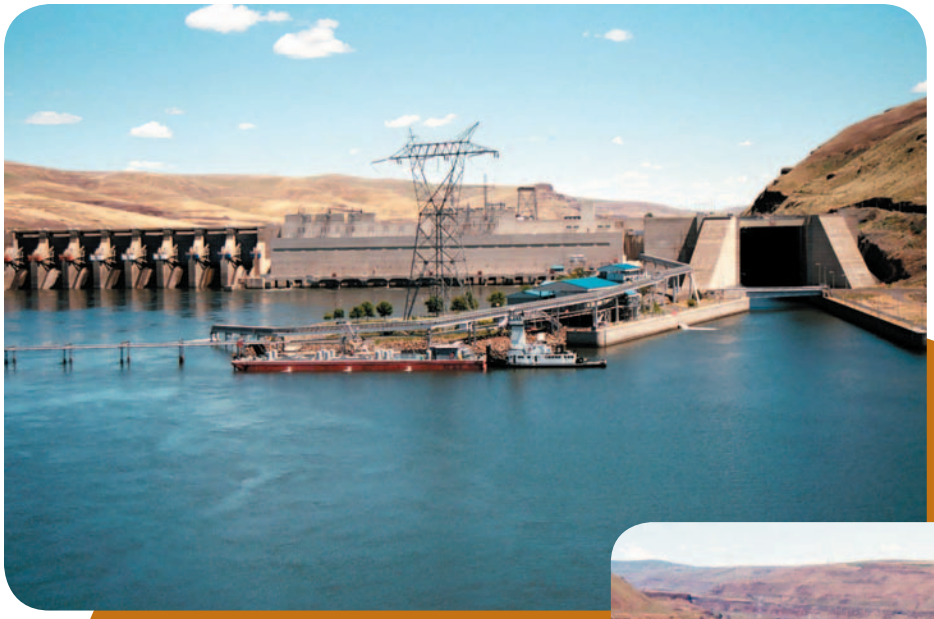
US Army Corps
of Engineers®
Walla Walla District

EPA
United States
Environmental Protection Agency
Region 10

Lower Snake River Navigation Maintenance

Lower Snake and Clearwater Rivers, Washington and Idaho



Environmental Impact Statement

June 2005

LOWER SNAKE RIVER NAVIGATION MAINTENANCE
FINAL ENVIRONMENTAL IMPACT STATEMENT

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(X) FINAL

Lead Agency. U.S. Army Corps of Engineers, Walla Walla District.
Cooperating Agency. U.S. Environmental Protection Agency, Region 10, Seattle, WA.
Type of Action. Administrative.

Abstract. This final Environmental Impact Statement (EIS) presents the U.S. Army Corps of Engineers' (Corps) plan for performing maintenance of the Federal navigation channel and berthing areas at certain public port facilities that need immediate maintenance on the lower Snake and Clearwater Rivers in Washington and Idaho. The EIS evaluates the actions the Corps could take to maintain the authorized navigation channel and berthing areas in the near future to address the immediate need for channel maintenance and identifies a preferred alternative.

The Corps' authority to maintain the lower Snake River Federal navigation channel was first established in the River and Harbor Act of 1945 (Public Law 79-14, 79th Congress, 1st Session). The Corps is authorized by Congress to maintain the Federal navigation channel that is 250 feet wide and 14 feet deep in the project area. Based on the authorizing documents and subsequent related Congressional documents, the Corps interprets that Congress intended for the Corps to maintain the navigation channel year-round. The designated Federal navigation channel dimensions are increased beyond typical dimensions in the turning places in front of port berthing areas in accordance with navigation practice as authorized in 33 United States Code 562, "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 of the free movement of boats." Historically, the Corps routinely used dredging actions to maintain the authorized dimensions of the navigation channel. Typically, the Corps performed maintenance dredging every 3 to 5 years. However, the Corps has not performed maintenance dredging in the channel since the winter of 1998-1999, when the Lower Monumental Lock and Dam (Lower Monumental) navigation lock approach was dredged.

The purpose of the routine channel maintenance is to provide a 14-foot depth throughout the designated Federal navigation channel in the project area, and to restore access to selected port berthing areas. Channel maintenance would increase public safety and facilitate navigation and commodity movement. Sediment is deposited in the navigation channel primarily during spring runoff periods. Because channel maintenance has not occurred since 1998-1999, shoaling in the navigation channel has become critical in some locations, and is now as shallow as 8.5 feet and 10.6 feet near the Ports of Clarkston and Lewiston, respectively. Also, the total surface area of the navigation channel having depths less than 14 feet in the Snake and Clearwater River confluence area has risen from approximately 38 acres in 2003 to approximately 52 acres in 2004.

The navigation industry is impacted when the navigation channel is less than 14 feet because of an increased safety risk, increased risk of damage to equipment, increased risk of

grounding, continued light loading, and lost efficiencies due to modified approach, loading, and unloading procedures. Grounding can cause damage to vessels, puts human life at risk, and can result in leakage or loss of cargo into the river, which is a significant environmental concern since petroleum products and fertilizer are among the commodities carried on the river.

Eight alternatives were considered to address the immediate need to restore the authorized navigation channel. The alternatives include actions that would change reservoir levels, manipulate water flows, or remove sediments using mechanical methods. After considerable analysis, the preferred alternative selected is to dredge the navigation channel to its authorized dimensions at five particularly shallow and/or narrow areas, and use in-water disposal of the dredged material to create shallow-water habitat for listed salmonids. The Corps believes, after consideration of economic, environmental, technical, and other factors, that this alternative would best fulfill its statutory mission and responsibilities.

Copy. The final copy of this report was officially filed with the Director, Office of Federal Activities, U.S. Environmental Protection Agency, on June 3, 2005.

Notice. The Notice of Availability for the Final EIS will be published in the Federal Register June 10, 2005. Agencies and the public will have at least 30 days after the Notice appears to consider the recommendations and the rationale before the Corps signs a Record of Decision (ROD). Our mailing address, fax number, and web site are as follows:

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Further Information. Additional information on the final EIS and related documents may be obtained from Mr. Jack Sands, Program Manager, at 509-527-7287 or Ms. Sandy Simmons, Environmental Coordinator, at 509-527-7265.

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APPENDIXES

ABBREVIATIONS AND ACRONYMS

AIRFA	American Indian Religious Freedom Act
APE	area of potential effect
Basinwide Salmon Recovery Strategy	2000 FCRPS BiOp and the December 2000 *Memorandum of Understanding Among Federal Agencies Concerning the Conservation of Threatened and Endangered Fish Species in the Columbia River Basin*
BiOp	Biological Opinion
Bonneville	Bonneville Lock and Dam
BPA	Bonneville Power Administration
°C	degrees Celsius
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	cubic feet per second
CFR	Code of Federal Regulations
Colville Tribe	Confederated Tribes of the Colville Reservation
Compensation Plan	Lower Snake River Fish and Wildlife Compensation Program
Corps	U.S. Army Corps of Engineers
CRCIP	Columbia River Channel Improvement Project
CRI	cumulative risk initiative
CRITFC	Columbia River Inter-Tribal Fish Commission
CRTA	Columbia River Towboat Association
cy	cubic yard(s)
The Dalles Dam	The Dalles Lock and Dam
DART	data acquisition in real time
dBA	decibels adjusted
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
°F	degrees Fahrenheit
FCRPS	Federal Columbia River Power System
FCRPS BiOp	Federal Columbia River Power System Biological Opinion (NOAA Fisheries)
feet MSL	feet above mean sea level
fps	feet per second
GIS	Geographic Information Systems
HMU	habitat management unit
HTRW	hazardous, toxic, and radioactive waste
Ice Harbor	Ice Harbor Lock and Dam
IDAPA	Idaho Administrative Procedures Act
IDFG	Idaho Department of Fish and Game
ISG	Independent Scientific Group

Lewiston-Clarkston	Lewiston, Idaho-Clarkston, Washington
LSRJSM Feasibility Report/EIS	*Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement* (Corps 2002b)
Little Goose	Little Goose Lock and Dam
Lower Granite	Lower Granite Lock and Dam
Lower Monumental	Lower Monumental Lock and Dam
LSMG	Local Sediment Management Group
McNary	McNary Lock and Dam
MCR	mouth of the Columbia River
µg/L	microgram(s) per liter
m	meter
MASS2	Modular Aquatic System Simulator, 2-dimensional
m/s	meters per second
mg/kg	milligram(s) per kilogram
mg/L	milligram(s) per liter
MOP	minimum operating pool
MPI	Matrix of Pathways and Indicators
MSL	mean sea level
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NDT	National Dredging Team
NEPA	National Environmental Policy Act
NGVD29	National Geodetic Vertical Datum 1929
NH_3	ammonia (un-ionized)
NH_3-N	ammonia nitrogen
NH_4^+	ammonium ion
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service (this document uses current name: NOAA Fisheries)
NO_2-N	nitrite nitrogen
$NO_2 + NO_3$	nitrite/nitrate (
NO_3-N	nitrate nitrogen
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Oceanic and Atmospheric Administration Fisheries (formerly NMFS)
NPCC	Northwest Power and Conservation Council
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NTU	nephelometric turbidity unit
NWF	National Wildlife Federation
ortho-P	ortho-phosphate
oz/yd^2	ounce(s) per square yard
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PFC	Properly Functioning Conditions
PFMC	Pacific Fishery Management Council

PIT	passive integrated transponder
PM10	particulate matter 10 microns or smaller in size.
ppb	parts per billion
ppm	parts per million
RBM-10	river basin model-10 (EPA)
RCRA	Resource Conservation and Recovery Act
RKM	river kilometer(s)
RM	river mile(s)
RPA	reasonable and prudent alternative
SAR	smolt to adult return ratio
SHPO	State Historic Preservation Office
SOR	Columbia River System Operation Review
SPF	standard project flood
SW	spillway weir
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCP	traditional cultural property
TDG	total dissolved gas
T&E	threatened and endangered [species]
TMDL	total maximum daily load
TMT	Technical Management Team
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TP	total phosphorus
TSS	total suspended solids
UPA	Updated Proposed Action
Umatilla Tribe	Confederated Tribes of the Umatilla Indian Reservation
U.S.C.	United States Code
USDA	U.S. Department of Agriculuture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WQRRS	Water Quality for River-Reservoir Systems
Yakama Nation	Confederated Tribes and Bands of the Yakama Indian Nation of the Yakama Reservation

US Army Corps
of Engineers
Walla Walla District

United States
Environmental Protection Agency
Region 10

Executive Summary

June 2005

EXECUTIVE SUMMARY

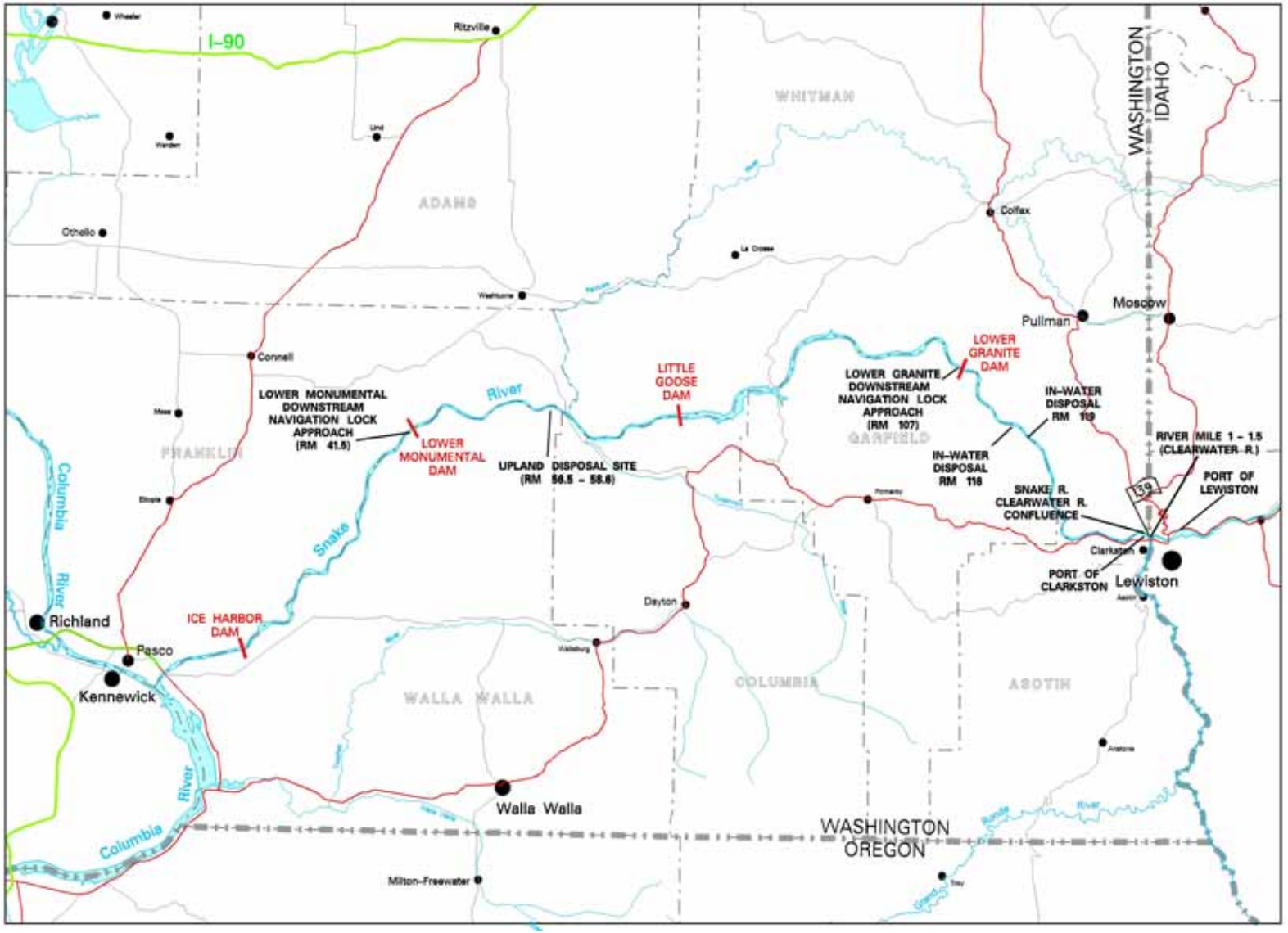
INTRODUCTION

The U.S. Army Corps of Engineers (Corps), Walla Walla District, prepared this Environmental Impact Statement (EIS) for performing maintenance of the Federal navigation channel and berthing areas at certain public port facilities that need immediate maintenance on the lower Snake and Clearwater Rivers in Washington and Idaho. The EIS evaluates the actions the Corps could take to maintain the authorized navigation channel and port berthing areas in the near future and identifies a preferred alternative. The actions considered should be effective for a period of approximately 3 years following implementation to correspond with the typical frequency of past maintenance activities. The U.S. Environmental Protection Agency, Region 10, is a cooperating agency for the EIS.

