U.S. Army Corps of Engineers
Walla Walla District

Lower Snake River Programmatic Sediment Management Plan, Final Environmental Impact Statement

Appendix L - Current Immediate Need Navigation Maintenance Clean Water Act Section 404(b)(1) Evaluation

August 2014

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TABLES

FIGURES

1 INTRODUCTION

Section 404 of the Clean Water Act of 1977 (the "Act") requires that all projects involving the discharge of dredged or fill material into waters of the United States be evaluated for water quality and other effects prior to making the discharge. This Section 404(b)(1) Evaluation addresses water quality effects of a proposed in-water discharge of dredged material to be performed by the Walla Walla District Corps of Engineers (Corps) in the first available in-water work window (December 15 to March 1) following completion of the Lower Snake River Programmatic Sediment Management Plan (PSMP) and associated Environmental Impact Statement (PSMP EIS). This action is consistent with the preferred alternative described in the PSMP EIS. The proposed discharge is associated with navigation channel maintenance dredging to address the current immediate need to re-establish the congressionally-authorized dimensions of the navigation channel at certain locations in the lower Snake and Clearwater Rivers. The proposed discharge also includes dredged material from ancillary/related maintenance actions by the Ports of Lewiston and Clarkston to restore the dimensions of berthing areas adjacent to the Federal navigation channel. The Ports are responsible for maintaining their respective berthing areas. The Ports and Corps have signed an agreement under which the Corps would include the Ports ancillary/related berthing area maintenance dredging and disposal in the Corps' federal navigation channel maintenance dredging contract, pending completion of environmental reviews. The Ports, however, must pay for their portion of the costs. The Ports are also responsible for obtaining their own in-water work permits through the Corps' Regulatory Program process. The Corps determined it was more efficient to address both actions in a single Section 404(b)(1) evaluation rather than prepare separate documentation for each Port action and the Corps' action.

This evaluation assesses the potential effects of the proposed discharges, and possible alternatives, utilizing guidelines established by the U.S. Environmental Protection Agency (EPA) under Section 404(b)(1) of the Act (40 C.F.R. 230). Although the Corps does not process and issue permits for its own activities (33 C.F.R. 336.1(a)), the Corps authorizes its own discharges of dredged or fill material by applying all applicable substantive legal requirements, including application of the section 404(b)(1) guidelines and associated evaluation factors in 33 C.F.R. 336.1(c).

2 DESCRIPTION OF THE PROPOSED PROJECT

2.1 Proposed Action

2.1.1 Dredging Site Information

The Corps proposes to perform maintenance dredging in the federal navigation channel to reestablish a 14-foot depth as measured at minimum operating pool (MOP) at two locations in

the lower Snake River in Washington and the lower Clearwater River in Idaho (Figure L-1). One site is the downstream navigation lock approach for Ice Harbor Dam (Snake RM 9.5) while the other site is located at or near the confluence of the Snake and Clearwater Rivers near Lewiston, Idaho (Snake RM 138 to Clearwater RM 2) in the Lower Granite Dam and Reservoir Project. The site in Lower Granite Project is adjacent to two proposed ancillary/related berthing area maintenance actions (dredging) by the Port of Clarkston (Snake RM 137.9-139) and Port of Lewiston (Clearwater RM 1-1.5). The Corps has proposed discharge of all dredged material from the Federal channel and Port berthing areas at an in-water location within the Lower Granite Reservoir at RM 116 just upstream of Knoxway Canyon. The Corps proposes to use the dredged material to create additional shallow water habitat for juvenile salmonids, as occurred during similar navigation channel maintenance in the winter of 2005/2006.

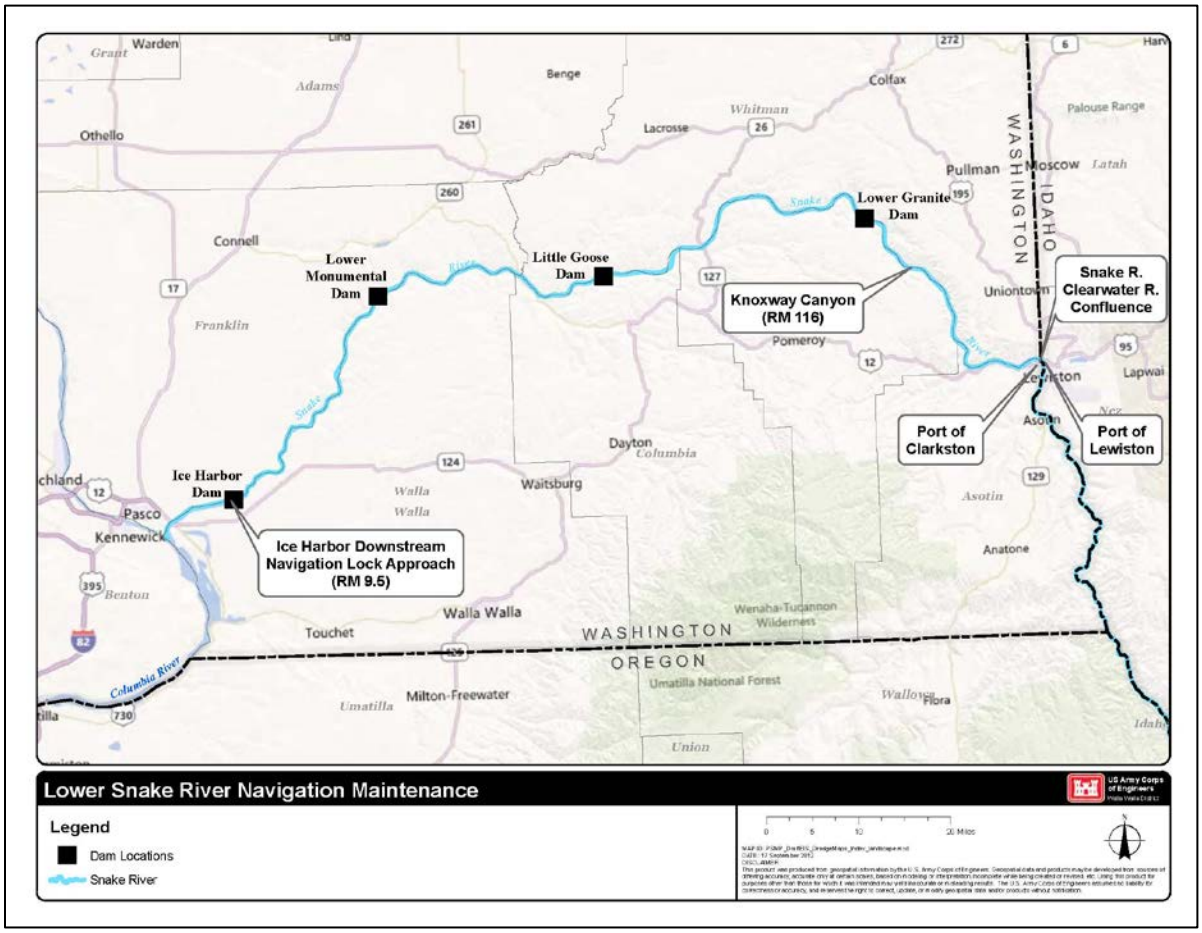

Figure L-1. Location of Dredging and Disposal Actions

Under the proposed action all dredging and disposal action would occur during the in-water work window from December 15 to March 1. This in-water work window was established through coordination with state and federal resource agencies as the time period in which in-water work could be performed with the least potential effect on Endangered Species Act (ESA)-listed salmonid species.

The proposed action would restore the federal navigation channel to the authorized depth (and adjacent port berthing areas) by dredging to a depth of no more than 16 feet as measured at MOP. The overdepth dredging (i.e., to 16 feet) is standard procedure as outlined in Engineer Regulation 1130-2-520, *Project Operations – Navigation and Dredging Operations and Maintenance Policies* (U.S. Army Corps of Engineers, 1996). Overdepth allowance helps minimize the need for more frequent and intermittent dredging of high spots. A 16-foot depth is used as the maximum dredging depth in the Federal navigation channel in order to maintain a consistent 14-foot depth. Of the additional 2 feet, 1 foot is considered allowable overdepth, which is the additional depth below the required section specified in a dredging contract, and is permitted because of inaccuracies in the dredging process. The other foot is considered advance maintenance, which is the additional depth and/or width specified to be dredged beyond the project channel dimensions for the purpose of reducing overall maintenance costs and effects by decreasing the frequency of dredging (Corps, 1996).

Table L-1 lists the sites proposed for immediate dredging and the estimated quantities of material to be removed from each site. Sediment is expected to continue to accumulate at these locations, depending on river flows, while this action is being planned, therefore the amount of material to be removed at the time of the dredging will likely be greater than what is shown in the table. The Corps anticipates the quantity of material needing to be dredged will range from 400,000 cubic yards (cy) to a maximum of 500,000 cy.

Table L-1. **Sites Proposed for Immediate Need Maintenance Dredging**

Site to be Dredged	Quantity to be Dredged (cy)
Federal navigation channel at confluence of Snake and Clearwater Rivers (Snake RM 138 to Clearwater RM 2)	458,472[1]
Port of Clarkston (Snake RM 137 and 139)	14,143[2]
Port of Lewiston (Clearwater RM 1-1.5)	4,664[1]
Ice Harbor Navigation Lock Approach (Snake RM 9.5)	2,337[3]
Total	479,616

Notes: 1. Based on removal to 16 feet below MOP using survey data from August 2013.
2. Based on removal up to 16 feet below MOP using survey data from November 2012.
3. Based on removal to 16 feet below MOP using survey data from September 2013.

The following paragraphs describe the four sites proposed for maintenance dredging.

Ice Harbor Lock Approach. About 2,337 cy of material would be removed from the Ice Harbor lock approach (Figures L-2 and L-3). Routine maintenance dredging has not occurred in this area since the 1970s although about 400 cubic yards of rock and cobble was dredged in Fall 2012 to remove an obstruction that presented a safety hazard in the downstream navigation lock approach. Sediment sampling showed that sediment composition was large rock substrate and cobbles greater than or equal to 2-6 inches.

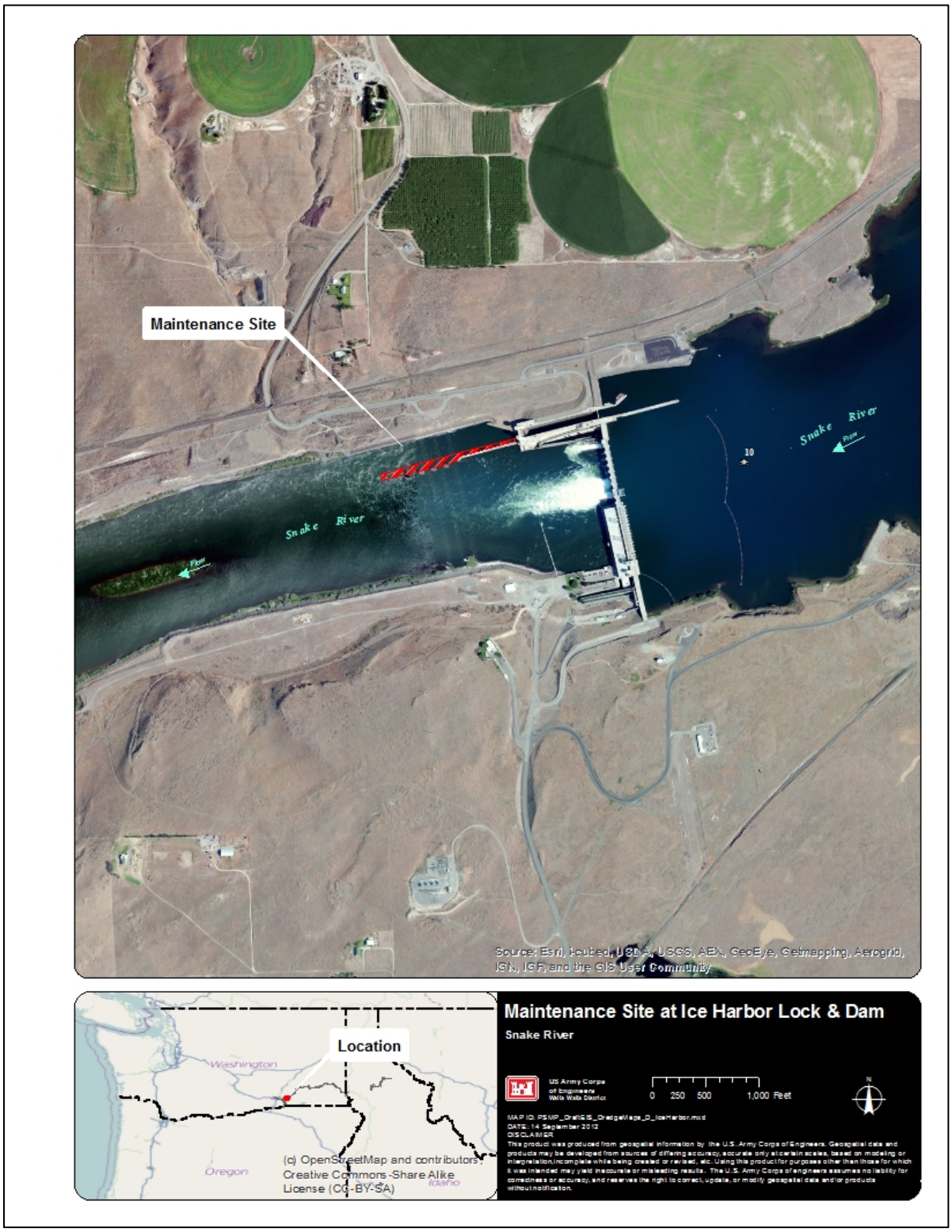

Figure L-2, Dredging Site at Ice Harbor Dam Navigation Lock

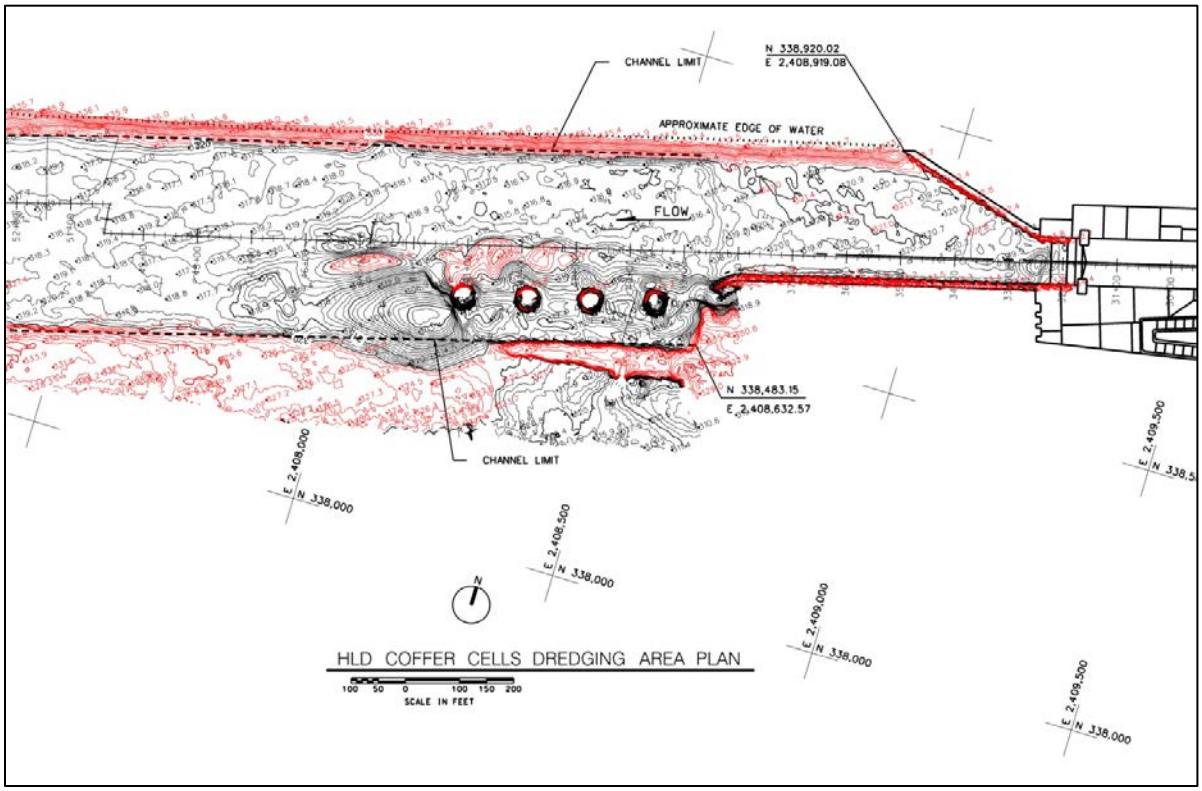

Figure L-3. Shoaling at Ice Harbor Navigation Lock Approach.
Areas less than 14 feet deep at MOP are in red.

Confluence of Snake and Clearwater Rivers (Federal navigation channel). About 458,000 cy of material would be removed from the federal navigation channel at the confluence of the Snake and Clearwater Rivers (Figures L-4 and L-5).

At locations in front of port berthing areas, the federal navigation channel has been expanded up to a maximum total width of 950 feet. "Channel dimensions specified shall be understood to admit of such increase at the entrances, bends, sidings, and turning places as may be necessary to allow for the free movement of boats." 33 U.S.C. § 562. This widening is provided to allow for maneuvering of barge tows in accordance with navigation practices.

Sediment samples were collected in August 2013 from the main navigation channel in the confluence area. In general, the grain size was higher in the Clearwater River dredge material management units (DMMUs) relative to the DMMUs below the confluence in the Snake River. For Clearwater DMMUs 7 – 11 the grain size averaged 96 percent sand, with a relatively narrow range of 92 – 99 percent. The DMMUs (1 – 6) below the confluence were still relatively course, but had a lower sand content that averaged 85 percent, and ranged from 69 to 93 percent.

