat construction activities.

3.0 FINDINGS OF COMPLIANCE OR NON-COMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE

3.1 Adaptation of the Section 404(b)(1) Guidelines to this Evaluation

No significant adaptations of the Guidelines were made relative to this evaluation.

3.2 Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site which Would Have Less Adverse Impact on the Aquatic Ecosystem

The habitat value at either of the two proposed disposal sites would be improved, not adversely affected, by the proposed actions. Other practicable alternatives that incorporate beneficial uses were not available. Upland beneficial uses are dependent on identifying an entity that has use for the material. No such entity has been identified for the proposed winter 2002-2003 project.

3.3 Compliance with Applicable State Water Quality Standards

In-water disposal and habitat construction activities will be conducted and monitored for impacts to water quality. Actions will be taken to reduce resulting impacts to a level within the criteria set forth in applicable state standards.

3.4 Compliance with Applicable Toxic Effluent Standard or Prohibition Under Section 307 of the Clean Water Act

Materials to be dredged have been sampled and analyzed for selected metals and organic compounds. Contaminant concentrations measured were below the screening levels prescribed in the Dredged Material Evaluation Framework: Lower Columbia River Management Area.

3.5 Compliance with Endangered Species Act of 1973

Biological Assessments were prepared for anadromous fish species (Appendix F of the DMMP) and non-anadromous fish and terrestrial species (Appendix G of the DMMP). The Corps has initiated ESA consultations with the USFWS and NMFS regarding listed species at sites included in the proposed winter 2002-2003 work.

3.6 Compliance with Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972

Designated marine sanctuaries are not located within the area covered by the DMMP.

3.7 Evaluation of Extent of Degradation of the Waters of the United States

3.7.1 Significant Adverse Effects on Human Health and Welfare

3.7.1.1 Municipal and Private Water Supplies

Municipal and private water supply intakes are not located in the vicinity of the proposed discharge sites. Such water supplies are not expected to be adversely affected by the proposed in-water disposal activities.

3.7.1.2 Recreational and Commercial Fisheries

Commercial fisheries are not present within the area covered by the DMMP. Localized, short-term adverse impacts to recreational fisheries are expected to be mitigated by the long-term benefits provided by additional woody riparian and shallow water habitat.

3.7.1.3 Plankton

Localized, short-term adverse impacts to plankton are expected to be mitigated by the long-term benefits provided by additional shallow water and mid-depth habitat.

3.7.1.4 Fish

Localized, short-term adverse impacts to ESA-listed salmonids are expected to be mitigated by the long-term benefits provided by additional woody riparian and shallow water habitat. Significant adverse impacts to other fish populations are not anticipated.

3.7.1.5 Shellfish

Localized, short-term adverse impacts to shellfish are expected to be mitigated by the long-term benefits provided by additional shallow water habitat.

3.7.1.6 Wildlife

Impacts to other wildlife are not anticipated. Other wildlife are expected to receive long-term benefits from development additional woody riparian and shallow water habitat.

3.7.1.7 Special Aquatic Sites

The proposed discharge at the Chief Timothy HMU (RM 132) site has been designed to avoid impacts to an adjacent wetland. Wetlands are not present at the RM 116 site. Sanctuaries and refuges, mud flats, vegetated shallows, coral reefs, and riffle and pool complexes are not present at either of the proposed discharge sites.

3.7.2 Significant Adverse Effects on Life Stages of Aquatic Life and Other Wildlife Dependent on Aquatic Ecosystems

The in-water work window had been scheduled to avoid migrations of anadromous fish. Localized, short-term adverse effects on resident aquatic life and other wildlife are expected to be mitigated by the long-term benefits provided by additional woody riparian and shallow water habitat.

3.7.3 Significant Adverse Effects on Aquatic Ecosystem Diversity, Productivity and Stability

Localized, short-term adverse effects on the productivity of plankton and benthic communities within proposed disposal sites are expected to be mitigated by the creation of woody riparian and/or shallow water habitat. The additional habitat is expected to be conducive to recolonization by more diverse, productive, and stable populations.

3.7.4 Significant Adverse Effects on Recreational, Aesthetic, and Economic Values

Adverse effects on economic values are not expected. Adverse effects on recreational and aesthetic values are expected to be localized and short-term. The long-term effects of creating additional woody riparian and shallow water fish habitat are expected to be beneficial to recreational, aesthetic, and economic values

3.8 Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem

- In-water discharges will be used to develop woody riparian and/or shallow water habitat.
- In-water discharge and habitat construction activities will be restricted to December 15 through March 1.
- Materials to be dredged have been sampled and analyzed for grain size distribution and selected chemical concentrations.
- The composite of dredged materials to be discharged has less than 30% silt.
- Dredged material to be discharged does not have significant contaminant concentrations.
- Water quality and sediment contaminant monitoring will be performed prior to, during, and after in-water disposal activities as described in the monitoring plan (Appendix M of the DMMP).
- Data collected from the discharge project will be used to improve management of future dredged material discharges.

3.9 Finding of Compliance or Non-Compliance

The discharge complies with the Section 404(b)(1) Guidelines, with the inclusion of the appropriate and practicable steps taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem. A request for Section 401 water quality certification for the proposed winter 2002-2003 work will be submitted to the Washington Department of Ecology.