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), 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. Based on the authorizing documents and subsequent related Congressional documents, the Corps interprets that Congress intended for the Corps to maintain the navigation channel year-round. The designated Federal navigation channel dimensions are increased beyond typical dimensions in the turning basins in front of port berthing areas in accordance with navigation practice as authorized in 33 U.S.C. § 562: "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 of the free movement of boats." Historically, the Corps has routinely maintained the navigation channel through dredging actions to reestablish the authorized dimensions, typically every 3 to 5 years. The Corps has not performed maintenance dredging in the channel since the winter of 1998-1999, when the Lower Monumental Lock and Dam (Lower Monumental) navigation lock approach was dredged.

The purpose of the routine channel maintenance is to provide a 14-foot depth throughout the designated Federal navigation channel in the project area and to restore access to selected port berthing areas. Channel maintenance would facilitate navigation and commodity movement and increase public safety.

Figure ES-1. Project Area Map



Sediment is deposited in the navigation channel primarily during spring runoff periods. Over time, the sediment buildup has reduced the proportion of the navigation channel with adequate depth and creates unsafe navigation conditions. Because the Corps has not performed routine channel maintenance since 1998-1999, shoaling in the channel has become critical in some locations. Currently, these locations have been identified as the downstream navigation lock approaches to Lower Monumental and Lower Granite Lock and Dam (Lower Granite), the Federal channel in the vicinity of the confluence of the Snake and Clearwater Rivers, and the berthing areas at the Port of Clarkston and the Port of Lewiston (see figure ES-1).

Survey results from August 2004 show that the total surface area of the Federal navigation channel having depths less than 14 feet in the Snake and Clearwater River confluence area has risen from approximately 38 acres in 2003 to approximately 52 acres in 2004. Water depths in the Federal navigation channel near the Port of Clarkston berthing area and in the turning basin near the Port of Lewiston berthing area are currently much less than the 14-foot authorized depth, and are now as shallow as 8.5 feet and 10.6 feet, respectively, based on a minimum operating pool water surface elevation. Navigation channel depths less than 14 feet substantially impact access to nearby port facilities and, at some locations, could impede passage into the upper parts of the system.

Because of the limited available depths in the channel, as well as the port berthing areas, some port facilities have been forced to operate at reduced capacity. Impacts 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, which can lead to sinking or capsizing due to holes or rips in hulls, and increases risk to crew and passengers. On commercial barges, grounding also can result in leakage or loss of cargo into the river. This is a substantial environmental concern, since petroleum products and fertilizer are among the commodities carried on the river.

ALTERNATIVES

The Corps, in coordination with EPA, evaluated and considered a range of alternatives in an effort to select an alternative that was consistent with the stated purpose of maintaining a 14-foot depth throughout the designated navigation channel and restoring access to selected port berthing areas in the project area. These alternatives are summarized in table ES-1 and include actions that would change reservoir levels, manipulate water flows, or remove/relocate sediments using flushing or mechanical means. These actions were further influenced by variable factors relating to location, timing, and duration of effects.

Table ES-1. Summary of Alternatives

Alternative	Features
No Action	Maintains the status quo, with no change from current operations. No maintenance of the Federal navigation channel or selected port facilities. Continue potential deviation from MOP operation during fish outmigration.
Sediment Reduction	Reduces the amount of sediment coming into the reservoirs from contributing drainage basins.
Maintenance Dredging with Beneficial Use of Dredged Material	Dredges up to 450,000 cy of material and disposes of the dredged material in-water by reshaping some of the materials to create 3.7 acres of higher-quality[1] resting/rearing salmon habitat and 2.9 acres of lesser-quality[1] resting/rearing salmon habitat.
Maintenance Dredging with Traditional In-water Disposal	Dredges up to 450,000 cy of material and uses in-water disposal of the dredged material, without reshaping, to create approximately 16 acres of lesser-quality resting/rearing salmon habitat. Uses deep water disposal of silt materials.
Navigation Objective Reservoir Operation	Operates the pools at the elevations necessary to provide depths adequate for navigation, limited by the normal operating pool elevations.
Navigation Objective Reservoir Operation/High-spot Dredging	Operates the pools at the elevations necessary to provide depths adequate for navigation, limited by the normal operating pool elevations, and includes dredging of high spots (up to 65,400 cy) that continue to impair navigation at the higher pool elevation. Uses in-water disposal of dredged material to create about 2.9 acres of higher-quality resting/rearing salmon habitat.
Drawdown/Sediment Flushing	Draws down the pool elevation by 10 to 15 feet during a 30- to 45-day period in an effort to flush sediments from the navigation channel and selected port berthing areas.
Drawdown/Sediment Flushing and Dredging	Draws down the pool elevation by 10 to 15 feet during a 30- to 45-day period in an effort to flush sediments from the navigation channel and selected port berthing areas. During the in-water work window (December 15 to March 1), dredges locations (approximately 250,000 to 450,000 cy) that continue to impair navigation at MOP. Uses in-water disposal of dredged material to create resting/rearing salmon habitat. The amount of habitat created and the habitat quality would vary depending on how much material is dredged and available.

Note: 1. Aquatic resting/rearing habitat is considered to be higher quality if it is a smooth, gently sloping area with a sandy substrate, and the substrate is within 10 feet of the water surface (depth 0-10 feet) during the juvenile salmonid outmigration period. Habitat is considered to be lesser quality if the characteristics are similar, but the substrate is at depths greater than 10 feet.

The Corps developed screening criteria to assist in evaluation of alternatives. The screening criteria were applied to the alternatives listed in table ES-2 to determine which alternatives would accomplish the purpose and satisfy the need. The following are the screening criteria:

- Alternatives must be able to be implemented within the near future following the spring 2005 runoff.
- Alternatives must provide results/benefits immediately following implementation.
- Alternatives must provide a 14-foot depth throughout the designated navigation channel in the project area and restore access to selected port berthing areas.

Only those alternatives that meet all of the screening criteria were moved forward for further evaluation. The exception to this is the No Action Alternative. As a standard NEPA practice, this alternative was carried forward to serve as the baseline for comparison. Table ES-2 presents a summary of the screening results.

Table ES-2. Screening Results Summary

Alternative	Near Future Implementation	Immediate Results or Benefit	Provide 14-foot Deep Navigation Channel	Alternative Carried Forward
No Action	YES	NO	NO	YES[1]
Sediment Reduction	NO	NO	NO	NO
Maintenance Dredging with Beneficial Use of Dredged Material	YES	YES	YES	YES
Maintenance Dredging with Traditional In-Water Disposal	YES	YES	YES	YES
Navigation Objective Reservoir Operation	YES	YES	NO	NO
Navigation Objective Reservoir Operation/High-spot Dredging	YES	YES	YES	YES
Drawdown/Sediment Flushing	YES	YES	NO	NO
Drawdown/Sediment Flushing and Dredging	YES	YES	YES	YES

Note:
1. Carried forward as the baseline.

The Corps identified five alternatives to be carried forward for further evaluation. These are:
Alternative 1 – No Action.
Alternative 2 – Maintenance Dredging with Beneficial Use of Dredged Material.
Alternative 3 – Maintenance Dredging with Tradition In-water Disposal.
Alternative 4 – Navigation Objective Reservoir Operation with High-spot Dredging.
Alternative 5 – Drawdown/Sediment Flushing and Dredging.

In selecting the preferred alternative, the Corps considered and compared the five alternatives carried forward for further evaluation. The evaluation of the alternatives considered several factors, including consistency with current Endangered Species Act (ESA) recovery efforts; number of environmental impacts; reduction of unsafe conditions in the navigation channel; ability to incorporate the beneficial use of dredged material; and ability to implement at a reasonable cost. This evaluation also considered, but was not limited to, the following resource areas: water quality; sediments; air quality; noise;

aesthetics; hazardous, toxic, and radioactive waste (HTRW); aquatic resources (including anadromous and resident fish); terrestrial resources; plants; threatened and endangered species; cultural resources; recreation; and socio-economics.

Table ES-3 summarizes and compares the anticipated environmental effects of the alternatives carried forward for further consideration. Further summarized information follows this table.

Table ES-3. Summary Comparison of Environmental Effects by Alternatives Considered

Resource	Alternative 1 No Action	Alternative 2 Maintenance Dredging with Beneficial Use of Material	Alternative 3 Maintenance Dredging with Traditional In-water Disposal	Alternative 4 Navigation Objective Reservoir Operation/High-spot Dredging	Alternative 5 Drawdown/Sediment Flushing and Dredging
Water Quality	Continuation of minor negative, short-term impacts due to existing conditions. Negligible, short-term, localized turbidity resulting from maritime vessels scraping/disturbing the river bottom. This scraping or disturbance could also cause associated water quality problems. Possible cargo leakage from vessels damaged by grounding.	Negligible, short-term increase in water temperature due to increased surface area in Lower Granite from habitat creation. Minor negative, short-term impacts at five locations due to increase in turbidity from dredging and from the possible localized turbidity plume at one location during disposal. A dredging operation could increase ammonia levels; however, any short-term effects would be minimized due to working during winter when temperatures are lower and fewer fish are present.	Negligible, short-term increase in water temperature due to increased surface area in Lower Granite from habitat creation. Minor, negative, short-term impacts at five locations due to increase in turbidity from dredging and from the possible localized turbidity plume at two locations during disposal. A dredging operation could increase ammonia levels; however, any short-term effects would be minimized due to working during winter when temperatures are lower and fewer fish are present.	Negligible, short-term increase in water temperature due to increased surface area in Lower Granite. Minor negative, short-term impacts at five locations due to increase in turbidity from dredging and from the possible localized turbidity plume at one location during disposal. A dredging operation could increase ammonia levels; however, any short-term effects would be minimized due to working during winter when temperatures are lower and fewer fish are present and because of the reduced amount of dredging due to dredging only the high spots.	Negligible, short-term increase in water temperature due to increased surface area in Lower Granite from habitat creation. Minor, negative impacts with exposure of undisturbed sediments (potential for release of contaminants). Regarding the dredging and disposal activities, minor negative, short-term impacts at five locations due to increase in turbidity from dredging and from the possible localized turbidity plume at one location during disposal. A dredging operation could increase ammonia levels; however, any short- term effects would be minimized due to working during winter when temperatures are lower and fewer fish are present

Resource	Alternative 1 No Action	Alternative 2 Maintenance Dredging with Beneficial Use of Material	Alternative 3 Maintenance Dredging with Traditional In-water Disposal	Alternative 4 Navigation Objective Reservoir Operation/High-spot Dredging	Alternative 5 Drawdown/Sediment Flushing and Dredging
Water Quality continued		Minor, negative, short-term impacts at disposal site when placing material to build shallow-water habitat. Anticipate no more than minor, short-term, negative impacts from contaminants as all detected concentrations of contaminants were below screening levels. Minor impact by turbidity with controlled (dredging) disturbance of sediment.	Minor, negative, short-term impacts at disposal site when placing material to build shallow-water habitat at RM 116 by disposing on an existing bench. Minor adverse impacts if material disposed in deep water and at RM 119 by disposing in deep water. Anticipate no more than minor, short-term, negative impacts from contaminants, since all detected concentrations of contaminants were below screening levels. Minor impact by turbidity with controlled (dredging) disturbance of sediment.	Minor, negative, short-term impacts at disposal site when placing material to build shallow-water habitat at RM 119 by disposing in deep water and on an existing bench. Anticipate no more than minor, short-term, negative impacts from contaminants, since all detected concentrations of contaminants were below screening levels	Minor, negative, short-term impacts at disposal site when placing material to build shallow-water habitat. Negative impact from high turbidity and TDG during drawdown. The TDG is expected to exceed regulatory limits during a flushing event. Major, short-term increase in suspended solids during a flushing event that is anticipated to exceed regulatory limits.