Figure L-4. Federal Channel Dredging Location at the Confluence of the Snake and Clearwater Rivers

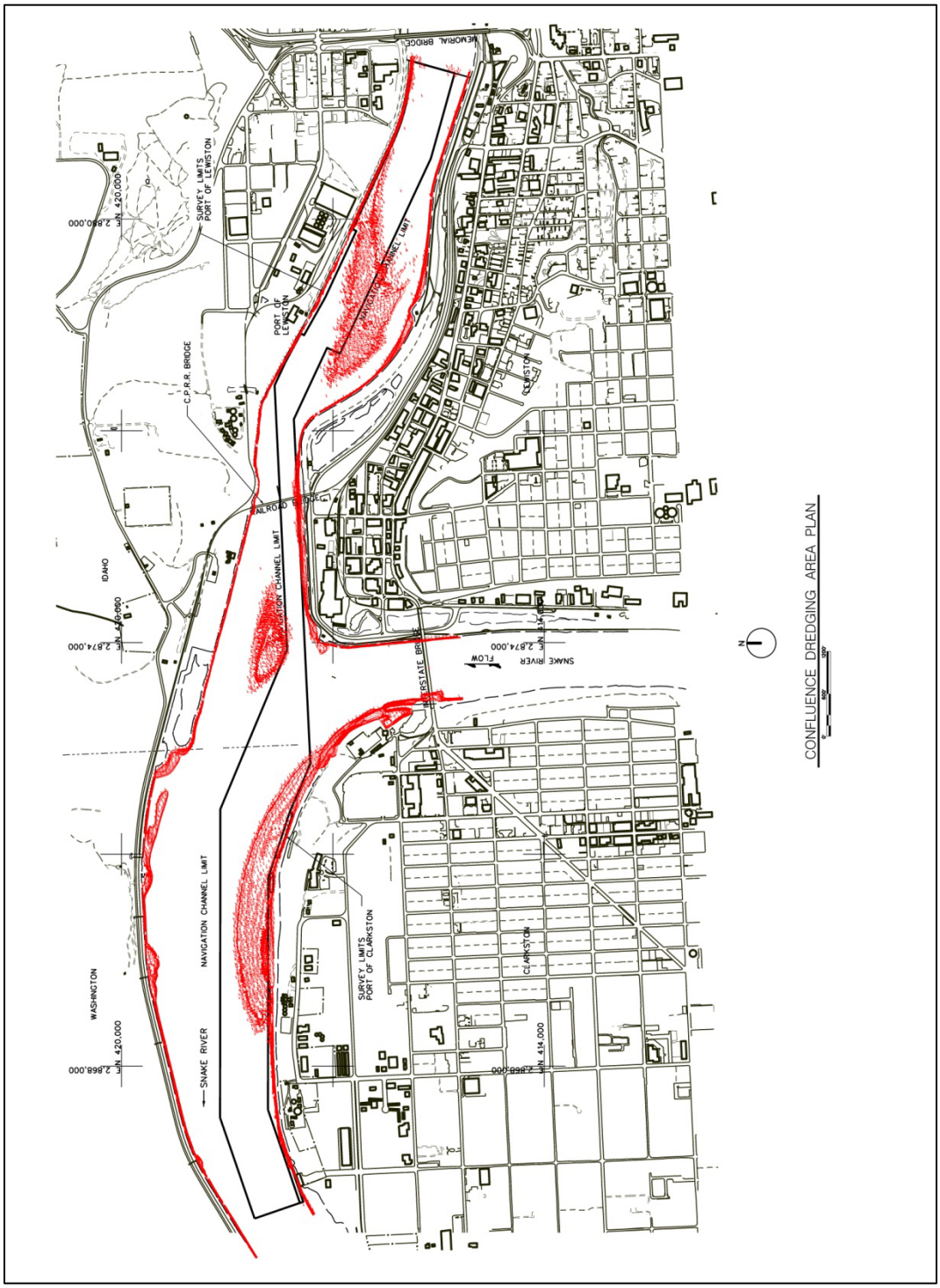

Figure L-5. Shoaling Locations at the Snake/Clearwater Rivers Confluence
Areas less than 14 feet deep at MOP are in red.

Port of Clarkston. About 14,143 cy of material would be removed from four berthing areas at the Port of Clarkston: the crane dock at the downstream end of the Port property (RM 137.9), the Lewis-Clark Grain Terminal (RM 138.2), the recreation dock at RM 138.3, and the tour boat

dock at the upstream end (RM 139) (Figure L-6). The berthing area is defined as a zone extending 50 feet out into the river from the port facilities and running the length of the port facilities. Maintenance in this area is the Port of Clarkston's responsibility and the Port would provide funding to the Corps for this maintenance work. Most of the area was last dredged in 2005/2006. Sediment samples were collected in November 2012 and August 2013. The data showed that sediment composition ranged from 45 to 94 percent sand depending on the DMMU. Silt composition ranged from 3 percent to 41 percent.

Port of Lewiston. About 4,664 cy of material would be removed from the berthing area at the Port of Lewiston (Figure L-7). The berthing area is defined as a zone extending 50 feet out into the river from the port facilities and running the length of the port facilities. Maintenance in this area is the Port of Lewiston's responsibility and the Port would provide funding to the Corps for this maintenance work. The area was last dredged in 2005/2006. The August 2013 sediment samples showed that sediment composition averaged 95 percent sand, and nearly equal proportions of silt and clay.

Figure L-6. Dredging sites at the Port of Clarkston

Figure L-7. Dredging site at the Port of Lewiston

2.1.2 Dredging Methods and Timing

Dredging would be accomplished by a contractor using mechanical methods, such as clamshell, dragline, or shovel/scoop. Based on previous dredging activities, the method to be used would likely be clamshell. Material would be dredged from the river bottom and loaded onto barges for transport to the disposal site. Clamshell dredges with a capacity of approximately 15 cy and barges with capacity of up to 3,000 cy and maximum drafts of 14 feet would be used. It would take about 8 to 10 hours to fill a barge. The contractor could be expected to work up to 24 hours per day and 7 days per week to complete the work within the work window. Material would be scooped from the river bottom and loaded onto a barge, most likely a bottom-dump barge. While the barge was being loaded, the contractor would be allowed to overspill excess water from the barge to maximize the capacity of the barge to hold dredged material.

Once the barge was full, a tug would push it to the disposal site. Once unloaded, the barge would be returned to the dredging site for additional loads. All dredging would be performed within the established (winter) in-water work window (December 15 through March 1). Multiple-shift dredging workdays would be used when necessary to ensure that dredging was completed within this window.

2.2 Purpose and Need

The purpose of the current immediate need maintenance dredging is to reestablish the federal navigation channel to congressionally authorized dimensions (14-feet deep by 250 feet wide), as measured at minimum operating pool (MOP), at two (2) locations (Ice Harbor tailrace and Snake/Clearwater confluence), and as a related need, to restore access to/designed depths at the berthing areas of the Ports of Lewiston and Clarkston. The Corps has the responsibility to operate and maintain the authorized federal navigation channel in the lower Snake River from McNary Reservoir on the mid-Columbia River, up the Snake River to its confluence with the Clearwater River near Clarkston, Washington and Lewiston, Idaho, and up the Clearwater River to the Port of Lewiston. The Corps' authority to maintain the lower Snake River navigation channel was first established in Section 2 of the River and Harbor 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. The Corps is authorized by Congress to maintain a channel that is 250-feet wide and 14-feet deep as measured at minimum regulated flows. Historically, the Corps has routinely maintained the navigation channel through dredging actions to maintain its authorized dimensions, typically every 3 to 5 years. The Corps has not performed maintenance dredging in the channel since the winter of 2005-2006 when the Lower Monumental and Lower Granite downstream navigation lock approaches, the federal channel at the Snake and Clearwater rivers confluence, and the berthing areas of the Ports of Lewiston and Clarkston were dredged.

An important constraint affecting operation of the federal navigation channel is Reasonable and Prudent Alternative (RPA) Action 5 in the National Oceanic and Atmospheric Administration

(NOAA) 2014 Supplemental Biological Opinion for the Federal Columbia River Power System (NOAA FCRPS Bi-Op)[1]. RPA Action 5 states the lower Snake River reservoirs will be operated within one foot of MOP from April through August each year to help move juvenile threatened and endangered salmon through the river system to the ocean. Operating the reservoirs at MOP versus full pool (a drop in elevation of 3 to 5 feet) is intended to benefit anadromous fish freshwater survival by decreasing the amount of time downstream migrating juvenile fish spend in the reservoirs. Over time, sediment deposition in the navigation channel reduces the water depth to less than 14 feet deep at MOP, which interferes with navigation. RPA Action 5 allows the reservoir level to be adjusted (i.e., operated at a level above MOP) to meet authorized project purposes, primarily navigation, but this deviation from MOP operation is intended to be an interim measure for addressing sediment deposition in the navigation channel until maintenance can be performed.

Because routine navigation channel maintenance has not occurred since 2005-2006, shoaling in the channel and port berthing areas has become critical in some locations. Sediment has been depositing in these areas in the Snake/Clearwater confluence primarily during spring runoff periods. Survey results from 2010 through 2013 show that the total surface area of the federal navigation channel having depths less than 14 feet, as measured at minimum operating pool (MOP) in the Snake/Clearwater river confluence area increased from about 38 acres in 2010 to about 55 acres in 2012, but decreased slightly to 54 acres in 2013. Water depths in the federal navigation channel at the confluence are now as shallow as about 7 feet while the berthing areas at the Port of Clarkston and Port of Lewiston are now as shallow as 7.3 feet and 9.3 feet, respectively, based on a MOP water surface elevation. Navigation channel depths less than 14 feet substantially affect access to nearby port facilities.

Because of the shallow depths in the federal channel, as well as the port berthing areas, some port facilities have been forced to operate at reduced capacity. Effects to the navigation industry from not providing for the authorized navigation purpose include an increased safety risk, increased risk of damage to equipment, increased risk of grounding, and lost efficiencies due to modified approach, loading, and unloading procedures. Grounding can cause damage to vessels/property, personal injury/death and unintended release of harmful cargo/chemicals. Effects to commercial navigation from sediment deposition continue even though the operation of one of the four lower Snake River projects (Lower Granite) has been temporarily adjusted to operate at up to two feet above MOP. This deviation from MOP operation is not consistent with the desired operation presented in RPA Action 5 of the NOAA FCRPS Bi-Op. However, without this temporary, seasonal adjustment, effects to navigation would be more severe.

Shoaling in the Ice Harbor navigation lock downstream approach is interfering with the ability of barge traffic to safely maneuver when entering or exiting the navigation lock. Spill flows at the dam have scoured rock from the base of the four rock-filled coffer cells bordering the lock approach and have pushed material from the edge of the lock approach into the channel,

[1] The supplement to the 2008/2010 FCRPS BiOp.

narrowing the room available for barges to maneuver between the coffer cells and the north shore. At least one of the coffer cells has been losing rockfill through the exposed base and this may be contributing to the material encroaching in the lock approach. This material has created a shoal that encroaches across the south half of the lock approach for about 480 feet, reducing the depth to about 9 feet at MOP in McNary pool (the lock approach at Ice Harbor Dam is within McNary reservoir, not Ice Harbor reservoir).

The disposal of dredged material is a necessary part of maintenance dredging and requires completion of this 404(b)(1) analysis. The proposed maintenance dredging cannot be performed without considering alternatives to, and effects associated with, disposal of the dredged material, in accordance with all applicable laws/regulations.

2.3 Alternatives Considered

The proposed current immediate need maintenance dredging action, and ancillary/related port berthing areas maintenance, were considered and evaluated in the PSMP EIS. In the PSMP EIS, the Corps evaluated alternatives and identified only one (1) measure that can satisfy an immediate (short term) need to reestablish the federal navigation channel to congressionally authorized dimensions – i.e., dredging (EIS, Section 2.2.5.7). Dredging was, therefore, incorporated into the preferred alternative (Alternative 7) in the EIS, and as part of the proposed PSMP, as the only measure available in such circumstances. The alternatives analysis in this 404(b)(1) evaluation, therefore, does not revisit consideration of alternatives to the dredging action, but focuses only on alternatives for the disposal of the dredged material.

The Corps considered both upland and in-water disposal alternatives using guidance from the Corps and the Environmental Protection Agency (EPA). The Corps' "Federal standard" for disposal of dredged material is defined as "[T]he least costly alternatives consistent with sound engineering practices and meeting the environmental standards established by the 404(b)(1) evaluation process. . . ." (33 C.F.R. 335.7). 33 C.F.R. 336.1(c)(1) states, "[I]t is the Corps' policy to regulate the discharge of dredged material from its projects to assure that dredged material disposal occurs in the least costly, environmentally acceptable manner, consistent with engineering requirements . . . ." Additionally, it is the Corps' policy to always consider beneficial use of dredged material when evaluating disposal options (Engineer Manual 1110-2-5026). Corps policy is also provided in the *Planning Guidance Notebook* (Engineer Regulation 1105-2-100), which states "When determining an acceptable method of disposal of dredged material, districts are encouraged to consider options that provide opportunities for aquatic ecosystem restoration." EPA guidance is provided in the *Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material* (40 C.F.R. 230). 40 C.F.R. 230.10(a) specifically states "… no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse effect on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences." "Practicable" is defined as "available and capable of

being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes." [40 C.F.R. 230.10(a)(2)].

The disposal alternatives considered by the Corps are described and discussed below. Based on preliminary information, including location, size, access, development, and current use, the Corps and the Ports identified 12 potential locations for upland disposal site evaluation and two for in-water disposal. One of the sites is located downstream of Ice Harbor Dam while the other sites are located along the Snake River between Ice Harbor Dam and the confluence of the Snake and Clearwater Rivers near Clarkston, Washington, or in the Lewiston-Clarkston area. These alternatives may be applicable to just the federal channel dredging, just the Port of Clarkston or Port of Lewiston berthing area dredging, or all of the dredging jointly. The Corps regulatory permitting program requires applicants to identify locations for disposal of dredged materials. Because the quantities from each of the Ports are much less than that from the federal channel, several disposal sites are applicable to only the Ports. All but one of the upland sites the Corps considered for material from the federal channel is on federal land managed by the Corps, as the Corps does not have the authority to acquire additional land or lease additional land to facilitate placement of dredged material on private property.

2.3.1 Corps Only Alternatives

2.3.1.1 Upland - Ice Harbor Storage Yard

The Ice Harbor storage yard is a 20 acre site located 0.3 miles downstream of Ice Harbor Dam on the south shore (left bank) of the Snake River at RM 9.5, across the river from the dredging site at the navigation lock approach (Figure L-8). It is on Corps property used for temporary and long-term storage of equipment and materials associated with operation of the dam and facilities. Because of proximity and site size, this location would only be considered for disposal of material from the Ice Harbor navigation lock approach dredging. This site is designated for other project uses so any dredged material placement in this location would be for temporary stockpiling until the material could be used for other purposes or relocated.

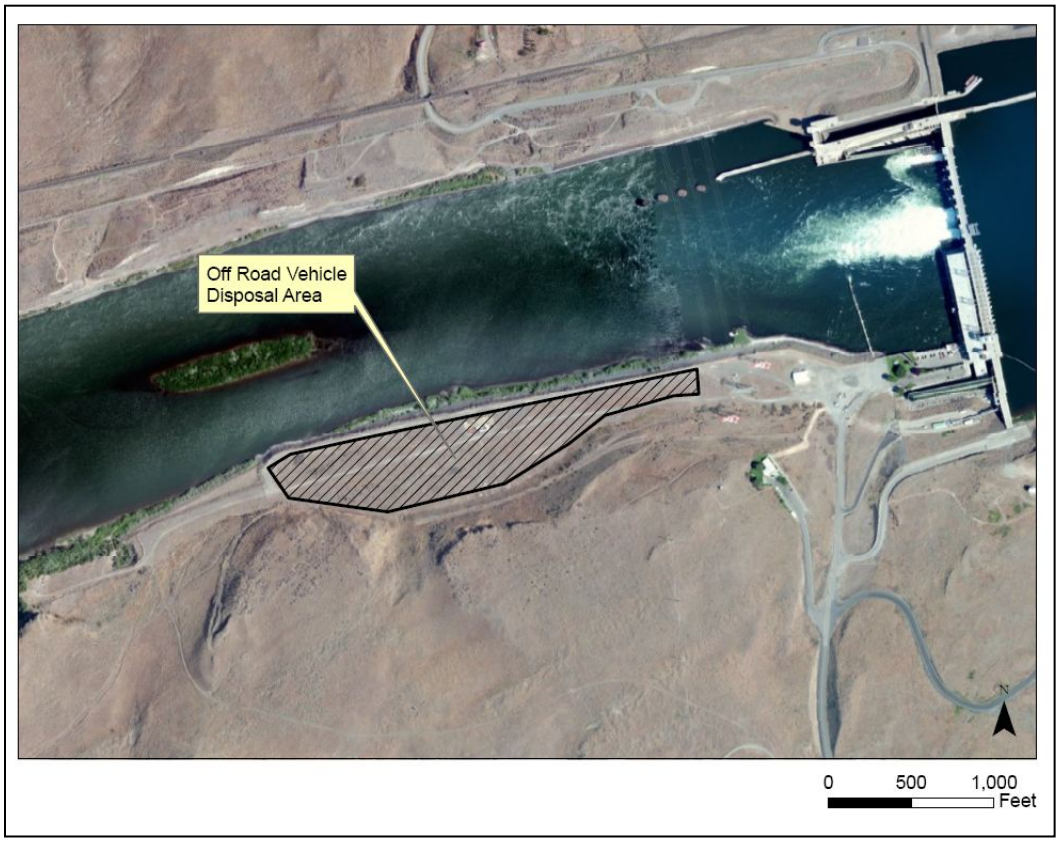

Figure L-8. Ice Harbor Storage Yard Site

The total volume of material to be placed at this site would fill one barge. Barge access may be difficult as it appears the water depth is shallow at this site. Establishing barge access may require dredging. Offloading the material could include some dredging to allow closer access for the barge, and repositioning for unloading. Unloading the barge would be accomplished by clamshell using shore-based equipment. The site has adequate vehicular access for this equipment. Because the site is immediately downstream of the dam, dredged material offloading may be delayed by high flows if water is being spilled at the dam. Because the dredged material is primarily cobble, construction of a settling pond would not be required.

2.3.1.2 Upland - Un-named Site, RM 11.5

The un-named site at RM 11.5 is a 25-acre Corps-owned site located about one mile upriver from Ice Harbor Dam, on the north shore (right bank) (Figure L-9). There is currently no development at this site. The site has relatively flat topography and appears to have deep shoreline access for barges on the upstream end of the site. There is no vehicle access to the site. About 150,000 cy of dredged material could be placed at the site. The Corps considered using this as a disposal site for both the cobbles from the Ice Harbor navigation lock approach and the material from the Snake-Clearwater river confluence, which is about 127 miles upstream, however, the small size of this site and the distance from the confluence would limit its use to Ice Harbor dredged materials only (for either stockpiling or disposal).

Figure L-9. Un-named Site, RM 11.5

Material would be offloaded from the barge using a shore-based clamshell. The Corps would need to either establish vehicular access to the site or establish a barge slip or mooring facility for offloading equipment before using it for upland disposal. For vehicle access, the Corps would need to obtain easements from adjacent landowners to construct an access road for heavy equipment needed to handle materials on the site. The Corps may have to use the Columbia Plateau Trail (former railroad bed) to reach the site, then construct a new spur road that drops down from the trail onto the site.

2.3.2 Joint Corps/Port Alternatives

2.3.2.1 In-Water - Placement to create habitat at Knoxway Canyon, RM 116

The Corps identified Snake RM 116 in Lower Granite reservoir as a site suitable for placing dredged material in-water to create shallow water habitat. This site is an approximately 120-acre mid-depth bench (water depth of 20-60 feet) on the left bank of the Snake River about ½-mile upriver of Knoxway Canyon and 23 miles downstream from the Snake-Clearwater Rivers confluence. This is the furthest upstream mid-depth underwater bench in Lower Granite reservoir that is still downstream of RM 120. In-water disposal in Lower Granite reservoir needs to take place downstream of RM 120 to avoid affecting the water surface elevation at the confluence of the Snake and Clearwater Rivers. Material placed in-water upstream of RM 120 can raise the water level in the upper portion of the reservoir and impede the ability of high flows

to move through the channel. This diminishes the capability of the channel to pass high flows at the confluence and increases the flood risk at Lewiston, Idaho.

The site is owned by the Corps as it is above the original ordinary high water line of the Snake River and the Corps purchased this bench prior to inundating it with water from Lower Granite reservoir. This site would be used for all of the dredged material from the Ice Harbor navigation lock approach, the federal channel at the Snake-Clearwater Rivers confluence, and the berthing areas for both Ports.

The RM 116 site was historically an old homestead orchard and pasture located several hundred feet upland of the historic river shoreline. The site is located in a low velocity area that has been accumulating sediment at an estimated rate of 2 inches per year since the filling of Lower Granite reservoir. The upstream end of the site was used as the in-water disposal site for the Corps' 2005/2006 navigation maintenance dredging of the federal channel and the Port berthing areas. Approximately 420,000 cubic yards of primarily sand and silt was deposited on the upriver end of the bench. An estimated 3.7-acre shallow water habitat bench was created for summer rearing juvenile fall Chinook salmon (Figure L-10). The upper surface of this material is sand that was reshaped to gently slope towards the center of the river.

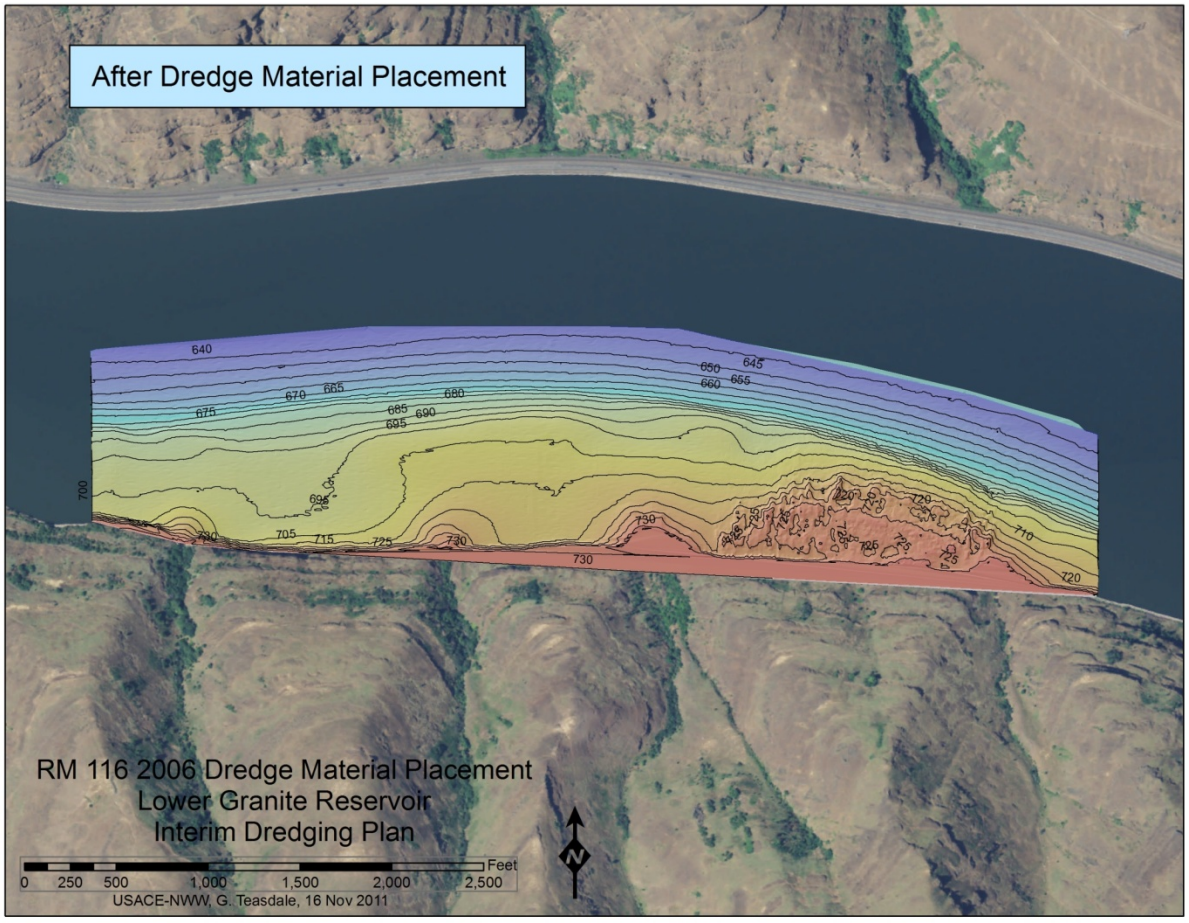

Figure L-10. Contour map of RM 116 Placement Site

The material from the proposed current immediate need dredging would be deposited adjacent to and downstream of the material deposited in 2005-2006 to form a continuous shallow-water bench (Figure L-11). The new dredged material would occupy a 27.44-acre footprint to construct a uniform, gently sloping shallow water bench along about 2,355 linear feet of shoreline. The top of the bench would be about 200 feet wide and have a 2-percent slope (Figures L-12 and L-13). This would provide about 11.39 acres of additional shallow water aquatic habitat up to 6 feet deep at MOP with features optimized for resting/rearing of outmigrating juvenile salmonids, particularly for fall Chinook salmon. The side slopes would be at the natural angle of repose, about 10H:1V. The Corps anticipates there would be about 16 acres of lesser-quality shallow water habitat at depths of 6 to 20 feet at MOP on the slope of the bench.

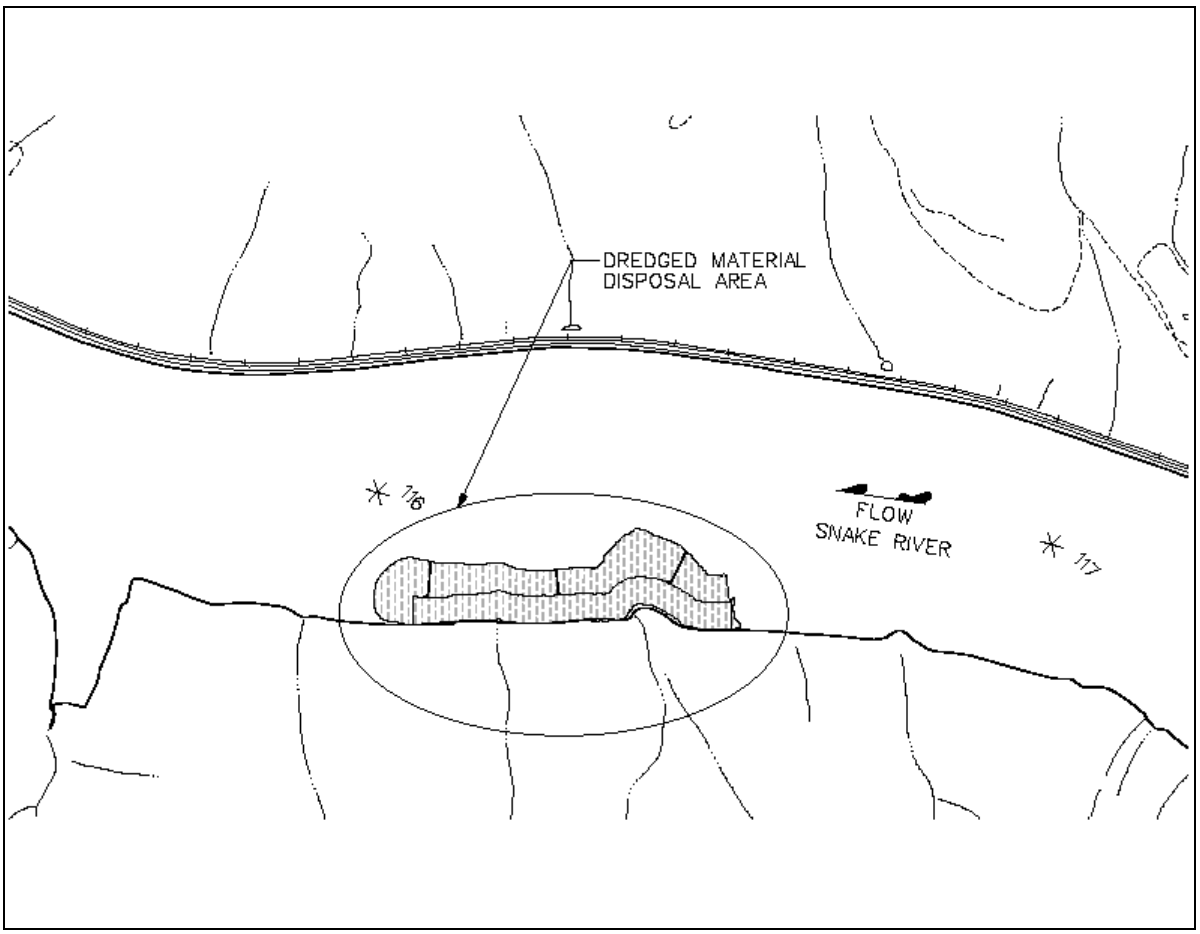

Figure L-11. Location of Proposed Disposal Site at RM 116

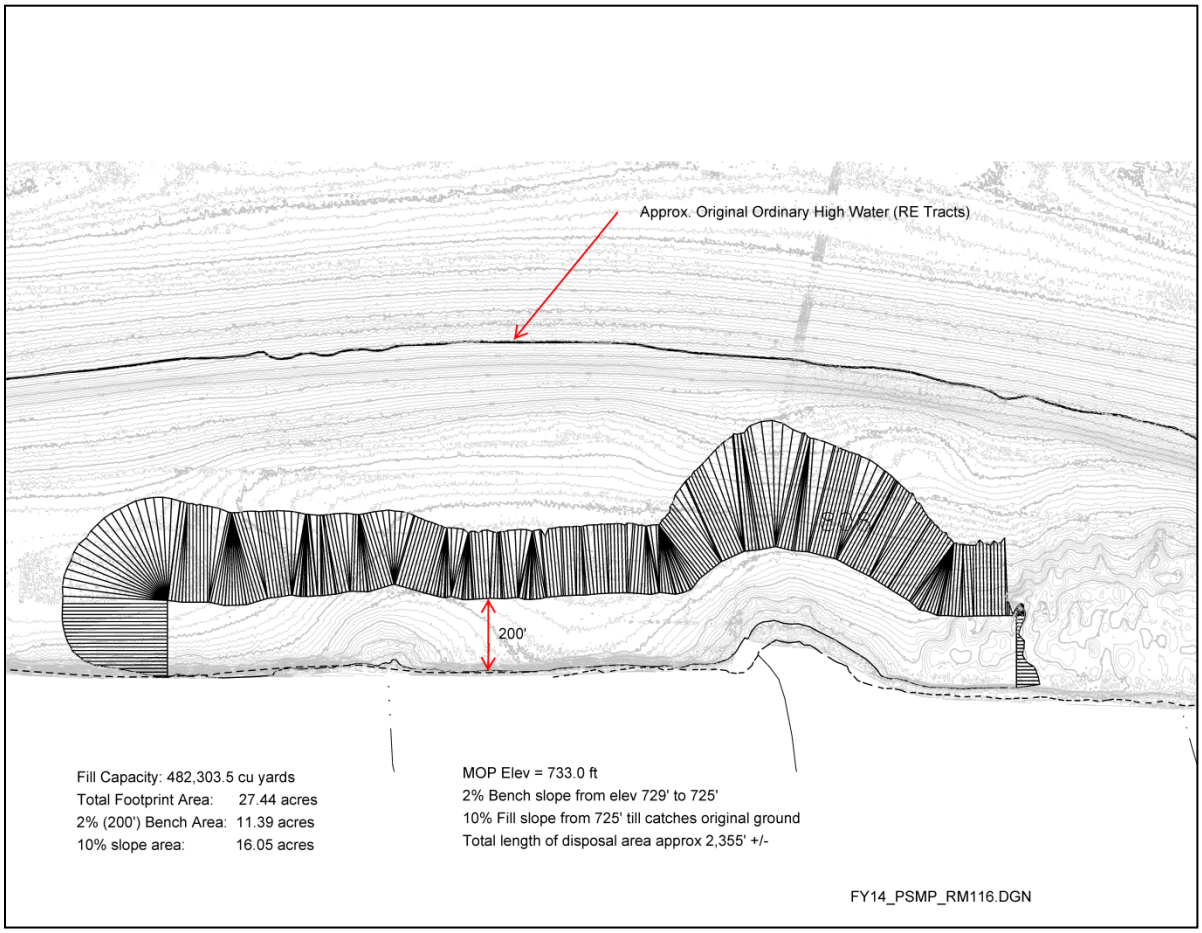

Figure L-12. Site Plan for Disposal at RM 116

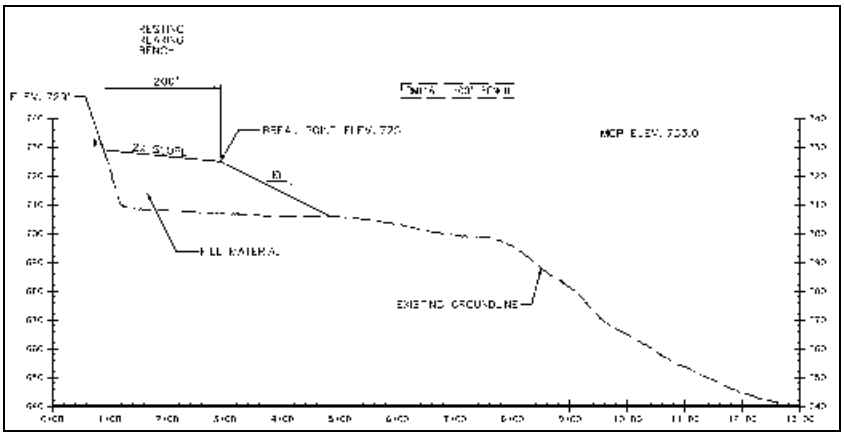

Figure L-13. Cross section of proposed disposal at RM 116

The dredged material would be placed in steps. The first step would be to place the cobbles from the Ice Harbor lock approach on the surface of the disposal site. This would be followed by placement of the sand from the Snake River DMMUs, both for the federal channel and the Port of Clarkston berthing areas. The dredge would start at the upstream end of the federal channel in

the Snake and work its way downstream, removing material from both the federal channel and the Port berthing areas. The material from the Snake River would be used to cover the cobbles and form the base of the embankment at RM 116. The dredge would then start at the upstream end of the Clearwater River and remove material from both the federal channel and the Port of Lewiston berthing area. This material would be used to form a cap of coarser sand, estimated to be about four feet thick, over the exposed surfaces of the newly created shallow water bench. All of the dredged material would be transported by bottom-dump barge to the disposal site. The barges would be positioned as close to the shore as possible, then opened up to allow the dredged material to drop to the river bottom. Because the barges would not be able to dump in the shallower depths, additional equipment would likely be needed to place or reshape the material to bring it up to the desired finished grade and slope. This may be accomplished by using equipment such as the clamshell bucket of the dredge to move the material to meet the desired configuration. For the previous disposal at this site, the dredge was relocated to the disposal site once dredging was completed and the clamshell bucket was used to reposition some of the dredged material.

2.3.2.2 In-water - Open Water Disposal, RM 119

The Corps identified Snake RM 119 in Lower Granite reservoir (Figure L-14) as a suitable site for open water disposal. This site is in the center of (deepest part of) the river and is about 20 miles downstream from the Snake-Clearwater Rivers confluence. This site is within the original riverbed of the Snake River, so it is owned by the State of Washington and managed by Washington Department of Natural Resources (DNR). As stated in Section 2.3.2.1.1, in-water disposal in Lower Granite reservoir needs to take place downstream of RM 120 to avoid affecting the water surface elevation at the confluence of the Snake and Clearwater Rivers. The RM 119 site is far enough downstream of this point to have no effect on the water surface at Lewiston. This site was also used for deep water disposal during the in-water dredged material disposal testing in the late 1980s and for the disposal of dredged silt during the Corps' 1997/1998 navigation maintenance dredging of the Snake-Clearwater Rivers confluence. The water depth in this location is about 80 feet below MOP. This site would be used for all of the dredged material from the Ice Harbor navigation lock approach, the federal channel at the Snake-Clearwater Rivers confluence, and the berthing areas for both Ports.

Figure L-14. RM 119 Open Water Disposal Site

Dredged material disposal would follow the same process used for the previous disposal actions at this location. Material would be transported to the disposal site in bottom-dump barges. The barges would be positioned along the downstream slope of the existing mound, then opened up to allow the dredged material to drop to the river bottom. Barges would dump material across the river channel in a back and forth pattern, filling the entire cross section until the new material reaches elevation 672 feet above mean sea level (msl), the same height as the previously dumped material (Figure L-15). The barges would continue this pattern of moving downstream and filling the entire cross section until all material had been disposed. There would be no reshaping of the material – it would be allowed to remain at an expected angle of repose approximately 10H:1V. The resulting underwater embankment would be about 20 feet high with a top elevation about 60 feet below MOP, which would not encroach on the navigation channel depth. The embankment would have a footprint of about 35.5 acres (Figure L-16).