Resource	Alternative 1 No Action	Alternative 2 Maintenance Dredging with Beneficial Use of Material	Alternative 3 Maintenance Dredging with Traditional In-water Disposal	Alternative 4 Navigation Objective Reservoir Operation/High-spot Dredging	Alternative 5 Drawdown/Sediment Flushing and Dredging
Sediments	No direct effect on sediment quality, but would continue to have moderate increases to quantity. Negligible, short-term, localized turbidity resulting from maritime vessels scraping/disturbing the river bottom. This scraping or disturbance could also cause associated water quality problems.	Minor negative, short-term impacts at five locations due to increase in turbidity from dredging and from the possible localized turbidity plume at one location during disposal. Major, long-term, positive effect on sediment quantity in problem locations as up to 450,000 cy of material would be dredged from 5 locations in the project area and relocated downstream. Anticipate no more than minor, short-term, negative impacts from contaminants in sediments, since all detected concentrations of contaminants were below screening levels.	Minor negative, short-term impacts at five locations due to increase in turbidity from dredging and from the possible localized turbidity plume at one location during disposal. Major, long-term, positive effect on sediment quantity in problem locations as up to 450,000 cy of material would be dredged from 5 locations in the project area and relocated downstream. Anticipate no more than minor, short-term, negative impacts from contaminants in sediments, since all detected concentrations of contaminants were below screening levels.	Minor negative, short-term impacts at five locations due to increase in turbidity from dredging and from the possible localized turbidity plume at one location during disposal. Moderate, short-term, positive effect on sediment quantity in problem locations as up to 65,400 cy of sediment from high spots would be dredged from 5 locations in the project area and relocated downstream. Dredge and relocate to an in-water disposal location downstream. Anticipate no more than minor, short-term, negative impacts from contaminants in sediments, since all detected concentrations of contaminants were below screening levels.	Minor negative, short-term impacts at five locations due to increase in turbidity from dredging and from the possible localized turbidity plume at one location during disposal. Major, long-term, positive effect on sediment quantity in problem locations as combination of flushing and dredging could move up to 450,000 cy and relocate it downstream. Uncontrolled redistribution of sediments could produce major negative short-term impacts depending on whether the relocation creates a problem for navigation. Short-term, anticipate that dredging would occur the following winter and would remove those problem areas. Impacts from dredging vary depending on amount of dredging needed. Impacts would range between those of Navigation Objective Reservoir Operation/ High-spot Dredging and the Maintenance Dredging alternatives.

Resource	Alternative 1 No Action	Alternative 2 Maintenance Dredging with Beneficial Use of Material	Alternative 3 Maintenance Dredging with Traditional In-water Disposal	Alternative 4 Navigation Objective Reservoir Operation/High-spot Dredging	Alternative 5 Drawdown/Sediment Flushing and Dredging
Sediments continued					Anticipate no more than minor, short-term, negative impacts from contaminants in sediments, since all detected concentrations of contaminants were below screening levels. However, metal concentrations from areas not traditionally dredged could be toxic to aquatic organisms, although concentrations of most organic compounds are at or below instrument detection limits. Major, localized erosion, bank destabilization, and other impacts (i.e., highways, railways, and other facilities) are anticipated to occur during a flushing event.

Resource	Alternative 1 No Action	Alternative 2 Maintenance Dredging with Beneficial Use of Material	Alternative 3 Maintenance Dredging with Traditional In-water Disposal	Alternative 4 Navigation Objective Reservoir Operation/High-spot Dredging	Alternative 5 Drawdown/Sediment Flushing and Dredging
Air Quality and Noise	No change to air quality and noise levels above existing conditions.	Negligible or de minimis, short-term effects to local air quality and minor, short-term impacts to noise levels from dredging and disposal equipment operating up to 24 hours a day, 7 days a week.	Negligible or de minimis, short-term effects to local air quality and minor, short-term impacts to noise levels from dredging and disposal equipment operating up to 24 hours a day, 7 days a week.	Negligible or de minimis, short-term effects to local air quality and minor, short-term impacts to noise levels from dredging and disposal equipment operating up to 24 hours a day, 7 days a week.	No direct impact to noise above existing conditions for drawdown. No impacts to air quality are expected as the exposed river bottom material would not dry out quickly enough to be blown by the wind . Negligible or de minimis, short-term effects to local air quality and minor, short-term impacts to noise levels from dredging and disposal equipment operating up to 24 hours a day, 7 days a week.
Aesthetics	No change in existing aesthetics.	Minor, negative, and short-term aesthetic effects from the sight of the dredging and disposal activities in the river.	Minor, negative, and short-term aesthetic effects from the sight of the dredging and disposal activities in the river.	Minor, positive, short-term effect to aesthetic quality of the shorelines depending on how much fluctuation in water levels occur as the higher water could cover cut banks and barren shorelines. Minor, negative, and short-term aesthetic effects from the sight of the dredging and disposal activities in the river.	Minor, short-term negative effects to aesthetics during drawdown. Minor, negative, and short-term aesthetic effects from the sight of the dredging and disposal activities in the river. Minor, negative, and short-term aesthetic effects from the sight of the dredging and disposal activities in the river.

Resource	Alternative 1 No Action	Alternative 2 Maintenance Dredging with Beneficial Use of Material	Alternative 3 Maintenance Dredging with Traditional In-water Disposal	Alternative 4 Navigation Objective Reservoir Operation/High-spot Dredging	Alternative 5 Drawdown/Sediment Flushing and Dredging
HTRW	No effects anticipated as no HTRW sites are known to exist in project area.	No effects anticipated as no HTRW sites are known to exist in project area.	No effects anticipated as no HTRW sites are known to exist in project area.	No effects anticipated as no HTRW sites are known to exist in project area.	No effects anticipated as no HTRW sites are known to exist in project area.
Aquatic Resources	Minor, positive effect to predatory resident fish species due to the minor, negative, short-term and long-term effect of increased travel time for juvenile salmonids if reservoirs are operated above MOP for single or multiple years. May result in minor, short-term, positive impacts to resident and anadromous fish by eliminating or reducing dredging on shoreline forming shallow-water habitat as sediment continues to accumulate.	Minor, short-term negative impacts to food sources (macroinvertebrates) for aquatic species in a 73.4 acre dredging footprint (Ports of Lewiston and Clarkston); no long-term effects anticipated as they would rapidly recolonize. Minor direct loss of crayfish negatively affecting resident fish.	Minor, short-term negative impacts to food sources (macroinvertebrates) for aquatic species in a 73.4 acre dredging footprint (Ports of Lewiston and Clarkston); no long-term effects anticipated as they would rapidly recolonize. Minor direct lost of crayfish negatively affecting resident fish. Minor, positive, long-term effect from creation of up to 16 acres of lesser-quality shallow-water salmonid habitat at a depth of 20 feet, but would create no higher-quality shallow-water rearing habitat. This habitat would also be beneficial to salmonid and resident fish prey productivity	Minor, short-term, positive impacts to fish due to greater macroinvertebrate composition and production in less turbid waters along with a moderate increase in acreage of shallow-water habitat. Minor, short-term negative impacts to food sources (macroinvertebrates) for aquatic species in a 21.1 acre dredging footprint (Ports of Lewiston and Clarkston); no long-term effects anticipated, as they would rapidly recolonize. Minor direct lost of crayfish negatively affecting resident fish.	Minor, negative, short-term impacts due to sediment flushing would create large turbidity plumes at a high frequency for up to 6 weeks, with likely impacts to aquatic resources, including disruptions to biological functions and habitat accessibility (stranding). Minor, positive, long-term effect from creation of up to 3.7 acres of higher-quality shallow-water rearing habitat at a depth of 0 to 10 feet and up to 16 acres of lesser-quality shallow-water habitat for juvenile fall chinook salmon, also beneficial to salmonid and resident fish prey productivity. Minor, negative effects to resident predatory fish species because this type of habitat construction reduces the type of habitat favored by predatory species.

Resource	Alternative 1 No Action	Alternative 2 Maintenance Dredging with Beneficial Use of Material	Alternative 3 Maintenance Dredging with Traditional In-water Disposal	Alternative 4 Navigation Objective Reservoir Operation/High-spot Dredging	Alternative 5 Drawdown/Sediment Flushing and Dredging
Aquatic Resources continued	Minor, negative, short-term impact to pacific lamprey in the Snake and Clearwater River, if they are present during sediment movement activities and are disturbed or removed. Minor, short-term, negative impacts to aquatic plants as the fluctuation of the pools impact establishment and productions zones. No effect on sturgeon.	There could be a minor, positive, long-term effect from creation of up to 3.7 acres of higher-quality shallow-water salmonid rearing habitat at depths of 0 to 10 feet and 2.9 acres of lesser-quality shallow-water habitat at depths of 10 to 20 feet. This habitat would also be beneficial to salmonid and resident fish prey productivity. This type of habitat construction reduces the type of habitat favored by predatory species. Minor, negative, short-term impact to Pacific lamprey in the Snake and Clearwater River, if they are present during sediment movement activities and are disturbed or removed.	Minor, negative, short-term impact to Pacific lamprey in the Snake and Clearwater River, if they are present during sediment movement activities and are disturbed or removed. Minor, short-term, negative impacts to aquatic plants as the fluctuation of the pools impact establishment and productions zones. Minor, positive, short-term effect to sturgeon with deep water disposal of dredged material. Minor, negative, short-term impacts to resident fish due to dredging and disposal activities as they can easily avoid the dredging areas.	Minor, long-term, positive effect from creation of up to 2.9 acres of higher-quality shallow-water salmonid habitat plus 3 acres of slope (considered lesser-quality). This habitat would also be beneficial for salmonid and resident fish prey productivity. Minor, negative effects to resident predatory fish species because this type of construction also reduces the suitability of the habitat for resident fish (i.e., predators) Increased passage times through the reservoirs also may increase the predation rate on juvenile fish in the reservoirs resulting in a negative effects to juvenile salmonids, but a positive effect to resident predator fish species.	Minor, short-term, negative impacts to food sources (macroinvertebrates) for aquatic species in a dredging footprint up to 73.4 acres (Ports of Lewiston and Clarkston), although no long-term effects anticipated as they would rapidly recolonize. Moderate direct lost of crayfish negatively affecting resident fish. Minor, short-term, negative impacts to aquatic plants by the scour and turbidity of drawdown. Minor, negative, short-term impact to Pacific lamprey in the Snake and Clearwater Rivers, if they are present in shoreline sediments during sediment movement activities and are disturbed or removed. Minor, negative, short-term impacts due to increased TDG, as the increase has the potential to negatively affect all aquatic organisms.

Resource	Alternative 1 No Action	Alternative 2 Maintenance Dredging with Beneficial Use of Material	Alternative 3 Maintenance Dredging with Traditional In-water Disposal	Alternative 4 Navigation Objective Reservoir Operation/High-spot Dredging	Alternative 5 Drawdown/Sediment Flushing and Dredging
Aquatic Resources continued		Minor, short-term, negative impacts to aquatic plants as the fluctuation of the pools impact establishment and productions zones. No effect on sturgeon from the dredging or disposal due to the sturgeons' preference for deeper water with higher velocities. Minor, negative, short-term impacts to resident fish due to dredging and disposal activities as they can easily avoid the dredging areas.	Minor, negative, long-term impact to juvenile salmonids from bottom-dumped sediment disposal method, as without shaping for preferred shallow water habitat configuration, disposal in piles has the potential to add ambush habitat for predatory species. Minor, positive, long-term effect to resident predatory fish species	Minor, negative, short-term impact to Pacific lamprey in the Snake and Clearwater Rivers, if they are present during sediment movement activities and are disturbed or removed. Minor, short-term, negative impacts to aquatic plants as the fluctuation of the pools impact establishment and productions zones. A full pool, year-round may positively effect juvenile resident fish. Increased pool levels also adds cover and feeding areas for small mouth bass and northern pikeminnows. Minor, negative, short-term impacts to resident fish due to dredging and disposal activities as they can easily avoid the dredging areas.	Minor, negative, short-term impacts to resident fish due to dredging and disposal activities as they can easily avoid the dredging areas, however, the flushing event may strand and disrupt their habitat.

Resource	Alternative 1 No Action	Alternative 2 Maintenance Dredging with Beneficial Use of Material	Alternative 3 Maintenance Dredging with Traditional In-water Disposal	Alternative 4 Navigation Objective Reservoir Operation/High-spot Dredging	Alternative 5 Drawdown/Sediment Flushing and Dredging
Terrestrial Resources	Minor, negative, short-term impacts to shoreline nesting birds because of continued operations above MOP. Minor, negative, short-term impact due to the reduced amount of vegetation above MOP.	Minor, negative, short-term effects on terrestrial wildlife from dredging and disposal activities as they would return quickly after equipment is gone. No impacts anticipated to wetlands or to the floodplain from disposal.	Minor, negative, short-term effects on terrestrial wildlife from dredging and disposal activities as they would return quickly after equipment is gone. No impacts anticipated to wetlands or to the floodplain from disposal.	Minor, negative, short-term effects on terrestrial wildlife from dredging and disposal activities as they would return quickly after equipment is gone. Minor, negative, short-term impacts to shoreline nesting birds because of continued operations above MOP. Minor, negative, short-term impacts to vegetation and/or wetlands anticipated due to higher pool but no impacts to the floodplain from disposal. Minor, negative, short-term impact to shoreline nesting birds because of above-MOP operation.	Minor, negative, short-term impacts to wildlife habitat as resources would be decreased and degraded. Minor, negative, short-term effects on terrestrial wildlife from dredging and disposal activities as they would return quickly after equipment is gone. Beavers and Muskrats would be displaced from lodges and burrows. Minor, negative, short-term impacts to vegetation and wetlands, as some areas will be dewatered for up to 6 weeks. Minor, positive, short-term impacts to birds and small mammals due to increase in food sources during a drawdown event.