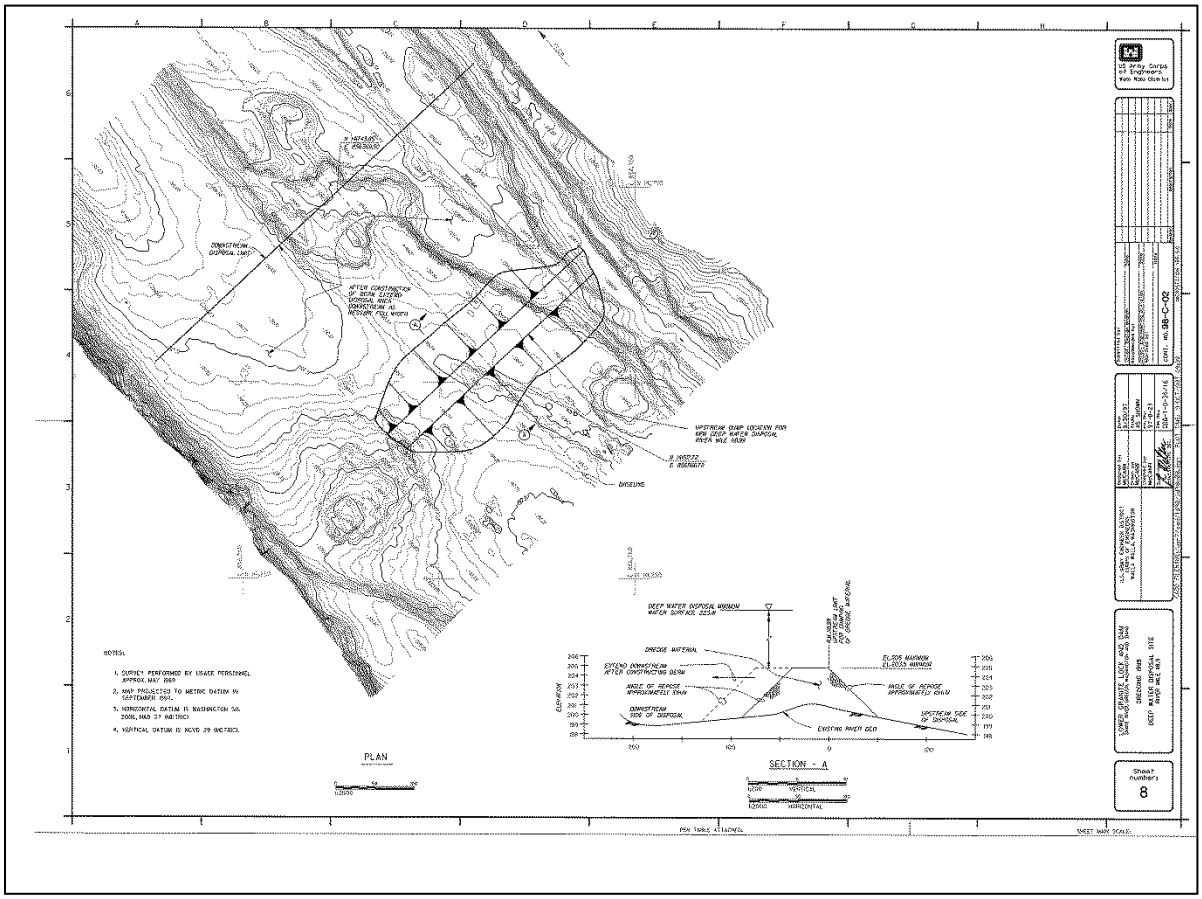

Figure L-15. Conceptual Plan for In-Water Disposal at RM 119

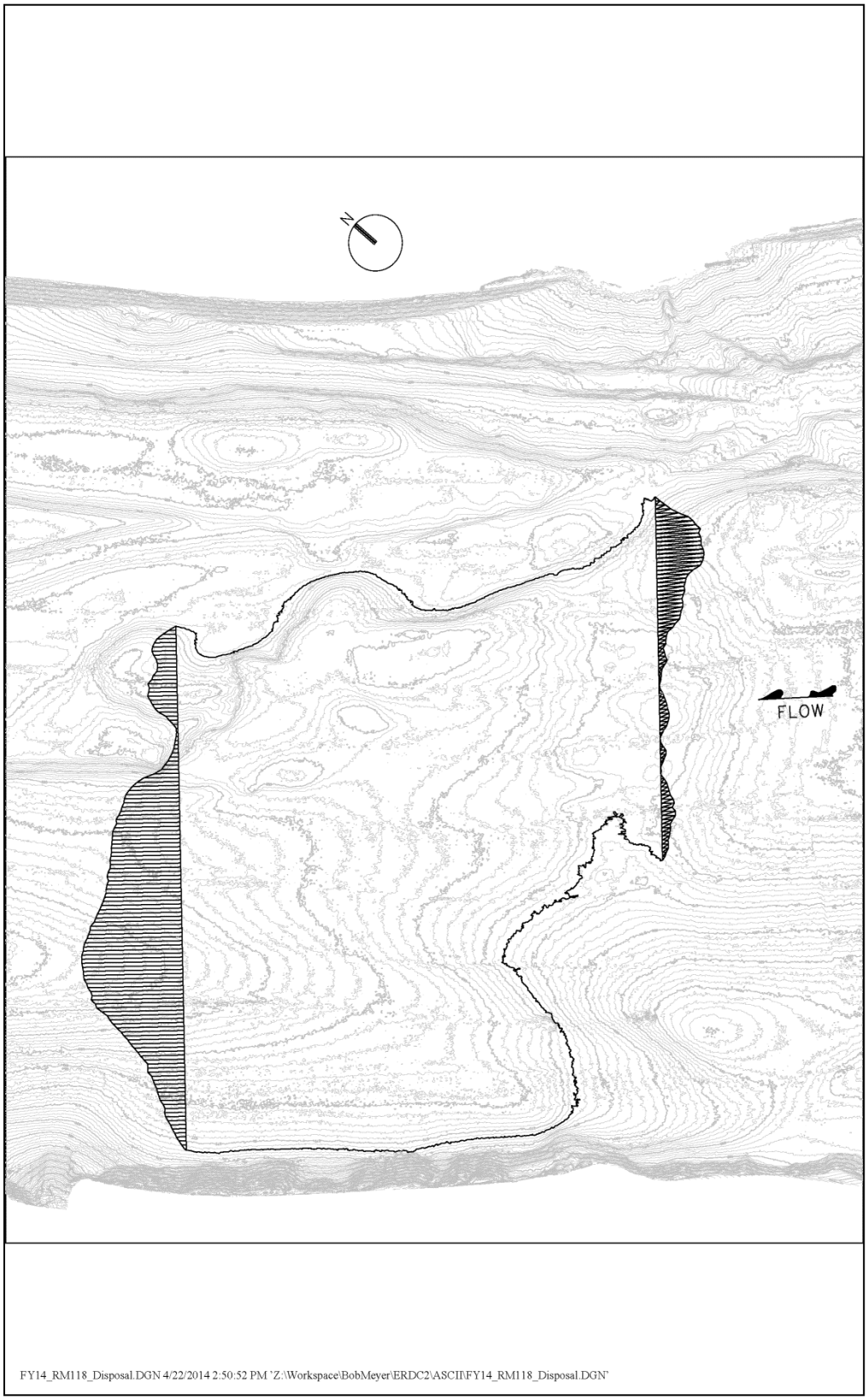

Figure L-16. Footprint of RM 119 Disposal

2.3.2.3 Upland - Joso

Joso is a Corps-owned site located along the southern shore (left bank) of the Lower Monumental reservoir at RM 57 (Figure L-17). The site contains an 80-acre borrow pit used during construction of the Lower Monumental Dam project in the 1970s. The vegetation and topsoil were stripped from the borrow pit and not replaced when construction activities were completed. Much of this borrow pit remains exposed rock and cobble with a sparse cover of grass in areas where some soil has drifted in. There is no development at the site, but it does have vehicular access. Barge access could be accommodated at the downstream end of the site. The Corps considered this as a disposal site for both the cobbles from the Ice Harbor navigation lock approach and the material from federal channel at the Snake-Clearwater rivers confluence and the Port berthing areas.

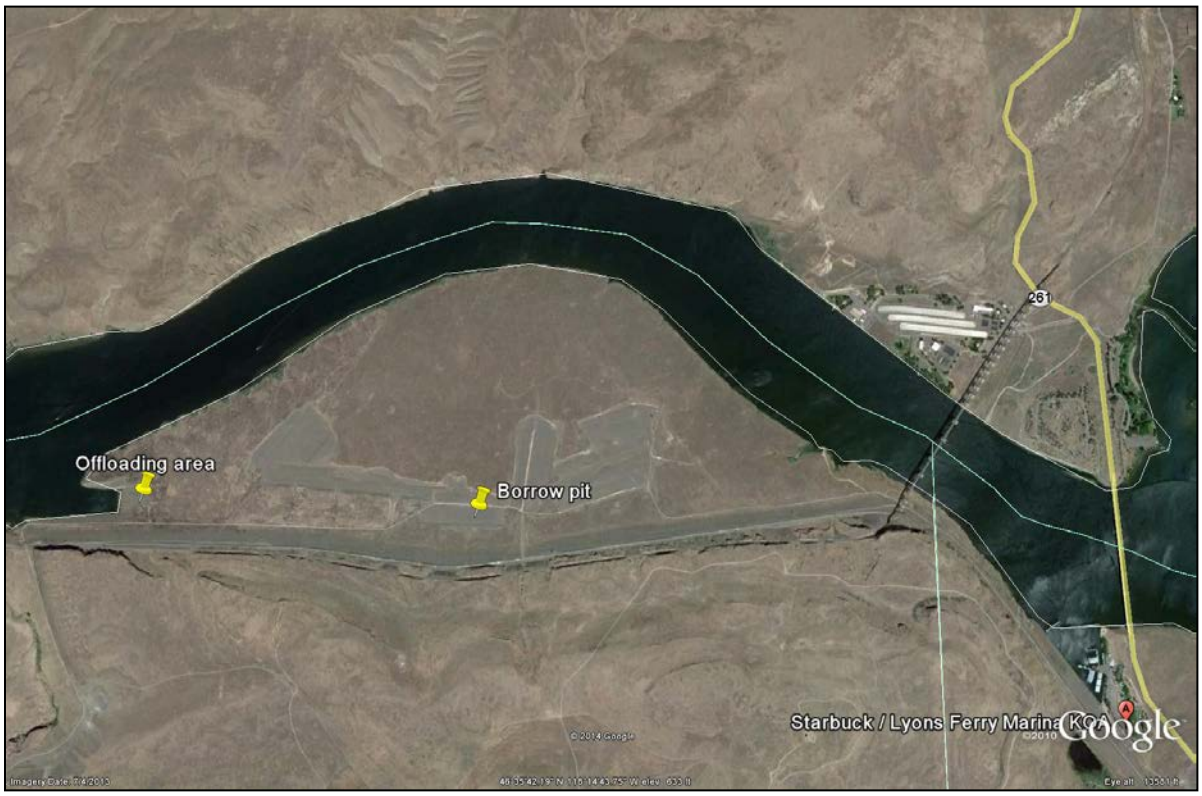

Figure L-17. Joso Site

Dredged material disposal would be confined to the limits of the existing borrow site. Offloading would take place at the downstream end of the site. The Corps would need to dredge a 14-foot-deep channel to provide a barge access slip as the water is too shallow for a loaded barge. The Corps may construct a sheet-pile barge slip into the uplands to minimize disturbance to shallow-water habitat. The Corps would most likely offload the material with a shore-based clamshell, although the material from the Snake-Clearwater Rivers confluence could be offloaded hydraulically as the material is predominantly sand. The material could be loaded directly into earthmoving vehicles for transport to the selected disposal location within the

borrow pit, or it could be temporarily stockpiled near the shore to dry before being loaded into vehicles for transport to the disposal location. Temporary stockpiling may require construction of containment berms. These could be constructed using sheetpile or by pushing up the existing gravel substrate.

The dredged material could potentially be used to restore a vegetative cover over the borrow pit. If used for restoration purposes, placement of the dredged material on the Joso site would depend on the type of the material. The cobbles from the Ice Harbor navigation lock approach would be placed in a low spot to provide a level base. The sandy material from the Snake-Clearwater Rivers confluence area would be placed on top of the cobbles to provide a planting substrate. By spreading the sandy material in a layer three and one-half feet thick, the Corps estimates it could restore the entire borrow pit surface. The dredged material would be compacted and shaped to appropriate contours to support seeding. The Corps would then seed the area with native grasses, thereby creating a vegetative cover.

2.3.2.4 Upland - Kelly Bar, RM 120

Kelly Bar is a 25-acre Corps-owned site on the left bank of the Snake River at RM 120 in Lower Granite reservoir (Figure L-18). The site exhibits steep topography and has no road access. Offshore of the site is shallow water, with a bar and an island (Centennial Island) located approximately mid-shoreline of the site. Centennial Island and the underwater area surrounding the island were constructed with dredged material by the Corps in the 1980s and 1990s as part of the in-water disposal methods testing and evaluation. The area surrounding the island provides shallow water rearing habitat for juvenile Snake River fall Chinook salmon. The Corps considered this as a disposal site for both the cobbles from the Ice Harbor navigation lock approach and the material from the federal channel at the Snake-Clearwater rivers confluence and the Port berthing areas.

Figure L-18. Kelly Bar Site.

The Corps would need to modify the site to accommodate upland disposal. The Corps would use earthmoving equipment to construct a large berm on the downslope side of this site to contain the wet dredged material on the steep slope. There is no road access to the site, and due to steep terrain, road construction would be prohibitive, therefore all earthmoving equipment would be transported to the site by barge. The berm would be constructed by pushing up material from the site. The Corps may be able to use the cobbles from the Ice Harbor navigation lock approach for some of the berm construction. If the berm had a 2H:1V side slope and extended up to the same elevation as the top of the site (Figure L-19), the berm would cover half of the site's footprint. The shallow water approach at this site would require construction of barge off-loading facilities, such as a barge slip. Modifications at this site to allow disposal of dredged material would damage portions of the developed shallow water habitat. The Corps would most likely offload the material with a shore-based clamshell, although the material from the Snake-Clearwater Rivers confluence could be offloaded hydraulically as the material is predominantly sand. Containment of effluent may be difficult due to slope and runoff. The Corps would seed the dredged material to native grasses once the material dried out enough for planting.

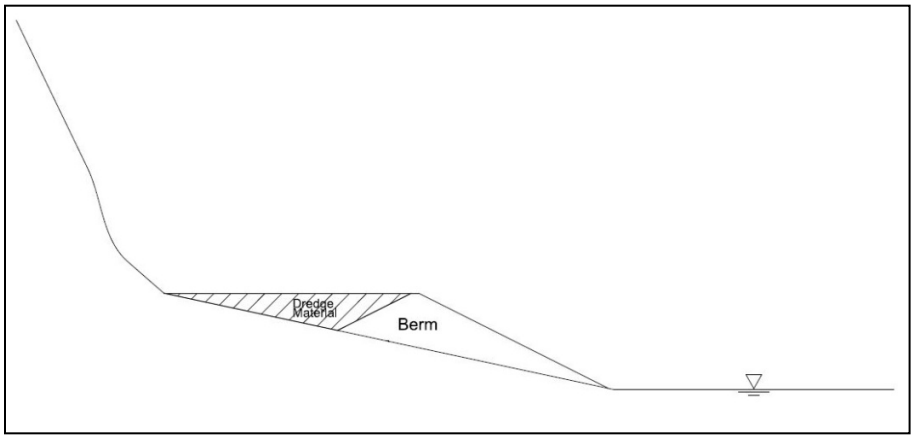

Figure L-19. Cross Section: Concept of Kelly Bar site

2.3.2.5 Upland - Silcott Island

Silcott Island is a 120 acre island site owned by the Corps. It is located on the left bank of the Snake River at RM 132 in Lower Granite reservoir (Figure L-20). Approximately 70 acres of the island are minimally developed open land. The Corps estimates this site could accommodate over 400,000 cubic yards of dredged material. Barge access at this site would presumably be favorable as the shore appears steep on the north and downstream side of the island, providing the needed draft for a barge to park close enough to unload. There is vehicle access to this site. The site is part of Chief Timothy Park which the Corps has leased to a private company, Northwest Land Management (NLM), to provide for public recreation. A sewage lagoon for the park is located in the center of the island. The Corps considered the island as a disposal site for both the cobbles from the Ice Harbor navigation lock approach and the material from the federal channel at the Snake-Clearwater rivers confluence and the Port berthing areas.

Figure L-20. Silcott Island Site

Upland disposal at this site would be similar to that performed at Kelly Bar. The Corps would use earthmoving equipment to construct a containment berm, primarily by pushing material up from the site. The Corps may be able to use the cobbles from the Ice Harbor navigation lock approach for some of the berm construction. Given the relatively flat topography of the undeveloped area, the Corps could construct a berm that would allow dredged material to be piled up to five feet high within the 70 acres. The Corps would need to either relocate the sewage lagoons, or construct a berm around the lagoons to exclude them from the disposal area. The Corps would most likely offload the material with a shore-based clamshell, although the material from the Snake-Clearwater Rivers confluence could be offloaded hydraulically as the material is predominantly sand. The Corps would seed the dredged material to native grasses once the material dried out enough for planting.

2.3.2.6 Upland - Chief Timothy Habitat Management Unit (HMU)

The Chief Timothy Habitat Management Unit (HMU) is an 18 acre site located on the left bank of the Snake River at RM 133, just upriver from and adjacent to Silcott Island (Figure L-21). This Corps-owned site is managed as one of the intensively managed, irrigated HMUs developed as part of the Lower Snake River Fish and Wildlife Compensation Plan to mitigate for loss of wildlife habitat and hunting opportunities associated with the four lower Snake River dams and reservoirs. This narrow site is approximately ¾- mile long and is parallel with and adjacent to U.S. Highway 12. Due to the narrow configuration of the site, dimensional requirements for a containment berm would substantially reduce the amount of space available for dredged material. There is vehicle access to the site. The shallow water shoreline would require in-water

work to allow barge access. This site has a capacity for disposal of about 50,000 cubic yards. The Corps considered the site as a disposal site for both the cobbles from the Ice Harbor navigation lock approach and the material from the federal channel at the Snake-Clearwater rivers confluence and the Port berthing areas.

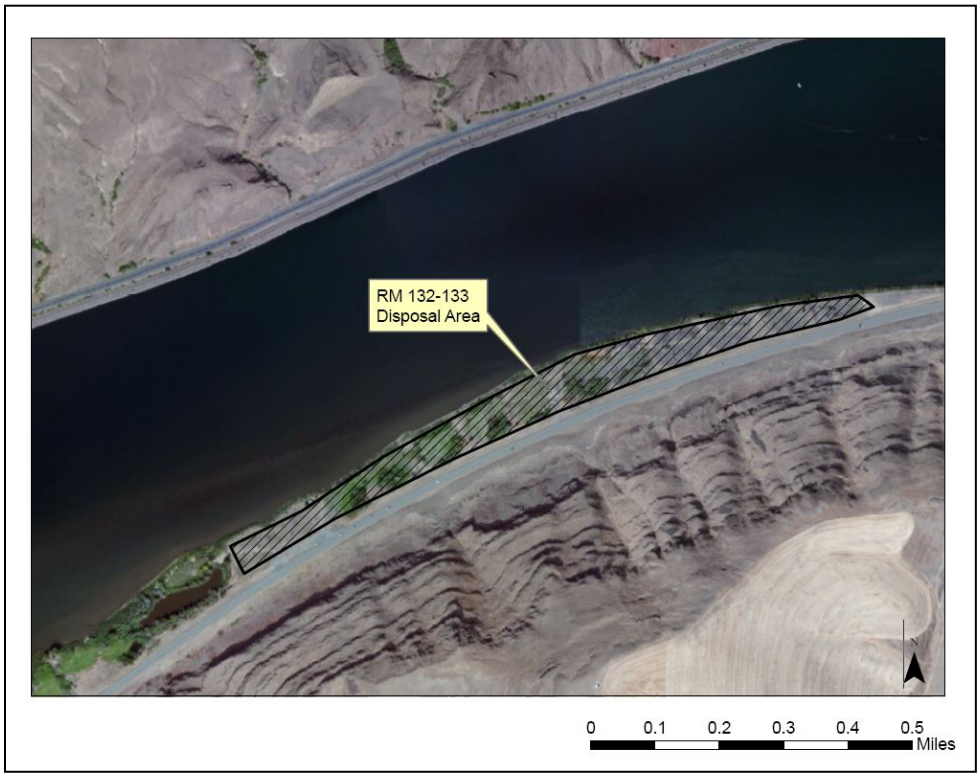

Figure L-21. Chief Timothy HMU Site

Upland disposal at this site would be similar to that performed at Kelly Bar. The shallow water approach at this site would require construction of barge off-loading facilities, such as a barge slip. The Corps would construct a containment berm by pushing material up from the site and possibly using the cobbles from the Ice Harbor navigation lock approach. The Corps would most likely offload the material with a shore-based clamshell, although the sandy material could be offloaded hydraulically. The Corps would seed the dredged material to native grasses once the material dried out enough for planting.

2.3.2.7 Upland - Port of Wilma, RM 134

The Port of Whitman, Wilma site (Port of Wilma) is located on the right bank of the Snake River at RM 134 in Lower Granite reservoir, just downstream from Clarkston (Figure L-22).
The property was formerly owned by the Corps, but is now owned by the Port of Whitman.
The proposed disposal location is at the downstream end of the Port, where the Corps used the Wilma site for dredged material disposal in 1986. At that time, the Corps constructed a series of three settling ponds (cells) to contain material from a hydraulic dredging maintenance action at

the confluence area. Dredged material from that initial action filled the first cell and a portion of the second cell.

Figure L-22. Port of Wilma Site

Following its acquisition of the property in the 1990s, the Port expressed an interest in obtaining additional dredged material to fill the remaining cells. However, the Port has been preparing the second cell for development without additional fill material, and has initiated use at that location. The third cell, at the downstream end of the Port has not been used. The Corps determined that the remaining cell has a capacity of approximately 60,000 cy. There is vehicle access to the site. The shoreline is too shallow for barge access. The Corps considered this as a disposal site for only the sandy material from the federal channel at the Snake-Clearwater Rivers confluence and the Port berthing areas as this material could be offloaded hydraulically.

Because of requirements to protect shallow water habitat for threatened and endangered fish along the shoreline at Port of Wilma, barges would not offload at the shoreline. Instead a pumpout system would be required to move material from the barge to the disposal cell. The Corps assumed the existing docking facilities, just upstream of the disposal cell, would be used during the off-loading. Approximately 3,200 feet of temporary pipeline would be required to move material from the dock to the disposal cell. There would also be an upland disposal crew with earth moving equipment to move and form the material within the disposal site.

2.3.3 Port Only Alternatives

2.3.3.1 Upland - Port of Clarkston Property

The Port of Clarkston site is located on the left bank of the Snake River from about RM 137 – 139 immediately downstream from the confluence of the Snake and Clearwater Rivers (Figure L-6). The Port manages its 120-acre waterfront site for a variety of business tenants, but there are several parcels of land that have not yet been developed. Most of the property is relatively level, but it drops off steeply at the river bank. The Corps would consider Port property only for disposal of only the material dredged from the Port of Clarkston berthing area.

Disposal on Port property would involve several stages. Offloading would likely occur at the crane dock, located at the downstream end of the Port property. The material would be offloaded with either a shore-based clamshell or pumped off. One or more containment berms would need to be constructed at the site to hold the material and control effluent until the material dried out. Once the material was dry enough to be transported on public roads, it would be loaded onto trucks and transported to its permanent disposal site at one or more locations on Port property.

2.3.3.2 Upland - Property not owned by Port of Clarkston

The Port of Clarkston considered several different disposal options on property other than that owned by the Port. These included private property near the waterfront, private and businesses-owned property away from the waterfront, and owners of agricultural property in the vicinity of Clarkston. This disposal option would be considered only for material from the Port of Clarkston berthing area.

Disposal of material under this option would follow the same steps as described above for Port owned property.

2.3.3.3 Upland - Confluence Riverfront Site

The Confluence Riverfront Site is an 8-acre site on the right bank of the Clearwater River, approximately one half mile downriver from the Port of Lewiston berthing area and is owned by the Port (Figure L-23). The site is undeveloped and adjacent to the river. The site contains an original toxic, organic, and municipal waste depository known as the "Lewiston Levee Landfill" developed during construction of the Lewiston levee system. The landfill was sealed with two feet of low permeability soil when it was closed in about 1973. There is road access to the site. The Corps would consider this disposal option only for material from the Port of Lewiston berthing area.

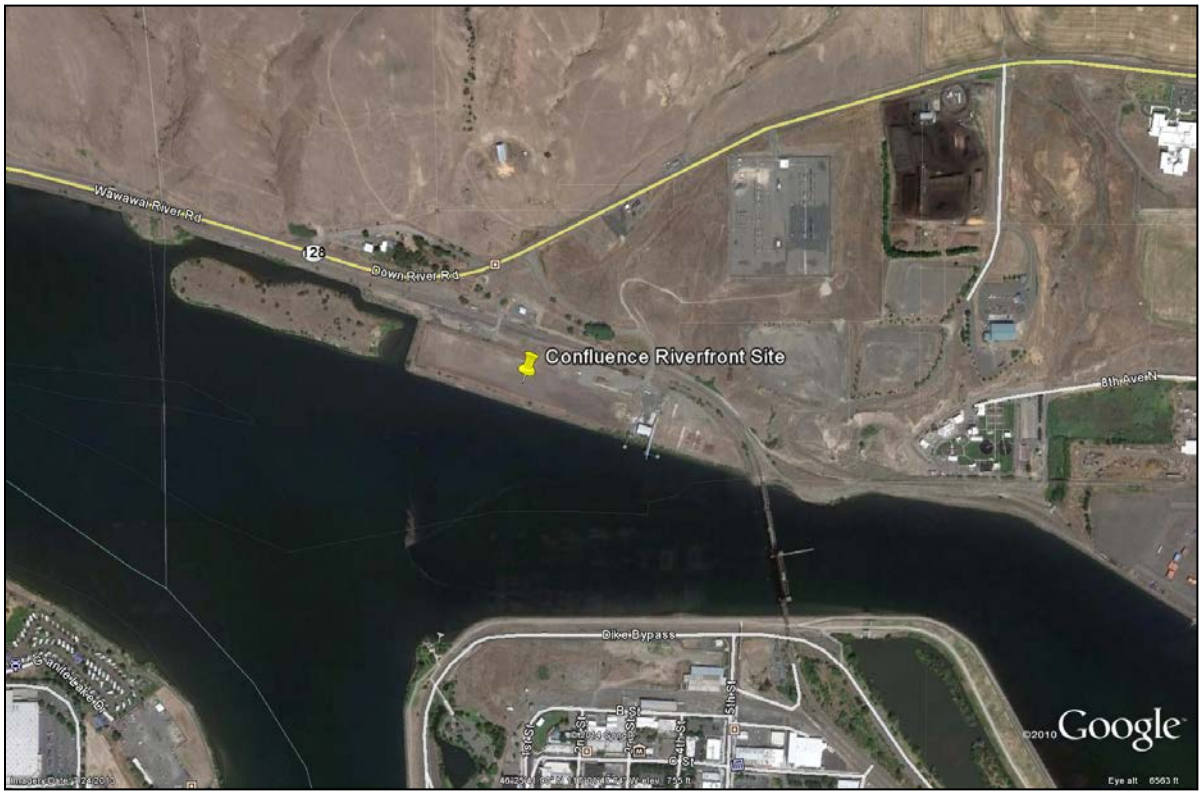

Figure L-23. Confluence Riverfront Site

Disposal of material under this option would be performed similar to that at Silcott Island. The Corps would construct a berm to contain the material. Offloading would be by shore-based clamshell.

2.3.3.4 Upland - Other Port of Lewiston Property

The Port of Lewiston indicated it owns about 30 acres of undeveloped property, located two to five miles inland from the Clearwater River, it considered when identifying potential disposal areas. This property would be considered for disposal of only dredged material from the Port of Lewiston berthing area.

Disposal on any of this property would require an offloading and staging area along the shoreline, similar to that for the Port of Clarkston property alternative. The Port of Lewiston has indicated there are no undeveloped or unused properties along the Clearwater River shoreline suitable for staging/dewatering the dredged material prior to transporting it to any of the undeveloped property.

2.3.3.5 Upland - Asotin County Regional Landfill

Both the Port of Clarkston and the Port of Lewiston considered the potential of disposing material from their respective berthing areas at the Asotin County Regional Landfill. The

landfill is about 8 miles from the Port of Clarkston and about 19 miles from the Port of Lewiston waterfront. To dispose of the dredged material at the landfill, both Ports would need to construct upland containment areas to hold the material until it dried out enough to be transported to the landfill via public roads.

2.4 Screening Criteria for Disposal Alternatives

2.4.1 Screening

In general, the 404(b)(1) guidelines mandate that "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences." [40 C.F.R. 230.10(a)]. "Practicable" is defined as "available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes." [40 C.F.R. 230.10(a)(2)]. It is also the Corps' policy to designate the least costly alternative, if environmentally acceptable [i.e., selected through the 404(b)(1) guidelines] and engineering/technologically feasible, as the "Federal standard" for the proposed discharge action [33 C.F.R. 336.1(c)(1)]. The Corps, therefore, identified the following disposal alternatives screening criteria:

1. Alternative satisfies the Corps and/or the Ports basic disposal purpose.

2. Alternative is practicable/available for Corps and/or Ports (cost, technology, logistics).

3. Alternative is environmentally acceptable [404(b)(1) guidelines].

4. Alternative is the least cost after consideration of 1-3 (Federal standard).

Multiple factors must be considered when determining if a location is a viable disposal site. Small sites could be utilized for portions of material but using multiple sites requiring access development, retention pond construction and revegetation work would likely be cost-prohibitive. Sites must be free of existing developments, such as recreation, habitat management, or permanently installed infrastructure equipment, and sites must not be encumbered by a real estate license unless specific to this use. Disposal site proximity to the dredging area is also considered to facilitate completion of the dredging within the in-water work window time constraint. Closer locations promote efficiency of equipment resources while more distant disposal locations can increase cost by increasing the amount of equipment needed to perform the work within the limited time of the in-water work window. When selecting sites, the Corps tries to avoid environmentally sensitive areas such as existing juvenile salmon rearing habitat in shallow water areas, managed wildlife habitat mitigation sites, known or potential cultural resource locations, and public recreation areas. Disposal by the Corps on non-federal land requires specific project authorization (new authority) or a beneficial use cost share agreement with a local government. The process could require approval by Corps Headquarters (possibly Congress), requiring extensive (possibly years) lead time for execution. Engineering

feasibility is also an important consideration in selection and development of sites for dredged material disposal. Barge access must be reasonably good or extensive in water work, with associated additional costs and environmental effects, would be required. Existing road access to the site facilitates use of earth moving equipment at the site and reduces environmental effects of road construction.

The Corps applied the screening criteria above to the disposal alternatives listed in Section 2.3 to determine which alternative(s) would be carried forward for further evaluation resulting in the selection of the preferred disposal alternative. Table L-2 presents a summary of the screening results. Only disposal alternatives that met the first three screening criteria(purpose, practicable, environmental) were evaluated for costs. Only alternatives meeting all four criteria were carried forward for evaluation.

Table L-2. Disposal Alternatives Screening

	Criteria			
Alternatives	**Purpose**	**Practicable**	**Environmental**	**Least Cost**
Corps Only Alternative				
Upland - Ice Harbor Storage Yard	Y*	Y	N	-
Upland - Un-Named (RM 11.5)	Y*	N	N	-
Joint Alternatives				
In Water - Knoxway (RM 116)	Y	Y	Y	Y
In Water - Open Water (RM 119)	Y	Y	N	-
Upland - Joso	Y	N	Y	-
Upland - Kelly Bar (RM 120)	Y	N	N	-
Upland - Silcott Island	Y	N	N	-
Upland - Chief Timothy HMU	Y*	N	N	-
Upland - Port of Wilma (RM 134)	Y*	N	N	-
Ports Only Alternatives				
Upland - Port Clarkston Property	Y	N	Y	-
Upland - Not Port of Clarkston Prop.	Y	N	Y	-
Upland - Confluence Riverfront	Y	N	N	-
Upland - Port of Lewiston Property	Y	N	Y	-
Upland - Asotin County Landfill	Y	N	Y	-

Y=Yes N= No *=In Part

2.4.2 Screening Results Discussion

The following paragraphs discuss the results of the screening for each of the disposal sites.

2.4.2.1 Corps Only Alternatives

Upland - Ice Harbor Storage Yard

The Ice Harbor storage yard would be used for stockpiling the cobbles from the Ice Harbor navigation lock approach. The property is owned by the Corps and is not leased out. It has existing road access and does not require any easements for access for the land-based offloading equipment. The site is a heavily disturbed area that has been seeded to grass. Stockpiling the cobbles would not have a permanent effect on the habitat at the site and the site could be

reseeded once the cobble was removed for other use. However, the Corps may need to dredge an area along the shoreline to provide access for the barge, adding cost to the project.

Use of this site is practicable/available, but it would satisfy only a very small part of the Corps disposal purpose. The need for access area dredging from the river side, and manipulating/repositioning of material on shore, may also cause additional environmental effects to riparian vegetation and/or fish habitat. A redd survey would likely be needed to ensure no redds are located in the barge access location. There would be increased contract costs associated with this alternative given the likely need for access dredging and repositioning of the material on shore and potential delay in upstream work. Corps policy requires the Corps to consider the least costly, environmentally acceptable disposal alternative that meets sound engineering practices. Because of these cost and environmental issues, the Corps did not carry this alternative forward for evaluation.

Upland Un-named Site, RM 11.5

The RM 11.5 site would be used for upland stockpiling or disposal of the cobbles from the Ice Harbor lock approach. The site would not be used for any material from the Snake-Clearwater Rivers confluence or Port berthing areas as the site is 127 miles downstream from those dredging areas and it would take an estimated 42 hour cycling time per barge for loading, transporting to the disposal site, offloading, and returning to the dredging site. The site is owned by the Corps and is not leased out. There is no road access, so the Corps would need to either obtain easements for road construction or use barges to bring in off-loading equipment. As described in Section 2.3.1, the Corps does not have the authority to obtain additional real property interests, including easements, and obtaining that authority is expensive and time-consuming. The Corps would not likely be able to obtain authority in time to perform the proposed dredging. The Corps would therefore need to barge in the offloading equipment. This may require construction of a barge slip, which would incur significant additional expense and would likely adversely affect the shoreline aquatic habitat. Offloading and stockpiling the cobbles at this site would also have the same cost and authority issues as the Ice Harbor storage yard. Using this site for permanent disposal of the cobbles would not have minimal effects on the upland environment. All upland habitat on Corps-owned property is being used to meet mitigation requirements of the Lower Snake River Fish and Wildlife Compensation Plan (LSRCP). Placement of the cobble from the Ice Harbor lock approach would adversely affect the habitat on the site. The cobble would have no value as wildlife habitat and would not provide a suitable substrate for habitat plantings. Because of these practicability, environmental, and costs issues, the Corps did not carry this alternative forward for evaluation.

2.4.2.2 Joint Alternatives

In-water - Placement to create habitat at Knoxway Canyon, RM 116

The RM 116 site would be used for disposal of all of the dredged material. The site is owned by the Corps and has no legal encumbrances. The Corps estimates the cost to implement this alternative is less than any of the upland disposal alternatives and slightly higher than open water disposal as some of the material would need to be rehandled to produce the desired final contours of the created shallow water habitat. This minor increase in cost is considered acceptable under Corps policy, however, if it results in substantial environmental benefits. Cobble/rock from Ice Harbor navigation lock approach would be dredged first and deposited at the Knoxway Canyon (RM 116) site as the equipment moved upriver to the confluence site, promoting time efficiency. Only one towing vessel and two barges would be needed to keep the dredge in production 24 hours per day at the confluence to complete the work within the winter in-water work window. Bottom-dump barges can typically be unloaded without use of additional equipment, allowing the material to be removed from the barge in minutes rather than hours. Cycle time would be about six hours: 2 ½ hours transportation time from the confluence dredging sites to the disposal site, one hour for positioning and offloading, and 2 1/2 hours to return to the dredging site.

The bottom dumping of dredged material at this site would have a minor, short-term effect on water quality. Testing of the effects of bottom-dumping dredged material showed the material tended to fall to the river bottom in a clump rather than disperse. Bottom dumping at this site would result in the dredged material falling through about 20 feet of the water column. The material would create a turbidity plume along the river bottom that would be short-lived and would dissipate before the next barge load was dumped. Rehandling the material to establish the desired final contours of the disposed material would likely increase turbidity in the upper part of the water column during the 1-2 weeks in which the shaping would take place, however using sand from the Clearwater River to cover the siltier sand from the Snake River would reduce the amount of any turbidity generated by the reshaping activity. The turbidity would reduce light penetration, but the effects would be short-lived and would have little effect on aquatic organisms as they would not be as active during the winter window.

Placement of dredged material on this mid-depth site would bury the existing benthic organisms, although the site does not provide optimum habitat for those organisms as it is at the deeper extent of the photic zone. Some of the benthic organisms captured within the dredged material are likely to survive being placed at this shallow water disposal site. The newly created shallow water habitat would improve the aquatic habitat on the bench by raising the river bottom up into the photic zone. Benthic organisms would recolonize the site at the same density and diversity or higher within the first growing season.

Disposal and reshaping activities would likely cause any fish at the site to move from the immediate work area temporarily. The Corps' most recent monitoring of the site indicates overwintering juveniles of ESA-listed salmon species are not likely to be found in this relatively

colder water along the shoreline and instead tend to be found in the warmer, deeper water towards the center of the reservoir. USFWS indicated in their July 2014 draft Biological Opinion for this action that any bull trout (an ESA-listed species) that may be present during the disposal and reshaping activities would more likely to be found in the thalweg (deepest part of the river) rather than at this underwater bench. If fish were present during the bottom-dumping actions, they could potentially be entrained by the falling material. The conversion of the mid-depth bench to shallow water habitat would improve the quality of the site for outmigrating ESA-listed juvenile fall Chinook salmon, which continues to be supported by the National Marine Fisheries Service (NMFS) based on success of previous shallow water habitat creation projects in Lower Granite reservoir using dredged material.

This site met all of the screening criteria, therefore the Corps carried this alternative forward for evaluation.

In-water - Open Water Disposal, RM 119

The RM 119 site would be used for disposal of all of the dredged material. Although the site is owned by Washington DNR, the Corps is able to use it for disposal in accordance with the superior right of "navigational servitude." Open-water disposal is estimated to be the least costly disposal alternative. This alternative would require the same equipment as the RM 116 site and would have the same cycle time.

Bottom dumping at this site would have the same kind of effect on water quality as for bottom dumping at the RM 116 site. Bottom dumping would result in the dredged material falling through about 80 feet of the water column. The material would create a turbidity plume along the river bottom that would dissipate before the next barge load was dumped. The turbidity plume would not affect light penetration as the river bottom at this site is below the photic zone.

Placement of dredged material on this deep-water site would bury the existing benthic organisms, although few organisms are found at this depth. The benthic organisms captured within the dredged material are not likely to survive being placed at this deep water disposal site. There would be no change in the benthic community as the river bottom would still be below the photic zone once disposal was complete. Benthic organisms would recolonize the site at the same low density and diversity within the first growing season.

Results of the Corps' biological monitoring for the PSMP indicates overwintering juveniles of ESA-listed salmon species are more likely to be found in the warmer, deeper water towards the center of the reservoir than the relatively colder water along the shoreline. USFWS indicated in their July 2014 draft Biological Opinion for this action that any bull trout (an ESA-listed species) that may be present would be more likely to be found in the thalweg (deepest part) of the river. Disposal activities would likely cause any fish at the site to move from the immediate work area temporarily. If fish were present during the bottom-dumping actions, they could potentially be entrained by the falling material. Once disposal is complete, the resulting mound of material on

the river bottom would have no adverse or beneficial effect on habitat for ESA-listed salmonid species. In June 2013, NMFS stated they strongly oppose any deep water dumping as it would have no beneficial effect to ESA-listed fish or their habitat.

This alternative does meet the purpose, is practicable, and is least costly (slightly). Additionally, the environmental effects associated with this disposal alternative are similar to those associated with placement of dredged material at RM 116 (Knoxway Canyon), as described above. This alternative does not, however, have as many environmental benefits. The Corps, therefore, did not carry this alternative forward for evaluation.

Upland - Joso

The Joso site would be used as an upland disposal site for all of the dredged material. Joso is owned by the Corps, is not leased out, and has vehicle access. This site would have the same cost issue as the Ice Harbor storage yard if the Corps used the site for stockpiling the cobbles from the Ice Harbor lock approach. Transportation costs for the cobbles would not be an issue as the barge could be offloaded while on its upstream trip to the Snake-Clearwater Rivers confluence dredging site. Offloading the cobbles, however, would have similar cost and environmental issues discussed below for confluence/port dredged material.