Resource	Alternative 1 No Action	Alternative 2 Maintenance Dredging with Beneficial Use of Material	Alternative 3 Maintenance Dredging with Traditional In-water Disposal	Alternative 4 Navigation Objective Reservoir Operation/High-spot Dredging	Alternative 5 Drawdown/Sediment Flushing and Dredging
Threat-ened and Endan-gered Species	The baseline condition under the 2004 FCRPS BiOp is "*May affect and likely to adversely affect*" Snake River fall-run chinook, Snake River spring/summer-run chinook, and Snake River basin steelhead, but no jeopardy expected. Minor, negative, short-term impacts to listed species due to slightly increased travel time for juvenile salmonids if reservoirs are operated above MOP for single or multiple years.	"*May affect and likely to adversely affect*" SR fall-run chinook, Snake River spring/summer-run chinook, and Snake River basin steelhead, but no jeopardy expected. Minor, positive, long-term impacts due to the creation of up to 3.7 acres of higher-quality resting/rearing habitat at a depth of 0 to 10 feet and 2.9 acres of lesser-quality resting/rearing habitat at a depth of 10 to 20 feet for Snake River fall-run chinook salmon created to compensate for sediment (sand) removed from navigation channel. This type of habitat creation was coordinated with and supported by National Oceanic and Atmospheric Administration (NOAA) Fisheries.	"*May affect and likely to adversely affect*" fall chinook, spring/summer-run chinook, and steelhead, but no jeopardy expected Minor, positive, long-term effect from creation of up to 16 acres of lesser-quality shallow-water salmonid habitat at a depth of 20 feet, but would create no higher-quality shallow-water rearing habitat. Minor, negative, long-term impact to juvenile salmonids from bottom-dumped sediment disposal method, as without shaping for preferred shallow water habitat configuration, disposal in piles has the potential to add ambush habitat for predatory species. Minor, positive, long-term effect to resident predatory fish species. "*May affect but not likely to adversely affect*" sockeye salmon.	Minor, negative, short-term impacts from multiple year operations above MOP. May impact juvenile salmonid migration by increasing travel time through the reservoirs and decrease overall survival delaying their arrival to the lower Columbia River and the ocean. Minor, negative, short-term adverse impacts to food sources (macroinvertebrates) for aquatic species in reduced dredging footprint (Ports of Lewiston and Clarkston), although no long-term effects anticipated as they would rapidly recolonize. Moderate, negative, short-term impacts due to loss of potential shallow-water habitat created for fall chinook salmon rearing due to reduced cubic yardage of sand removed from navigation channel.	Erosion and desiccation of shoreline along the Snake River in the Port of Clarkson area likely to cause a minor, negative, short-term impact to listed salmonid species because of up to a 6 week loss of important shallow-water habitat for rearing fall chinook . Reduction in suitability of shallow-water rearing habitat in the lower Clearwater River due to deepening (from 10 to 20 feet) of about 30 acres. Juvenile fish could be stranded in pools and along exposed shorelines. Redistributed sediment could cover valuable critical habitat. Minor, negative, short-term effect to juvenile spring/summer chinook salmon and steelhead passage success at dams if forebay elevation is drawn down 26 to 28 feet. Effect could be partially alleviated since a greater percent of these stock's downstream migrants would pass through spill and not be bypassed around turbines or collected for transport.

Resource	Alternative 1 No Action	Alternative 2 Maintenance Dredging with Beneficial Use of Material	Alternative 3 Maintenance Dredging with Traditional In-water Disposal	Alternative 4 Navigation Objective Reservoir Operation/High-spot Dredging	Alternative 5 Drawdown/Sediment Flushing and Dredging
Threat-ened and Endan-gered Species continued	Minor, positive, short-term impacts operating above MOP with higher forebay levels result in more water over the spillway weir (SW) resulting in drawing more fish over the device, decreasing forebay residence time-thereby reducing predation. It may also deliver juveniles downstream in better condition than through the bypass system or turbines. Minor, positive effect to predator fish species and a minor, negative, short-term impact to juvenile salmonids due to increased travel time.	No impact to Snake River fall chinook adults anticipated during dredging or disposal as the adults are not present during the winter (date December-early February). Minor, negative, short-term impacts to food sources (macroinvertebrates) for aquatic species in a 73.4 acre dredging footprint (Ports of Lewiston and Clarkston), no long-term effects anticipated as they would rapidly recolonize. "*May affect but not likely to adversely affect*" Snake River sockeye salmon "*May affect and likely adversely affect*" bull trout. "*May affect, but not likely to adversely affect*" bald eagle.	"*May affect and likely adversely affect*" bull trout. "*May affect, but not likely to adversely affect*" bald eagle. "No effect" on Ute ladies'-tresses, Spalding's silene, Canada lynx, and gray wolf. Minor, negative, short-term impacts to food sources (macroinvertebrates) for aquatic species in a 73.4 acre dredging footprint (Ports of Lewiston and Clarkston), no long-term effects anticipated as they would rapidly recolonize. A dredging operation could increase ammonia levels; however, any short-term effects would be minimized due to working during winter when less of the toxic form of ammonia and fewer fish present.	Potential minor, long-term, positive effect from creation of up to 2.9 acres of higher- quality shallow-water salmonid habitat plus 3 acres of slope (considered lesser-quality). This type of construction also reduces the suitability of the habitat for resident fish (i.e., predators). Increased passage times through the reservoirs also may increase the predation rate on juvenile fish in the reservoirs. A dredging operation could increase ammonia levels; however, any short-term effects would be minimized due to working during winter when less of the toxic form of ammonia and fewer fish present.	Minor, negative, short-term effect to survival of juvenile salmon and steelhead attributed to lack of barge transportation during critical times. Minor, positive, short-term, effect due to increase in water velocity from 1.3 to 5 fps in upper 1/3 of Lower Granite reservoir; however, would likely not compensate for loss in survival due to no smolt collection and transport from the dams. Minor, negative, short-term impacts due to sediment flushing would create large turbidity plumes at a high frequency for up to 6 weeks, with likely impacts to juvenile salmonids, including disruptions to biological functions and habitat accessibility (stranding) and creating stress and some reduced feeding and growth.

Resource	Alternative 1 No Action	Alternative 2 Maintenance Dredging with Beneficial Use of Material	Alternative 3 Maintenance Dredging with Traditional In-water Disposal	Alternative 4 Navigation Objective Reservoir Operation/High-spot Dredging	Alternative 5 Drawdown/Sediment Flushing and Dredging
Threat-ened and Endan-gered Species continued		"*No effect"* on Ute ladies'-tresses, Spalding's silene, Canada lynx, and gray wolf. A dredging operation could increase ammonia levels; however, any short-term effects would be minimized due to working during winter when less of the toxic form of ammonia and fewer fish present. Critical habitat located at or near the navigation lock approaches is not anticipated to have impacts since the areas have been disturbed within the last 6 years, areas are not suitable for spawning, and surveys have found no redds in those areas.	Minor, negative, short-term impact due to salmon and steelhead from increased turbidity as it may cause stress by accelerating foraging rates among juvenile salmon.	"*May affect, and likely adversely affect*" Snake River fall-run chinook, Snake River spring/summer-run chinook, and Snake River basin steelhead, but no jeopardy expected for ESA-listed salmonids in relation to 2004 FCRPS BiOp. "*May affect but not likely to adversely affect*" Snake River sockeye salmon "*May affect and likely adversely affect*" bull trout. "*May affect, but not likely to adversely affect*" bald eagle. *"No effect"* on Ute ladies'-tresses, Spalding's silene, Canada lynx, and gray wolf.	Minor to moderate, positive, 6 week long effect to juvenile salmonid reach survival due to large turbidity plume masking predatory resident fish from locating and capturing juvenile salmonids. A dredging operation could increase ammonia levels; however, any short-term effects would be minimized due to working during winter when less of the toxic form of ammonia and fewer fish present. Minor, positive, short-term effect from creation of up to 3.7 acres of higher-quality shallow-water rearing habitat at a depth of 0 to 10 feet and up to 16 acres of lesser-quality shallow-water habitat for salmonids. This type of habitat construction reduces the type of habitat favored by predatory species.

Resource	Alternative 1 No Action	Alternative 2 Maintenance Dredging with Beneficial Use of Material	Alternative 3 Maintenance Dredging with Traditional In-water Disposal	Alternative 4 Navigation Objective Reservoir Operation/High-spot Dredging	Alternative 5 Drawdown/Sediment Flushing and Dredging
Threat-ened and Endan-gered Species Continued					Minor, short-term negative impact to food sources (macroinvertebrates) for juvenile salmonids in a dredging footprint up to 73.4 acres (Ports of Lewiston and Clarkston), although no long-term effects anticipated as they would rapidly recolonize. Minor, negative, short-term impacts due to juvenile salmon increased spill with increased TDG (in 1992 levels ranged as high as 125-134 percent during drawdown) and high levels of suspended solids. "*May affect, and likely to adversely affect*" Snake River fall-run chinook, Snake River spring/summer-run chinook, and Snake River basin steelhead, possible jeopardy determination for ESA-listed salmonids in relation to 2004 FCRPS BiOp. "*May affect but not likely to adversely affect*" Snake River sockeye salmon.

Resource	Alternative 1 No Action	Alternative 2 Maintenance Dredging with Beneficial Use of Material	Alternative 3 Maintenance Dredging with Traditional In-water Disposal	Alternative 4 Navigation Objective Reservoir Operation/High-spot Dredging	Alternative 5 Drawdown/Sediment Flushing and Dredging
Threat-ened and Endan-gered Species continued					"M*ay affect and likely adversely affect*" bull trout. "*May affect, but not likely to adversely affect*" bald eagle. " No effect" on Ute ladies'-tresses, Spalding's silene, Canada lynx, and gray wolf.
Cultural Resources	Continued, minor, negative, long-term effects but no additional impacts anticipated above current conditions.	Known submerged cultural properties would be avoided during dredging and disposal activities.	Known submerged cultural properties would be avoided during dredging and disposal activities.	Minor, positive, short-term effect from a decrease in the rate of cultural site exposure.	Potential minor, negative long-term impacts as may destroy some cultural resources through increasing cut-bank erosion due to wave action and site vandalism. Minor, negative, short-term impact due to increase the rate of cultural site exposure.

Resource	Alternative 1 No Action	Alternative 2 Maintenance Dredging with Beneficial Use of Material	Alternative 3 Maintenance Dredging with Traditional In-water Disposal	Alternative 4 Navigation Objective Reservoir Operation/High-spot Dredging	Alternative 5 Drawdown/Sediment Flushing and Dredging
Recreation	Potential minor, negative, long-term effects as recreation sites and boat access continue to silt in and become inaccessible. Direct, moderate, negative impact to tourism (i.e., tour boats).	Potential minor, negative, long-term effects as recreation sites and boat access continue to silt in and become inaccessible. Minor, short-term, negative impact on access to portions of the river for recreational boats near dredging and disposal activities. Minor, short-term, negative impact to steelhead fishing as turbidity plume from dredging may discourage steelhead from moving upriver or discourage fisherman in trying to catch fish.	Potential minor, negative, long-term effects as recreation sites and boat access continue to silt in and become inaccessible. Minor, short-term negative impact on access to portions of the river for recreational boats near dredging and disposal activities. Minor, short-term, negative impact to steelhead fishing as turbidity plume from dredging may discourage steelhead from moving upriver or discourage fisherman in trying to catch fish.	Minor, positive, short-term effect as more channel depth is available for recreational craft and at recreation facilities. Minor, short-term, negative impact on access to portions of the river for recreational boats near dredging and disposal activities. Minor, short-term, negative impact to steelhead fishing as turbidity plume from dredging may discourage steelhead from moving upriver or discourage fisherman in trying to catch fish.	Direct, minor, negative, short-term impact to river recreation as water surface elevation decreases below MOP and recreation sites and boat ramps become unusable. Most water-based recreation facilities would be adversely affected for up to 6 weeks due to lower water elevations and during the winter dredging period. Minor, short-term, negative impact on access to portions of the river for recreational boats near dredging and disposal activities. Minor, short-term, negative impact to steelhead fishing as turbidity plume from dredging operation may discourage steelhead from moving upriver or discourage fisherman in trying to catch fish. Potential moderate, negative, short-term structural damage to some boat docks and marinas as the reservoirs are drawn down.

Resource	Alternative 1 No Action	Alternative 2 Maintenance Dredging with Beneficial Use of Material	Alternative 3 Maintenance Dredging with Traditional In-water Disposal	Alternative 4 Navigation Objective Reservoir Operation/High-spot Dredging	Alternative 5 Drawdown/Sediment Flushing and Dredging
Socio-economics and Naviga-tion	Major, negative, long-term effects due to increase in economic impacts and decreased safety to barge/tow operators as sediment continues to build up and continuing increase in navigation hazards and risking life and property damage. Moderate, negative, short-term impacts if more barges used to carry the same amount of cargo; would directly impact regional economy by increasing the cost of shipping cargo (estimated 5-6 percent increase per 6-inch loss of draft).	Major, positive, long-term effect with increased channel depths in areas where commercial navigation users have had difficulty operating safely. Moderate, positive, short-term effect as navigation operators would not need to use light loading to overcome channel depth issues. Possible moderate, positive, short-term effect by reducing modified approach, loading and unloading of tugs/barges. Potential for minor, negative, short-term impacts to the Lewiston Levee System, however, no flooding is anticipated.	Major, positive, long-term effect with increased channel depths in areas where commercial navigation users have had difficulty operating safely. Moderate, positive, short-term effect as navigation operators would not need to use light loading to overcome channel depth issues. Possible moderate, positive, short-term effect by reducing modified approach, loading and unloading of tugs/barges. Potential for minor, negative, short-term impacts to the Lewiston Levee System, however, no flooding is anticipated.	Major, positive, long-term effect with increased channel depths in areas where commercial navigation users have had difficulty operating safely. Moderate, positive, short-term effect as navigation operators would not need to use light loading to overcome channel depth issues. Possible moderate, positive, short-term effect by reducing modified approach, loading and unloading of tugs/barges. Potential for minor, negative, short-term impacts to the Lewiston Levee System, however, no flooding is anticipated	Moderate, negative, short-term effect to barge passage for up to 6 weeks resulting in higher barging costs and an unreliable transportation system for commodity movement. Major, positive, long-term effect with increased channel depths in areas where commercial navigation users have had difficulty operating safely. Moderate, positive, short-term effect as navigation operators would not need to use light loading to overcome channel depth issues. Minor, negative, short-term impacts due to lower-head elevation during flushing resulting in lower power generation if sufficient water is not available to replace water used in flushing.