The Joso site would have a significant cost issue as a disposal site for the confluence and Port berthing areas dredging as the site is 81 miles downstream of the confluence dredging locations. Using this site would require about five towing vessels with barges to keep the dredge in production 24 hours per day and to complete the work within the in-water work window. Based on historical data from previous confluence dredging, each towing vessel/barge would have a cycle time of 27 hours. Cycle time is based on the following assumptions:

- The approximate time to fill a 3,000 cubic yard barge is 10.75 hours.
- The hauling time from the confluence to the Joso disposal site is 10.55 hours.
- The off-loading time is about six hours.
- The time to return to the dredging site is 10.55 hours.

In addition to the costs for the additional equipment would be the additional fuel costs for the 162-mile round trip.

Off-loading material at the Joso site would also incur significant additional costs. The downstream end of the site would require dredging as the water is too shallow to accommodate a loaded barge. The dredging would also have an adverse effect on the shoreline aquatic environment. A temporary mooring structure may be needed for the barges. A containment berm or structure may need to be constructed to serve as a staging area for the off-loaded sediment. Land-based equipment and operators would be needed to offload the material and transport it to the interior of the borrow pit for final placement. The Corps estimates the costs for

dredging with upland disposal at Joso would be about three to four times higher than the approximately $5 million the Corps incurred when performing an almost identical dredging action with in-water disposal in 2005/2006. This additional cost would exceed the Corps budget for this project and the Corps would be unable to perform the dredging action.

Use of the Joso site could have an environmental benefit as there would be sufficient material to place an estimated 3-½ foot thick layer of sand over the entire 80 acres of exposed rock within the borrow pit. This sandy substrate could then be planted with native grasses, which would improve this site for wildlife. However, the significantly higher cost associated with this effort made this alternative not practicable and unavailable, and the Corps did not carry this alternative forward for evaluation.

Upland - Kelly Bar, RM 120

Kelly Bar would be used as a disposal site for all of the dredged material. The site is owned by the Corps and is not leased out. This site is located about 18 miles from the dredging site at the confluence. As with the Joso site, transportation cost for the cobbles from the Ice Harbor lock approach would not be an issue as the barge could be offloaded when it makes its upstream trip to the Snake-Clearwater Rivers confluence dredging site.

Use of this site does not meet the cost criteria. This alternative would require approximately two towing vessels with barges to keep the dredge in production 24 hours per day and to meet the in-water work window. This assumes a cycling time of 11 hrs per barge: about 2-½ hours hauling time from the confluence to the disposal site, six hours for off-loading, and 2-½ hours to return to the dredging site. There would be site preparation costs for constructing retaining berms with dewatering capabilities (such as culverts with weirs), constructing possible temporary docking facilities, dredging to create a barge slip, and transporting land-based earthmoving equipment. There would also be costs for an upland disposal crew using earth moving equipment to move and form the material within the disposal site. The Corps estimates the cost of using this site would be two to three times higher than the approximately $5 million cost incurred by the Corps for its 2005/2006 dredging action with in-water disposal. This additional cost would exceed the Corps budget for this project and the Corps would be unable to perform the dredging action.

Use of this site would have adverse environmental effects. All upland habitat on Corps-owned property is being used to meet mitigation requirements of the Lower Snake River Fish and Wildlife Compensation Plan. Containment berm construction and the disposal of the dredged material would adversely affect the habitat on the site. Reseeding the site would incur additional expense. The sandy substrate would limit the species of vegetation that could be reseeded and may not replace the species abundance and diversity that currently exists. Construction of a barge slip would adversely affect shallow water habitat along the shoreline.

Because of the cost and environmental effects issues, the Corps did not carry this alternative forward for evaluation.

Upland - Silcott Island

Silcott Island would be used for disposal of all dredged material. The site is owned by the Corps and it has existing road access, so it would not require any easements for land-based offloading equipment. The site is leased to NLM under a park and recreation lease (Chief Timothy Park). The Corps does not have authority to revoke the lease for the purpose of dredged material disposal, nor can it use the property for a use that is not compatible with the recreation lease. A non-profit organization has been working with the Corps and NLM for several years to obtain approvals for constructing an amphitheater/artwork (by well-known artist Ms. Maya Lin) on the island to commemorate the Lewis and Clark expedition. Disposal of dredged material on the site would result in a seven-foot high layer of sand over all of the undeveloped parts of the island and is not compatible with the lease or the proposed artwork.

Use of the site does not meet the cost criteria. There would be costs for constructing containment berms, protecting or replacing the sewage treatment lagoons, operating the shore-based offloading equipment, contouring the disposed material, and possibly reseeding the site once disposal actions were completed. These costs would be similar to those for Kelly Bar and for Joso. The Corps estimates use of this site would be about twice as expensive as the $5 million used for the previous dredging and in-water disposal action in 2005/2006. This additional cost would exceed the Corps budget for this project and the Corps would be unable to perform the dredging action.

Use of this site would also have adverse environmental effects. The site currently supports dryland grasses with a band of woody riparian vegetation along the shoreline of the island. Construction of the containment berms and placement of the dredged material would destroy the grasses. The sandy substrate would limit the species of vegetation that could be reseeded on the site and may not replace the species abundance and diversity that currently exists. There are documented cultural resources at this site. Covering cultural resource sites with dredged material is generally unacceptable to the affected Tribes.

Because the existing lease makes use of the island impracticable, and the significant costs and environmental effects associated with this alternative, the Corps did not carry this alternative forward for evaluation.

Upland - Chief Timothy HMU

Chief Timothy HMU would be used for disposal of material from the Snake-Clearwater Rivers confluence and possibly the Ice Harbor lock approach. The site is owned by the Corps and is not leased out. The site has existing vehicle access suitable for land-based equipment and would not require easements for access.

Use of this site would not meet the cost or environmental effects criteria. The site would hold a little over 10 percent of the total amount of material that would be dredged, therefore an additional site or sites would also need to be developed for disposal of the remaining material.

The Corps would incur site preparation costs for these additional sites. To use this site, the Corps would need to construct containment berms and possibly a barge slip to facilitate offloading. The dredging needed to create the barge slip would adversely affect the shallow water habitat along the shoreline. The site was developed and is operated and maintained for wildlife habitat as part of the Lower Snake River Fish and Wildlife Compensation Plan. Disposal of dredged material at this site would damage the developed electrical and irrigation systems and destroy established vegetation utilized for cover and food by numerous wildlife species. The Corps would not be able to restore the habitat development on the dredged material as the material is not suitable substrate for the vegetation that would be lost. The Corps would be unable to replace the lost habitat development on other Corps property and does not have authority to acquire additional property. Loss of the developed habitat would result in the Corps not meeting its mitigation obligations for the lower Snake River dams.

Because of the significant costs and increased environmental effects, the Corps did not carry this alternative forward for evaluation.

Upland - Port of Wilma

The Port of Wilma site would be used for disposal of material from the Snake-Clearwater Rivers confluence and possibly the Ice Harbor lock approach. The site is owned by the Port of Whitman and the Corps does not have the authority to use this site. Use of this site would require a request by the Port of Whitman, and associated cost-share agreement, to use dredged material for a beneficial use. The Port has not approached the Corps about entering into a cost-share agreement to place dredged material on the site. Such a request could take years to negotiate and would not accommodate the current immediate need to re-establish the federal navigation channel and port berthing areas.

The site does not meet the cost criteria. The site would hold a little over 12 percent of the total amount of material that would be dredged, therefore an additional site or sites would also need to be developed for disposal of the remaining material. The Corps would incur site preparation costs for these additional sites. As discussed for some of the other upland disposal sites above, costs for upland disposal have been estimated to be 2 to 3 times more than the $5 million cost of the 2005/2006 dredging and disposal.

This site does not meet the environmental criteria. The third cell and the adjacent shoreline now provide high value riparian habitat and some wetlands, both of which are scarce in the arid canyon of the lower Snake River. Placement of dredged material in the cell would eliminate this habitat. Cultural resources have also been documented at the Wilma site. Placement of dredged material on top of cultural resources is considered an adverse effect by affected Tribes.

The alternative is not practicable as the Corps lacks the authority to use the property. There are also, cost, and environmental issues associated with this alternative. The Corps, therefore, did not carry this alternative forward for evaluation.

2.4.2.3 Port Only Alternatives

Upland - Port of Clarkston Property

The Port of Clarkston property would be used for disposal of only material from the Port's berthing areas. The Port has indicated all Port-owned property is currently allocated for other purposes and is not suitable or available for temporary or permanent placement of dredged material. Tenants of the Port declined to allow placement of dredged materials due to interference with existing structures, ongoing commercial development interests, and incompatibility with planned future use. The material is not suitable for construction on any Port property. The Port estimates the cost of upland disposal on Port-owned property would be at least 1000 percent higher than in-water disposal, exceeding the Port's capability to fund the project.

This alternative is potentially environmentally acceptable and would satisfy the Port of Clarkston's underlying purpose, but significant cost increases make this alternative not practicable/available. The Corps did not carry this alternative forward for evaluation.

Upland - Property not owned by Port of Clarkston

Private property in the Clarkston vicinity would be used for disposal of only material from the Port of Clarkston's berthing areas. The Port was unable to find any landowners willing to allow disposal of the dredged material on their property. Private property owners declined to consider disposal options that may interfere with potential commercial use of their property. Owners of agricultural property were uninterested due to the makeup of the sediment and the need for soil supplementation for growing purposes. These included agricultural lands for sale that would be devalued by this use. This alternative is potentially environmentally acceptable and may satisfy the Port of Clarkston's underlying purpose, but the lack of available non-Port property make this alternative not practicable/available. The Corps did not carry this alternative forward for evaluation.

Upland - Confluence Riverfront Site

The confluence riverfront site would be used for disposal of only material from the Port of Lewiston. The site would not meet the cost criteria as the costs for site preparation and offloading would exceed the Port' available funding. This site would not meet the environmental criteria as this site is a former landfill for toxic and municipal waste. Placement of dredged material at this site is not feasible because drainage from the dredged material could infiltrate through the landfill cap and mobilize contaminants in the hazardous materials beneath the cap. The drainage could alter groundwater depth and flow conditions and cause mobilized contaminants to enter the river. The weight of the dredge material and placement activities could cause settlement of the cap and consolidate the hazardous materials beneath the cap. The integrity of the cap could be compromised and potentially risk exposure/movement of the underlying hazardous materials. Consolidation of the cap and materials could also disturb

the current groundwater flow conditions and function of the containment, potentially releasing contaminants to groundwater and/or surface water. Because of these environmental issues, the Corps did not carry this alternative forward for evaluation.

Upland - Other Port of Lewiston Property

Other Port of Lewiston property would be used for disposal of only material from the Port of Lewiston. This property would not meet the cost criteria as the costs for staging site preparation, and offloading, and transportation to this property would exceed the Port's available funding. The Port has also indicated there are no suitable staging areas available along the waterfront. Disposal of the dredged material would preclude use of the property for future port development as the sand is considered unsuitable for use as structural fill and has no resale value. Because of these issues the Corps did not carry this alternative forward for evaluation. This alternative is potentially environmentally acceptable and would satisfy the Port of Lewiston's underlying purpose, but significant cost increases make this alternative not practicable/available.

Upland - Asotin County Regional Landfill

The Asotin County Regional Landfill would be used for disposal of berthing area material from both Ports. The Port of Clarkston indicated their initial contact with managers at the Asotin County Regional Landfill was negative and would require further legal review. Use of the landfill for dredged material disposal would require special permission from the Asotin County Commissioners. This alternative is potentially environmentally acceptable and would satisfy the underlying purpose for the Ports of Clarkston and Lewiston. However, the landfill would not meet the cost criteria for either Port as there would be significant additional costs to transport the material to the landfill. Because of these legal and cost issues, the Corps did not carry this alternative forward for evaluation.

2.4.3 Sites Carried Forward for Evaluation

Based on the application of the screening criteria, the Corps identified one (1) alternative to carry forward for additional evaluation as the preferred disposal site: in-water placement at Knoxway Canyon (RM 116) to create habitat shallow water habitat for juvenile salmonids. The Corps determined that all upland disposal alternatives were not practicable for (primarily) cost and logistical reasons. Both in-water disposal options (RM 116 and 119) are practicable and environmental effects associated with each disposal option are similar or closely aligned. Water quality issues associated with deep water disposal at RM 119 may be greater than for the RM 116 site as the material would pass through more of the water column and would likely have a larger turbidity plume that lasts longer (simply given the depth), but re-handling of sediment to create habitat at RM 116 would add a second turbidity occurrence that would be within the photic zone. Additionally, the effects to benthic/aquatic organisms are similar (i.e., no net loss), but creation of shallow water habitat at RM 116 may also result in a net increase as the newly-created shallow water habitat would be at the optimum depth in the photic zone. Finally, both disposal methods are believed to have similar effects on fish (if present), but placement of dredged material at RM 116 would help re-establish shallow water sand bar habitat important to ESA-listed fall Chinook salmon, and would benefit benthic organisms. Although there would be a slightly higher cost and short-term adverse effects to water quality during the creation of the shallow water habitat, the Corps determined these would be acceptable considering the long-term benefit of the created habitat.

2.5 Evaluation/Selection of Preferred Disposal Alternative

In-water placement of the dredged material at RM 116 would improve the aquatic environment in Lower Granite reservoir and mimic some of the important habitat features that were present in the Snake River prior to inundation by the reservoir. According to old sounding maps, the river generally averaged between 8 and 15 feet in depth during other than the spring high water season. Some areas were relatively shallow at 4 to 6 feet in depth, while other areas had depths of 30 to 35 feet. The annual fluctuation in the Snake River averaged about 17 feet vertically, following the yearly seasonal pattern of high spring flows followed by low flows in the later summer and fall. Numerous gravel bars, sand bars, and rocky islands were seasonally inundated and exposed as a result of the river fluctuation. The Corps identified a total of 41 sand bars of varying size and shape along both sides of the river (U.S. Army Corps of Engineers, 1971). The average size of these sand bars was about four acres. The reservoir replaced this shallow-water habitat with a reservoir up to 100 feet deep. Currently, shallow water habitat in Lower Granite reservoir comprises less than 10 percent of the total surface area within the reservoir (Tiffan and Hatten, 2012).

Shallow water habitat was an important element along the Snake River before the reservoir was created. These buffer zones at the water/ terrestrial interface and their associated riparian habitat provided several benefits, including bank stabilization, nutrient filtration and suspended solids removal from terrestrial runoff, wildlife habitat and terrestrial insects that often become available

for fish forage, in addition to providing shading. Organic matter deposited into the water, along with near-shore low velocity areas promoted colonization by submerged and emergent aquatic vegetation. These plants not only provided direct habitat for some fish, but were also a vital part of the aquatic food-web that included primary producers such as algae that were consumed by zooplankton and aquatic insects, which then became fish forage. Studies of downstream migrant juvenile salmon in the free-flowing Hanford Reach of the Columbia River in southeastern Washington found subyearling fall Chinook salmon were present in higher densities towards the shoreline than the mid-channel part of the river (Dauble, 2000). Juvenile fall Chinook in the Snake River prior to the reservoir may also have occurred in higher densities along the shoreline. The reservoir removed this near-shore habitat and replaced it with a deep-water, pelagic ecosystem bordered with steep slopes.

The RM 116 site is a former upland bench that was converted into an underwater (mid-depth) site by the reservoir. The site was historically an old homestead orchard and pasture located several hundred feet upland of the historic river shoreline. The site is now located in a low water velocity area that has been accumulating silt at an estimated rate of 2 inches per year since the filling of Lower Granite reservoir. About four feet of silt are estimated to cover the bottom of the bench. Water depth over the site is 28-38 feet, which is below the photic zone (0 – 20 feet of depth) and is not providing high quality aquatic habitat.

In the late 1980s and early 1990s, the Corps funded a series of studies to evaluate the effects of in-water disposal in Lower Granite reservoir. The Corps performed several dredging and disposal actions to test in-water disposal in deep water, mid-depth, and shallow-water locations. One of the key concerns addressed by the studies was the effect on salmonids. The studies indicated in-water disposal for habitat development could be beneficial to juvenile salmonids and not create habitat for predators if certain design criteria, such as shallow, open, sandy areas along low gradient shorelines, were used to guide sediment disposal methods.

The Corps funded additional biological research, monitoring and evaluation within the lower Snake River to support preparation of the PSMP EIS. The results of this research indicated shallow-water disposal of dredged material has successfully created resting and rearing habitat in the lower Snake River reservoirs for juvenile salmonids, primarily juvenile fall Chinook. This research has shown that the use of dredged materials to create shallow-water habitat within the photic zone of shoreline areas has not adversely affected salmonid species, and after stabilization, provides suitable salmonid rearing (Arntzen et al, 2012; Gottfried et al, 2011; Tiffan and Connor, 2012). Newly built shallow water areas were found to provide beneficial shallow water habitat for juvenile salmonids particularly natural subyearlings during the spring and summer (i.e., rearing fall Chinook), minimized the presence of predators at disposal sites, were at least as productive for invertebrates as compared to reference sites, and in general made the reservoir environment more hospitable for the Chinook salmon using it (Arntzen et al, 2012; Gottfried et al, 2011; Tiffan and Connor, 2012). This research provides evidence for large scale use of shallow water by juvenile fall Chinook salmon during the spring and summer, but

evidence against large-scale use of shallow water habitat by juvenile salmonids during the fall and winter, and suggests that creation of shallow water habitat be focused on creating narrow ribbons along the shoreline under six feet of depth (Tiffan and Connor, 2012). Currently, most juvenile fall Chinook rearing habitat in the Lower Granite reservoir is located in the upper half of the reservoir (i.e., upstream of Kelly Bar, RM 120) and little currently exists in the lower half due to steeper and deeper lateral bed slopes with more unsuitable substrate along the shorelines (not dominated by sand or small gravel). Because subyearling fall Chinook salmon are shoreline oriented and transient during rearing, creating new habitat in the lower portion of Lower Granite reservoir in narrow ribbons along the shoreline should provide the greatest benefit (Tiffan and Connor, 2012).

Regional fisheries managers have provided qualified support for shallow water disposal of dredged material as long as the Corps performs the disposal using design criteria from the most recent research and performed monitoring. In June 2013, NMFS informed the Corps the literature and the Corps' reports indicate the shallow water habitat created at RM 116 in 2005/2006 was having positive effects and NMFS supported continuing to use dredged material to create shallow water habitat. NMFS stated shallow water habitat is in short supply in both the Columbia and Snake Rivers and creation of the shallow water habitat at RM 116 was a small way the Corps could fulfill its responsibilities under ESA.

The use of dredged material to build shallow low-velocity fish habitat at RM 116 is intended to provide resting areas, as well as forage potential, for out-migrating juvenile fall Chinook salmon as well as resident fish. Oligochaete worms and dipteran chironomid fly larvae are the primary benthic invertebrates that colonize these areas. Crayfish that forage on the worm population can be a valuable food source for several fish species would also be present if there is suitable habitat. Over time aquatic vegetation may establish as more substrate would be available within the photic zone, and this would provide additional niches for primary and secondary producers.

Placement of the dredged material at RM 116 would create a gently sloping shallow water bench along about 2,355 linear feet of shoreline. All of the exposed surfaces would be sand, the preferred substrate for juvenile fall Chinook. The top of the bench would be about 200 feet wide and have a 2-percent slope. This would provide about 11.39 acres of additional aquatic habitat up to 6 feet deep at MOP with features optimized for resting/rearing of outmigrating juvenile salmonids, particularly for fall Chinook salmon. This exceeds the minimum sand bar size of four acres the Corps calculated existed prior to the reservoir. The Corps anticipates there would be about 16 acres of lesser-quality shallow water habitat at depths of 6 to 20 feet on the slope of the bench.