Resource	Alternative 1 No Action	Alternative 2 Maintenance Dredging with Beneficial Use of Material	Alternative 3 Maintenance Dredging with Traditional In-water Disposal	Alternative 4 Navigation Objective Reservoir Operation/High-spot Dredging	Alternative 5 Drawdown/Sediment Flushing and Dredging
Socio-economics and Naviga-tion continued	Moderate, negative, long-term impact to region by reducing tourism. Indirect effects to hotel, restaurants, other ancillary services to tour industry. If no action is continued for an indefinite amount of time, there is potential for major, negative, long-term effects to regional infrastructure as more cargo is shipped on rail and public roads; however, the effects to rail and trucking industry, supporting industry, and destination ports would be a positive impact. Major, negative, long-term impacts to Port of Lewiston and Clarkston and their supporting industry.				Moderate, negative, short-term adverse effect to navigation system for up to 6 weeks. Direct, adverse effect due to interruption of barge traffic. Minor, negative, short-term impacts if flushing is only partially effective. It is also unpredictable in the confluence area, and may cause more shoaling further downstream, which might require further dredging than described in the alternatives 2 and 3. Possible moderate, positive, short-term effect by reducing modified approach, loading and unloading of tugs/barges. Minor, negative, short-term increase in economic costs incurred to repair anticipated damages to embankments and facilities due to drawdown. Potential for minor, negative, short-term impacts to the Lewiston Levee System, however, no flooding is anticipated.

Resource	Alternative 1 No Action	Alternative 2 Maintenance Dredging with Beneficial Use of Material	Alternative 3 Maintenance Dredging with Traditional In-water Disposal	Alternative 4 Navigation Objective Reservoir Operation/High-spot Dredging	Alternative 5 Drawdown/Sediment Flushing and Dredging
Socio-economics and Naviga-tion continued	Potential for minor, negative, short-term impacts to the Lewiston Levee System, however, no flooding is anticipated.				

Note on Impact Terms.

Type Negative or Positive.

Duration: Short-term – less than 3 years.
Long-term – greater than 3 years.

Intensity: Negligible – (i.e., an action that could result in a change to a resource, but the change would be so small that it would not be of any measurable or perceptible consequence.)
Minor – (i.e., an action that could result in a change to a resource. The change would be measurable but small and localized and of little consequence.),
Moderate – (i.e., an action that would result in some change to a resource. The change would be measurable and of consequence but would be of moderate scale and would occur over a limited area)
Major – (i.e., an action that would result in a significant change to a resource. The change would be measurable and either result in a major beneficial or major negative impact upon a resource. The impacts or benefits are very significant and occur over a wide geographic area.)

In comparing the best available information with regard to each alternative, the Corps determined that the Alternative 2 -Maintenance Dredging with Beneficial Use of Dredged Material best satisfies the purpose and selected it as the preferred alternative. A brief summary of each of the other four alternatives follows.

Alternative 1 - No Action is the baseline case to compare impacts of all other alternatives. The economic viability of the navigation channel would continue to be compromised without maintenance in the near-term to restore the dimensions of the authorized channel. Although light loading was suggested as an alternative, it is not an alternative to routine channel maintenance because it would not maintain the dimensions of the authorized navigation channel. There would also be continuing coordination for deviation from operating the reservoirs at the lower end of their operating range (minimum operating pool or MOP) during spring and summer fish outmigration. Operating the reservoirs at MOP is the preferred operating range for the lower Snake River reservoirs in the 2004 Federal Columbia River Power System (FCRPS) Biological Opinion (BiOp). This deviation means raising the water level to provide increased water depth over the high spots caused by sediment buildup in the channel. The Final Updated Proposed Action (UPA) implemented in the FCRPS and the subsequent 2004 FCRPS BiOp[1] allows deviation from MOP if needed to meet other authorized purposes of the dams and reservoirs. Also, the Corps has no authority to direct barge owners/operators to light load. There could be indirect adverse impacts to the aquatic environment if barge operations disturb the river bottom either by groundings or hydraulic disturbance due to low depths. Since some of the cargo includes petroleum products, fertilizers, and other chemicals, grounding could result in the spilling of harmful cargo. Due to current conditions, the Corps believes that the maintenance of the channel is a necessity. Taking no action would not address the Corps' mission to provide for navigation, and this alternative was not selected.

Alternative 2 – Maintenance Dredging with Beneficial Use of Dredged Material is discussed below in the Preferred Alternative section.

Alternative 3 - **Maintenance Dredging with Traditional In-water Disposal** would have the same effects as the preferred alternative except for the disposal method and the addition of RM 119 as the deep water disposal site for silt. The disposal site above Knoxway Canyon (RM 116) has the capacity for the 450,000+ cy used for habitat construction. Disposal of the dredged material would produce resting/rearing habitat, but it would be at depths from 15 to 20 feet below the water surface depending on the pool elevation. While this may be an improvement from the mid-depth elevations the disposal embankment rests on, NOAA Fisheries does not regard habitat at this depth as desirable

[1] On May 26, 2005, in the District Court for the District of Oregon finding the 2004 FCRPS BiOp invalid. The Corps has reviewed the ruling in light of the issues identified in the opinion and believes the research, conclusions, and recommendations in the EIS are based on the best science and information available and still valid.

as resting/habitat in the zone between 0- and 10-foot depths. Therefore, Alternative 3 was not selected as the preferred dredging and disposal alternative.

Alternative 4 - Navigation Objective Reservoir Operation with High-spot Dredging would have less physical impact to critical habitat in the lower Snake River than the other alternatives. Operating the reservoirs at the upper end of their operating range would not disturb any sediment or result in any in-water activities that may have an adverse impact on aquatic species. The limited dredging that would be performed would be the minimum deemed necessary to provide a 14-foot channel after the spring 2005 runoff. This dredging would be much less than that associated with the other two dredging alternatives. The disposal would be in-water and would be used to provide shallow-water habitat for ESA-listed fish. Impacts from the dredging and disposal activities would be similar to those of the Maintenance Dredging with Beneficial Use of Dredged Material Alternative, but on a smaller scale.

Although this Navigation Objective Reservoir Operation with High-spot Dredging alternative meets the purpose, it is inconsistent with FCRPS BiOp regarding the preferred operating ranges for the lower Snake River reservoirs. The concern relates to the theory that operating above MOP may adversely impact juvenile salmonid migration by decreasing water velocity in the reservoirs. According to the resource agencies, decreased water velocity may increase travel time for juvenile salmonids, and may decrease overall survival of the juveniles in the Columbia River system by delaying their arrival to the lower Columbia River and ocean. Increased passage times through the lower Snake River reservoirs also may increase the predation rate on juvenile fish in the reservoirs.

Previous short-term deviations from MOP for navigation have been undertaken through the adaptive management process in the 2000 and 2004 FCRPS BiOps in coordination with the Technical Management Team (TMT); however, those requests were for a lesser magnitude of elevation change than the ranges proposed in this alternative. This alternative would also reduce the amount of substrate material available for building additional juvenile salmonid resting and rearing habitat, a valuable beneficial use. Although the Corps is not convinced that this alternative would result in more negative environmental effects, the Corps will follow the Final UPA implemented in the FCRPS and the subsequent 2004 FCRPS BiOp. This alternative was not selected as the preferred alternative.

Alternative 5 - Drawdown/Sediment Flushing and Dredging would be anticipated to have the following impacts: large increase in erosion; damage to embankments and port facilities; a moderate decrease in the water table; total dissolved gas (TDG) levels increasing with extra spill and likely exceeding water quality standards for TDG at a high frequency; uncontrolled movement of contaminants; and exceedances of multiple water quality parameters in the water column, such as turbidity. In addition, the diversion and transport of anadromous salmon and steelhead would be eliminated at Lower Granite for the duration of the drawdown; shoreline vegetation would be impacted; juvenile fish could potentially be stranded in pools; wildlife habitat and resources would be decreased

and degraded; there would be an increased rate of cultural site exposure and impacts from wave erosion, along with a high potential for site vandalism; most water-based recreation facilities would be hampered; navigation access to the lower Snake River locks would be prevented; annual shipping costs would increase; substantial capital cost would be required prior to drawdown; and there would be some impacts to the local economy from reduced employment and regional income.

There is no control over where material is picked up from the river channel and where it is redeposited. Although a 10- to 15-foot drawdown would have some effectiveness in moving sediment, environmental impacts during the flushing would occur.

Environmental effects include disruption of biological functions and habitat accessibility for both aquatic and terrestrial resources. With the inability to control how much material would move or where it would go, sediment could resettle in the channel, over spawning beds or other valuable habitat. The material that goes into suspension during a flushing event may have an adverse effect on ESA-listed species and fish passage.

The dredging performed would be the minimum deemed necessary to provide a 14-foot channel after the spring runoff. This dredging is anticipated to be less than that associated with the two maintenance dredging alternatives. Depending on the amount of material available, the disposal would be in-water and would be used to provide shallow-water habitat for ESA-listed fish. Impacts from the dredging and disposal activities would be similar to those of the Maintenance Dredging with Traditional In-water Disposal Alternative, but on a smaller scale.

In summary, because of the potential adverse biological impacts, impacts to physical structures, combined with the expected economic impacts of implementation, the Drawdown/Sediment Flushing and Dredging Alternative was not selected as the preferred alternative.

PREFERRED ALTERNATIVE

In comparing the best available information with regard to each alternative, the Corps determined that Alternative 2, Maintenance Dredging with Beneficial Use of Dredged Material, best satisfies the purpose and need when selecting it as the preferred alternative. The benefits anticipated from implementation of this alternative include lessened economic effects on the navigation industry, the reduction of the conditions considered to be unsafe, such as groundings, barge accidents, and possible cargo spills and the creation of shallow-water habitat for listed salmonids. This alternative would produce results in the near future after the 2005 spring runoff and provide a 14-foot navigation channel and port berthing area access.

This alternative would have short-term, adverse impacts, primarily due to mobilizing sediments that may increase turbidity and ammonia levels during dredging and disposal. The dredging and disposal operation contains measures to minimize and avoid these

effects, including implementing the operation during winter when there is less of the toxic form of ammonia and fewer fish are present, limiting the intensity and extent of the turbidity plume, and requiring monitoring for ammonia and turbidity. There would be minor, short-term adverse impacts to food sources (macroinvertebrates) for aquatic species, although no long-term effects are anticipated. Based on previous investigations, it is expected that disturbed substrates will be rapidly recolonized by macroinvertebrates. This alternative "may affect and would likely adversely affect" Snake River fall chinook, Snake River spring/summer-run chinook, Snake River basin steelhead, and bull trout, although no jeopardy is expected to these listed species.

When compared to the other alternatives, the Corps considered Alternative 2 to best meet navigation needs while minimizing environmental impacts and maximizing environmental benefits. This alternative would provide a 14-foot channel in the critical areas while Alternative 1 would not. Compared with Alternative 3, this alternative would provide better quality juvenile salmon habitat and would use all of the dredged material for beneficial use rather than disposing of the silt in a deep site where it would provide no benefit. Compared with Alternative 4, the preferred alternative would have more dredging, both in area and quantity of dredged material, which could be considered to be more of an adverse effect on the aquatic environment. Although both alternatives would result in the creation of about 3 acres of higher-quality salmon habitat, the preferred alternative would create a new area of habitat further downstream, which would address the need to provide a better distribution of resting/rearing habitat in the reservoir. The preferred alternative would have less of an adverse impact on water quality and infrastructure than Alternative 5.

The Corps prepared a new Biological Assessment (BA) (appendix A of the EIS) and Monitoring Plan (appendix D of the EIS), incorporating the most recent fall Chinook salmon and other salmonid stock life history, habitat monitoring information, and operational responses compiled since 2003-2004. An addendum highlighting the most recent scientific findings and the reduction in scope (i.e., elimination of maintaining boat basins and recreation areas and elimination of constructing any riparian planting bench at the disposal site) would not modify the effects determination in the NOAA Fisheries BiOp, *Routine Maintenance Dredging in the Lower Snake River Reservoirs, Snake River Basin, Asotin, Garfield, Walla Walla, and Whitman Counties, Washington, Nez Perce County, Idaho* (NOAA Fisheries Nav. Maint. BiOp 2004b). All habitat construction would be shallow water rearing habitat for fall chinook salmon. Based upon the information in the revised BA and coordination utilizing the addendum, NOAA Fisheries indicated that re-initiation of consultation was not warranted because their existing and standing 2004 Nav. Maint. BiOp for maintenance activities was valid with adequate coverage for a new preferred alternative that did not substantially vary in application or effect from that evaluated in the existing 2004 BiOp for maintenance activities. The reduction in scope of the proposed action resulting in minimal changes in negative effects should not result in effects to the evolutionary significant units of endangered Snake River sockeye salmonids beyond those effects anticipated in and authorized by the standing 2004 Nav. Maint. BiOp for maintenance activities. Conservation measures

consistent with the 2004-2005 consultation's Nav. Maint. BiOp for maintenance activities would be implemented in the 2005-2006 action to minimize direct effects and incidental take.

It is believed that these potential impacts can be reduced with early detection of problems. A high-quality monitoring plan associated with this alternative addresses the impacts of the dredging and disposal on water quality and on fish use (salmonids in particular) of the work areas, and determines physical stability or potential movement of the disposed material. The purpose of the monitoring is to:

- Address issues related to ESA consultation;
- Comply with the terms and conditions of the Clean Water Act, Section 401, Water Quality Certification.
- Gather information for adaptive management in planning future dredging and disposal activities and for mainstem habitat-related activities.

The monitoring plan for the maintenance dredging evaluates several issues associated with the proposed dredging and disposal. These issues include water quality, biological impacts, and structural stability of the disposed material. This plan includes water quality monitoring that has been historically conducted for maintenance dredging projects in the lower Snake River, as well as addressing concerns raised in ESA consultations. These concerns include potential for releases of ammonia, viability of fish habitat, and stability of the disposal embankment.

There are inherent uncertainties in any cumulative impact analysis. However, based on available information, the incremental impact of the preferred alternative, when added to the impacts of the other projects and developments described in this section, is not anticipated to be significant. One of the fundamental reasons is the minimal adverse impact of the preferred alternative

The Corps, after consideration of economic, environmental, technical, and other factors, selected this alternative as best fulfilling its statutory mission and responsibilities.

1. INTRODUCTION

1.1. Purpose and Need

The U.S. Army Corps of Engineers (Corps), Walla Walla District, prepared this Environmental Impact Statement (EIS) to evaluate maintenance of selected areas in the Federal navigation channel and berthing areas at certain public port facilities that need immediate maintenance on the lower Snake and Clearwater Rivers in Washington and Idaho. The EIS identifies a preferred alternative, and the actions considered should be effective for a period of approximately 3 years following implementation. This period corresponds with the typical frequency of past maintenance activities. The U.S. Environmental Protection Agency (EPA), Region 10, is a cooperating agency for the EIS.

The Corps has the responsibility to operate and maintain the authorized Federal navigation channel in the lower Snake River from the McNary Lock and Dam (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 just past 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 (PL) 79-14)] and approved March 2, 1945, in accordance with House Document 704, 75th Congress, 3rd Session. (See section 1.2 for specific project authorities.) 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. Based on the authorizing documents and subsequent related Congressional documents, the Corps interprets that Congress intended for the Corps to maintain the navigation channel year-round. In 1991, Congress reiterated its intent to provide for navigation in the Columbia and Snake River system (102 Senate Report 80). (See section 1.5.1.1.). Figure 1-1 is a map showing locks and dams on portions of the Columbia, lower Snake and Clearwater Rivers. The designated Federal navigation channel dimensions are increased beyond typical dimensions in the turning basins in front of port berthing areas in accordance with navigation practice as authorized in the United States Code (U.S.C.) at 33 U.S.C. § 562: "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 of the free movement of boats."

Historically, the Corps routinely used dredging actions to maintain the authorized dimensions of the navigation channel. Typically, the Corps performed maintenance dredging every 3 to 5 years. However, the Corps has not performed maintenance dredging in the channel since the winter of 1998-1999, when the Lower Monumental Lock and Dam (Lower Monumental) navigation lock approach was dredged (see section 1.4).

Figure 1-1. Regional Map

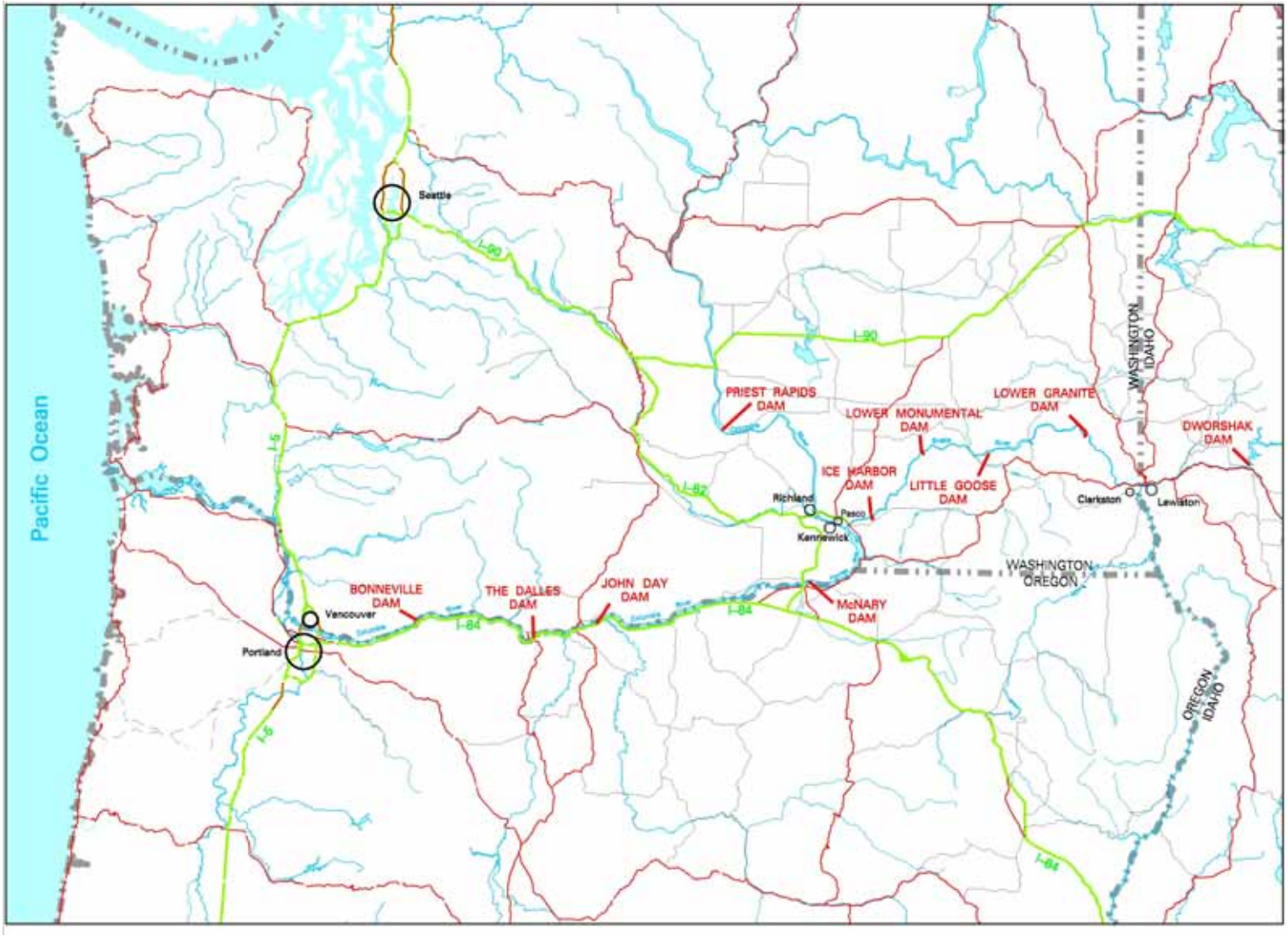
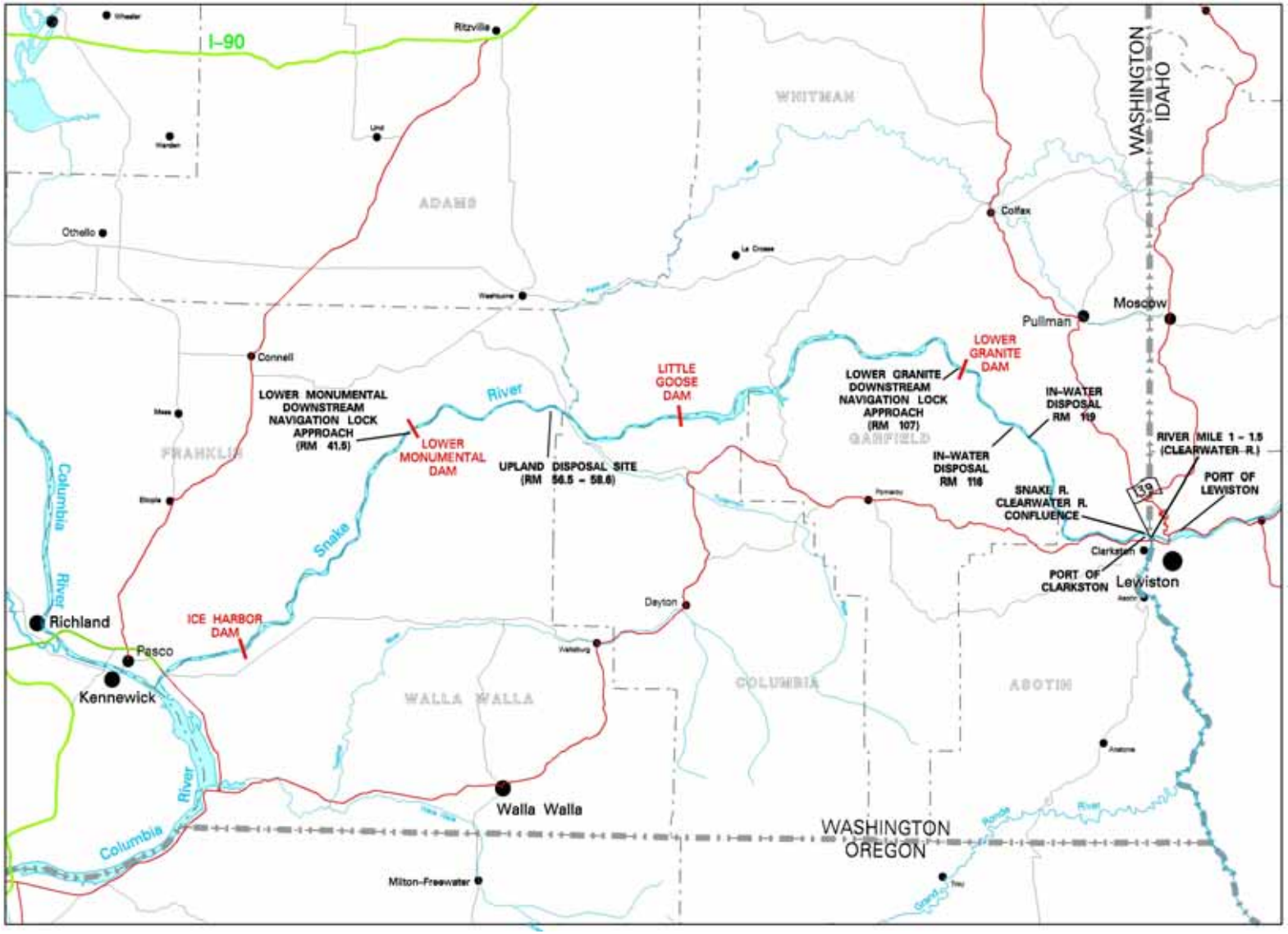


Figure 1-2. Project Area Map



The purpose of the routine channel maintenance is to provide a 14-foot depth throughout the designated Federal navigation channel in the project area and to restore access to selected port berthing areas. Channel maintenance would facilitate navigation and commodity movement and increase public safety.

Sediment is deposited in the navigation channel primarily during spring runoff periods. Over time, the sediment buildup has reduced the proportion of the channel with adequate depth and created unsafe navigation conditions. Because channel maintenance has not occurred since 1998-1999, shoaling has become critical in some channel locations. Currently, these locations have been identified as: (1) the downstream navigation lock approach to Lower Monumental; (2) the downstream navigation lock approach to Lower Granite Lock and Dam (Lower Granite); (3) the Federal channel in the vicinity of the confluence of the Snake and Clearwater Rivers; and (4) the berthing areas at the Ports of Clarkston and Lewiston (see figure 1-2). Survey results from August 2004 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 and Clearwater River confluence area, has risen from approximately 38 acres in 2003 to approximately 52 acres in 2004.

Water depths in the Federal navigation channel near the Port of Clarkston berthing area and in the turning basin near the Port of Lewiston berthing area are currently much less than the 14-foot authorized depth, and are now as shallow as 8.5 feet and 10.6 feet, respectively, based on a MOP water surface elevation. Navigation channel depths less than 14 feet substantially impact access to nearby port facilities and, at some locations, could impede passage into the upper parts of the system.

Because of the limited depths in the channel, as well as in the port berthing areas, some port facilities have been forced to operate at reduced capacity. Channel depths less than 14 feet impact the navigation industry because of an increased safety risk, increased risk of damage to equipment, and increased risk of grounding. Grounding can cause damage to vessels, which can lead to sinking or capsizing due to holes or rips in hulls, and puts crews and passengers at risk. On commercial barges, grounding also can result in leakage or loss of cargo into the river. This is a substantial environmental concern since petroleum products and fertilizer are among the top five commodities carried on the Snake and Columbia Rivers.

On several occasions during the past few years, the Corps has unsuccessfully attempted to maintain the authorized 14-foot channel depth. In July 2002, the Corps, with the EPA as a cooperating agency, completed a *Dredged Material Management Plan/Environmental Impact Statement* (Corps 2002a). The plan addressed a proposed short-term maintenance dredging and disposal action to be completed in the winter of 2002-2003, as well as actions to occur during the course of a 20-year period. The Corps was enjoined from performing the short-term maintenance dredging on December 12, 2002 [*National Wildlife Federation, et al. v. National Marine Fisheries Service, et al*., 235 F. Supp. 2d 1143 (W.D. Wash. 2002)] and withdrew the plan's Record of Decision in April 2003.

The Corps conducted additional environmental analyses and provided information addressing the impacts of maintenance dredging and other alternatives in a *Supplemental Environmental Analysis for Purposes of 2003-2004 Dredging, Lower Snake and Clearwater Rivers, Washington and Idaho* (Corps 2003a). The Corps was again enjoined from performing the maintenance dredging on November 1, 2004 [*National Wildlife Federation, et al. v. National Marine Fisheries Service, et al*. No. C02-2259L (W.D. Wash. 2004)].