Placing dredged material at RM 116 would help offset the negative effects the dredging would have on benthic organisms. The dredging areas are within the lower limits of the photic zone and support populations of benthic organisms. These populations would be removed by the dredging action. Placing the dredged material at RM 116 would allow some of these benthic organisms to survive as they would be relocated to a location within the photic zone. Although

placing that material at RM 116 bury any benthic organisms currently inhabiting the site, new populations would recolonize the site within the first year.

The placement and reshaping actions would have a negative effect on water quality from the amount of turbidity that would be created. Turbidity from placement would be short-lived as each bottom-dump of dredged material from the barge would be a single, short-duration event and the turbidity plume would dissipate fairly rapidly. Reshaping actions would generate a continuous turbidity plume that may exceed water quality standards. However, this plume would not extend far downstream, would not extend across the width of the reservoir, and would dissipate once reshaping actions were completed. The increased turbidity would not violate dissolved oxygen standards as the work would be performed in winter when the water is cold.

ESA-listed fish species are not likely to be at the site during placement activities. Any overwintering juveniles would more likely be in the deeper water of the reservoir where the water is warmer, not in the shallow area where the disposal would take place. Adults would also be more likely to be in the deeper water. Any adults that may be in the area would be able to avoid the machinery or the turbidity plume. Any fish in the area during the bottom dumping actions would have the potential to be entrained by the falling material. The Corps selected RM 116 as the preferred disposal site for the current immediate need action. The Corps identified in-water placement to create additional shallow-water habitat at Knoxway Canyon, RM 116, as the preferred disposal option as it would help recreate shallow water sand bar habitat important to ESA-listed fall Chinook salmon and would provide some benefit for benthic organisms removed from the dredging areas. Although there would be short-term adverse effects to water quality during the creation of the shallow water habitat, the Corps determined these would be acceptable considering the long-term benefit of the created habitat.

3 FACTUAL DETERMINATIONS

All factual determinations apply to the preferred disposal alternative, creation of shallow water habitat at RM 116.

3.1 Physical Substrate Determinations

3.1.1 Substrate Elevation and Slope

The existing substrate elevation at the RM 116 site is typically more than 25 feet below the minimum operating pool elevation, excluding the footprint of the previous disposal. The 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 for fish rearing habitat.

Sand from the Clearwater River would be placed on top of the base embankment to ensure that a layer of the cleanest sand about 4 feet thick covers the exposed surfaces of the embankment.

The tops of the mounds would be flattened and leveled to form a generally smooth, gently-sloping (2 percent) shallow area with water depths up to 6 feet as measured at MOP.

3.1.2 Sediment Type

As stated in Section 2.3.2.1 above, the RM 116 site is located in a low velocity area that has been accumulating sediment since the filling of Lower Granite reservoir at an estimated rate of 2 inches per year. Approximately 4 feet 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 November 2012, August 2013, and November 2013. The results of grain size analyses conducted on these samples are as follows:

- Sediment samples collected from the main navigation channel in the confluence area contained 70 to 98 percent sand and 2 to 30 percent fines. The navigation channel would provide over 96 percent of the material to be discharged.
- Sediment samples collected in 2013 from the cruise ship dock, grain elevator, and recreation dock at the Port of Clarkston were comprised of 45 to 94 percent sand and 6 to 55 percent fines. The sediment cores from the Crane Dock at the Port consisted of 59 percent sand, 37 percent gravel, and 4 percent silt.
- The Port of Lewiston sediment samples consisted of 95 percent sand and 5 percent silt.
- The downstream lock approach site at Ice Harbor consists of large rock substrate and cobbles greater than or equal to 2-inches.

The overall composition of the sediments to be dredged is expected to be less than 10 percent silt and includes materials suitable to provide improved substrate conditions for aquatic organisms.

3.1.3 Dredged/Fill Material Movement

Materials used to construct the in-water habitat area at RM 116 would consist of sand with small amounts of silt and cobble. This material is not expected to move after placement based on results of the monitoring performed on the previous disposal at the site in 2005/2006. The site would be monitored after construction to determine if the embankment slumps or moves. Monitoring embankment stability would be accomplished by performing hydrographic surveys after the first spring runoff (July-September time frame) following disposal and one year later if funding is available. Information gathered from this monitoring would be used to improve in-water placement strategies for future projects and to determine whether or not a berm is needed around the toe of the embankment to prevent movement.

3.1.4 Physical Effects on Benthos

Benthic organisms at the proposed in-water placement site 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. Recolonization is

expected to occur within six months of the disposal action. The dredged material would also contain benthic organisms, some of which may survive their relocation to the placement site.

3.1.5 Actions Taken to Minimize Impacts

- The dredging at the Snake/Clearwater rivers confluence would be sequenced to reduce turbidity from reshaping at the disposal site. Material from the Snake River has more silt and would be dredged and placed first. Material from the Clearwater is coarser sand and would be dredged and placed last to form a cap. The coarser sand is the material that would be reshaped.
- Material movement would be monitored at the site with periodic cross-section hydrographic surveys. Information gathered from this monitoring would be used to improve in-water placement strategies for future projects.
- Physical effects on benthos would be minimized by limiting discharges to a localized area, which is small relative to the reservoir system, and area would be offset by the shallow-water habitat created by the in-water discharge.

3.2 Water Circulation, Fluctuation, and Salinity Determinations

3.2.1 Water Chemistry

To minimize the potential for effects on water chemistry, materials have been screened for selected chemicals prior to dredging following the *Dredged Material Evaluation and Disposal Procedures*, and the *Sediment Evaluation Framework for the Pacific Northwest* guidelines. Also, turbidity would be monitored during the in-water discharge. Thus, the effects of in-water discharge on water chemistry are expected to be localized and short-term.

3.2.2 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. For example, at the Lower Granite tailrace from December 2012 through March 2013, the average water temperature was 40.0°F (4.4 °C), with a maximum hourly temperature of 45.9 °F (7.7 °C) and a minimum hourly temperature of 35.9 °F (2.1 °C). Conversely, average temperature between July and September 2013 were 66.6 °F (19.2 °C) with a range of 62.8 °F (17.1 °C) to 69.0°F (20.6 °C). Temperature data collected at the dredged material disposal site between December 12, 2005 and March 6, 2006 averaged 38.7 °F (3.7 °C).

The in-water discharge would be conducted during the winter in-water work window, when water temperature is relatively low. The creation of shallow-water fish habitat may result in a localized increase in water temperature at the disposal site. However, the area affected would be

small relative to the reservoir system. The proposed in-water discharge is not expected to result in long-term effects on the overall water temperature.

3.2.3 Light Attenuation

Water transparency in lakes and reservoirs is often evaluated using either Secchi disc or photic zone (where 1 percent of incident light remains) depths. Average Secchi depths at RM 119 from December 2008 through March 2009 and December 2009 through March 2010 were 2.8 m and 2.5 m, respectively. Mean photic zone depths during the same intervals were 6.1 m. sustained.

The in-water discharge and shaping of the material is expected to result in localized turbidity plumes. During the 2005/2006 dredging program, operations were temporarily halted if the turbidity was greater than 5 nephelometric turbidity units (NTU) over background (or 10 percent increase when background was over 50 NTUs) at the downstream compliance point from the project site for a period of four hours. Dredging, in-water disposal, or dredge material reshaping activities resumed, sometimes with modifications, when turbidity levels decreased and were again within the acceptable range. Additional details, regarding turbidity exceedances are presented below in Section 3.3.1.

3.2.4 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 lower Snake River since neither of these methods has been used. Potential effects on color are expected to be minimal.

3.2.5 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 dredging and in-water disposal would be investigated.

3.2.6 Taste

The reaches of the Snake and Clearwater Rivers where dredging and in-water disposal would occur are not sources of potable water. As such, the river water is not tested for taste using American Society for Testing and Materials (ASTM), EPA, or any other methods.

3.2.7 Dissolved Gas Levels

The dredge material does not have high organic content or chemistry that would result in increased oxygen demand. Average dissolved oxygen concentrations at the 2005/2006 in-water disposal site ranged from 12.6 to 12.7 mg/L, and the minimum value at any of the four monitoring locations was 10.3 mg/L. Analogous averages calculated from the Port of Clarkston dredging site data ranged from12.9 to 13.0 mg/L, and a minimum 5-minute concentration of 10.4 mg/L – all greater than the State of Washington standard of 8 mg/L.

3.2.8 Nutrients

Nutrient data was collected near the proposed disposal site between April 2008 and October 2010. The median total nitrogen concentration for the December through March period was 1.20 mg/L, and ranged from 0.93 to 2.4 mg/L. Nitrate was the prevalent form of soluble nitrogen in the water samples, accounting for approximately 75 percent of the total nitrogen. Total phosphorus concentrations near RM 119 ranged from 0.03 to 0.11 mg/L during the same time period. These concentrations indicate that the reservoirs are generally eutrophic. The discharge of dredged material has the potential to increase nitrate and, to a lesser extent, phosphorus concentrations. Since the dredging and in-water disposal activities would be conducted during winter months and when primary productivity is low, any increased nutrient levels are expected to be localized and of short duration.

Ammonia is present in some of the sediments proposed 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 in the water column at the disposal site was monitored during the previous dredging event. The average concentration at the background station was 0.24 mg/L, while the mean values for the three downstream monitoring stations ranged from 0.19 to 0.29 mg/L. These concentrations were at least an order of magnitude less than the acute toxicity limit for salmonids established by the EPA for the average pH of the water during that time of the year. As such, any increases in ammonia concentrations from the proposed action are not anticipated to reach a level where they would be detrimental to salmonids.

3.2.9 Eutrophication

The in-water discharge and shallow-water habitat creation could have localized, short-term effects on nutrient concentrations. The results of previous elutriate tests have shown that low levels of nutrients, primarily nitrogen compounds, can migrate from sediments to the surrounding water. However, any nutrient addition would occur during the winter when biological uptake is at a minimum and not have any long-term effects on eutrophication.

3.2.10 Current Patterns and Flow

Existing data on current and flow patterns at the proposed in-water disposal site are not available. The creation of shallow-water fish habitat may affect local current patterns and flow at the disposal site. However, these changes are expected to be minimal and beneficial to salmonids and other organisms.

3.2.11 Velocity

Velocity within the proposed discharge site is low as the site is on the inside of a river bend and within a reservoir. It likely varies with depth and location; however, measured velocity data at the proposed in-water discharge site are not available. The creation of shallow-water fish habitat may slightly increase velocity at the in-water disposal site. These changes are expected to be beneficial to salmonids and benthic organisms by causing water to sweep over the substrate, thereby increasing dissolved oxygen levels and food organism production

3.2.12 Stratification

Thermal stratification has not been observed at the RM 116 in-water disposal site during the winter and is not expected to occur as a result of in-water disposal for the creation of shallow-water fish habitat.

3.2.13 Hydrologic Regime

In-water disposal for the creation of shallow-water 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 in the lower Snake River system.

3.2.14 Normal Water Level Fluctuations

Normal water level fluctuations in the reservoirs are largely controlled at the dams. In-water disposal for the creation of shallow-water fish habitat is not expected to have a noticeable effect on water level fluctuations because the actual volume of sediment contained within the reservoir itself would not change. The combined dredging and disposal operation would only serve to redistribute sediments from the upstream portion of the reservoir to a location further downstream within the reservoir. The material proposed to be removed from the Ice Harbor navigational lock approach and placed in Lower Granite reservoir only represents approximately 0.75 percent of the total volume to be dredged and is a relatively insignificant portion of the total volume. Proposed discharges would be designed to prevent the creation of standing water bodies in areas of normally fluctuating water levels.

3.2.15 Salinity Gradients

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

3.2.16 Actions Taken to Minimize Impacts

- During in-water discharge, turbidity would be monitored for state water quality standards exceedances (see appendix J of the PSMP EIS).
- If the applicable turbidity limit is exceeded at the compliance boundary, the in-water work would be stopped until the turbidity returns to state standards. The disposal/construction methods would be modified to reduce the effect (to include modification of dredging timing, speed, or location) and work would resume.

3.3 Suspended Particulate/Turbidity Determinations

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

The turbidity standards in Washington and Idaho differ slightly. 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. The Idaho standard states that turbidity shall not exceed the background by more than 50 NTU instantaneously below the compliance boundary or by more than 25 NTU for more than 10 consecutive days.

The turbidity data collected upstream and downstream of the disposal location during the 2005/2006 channel maintenance project does show instances of elevated turbidity values. A station for monitoring background conditions was located approximately 300-ft upstream of the disposal zone and two compliance floats were anchored 300-ft downstream. Additionally, a lateral monitoring station was situated about 300-ft from the disposal zone in the direction of the thalweg. During the two and a half months when monitoring occurred 24-hrs per day, the four-hour criterion was exceeded 0.6 percent of the time at the compliance boundary and 2.3 percent of the time at the remote location. The sondes located at greater depth recorded higher turbidities than the ones near the surface. The surface sondes at the compliance boundary exceeded the 4-hour criterion 0.1 and 1.1 percent of the time, compared to 1.5 percent at the remote station. The deeper sonde near the bottom of the remote station exceeded the criterion 2.5 percent of the time compared to 1.1 percent and 3.1 percent at the compliance boundary. When the hourly data is considered, the bottom turbidity sensors recorded turbidity values greater than 5 NTU above the background 12 to 14 percent of the time at the compliance boundary to 15 percent of the time at the remote location. The remote bottom station also experienced the highest percentage of hourly values greater than 20 NTUs above the background with an occurrence of 4 percent. Elevated turbidity events were primarily attributed to scows releasing dredged material and reshaping of the dredge material. It should be noted that between scows, which arrived approximately every six hours, turbidity levels returned to background levels for several hours prior to the subsequent scow. Additionally, it is also noteworthy that the background turbidity levels exceeded the downstream values 27 to 41 percent of the time – an indicator of the inherent variability associated with low-level turbidity measurements.

Based on the turbidity data collected during the 2005/2006 channel maintenance project, in-water disposal and reshaping for creation of shallow-water fish habitat is expected to result in a localized, short-term increase in turbidity. Turbidity would be monitored during disposal and construction activities to ensure that regulatory limits are not exceeded at the downstream compliance boundary.

3.3.2 Effects on Chemical and Physical Properties of the Water Column

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

Dissolved oxygen concentrations are not expected to decrease below 8 mg/L, the current State of Washington water quality standard. The lowest dissolved oxygen concentration recorded in the Snake River near the 2005/2006 dredging sites was 10.4 mg/L, while the minimum value measured at the in-water disposal site was 10.3 mg/L.

Elutriate tests were not completed for the 2013 sediment sampling program, but were included for the August 2011 samples. Analytes included metals, a suite of pesticides, polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons, semi-volatile organic compounds, as well as dioxins and furans. None of the detected concentrations exceeded the *Sediment Evaluation Framework for the Pacific Northwest* guidelines.

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

3.3.3 Effects on Biota

Increased turbidity is expected to have a short-term negative effect on primary production within the project site and compliance boundary. The effect would be localized, limited to the duration of the in-water discharge and habitat construction, and minimal during the winter when water temperatures are relatively low. The effect would not affect a significant percentage of the reservoir system's primary production.

Increased turbidity is expected to have a short-term negative effect on suspension feeders within the project site and compliance boundary. The effect would be localized and limited to the duration of the in-water discharge and habitat construction. The effect would not affect a significant percentage of the reservoir system's suspension feeders.

Increased turbidity is expected to have a short-term negative effect on resident sight feeders within the project site and compliance boundary. The effect would be localized and limited to the duration of the in-water discharge and habitat construction. The effect would occur during

the in-water work window, which would minimize the number of salmonids present. The effect would not affect a significant percentage of the reservoir system's sight feeders.

3.3.4 Actions Taken to Minimize Impacts

- Expected changes in suspended particulate and turbidity levels would be minimized by managing and monitoring discharges to ensure that state water quality standards are not exceeded at the compliance boundary. If limits are exceeded, the in-water work would be stopped and discharge/construction methods would be modified to reduce the effect (to include modification of dredging timing, speed, or location).
- Effects on the chemical and physical properties of the water column would be minimized by chemical and physical screening of potential discharge materials. Sediments to be dredged have been evaluated for grain size distribution and selected chemical parameters. Results have been evaluated to determine that the sediments are suitable for the proposed in-water discharge. The Seattle District Dredged Material Management Office (DMMO) prepared a memo dated February 22, 2103 stating the proposed dredged material from the Port of Clarkston Crane Dock is suitable for open-water placement. The DMMO prepared a similar memo on February 18, 2014 stating the material proposed to be dredged from the Federal navigation channel and the port berthing areas other than the Crane Dock were also suitable for open water disposal.
- Effects on listed anadromous fish would be minimized by restricting discharges to the time of year when fewer individuals are likely to be present (the winter in-water work window, which is currently December 15 to March 1 in the lower Snake River).
- Effects on biota would be minimized by limiting discharges to a small area relative to the reservoir system.
- Materials discharged would be used to create shallow-water fish habitat. The long-term benefits of the improved habitat would offset for the localized, short-term effects on biota described above.

3.4 Contaminant Determinations

The purpose of contaminant determinations is to determine the degree to which the proposed discharges of dredged material would 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.

Sediment samples were collected from the federally authorized navigation channel within the Lower Snake and Clearwater Rivers, as well as the ports of Clarkston and Lewiston, during 2012 and 2013. The 2012 sediment characterization effort occurred at the Port of Clarkston Crane Dock and consisted of physicochemical evaluations. The remainder of the dredge material management units (DMMUs) were initially sampled during August 2013. Sediments from this sampling event were analyzed for the conventional parameters and chemicals of concern.

The second sampling event in November focused on a subset of the stations sampled in August where two phenolic compounds exceeded the in-water disposal guidelines. These additional collections were subjected to physicochemical as well as biological analyses. All field sampling and laboratory analyses adhered to the protocols set forth in the approved sample analysis plans, the *Dredged Material Evaluation and Disposal Procedures*, and the *Sediment Evaluation Framework for the Pacific Northwest.*

Analytical results for the DMMUs included:

- Conventional analyses of the samples showed that grain size was typically higher in the Clearwater River DMMUs relative to the DMMUs below the confluence in the Snake River. For the Clearwater DMMUs (7 – 11 and Port of Lewiston Grain Dock), the grain size averaged 95.8 percent sand. The DMMUs below the confluence were still relatively coarse, but had less sand, averaging 85 percent in the Federal Navigation Channel and 77.1 percent at the Port of Clarkston facilities.
- The total organic carbon (TOC) content, an indicator of organic enrichment, averaged 0.4 percent at the Clearwater River DMMUs and 2.1 percent in the Snake River navigation channel. Sediment TOC was slightly higher at the Port of Clarkston facilities, averaging 2.5 percent.
- The concentrations of metals were below the relevant Screening Level (SL)1 levels in all DMMUs. This included selenium, which had been a chemical of concern in past characterization events.
- The levels of phthalates, pesticides, and PCBs were all reported principally as non-detected compounds, or where detected they were below the SL1 in all DMMUs. This included toxaphene, which was a special chemical of concern requested by the Washington Department of Ecology and the Washington Department of Fish and Wildlife. Other phenols and miscellaneous extractables that were not detected include 2-methylphenol, 2,4-dimethylphenol, pentachlorophenol, and betahexachlorocyclohexane. Dibenzofuran was reported as an estimated (J-flagged) value at DMMU 5, at a very low level and well below the corresponding SL1.
- DMMU Port of Clarkston (POC) Recreation Dock had not been sampled previously, necessitating the need for a larger suite of chemical analyses that included PAHs, chlorinated hydrocarbons, hexachlorobutadiene, and N-nitrosodiphylamine. The concentrations of all chemicals of concern were below the SLs.
- The concentrations of 4-methylphenol in six of the eight Snake River DMMUs (1, 2, 3, 5, 6, and the Port of Clarkston Grain Elevator) exceeded the SL1 guidelines, with values ranging from 340 ppb to 4,900 ppb. Phenol also exceeded SL1 guidelines in DMMU 6 where a concentration of 170 ppb was determined. Benzoic acid, though not detected at concentrations greater than the SL1 guideline, was identified at an unusually high 890 ppb in DMMU 6. Additionally, the highest concentrations of these three constituents all occurred in DMMU 6, the one farthest upstream in the Snake River.