In an effort to consolidate and update the best information, the Corps developed this EIS to document the analysis, evaluation, National Environmental Protection Act (NEPA) compliance efforts, and Endangered Species Act (ESA) compliance efforts related to the selection of a preferred alternative that addresses the continuing purpose and outstanding need associated with navigation maintenance on the lower Snake and Clearwater Rivers.

1.2. Project Authority

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 (PL 79-14) and approved March 2, 1945, in accordance with House Document 704, 75th Congress, 3rd Session. The projects authorized under the statute include:

- Ice Harbor Lock and Dam (Ice Harbor) - Lake Sacajawea, Snake River, Washington.
- Lower Monumental - Lake Herbert G. West, Snake River, Washington.
- Little Goose Lock and Dam (Little Goose) - Lake Bryan, Snake River, Washington.
- Lower Granite - Lower Granite Lake, Snake River, Washington.

The projects are authorized for multiple uses, which include hydropower, navigation, recreation, fish and wildlife, and irrigation. The four lower Snake River projects are part of the Federal Columbia River Power System (FCRPS). Subsequent to the original authorizing statutes or enabling legislation, other statutes also addressed specific aspects of these projects. The navigation channel was described and dimensions were increased in the Flood Control Act of 1962 (Public Law 87-874) as, "… the depth and width of the authorized channel in the Columbia-Snake River barge navigation project shall be established as fourteen feet and two hundred and fifty feet, respectively, at minimum regulated flow."

The Water Resources Development Act of 1992 (PL 102-580), Section 109, authorized the Secretary of the Army to maintain navigation access to and berthing areas at all currently operating public and private commercial dock facilities associated with or having access to the Federal navigation project at a depth commensurate with the Federal navigation project (see section 1.5.1.1).

The original enabling legislation for the Lower Granite project included construction and maintenance of levees as appurtenant facilities of the authorized project. This provides for normal operating water surface elevations from 733 to 738 feet at National Geodetic Vertical Datum 1929 (NGVD29). All elevations in the EIS are NGVD29 in the Lewiston, Idaho, and Clarkston, Washington, areas. The backwater levee system was constructed as

part of the Lower Granite project in lieu of relocating the business district of Lewiston, Idaho. It was designed as an upstream extension of the dam to allow the Lower Granite reservoir to pass an SPF event while protecting Lewiston from inundation by such a flood.

1.3. Project Area

The project area for this EIS extends approximately 140 miles upriver from the confluence of the lower Snake River with the Columbia River near Pasco, Washington, through the confluence of the Snake and Clearwater Rivers and up the Clearwater River past the Port of Lewiston located at Clearwater RM 1.3 (figure 1-1) up to RM 2. This includes the four lock and dam projects on the lower Snake River system, including the reservoirs and navigation channels on the upper portion of the inland waterway (i.e., Ice Harbor, Lower Monumental, Little Goose, and Lower Granite). The characteristics of these projects are shown in table 1-1.

Table 1-1. Characteristics of the Lower Snake River Projects

Dam	Location (Snake RM[1])	Reservoir Name	Reservoir Capacity[2] (acre-feet)	Total Reservoir Capacity (acre-feet)	Reservoir Elevation[3] (NGVD29)
Lower Granite	107.5	Lower Granite Lake	43,000	483,800	733 to 738
Little Goose	70.3	Lake Bryan	49,000	565,200	633 to 638
Lower Monumental	41.6	Lake Herbert G. West	20,000	432,000	537 to 540
Ice Harbor	9.7	Lake Sacajawea	25,000	406,500	437 to 440

Notes:
1. River mile (RM).
2. Reservoir capacity within the normal operating range.
3. Normal operating range. For each project, MOP is the low end of this elevation range.
Each project is considered run-of-river, which means that, in general, on a daily basis, the inflow to the reservoir is the same as the outflow from the dam.

The project area is part of the Columbia-Snake Inland Waterway. The waterway is a 465-mile-long water highway formed by the eight mainstem dams and lock facilities on the lower Columbia and Snake Rivers. The waterway provides inland waterborne navigation up and down the river from Lewiston, Idaho to the Pacific Ocean. This system is used for commodity shipments from inland areas of the Northwest and as far away as North Dakota.

1.4. Navigation History

The Columbia and Snake Rivers have long been major transportation corridors for humans. Before the arrival of Euroamericans, the rivers served as travel routes for Native Americans. During its journey west to the Pacific Ocean in the early 1800s, the Lewis and Clark Corps of Discovery traveled extensively along the Columbia and Snake Rivers. As the only near sea-level passage through the Cascades, the Columbia River has consistently provided a key linkage from the ocean to the eastern interior portions of the Pacific Northwest. Ocean-going vessels historically sailed upriver to Vancouver, Washington, and Portland, Oregon, and then up the Willamette River to Oregon City, Oregon. When gold was discovered in Idaho

in 1862, steamers began traveling from The Dalles, Oregon, to Lewiston, Idaho. Navigation between the Columbia and Snake Rivers became possible with construction of the Cascades and Dalles-Celio canals in 1896 and 1915, respectively. Today, the Columbia and Snake Rivers provide a major water transportation route for commercial shipping.

Based upon congressional authorities and funding, the Corps has maintained and operated navigational improvements on the lower Snake River, including channels, locks, and dams providing access to ports, moorage, and recreational areas. Each of the projects is authorized to provide navigation facilities, including locks with dimensions of 86 feet in width and over 665 feet in length to allow the passage of a tug with the four-barge tow commonly used in river navigation. These locks and dams provide from 98- to 100-foot lifts, raising navigation from elevation 340 feet downstream of Ice Harbor to elevation 738 feet in the Lower Granite reservoir.

A common feature of the Snake River project is that the base of the lock gates rest against concrete sills. Sill depths at the navigation locks limit the passage of commercial or recreational vessels on the Snake River. At the projects, upstream sills are 15 feet below MOP. Operating the reservoirs at no lower than MOP provides the clearance needed over the sills to safely accommodate a loaded barge. The navigation industry built its port facilities, designed its commercial shipping fleet, and manages barge capacity around the parameters of the authorized 14-foot channel clearance.

Barge transportation of commodities accounts for the majority of commercial shipping activity on the shallow-draft portion of the Columbia-Snake Inland Waterway. Commodities are transported through the waterway system on non-powered barges propelled by tugboats. In addition to barge transportation, commercial operations include some passenger service, including cruise lines operating tour boats between Portland and Clarkston.

Products shipped on the shallow-draft segment of the river system consist principally of grain, wood products, logs, petroleum, chemicals, and other agricultural products. Bulk shipments, dominated by grain, make up much of the waterborne traffic traveling downstream. A number of commodities, principally non-grain agricultural products, food products, and paper products are shipped via container. Historically, the bulk of upriver barge shipments have been petroleum products.

The Corps has historically used periodic dredging at several locations on the Snake River to maintain the authorized channel depth. Table 1-2 provides a partial history of Federal dredging in the lower Snake River. Some of these activities were undertaken to restore the authorized depth in the Federal navigation channel. Others were directed toward removing sediment from berthing areas (see section 1.5.1.1) turning basins and access channels for individual ports. The main port areas were dredged under local port direct funding agreements. The Corps also maintains recreation facilities as part of the projects and has periodically dredged boat launches and swimming beaches to remove sediment.

Table 1-2. Partial History of Federal/Port Dredging in Lower Snake River

Dredging Location	Year	Purpose	Amount Dredged [cubic yards (cy)]	Disposal
Navigation Channel Ice Harbor, Part I and II, Channel Construction	1961	Navigation	3,309,500	Upland and in-water
Navigation Channel, Ice Harbor Part III, Channel Construction	1962	Navigation	120,000	Upland and in-water
Downstream Navigation Channel, Ice Harbor	1972	Navigation	80,000	Upland and in-water
Downstream Approach, Navigation Channel, Lower Monumental	1972	Navigation	25,000	Upland
Navigation Channel Downstream of Ice Harbor	1973	Navigation	185,000	Upland and in-water
Downstream Approach Channel Const., Lower Monumental Lock	1973	Navigation	10,000	Upland
Downstream Approach Channel Construction, Ice Harbor Lock	1978	Navigation	110,000	Upland and in-water
Downstream Approach Channel Construction, Ice Harbor Lock	1978 1981/82	Navigation	816,814	Upland and in-water
Various Boat Basins, Swallows Swim Beach, Lower Granite Reservoir (Corps)	1975-1998	Recreation	20,000	Upland sites
Port of Lewiston – Lower Granite Reservoir (Corps)	1982	Navigation/Maintain Flow Conveyance Capacity	256,175	Upland sites
Port of Clarkston – Lower Granite Reservoir (Corps)	1982	Navigation	5,000	Upland sites
Downstream Approach Channel Construction, Ice Harbor Lock	1985	Navigation	98,826	In-water
Confluence of Clearwater and Snake Rivers (Corps)	1985	Maintain Flow Conveyance Capacity	771,002	Upland site
Port of Lewiston – Lower Granite Reservoir (Corps)	1986	Navigation/Maintain Flow Conveyance Capacity	378,000	Upland sites
Confluence of Clearwater and Snake Rivers (Corps)	1988	Maintain Flow Conveyance Capacity	915,970	In-water
Confluence of Clearwater and Snake Rivers (Corps)	1989	Maintain Flow Conveyance Capacity	993,445	In-water
Schultz Bar – Little Goose (Corps)	1991	Navigation	27,335	Upland site
Confluence of Clearwater and Snake Rivers (Corps)	1992	Maintain Flow Conveyance Capacity	520,695	In-water
Barge Approach Lane, Juvenile Fish Facilities, Lower Monumental	1992	Navigation	10,800	Upland site
Ports of Lewiston (Lower Granite Reservoir), Almota & Walla Walla	1991/92	Navigation	90,741	Upland and in-water
Schultz Bar – Little Goose (Corps)	1995	Navigation	14,100	In-water
Confluence of Clearwater and Snake Rivers (Corps)	1996/97	Navigation	68,701	In-water
Confluence of Clearwater and Snake Rivers (Corps)	1997/98	Navigation	215,205	In-water
Greenbelt Boat Basin, Clarkston – Lower Granite Reservoir	1997/98	Recreation	5,601	In-water
Port of Lewiston – Lower Granite Reservoir (Port)	1997/98	Navigation	3,687	In-water
Port of Clarkston – Lower Granite Reservoir (Port)	1997/98	Navigation	12,154	In-water
Lower Granite Lock Approach	1997/98	Navigation	2,805	In-water
Lower Monumental Lock Approach	1998/99	Navigation	5,483	In-water

1.5. Related Actions and Operational Constraints

1.5.1. Prior Environmental Documentation

The operation and maintenance of the lower Snake River projects, including navigation, recreation, and fish and wildlife facilities, have been addressed in a number of environmental compliance documents since these projects were constructed, including the original EISs for each project, which evaluated routine operation and maintenance activities. The original EIS documents are: *Environmental Impact Statement - Little Goose Lock and Dam* (Corps 1975a); *Final Environmental Impact Statement: Lower Granite Project, Snake River, Wash.* (Corps 1975b); *Lower Monumental: Final Environmental Impact Statement* (Corps 1976); and *Final Environmental Impact Statement: Ice Harbor Operation and Management* (Corps 1979). These documents are incorporated in this EIS by reference.

Additional NEPA documents related to the lower Snake River projects have been prepared as need arose or as conditions or requirements changed, particularly requirements related to salmonids listed under the ESA. Environmental compliance also was updated in response to other statutory obligations.

Prior to 1970, actions taken regarding the lower Snake River projects and navigation channel maintenance do not have NEPA documentation, as NEPA was not in effect until 1970.

The following sections describe the three most recent systemwide EISs with information relevant to lower Snake River navigation.

1.5.1.1. 1992 Columbia River Salmon Flow Measures Options Analysis EIS

The Corps, in cooperation with Bonneville Power Administration (BPA) and the Bureau of Reclamation, prepared the *Columbia River Salmon Flow Measures Options Analysis/EIS* (Corps 1992) on the effects of operational changes at certain Federal multi-purpose water projects in the Columbia River basin. The data collected in the Options Analysis/EIS proved valuable in analyzing drawdown proposals. The actions implemented as a result of this analysis have led to lower pool levels. This, in turn, has had a critical effect on the Corps' ability to maintain authorized depths throughout the navigation system, and has relevance to any analyses that include drawdown. The preferred alternative in the Options Analysis included drafting all four lower Snake River projects to MOP from April 1 to July 31 and conducting a drawdown test. The Corps conducted a 1-month test in March 1992, involving the Lower Granite and Little Goose reservoirs.

In response to the actions recommended by the Options Analysis/EIS, Congress, through the Water Resources Development Act of 1992 (PL 102-580), Section 109, authorized the Secretary of the Army to maintain navigation access to berthing areas at all currently

operating public and private commercial dock facilities. This law covers areas associated with or having access to the Federal navigation project on the Columbia, Snake, and Clearwater Rivers from Bonneville Lock and Dam (Bonneville) to, and including, Lewiston, Idaho. All areas are to be maintained at a depth commensurate with the Federal navigation project.

The 1991 Senate Report (102 Senate Report 80) on the Energy and Water Development appropriation Bill noted the congressional understanding with regard to salmon and navigation when Congress provided not only the authorization but also funded the maintenance activities as they related to the proposed drawdown (one-time funding):

> The Committee understands that the Corps of Engineers in cooperation with the affected States, Bonneville Power Administration, Bureau of Reclamation, Indian tribes, and other affected river users, and consistent with the agreements reached by the salmon summit, has developed and begun to implement a plan designed to facilitate the outmigration of anadromous fish which includes substantially changing river flows and the operation of the projects on both the Snake and Columbia Rivers for extended periods of time at lower reservoir levels. The Committee is concerned that the operation of the projects on the Columbia and Snake River system at these lower pool levels may prohibit navigation access from the channel and operation of existing cargo handling facilities. Failure to preserve our current export facilities at these current operating levels could substantially damage U.S. export capabilities. Therefore, the Committee has included language in the bill providing, on a one-time basis, for maintenance dredging to ensure the operation of these facilities on the Columbia and Snake River system at depths commensurate with the authorized main navigation channel.