Additional sampling and analyses were completed in November 2013 as required by the Dredged Material Management Plan (DMMP) agencies based upon the detection of 4-methylphenol, phenol, and benzoic acid. Laboratory analyses consisted of chemical analyses for phenolic compounds and benzoic acid, as well as bioassay testing to further evaluate the suitability of the sediment from those DMMUs for open water disposal. The results of the measured conventionals were similar to those observed in the August-collected samples, with some notable differences. The TOC concentrations measured in the November DMMU 2, 3, and 6 samples were between 2 – 4.7 percent higher than the same samples collected in August. Grain size was generally similar, except at DMMUs 5 and 6 which had 25.6 and 17.8 percent higher percent fines, respectively, than the August samples. The samples submitted from the November collection confirmed the presence of 4-methylphenol at levels above the SL1 for DMMUs 1, 3, 5 and 6, but for DMMUs 2 and POC-Grain Elevator the reported levels were below the SL1. For DMMU 6, the phenol level in the August sample was reported above the SL1; for the November sample phenol was below the SL1.

The 10-day freshwater amphipod *Hyalella azteca* survival test and the 20-day freshwater midge *Chironomus dilutus* survival and growth test were conducted on the six DMMU composite samples and on two reference sediment samples. The results were:

- The 10-day freshwater amphipod mortality test indicated that all tested sediments (control, reference, and DMMUs) had mortality that was less than 5 percent - well below the one and two-hit criteria and considered to have passed relative to these guidelines.
- The 20-day freshwater midge mortality test demonstrated that all tested DMMU composite sediments had mortality that was less than that observed in the control sediment (18.8 percent); i.e., greater survival of the midge was observed in the test sediments relevant to the controls. Relative to the respective reference sediment, all tested DMMU sediments were within the range of ±3.8 percent. All test sediments were well below the one- and two-hit criteria, and are considered to have passed relative to these guidelines.
- The 20-day freshwater midge growth test showed that all tested DMMU composite sediments had mean individual growth rates that were at least 80 percent of that observed in the control sediment, and at least 91 percent of that observed in the relevant reference sediment. In several cases the mean individual growth rates exceeded that observed in the control and reference sediments. All test sediments were well below the one and two-hit criteria, and are considered to have passed relative to these guidelines.

The chemicals 4-methylphenol and phenol occur in the environment from natural microbial degradation and anthropogenic sources. Their chemical properties enable them to sorb only modestly to organic particulates in water and sediment and they prefer to remain in the dissolved in the dissolved state. Due to their low affinity to bioconcentrate from water into fatty tissues, a well as the endogenous metabolism that occurs within aquatic organisms, these compounds display minimal bioaccumulation through food webs to higher trophic level fish such as steelhead and salmon. There currently are no national aquatic life water quality criteria for phenol or 4-methylphenol in the U.S. However, the Corps did have the 4-methylphenol and

phenol results reviewed by the Corps' Engineer Research and Development Center (ERDC) to evaluate their potential toxicity and bioaccumulation in the lower Snake River.

The ERDC evaluation focused on a comparison of the results from three models (DREDGE, STFATE, and RECOVERY) to water concentration screening levels suggested by NMFS (1.35 mg/L for 4-methylphenol and 0.07 mg/L for phenol). The DREDGE model was used to simulate sediment re-suspension and contaminant release at the dredging site. The results predicted that the total contaminant concentrations at the dredging site would be less than 0.1 percent of the NMFS criteria, assuming worst-case conditions at a downstream mixing zone boundary 150 ft from the dredge. The STFATE model was used to evaluate the short-term fate of dredged material during open water placement. These results showed that at anticipated river velocities of 0.2 and 0.4 ft/sec the exposure concentrations would be less than five percent of the NMFS criteria at the conservative mixing zone boundary of 150 ft downstream. The RECOVERY screening model was used to assess the impact of contaminant transfer from the sediments to the overlying water after 6 months, 5 years, and 50 years. The results demonstrated that nearly all sustained exposure concentrations at the placement site after construction is completed would be less than 0.1 percent of the NMFS criteria. Based on the predicted water concentrations within the immediate area of dredging operations, dredged material placement, and above or within the bioactive zone of the constructed shoal following site construction, toxicity to fish and tainting of fish tissue is not expected.

3.5 Aquatic Ecosystem and Organism Determinations

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 effects of the in-water discharge and habitat creation are not expected to have a significant effect on plankton populations.

Benthic organisms would be buried or displaced by the in-water discharge. However, the shallow-water habitat created is expected to provide a suitable substrate for re-colonization by organisms from adjacent benthic communities. The dredged material would also have benthic organisms that would be relocated from the dredging areas and may re-establish at the placement site.

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 effects of the in-water discharge are not expected to have a significant effect on nekton populations. The shallow-water habitat created is expected to provide long-term benefits for salmonids and other nekton.

Because most of the spring and summer dominant species of plankton are in the resting stage during the winter in-water work window, effects on 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 effects of the in-water discharges are limited to the project site and compliance boundary, significant effects on the winter food web outside of the project site are not expected.

Wetlands are not present at the disposal site. Sanctuaries and refuges, mud flats, vegetated shallows, coral reefs, and riffle and pool complexes are not present at the disposal site.

3.5.1 Threatened and Endangered Species

The proposed discharge site is designed to develop habitat that would provide long-term benefits for listed salmonids. The Corps conducted surveys at the RM 116 site, prior to use of the area for disposal, to determine if the area is currently being used by listed species (Tiffan and Connor, 2012; Arntzen et al. 2012). The survey results indicated that few juvenile salmonids are currently using the downstream portion of the site, but juvenile Snake River (SR) fall Chinook are using the dredged material at the upstream end of the site for resting and rearing. The proposed in-water disposal at the downstream end of the site is expected to create additional shallow-water habitat with the potential to increase resting/rearing habitat for juveniles of listed salmonids, especially Snake River fall Chinook. As discussed in Section 2.5.1 above, NMFS has reviewed the research and supports the use of the dredged material to create shallow water habitat for salmonids.

The Corps has prepared a biological assessment that addresses the effects of the proposed dredging and disposal activities on Endangered Species Act- (ESA) listed species and their designated critical habitat (Appendix K of the PSMP EIS). The Corps provided this biological assessment to NMFS and U.S. Fish and Wildlife Service (USFWS) in December 2012 and requested formal consultation. The Corps determined that the maintenance dredging and beneficial use of dredged material to create shallow-water salmonid habitat "may affect and is likely to adversely affect" SR fall Chinook, SR spring/summer Chinook, and SR steelhead and their designated critical habitat; "may affect but is not likely to adversely affect" SR sockeye salmon; middle Columbia River and upper Columbia River (UCR) steelhead, UCR spring Chinook, and UCR steelhead and their designated critical habitat; and "may affect, is likely to adversely affect bull trout and their designated critical habitat, and; would have "no effect" on gray wolf, Canada lynx, Ute ladies'-tresses, Spalding silene, and pygmy rabbit.

3.5.2 Wildlife

The effects on wildlife species as a result of dredging and in-water disposal at RM 116 are expected to be indirect, short-term and minor, primarily as a result of displacement during the operation. The proposed dredging and disposal activities would occur within the river and would

not prevent wildlife from obtaining food or otherwise using the areas adjacent to the dredging and disposal activities. Riparian habitat, as well as shoreline perch trees for raptors and other birds, would not be affected. Waterfowl, birds, aquatic furbearers, and other wildlife would use areas upstream and downstream of the sites where dredging and disposal activities occur. Dredging and disposal would not be a continuous activity confined to a single location. Waterfowl and other wildlife would return to the areas shortly after completion of the dredging and disposal. Mammals such as mule deer would not be affected as no existing upland areas would be affected. The Corps anticipates there would be no long-term direct or indirect effects to vegetation or wildlife from the proposed dredging and disposal activities.

3.5.3 Actions to Minimize Impacts

- Effects on plankton would be minimized by restricting discharges to the in-water work window, when the majority of plankton populations are in a resting stage, and by limiting discharges to a small area relative to the size of the reservoir system. In-water work would be monitored to ensure that direct effects caused by an increase in turbidity are limited to the compliance boundary.
- Effects on benthos would be minimized by limiting discharges to a small area relative to the size of the reservoir system.
- Effects on listed salmonids would be minimized by restricting discharges to the winter in-water work window, which is timed to avoid migrations of anadromous salmonids and minimize the number of salmonids present is the project area during in-water work.
- Effects on nekton would be minimized by limiting discharges to a small area relative to the reservoir system. In-water work would be monitored to ensure that direct effects caused by an increase in turbidity are limited to the compliance boundary.
- Effects on the aquatic food web would be minimized by restricting discharges to the winter in-water work window, which minimizes effects on spring and summer plankton populations, and by limiting discharges to a small area relative to the size of the reservoir system.
- Potential short-term, localized effects on plankton, benthos, nekton, the aquatic food web, and listed salmonids would be offset by the long-term benefits created by development of shallow-water fish habitat.

3.6 Proposed Disposal Site Determinations

3.6.1 Compliance Boundary Determination

The compliance boundary for the proposed action would be similar to what was used for the 2005/2006 dredging. A monitoring zone would be established at both the active dredging site and the disposal site. The zone at the dredging site in which the dredge would operate would be 800 feet long by 600 feet wide. The zone at the disposal site would also be 800 feet long and 600 feet wide, and the disposal and reshaping actions would take place within the zone. Monitoring stations would be set up at points 300 feet upstream of each zone to measure

background conditions, and at 300 and 900 feet downstream of the zone to measure water quality effects of the actions. The 300-foot station would be the "early warning" station, while the 900-foot station would be the compliance boundary. When all activity within the zone was completed, a new monitoring zone would be defined and the monitoring network repositioned. The Corps coordinated the compliance boundary location and the water quality monitoring plan with NMFS and Washington Department of Ecology. The Corps will provide this information to Idaho Department of Environmental Quality (IDEQ) once the monitoring plan is completed.

3.6.2 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 into 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. The Corps has requested Section 401 Water Quality Certification from the Washington Department of Ecology (Ecology) for the disposal of all of the dredged material as the disposal would occur in Washington. Although the Corps would not be disposing of any dredged material in Idaho, the Corps has requested a Short Term Activity Exemption (STAE), as a matter of comity, from IDEQ for the dredging activities that would take place in Idaho. The STAE may include the Port of Lewiston's dredging of their berthing area. The Port of Clarkston has requested Section 401 Water Quality Certification from Ecology for the dredging of their berthing areas. The Corps has determined, based on water quality monitoring from the 2005/2006 dredging and in-water disposal action, the proposed in-water activities would meet the Washington and Idaho state water quality standards for dissolved oxygen, temperature, pH, and conductivity and therefore the Corps will not monitor for those parameters during the proposed activities. The Corps has determined the proposed in-water activities will likely meet the state standards for turbidity by using 900 feet as the compliance boundary rather than 300 feet as was used during the 2005/2006 dredging action. The Corps will monitor for turbidity during the proposed activities.

3.6.3 Potential Effects of Human Use Characteristic

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

Commercial fishing is not conducted in the vicinity of the proposed disposal site or the dredging sites. Recreational fishing for Snake River steelhead and resident fish does occur in the vicinity. In-water disposal and habitat creation activities may have a localized, short-term effect on fishing in the immediate vicinity of the site. Short-term effects would be minimized by restricting work to the in-water work window, which is not during a period of high human use. The creation of shallow-water fish habitat is expected to have a long-term beneficial effect on recreational fisheries.

Numerous aquatic species, including salmonids, Pacific lamprey, sturgeon, whitefish, and sculpin, retain cultural significance to tribes. 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 effects 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 effects to fisheries would be minimized by restricting work to the winter in-water work window, which is designated to reduce effects on anadromous salmonids. The creation of shallow-water rearing habitat is expected to have a long-term beneficial effect on fisheries.

Recreational facilities such as boat ramps or developed swimming beaches are not present at the proposed discharge site at RM 116. Recreational activities may occur in the vicinity of the RM 116 throughout the year; however, recreational use is lower during the winter 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 disposal site at RM 116 is somewhat remote and therefore, the number of people viewing the site would be limited. During in-water disposal and habitat creation, barges placing material at the site would be visible to recreational users on the river and roadway travelers. The activities proposed at the RM 116 site would have localized and short-term effects on aesthetics. Also, the disposal site is not located in or adjacent to any parks, national seashores, wilderness areas, or wild and scenic rivers.

3.7 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 could be displaced by future sediment management actions such as construction of dikes or dredging and disposal activities. However, these communities would be expected to reestablish on the newly exposed surfaces within 6 months to 1 year. Future sediment management actions could have the potential to negatively affect listed salmonids, but these effects would be minimized by performing the work during a period when few individuals of the listed species would be present or by incorporating design features that would minimize the effects on salmonids. Additional analysis of cumulative effects can be found in Section 4 of the PSMP EIS.

3.8 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 shallow-water habitat creation.

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

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

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

4.2 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 the proposed disposal site would be temporarily affected but ultimately improved, and not adversely affected, by the proposed action. Upland disposal was considered (see Section 2.3 above); however, as discussed in Section 2.4 above, upland disposal alternatives are not practicable for this proposed action and most involve unacceptable environmental effects. The Corps considered two in-water disposal alternatives (Sections 2.3, 2.4 and 2.5 above) but selected the proposed placement at RM 116 and because it provides long term beneficial effects to Snake River fall Chinook and improves habitat for benthic organisms.

4.3 Compliance with Applicable State Water Quality Standards

In-water disposal and habitat construction activities would be monitored for effects to water quality (i.e., turbidity). Actions would be taken to reduce resulting effects to a level within the criteria set forth in applicable state standards.

4.4 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. The field sampling, laboratory analyses, and suitability determination followed the protocols set forth in the 2013 update to the *Dredged Material Evaluation and Disposal Procedures Users Manual*, and the *Sediment Evaluation Framework for the Pacific Northwest.*

4.5 Compliance with Endangered Species Act of 1973

The Corps is consulting with NMFS and USFWS regarding listed species at sites included in the proposed work. A biological assessment evaluating effects on listed species is in Appendix K of the PSMP EIS. As part of the on-going consultation, NMFS has stated their support for the proposed in-water placement to create shallow water habitat at RM 116. Both Services are preparing Biological Opinions for the proposed dredging and disposal action. Neither the Corps nor the Ports would proceed with the proposed action until the ESA consultations are complete and the requirements incorporated into the dredging and disposal contract.

4.6 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 in the proposed work area.

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

4.7.1 Significant Adverse Effects on Human Health and Welfare

The proposed dredging and disposal actions would have no significant adverse effects on human health and welfare.

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 activity.

Commercial fisheries are not present in the lower Snake and Clearwater Rivers. A Tribal fishery was initiated in 2013 just upstream of Lower Granite Dam, but is not in the vicinity of the dredging or disposal sites. Recreational fishing for Snake River steelhead and resident fish does occur in the vicinity of the dredging sites and the disposal site. In-water disposal and habitat creation activities may have a localized, short-term effect on recreational fishing in the vicinity of the sites. Short-term effects would be minimized by restricting work to the winter in-water work window, which is not during a period of high recreational use.

Localized, short-term effects to plankton, benthic communities, and listed salmonids are expected to be offset by the long-term benefits provided by additional shallow-water fish habitat. Significant, adverse effects to other fish populations are not anticipated.

The effects on wildlife as a result of dredging and in-water disposal are expected to be indirect, short-term and minor, primarily as a result of displacement during the operation. The proposed dredging and disposal activities would occur within the river and would not prevent wildlife from obtaining food or otherwise using the areas adjacent to the activities.

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

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

The proposed dredging and disposal would have no significant adverse effects on aquatic life or wildlife dependent upon aquatic ecosystems. The winter in-water work window has been

scheduled to avoid migrations of anadromous fish. Localized, short-term effects on resident aquatic life are expected to be offset by the long-term benefits provided by additional shallow-water fish habitat. Effects on wildlife are expected to be indirect, short-term and minor, primarily as a result of displacement during the operation.

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

The proposed dredging and disposal would have no significant adverse effects on the aquatic ecosystem. Localized, short-term effects on the productivity of plankton and benthic communities in the proposed disposal site are expected to be mitigated by the creation of shallow-water habitat. The additional habitat is expected to be conducive to recolonization by more diverse, productive, and stable populations.

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

The dredging and disposal activities would have no significant adverse effects on recreational, aesthetic, or economic values. Adverse effects on economic values are not expected as the purpose of the dredging is to maintain the navigation channel for commercial navigation. Adverse effects on recreational and aesthetic values are expected to be minor as the effects would be localized (confined to a relatively small part of two reservoirs) and short-term (during the 2 ½ month winter in-water window). The long-term effects of creating additional shallow-water fish habitat are expected to be beneficial.

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

- In-water discharges would be used to develop shallow-water fish habitat.
- In-water discharge would be restricted to December 15 to March 1.
- Materials to be dredged have been sampled and analyzed for grain size distribution and selected chemical concentrations.
- Dredged material to be discharged does not have significant contaminant concentrations and has been determined by the DMMO to be suitable for open water placement.
- Dredging at the Snake/Clearwater Rivers confluence would be sequenced. The material from the Snake River has more silt and would be dredged and disposed of first. The coarser sand from the Clearwater River would be dredged last and used to cover all of the exposed surfaces of the disposed material.
- Water quality monitoring would be performed prior to, during, and after in-water disposal activities as described in the monitoring plan (see Appendix J of the PSMP EIS).
- Data collected from the project would be used to improve management of future sediment management activities.

4.9 Finding of Compliance or Non-Compliance

The proposed dredging and disposal action complies with the Section 404(b)(1) Guidelines from EPA (40 C.F.R. 230), with the inclusion of the appropriate and practicable steps taken to minimize potential adverse effects of the discharge on the aquatic ecosystem. The preferred disposal action is the environmentally acceptable alternative, as it minimizes adverse effects while improving the aquatic habitat in Lower Granite reservoir. The preferred disposal action also complies with the applicable Corps evaluation factors in 33 C.F.R. 336.1(c)), as it provides for navigation while meeting the Federal standard of least costly, environmentally acceptable, and consistent with engineering requirements. Other factors identified in 33 C.F.R. 336.1(c) are adequately addressed under the Section 404(b)(1) evaluation.

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