Subsequent dredging activities conducted by the Corps in the Snake and Clearwater Rivers associated with non-Federal facilities have been funded by the non-Federal entity requesting the dredging. The Options Analysis/EIS is incorporated by reference because the analyses of the resource areas are comprehensive and are relevant to this EIS.

1.5.1.2. Final Columbia River System Operation Review EIS

The Columbia River System Operation Review (SOR), a joint effort of the Corps, BPA, and the Bureau of Reclamation, was initiated on July 18, 1990 to review multipurpose management of the Columbia-Snake River system and provide a strategy for system operation. The SOR started as a comprehensive, long-term study to review system operations of Federal water resource projects on the Columbia River and its tributaries in view of present and future needs of all users. The study included a technical, social, economic, and environmental analysis of alternatives for operation of the FCRPS. The SOR's scope included 14 Federal projects on the Columbia River and its tributaries (12 operated by the Corps and 2 operated by the Bureau of Reclamation).

With the ESA listings of Snake River sockeye and chinook salmon stocks in 1991 and 1992 (see next section), the SOR took on a different character. It began to focus on the role that system operations could play in survival of the salmon during migration through the system. Because of its responsibility under the ESA for determining the biological consequences of river operations, the National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries) became a key player in the SOR.

Ten functional work groups and four analysis groups conducted work on the SOR. The functional work groups evaluated the impacts of system operation alternatives under consideration for the particular functional area represented by each work group. For example, the anadromous fish work group evaluated the alternatives to determine impacts on anadromous fish, and the water quality work group focused on water quality. Representation on each of the work groups included staff from each of the three lead Federal agencies, in addition to the states, other Federal agencies, utility and other interest groups, the tribes, and the general public. A final EIS for the SOR was completed in November 1995 (BPA et al. 1995). The preferred alternative included the following provisions:

- Spring and summer flow targets for the Snake and Columbia Rivers;
- Refill to flood control levels by early spring;
- Summer draft limits at storage reservoirs;
- Kootenai River white sturgeon operation;
- Drawdown to MOP levels; and
- Increased spill levels limited by dissolved gas.

The Corps signed the SOR *Record of Decision* selecting the preferred alternative in February 1997. The SOR EIS is incorporated by reference because the analyses of the resource areas are comprehensive and are relevant to this EIS.

1.5.1.3. Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement

In February 2002, the Corps issued the *Final Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement* (LSRJSM Feasibility Report/EIS) (Corps 2002b), which analyzed measures that may increase the survival of juvenile anadromous fish through the lower Snake River projects and assist in the recovery of listed salmon and steelhead stocks (includes the Ice Harbor, Lower Monumental, Little Goose, and Lower Granite).

On November 20, 1991, NOAA Fisheries listed the Snake River sockeye salmon as endangered effective December 20, 1991 (56 *Federal Register* 58619). Snake River spring/summer chinook and Snake River fall chinook salmon were listed as threatened on April 22, 1992 (57 *Federal Register* 14653). Critical habitat was designated for Snake River sockeye, spring/summer chinook, and fall chinook salmon on December 28, 1993 (58 *Federal Register* 68543). Snake River basin steelhead were formally listed as threatened on August 18, 1997 (62 *Federal Register* 43937). On March 2, 1995, NOAA Fisheries

issued a *Biological Opinion for the Reinitiation of Consultation on 1994-1998 Operation of the Federal Columbia River Power System and Juvenile Transportation Program in 1995 and Future Years* (1995 FCRPS BiOp) (NOAA Fisheries 1995). The 1995 FCRPS BiOp, as well as the subsequent FCRPS BiOps, established measures necessary for the survival and recovery of Snake River salmonids listed under the ESA.

The purpose of the LSRJSM Feasibility Report/EIS was to evaluate and screen alternative measures that may increase the survival of juvenile anadromous fish through the lower Snake River projects and assist in the recovery of listed salmon and steelhead stocks.

The lower Snake River dams were designed with features to aid the migration of both juvenile and adult fish. In the last 30+ years, the Corps has consistently investigated and adopted new technologies for maximizing the number of fish that safely pass the dams in both directions. The LSRJSM Feasibility Report/EIS describes the successful features at the lower Snake River dams including adult fish ladders, juvenile bypass systems, and the fish transportation program.

For adult fish returning from the Pacific Ocean to spawn, fish ladders and devices to attract fish to the entrances of the ladders are the primary aid to their passing the dams. Fish ladders have been in place since the dams were built in the 1960s and early 1970s. Improvements to these ladders have been made at all four dams. Since 1996, the cumulative survival for adult salmon through all four dams and reservoirs ranges from 92 to 98 percent. The survival rate through each individual dam and reservoir ranges from 96 to 100 percent.

For juvenile fish traveling downriver, the dams and reservoirs present a more complex set of hazards. The slower reservoir water exposes juvenile fish to resident fish predators for a longer time than a natural river. In addition, spill below a dam increases turbulence and exposure of juvenile salmon to predatory birds. When juvenile fish arrive at a dam, they can pass it in three ways: through the turbines (about 90 to 95 percent survival past a dam); through the spillway with the water (about 98 percent survival past a dam); or through bypass systems, where most fish are diverted to trucks or barges for transport downriver (about 98 to 99 percent survival to the point of release below Bonneville).

Currently, the Corps, in coordination with NOAA Fisheries, manages juvenile fish passage to “spread the risk.” This spread-the-risk policy balances the number of fish that pass through the lower Snake River projects in-river versus those that are diverted and transported below Bonneville by barge or truck. About 50 to 65 percent of all fish traveling through the lower Snake River are collected for transport. The rest of the fish are left in the river. The spread-the-risk policy is necessary because the long-term positive and negative effects of both in-river and barge/truck transportation are not clear. Balancing the two approaches is a prudent course of action because it ensures that no inadvertent reduction in survival occurs if one approach is significantly favored over another. This information is presented in more detail in the LSRJSM Feasibility Report/EIS.

The LSRJSM Feasibility Report/EIS considered four alternatives. Three of the alternatives would keep the dams in place, while one alternative includes breaching of the earthen portion of the four dams. Breaching the dams would allow the lower Snake River to return to a more free-flowing condition, while eliminating hydropower production and the ability to use river navigation for the shipments of goods between Lewiston, Idaho; Clarkston, Washington (Lewiston-Clarkston); and the Tri-Cities, Washington, areas. The study's detailed economic analysis showed extensive economic benefits for navigation on the lower Snake River. The transportation savings of using the navigation system compared to alternative transportation modes resulted in average annual benefits of about $43.2 million (1998 dollars).

Based on a thorough examination of the best available biological, economic, social, environmental and other related information, the Corps selected a modified version of Alternative 3—Major System Improvements (Adaptive Migration), with increased focus on adaptive migration, as the recommended plan. Adaptive migration is an approach that balances the passage of fish between in-river and transport methods. It addresses concerns about risks and effectiveness associated with bypass-only and transport-only approaches. It also allows flexibility for changing operations related to juvenile salmon migration.

The recommended plan combined a series of the structural and operational measures described and evaluated in the LSRJSM Feasibility Report/EIS for Alternative 3 that are intended to improve fish passage through the lower Snake River projects. This alternative provided the maximum operational flexibility for juvenile fish passage. It optimized in-river passage in the spring when river conditions are best for fish and optimized the juvenile transportation program. It also allowed for combined passage when necessary for spread-the-risk operation or to conduct needed research. These improvements are not only intended to reduce direct mortality associated with dam passage, but also to reduce stress on juvenile fish, reduce total dissolved gas (TDG), and improve operational reliability.

Several key aspects relating to navigation, economics, hydrology, and water quality impacts are discussed in the LSRJSM Feasibility Report/EIS. Therefore, the LSRJSM Feasibility Report/EIS is incorporated by reference because the analyses of the resource areas are comprehensive and relevant to this EIS. The recommendations in the LSRJSM Feasibility Report/EIS concerning management of the lower Snake River projects were considered with regard to the activities described in this EIS. Based on the information in the LSRJSM Feasibility Report/EIS in 2002, the Corps concluded that some short-term maintenance of the projects would be necessary, regardless of the final decisions regarding dam breaching.

1.5.2. 1992 Reservoir Drawdown Test, Lower Granite and Little Goose Dams

A test of the reservoir drawdown concept was completed in March 1992, using Lower Granite and Little Goose dams on the lower Snake River. The test was designed to gather information regarding the effects of substantially lowering existing reservoirs to potentially improve survival of downstream migrating juvenile salmon, as proposed by various entities

in the Pacific Northwest. This test was primarily designed to provide information regarding the physical effects of such an operation on dam and reservoir structures. Major efforts were made to accomplish as much as possible during the March drawdown, recognizing the importance of evaluating the reservoir drawdown concept as a potential means to increase the Snake River salmon runs. The 1992 drawdown test was documented in the Walla Walla District Corps of Engineers report, *1992 Reservoir drawdown Test, Lower Granite and Little Goose Dams,* dated December 1993 (Corps 1993). The report consists of a main body and 24 technical appendixes.

In the early 1990s on an effort to develop regional consensus on a recovery for the Snake River salmon runs, Senator Mark Hatfield (Oregon) convened representatives from fish and power agencies, river users, and members of interest groups, in what was known as the Salmon Summit. The group met over a period of several months and although no consensus was reached on a long-term solution, measures were proposed as possible means to improve salmon survival. One idea proposed during the Salmon Summit was lowering the water surface elevations of the reservoirs behind Columbia and Snake River dams to increase water velocities and potentially reduce the amount of time it takes for juvenile salmon, migrating downstream, to get from their natal streams to the ocean. On February 14, 1992, the Corps of Engineers completed the required NEPA process and signed a Record of Decision to implement a drawdown test in March 1992.

1.5.3. Project Operating Ranges

Authorized operating ranges for the lower Snake River projects must be considered in determining navigation system needs. Each project is considered run-of-river, which means that, in general, on a daily basis, the inflow to the reservoir is the same as the outflow from the dam. While the design of the projects includes some small allowance for pool fluctuations (3 to 5 feet, see table 1-3), these run-of-river projects provide minimal storage capacity.

Table 1-3. Reservoir Operating Ranges

Reservoir	Normal Operating Range (feet NGVD29)	MOP Operation[1] (feet NGVD29)	Summer 2003-2005 Operating Range[2] (feet NGVD29)
Ice Harbor	437-440	437-438	438-439
Lower Monumental	537-540	537-538	537-538
Little Goose	633-638	633-634	634-635
Lower Granite	733-738	733-734	734-735

Notes:
1. Action in the FCRPS BiOps. Outmigration period is April to August (with the exception of Lower Granite, which runs April through October or later, depending on yearly conditions).
2. As coordinated with Technical Management Team (TMT).

The 2000 FCRPS BiOp (NOAA Fisheries 2000a) recommended that the lower Snake River dams operate in the lower foot of the normal operating range during the juvenile fish

migration season. The migration season is generally April through August, however Lower Granite is operated at the lower operating range from April through October. During the juvenile fish outmigration, the reservoirs above these dams are operated within a range from MOP to 1 foot above (MOP). These criteria, referred to as the MOP operation, are defined as operation within the range from MOP to MOP +1, rather than the full 3- to 5-foot normal operating range.

For the last several years, Ice Harbor, Little Goose, and Lower Granite have been operated above the MOP operation, from MOP +1 foot to MOP +2 feet. This was done to raise the water level in order to provide additional depth over the high spots caused by sediment buildup in the navigation channel. The deviation from MOP was coordinated through the Technical Management Team (TMT), an inter-agency technical group established in the 1995 FCRPS BiOp (NOAA Fisheries 1995). The TMT is responsible for making recommendations on dam and reservoir operations. The regional fish management agencies (Federal, states, tribes) typically raise questions about requests to operate above MOP. Concerns are due to the potential to negatively impact juvenile salmon survival.

Current operation of the system from MOP +1 to MOP +2 at these reservoirs has allowed the navigation industry to continue operations with a lower risk of equipment damage, a higher level of crew safety, and a decreased risk of environmental damage resulting from cargo spillage as compared to MOP operations under current conditions. However, it has not eliminated the channel problems caused by sediment buildup.

The MOP operation is recommended in the 2004 FCRPS BiOp (NOAA Fisheries 2004) (see section 1.5.6.1) and any deviations from MOP will be coordinated through the TMT adaptive management process. The following MOP operation for the four lower Snake River projects was specified in the *Final Updated Proposed Action* (UPA) (Corps et al. 2004) prepared by the Action Agencies for the 2004 FCRPS BiOp:

> Operate at minimum operating pool (MOP) elevation from April 3 until small numbers of juvenile migrants are present unless adjusted to meet authorized project purposes. For Lower Granite, operate at MOP until enough natural cooling has occurred in the Lower Granite forebay, generally after October 1.

1.5.4. Navigation Benefits

Following completion of the LSRJSM Feasibility Report/EIS, lower projections of grain export were developed for the updated economic analysis for the Columbia River Channel Improvement Project (CRCIP) (Corps 2003b). Reducing the projected future grain shipments lowered the original annual benefit for Snake River navigation to approximately $33.7 million, as compared to $43.2 million in the LSRJSM Feasibility Report/EIS.

The navigation industry is also forced to adopt light loading and experiences lost efficiencies due to modified approach, loading, and unloading procedures (see section 3.8.1 for more

information). Significant cargo carrying capacity is lost by a rate of 707 bushels per inch if the draft is reduced. For example, estimated loss with a grain barge for each inch of draft lost represents a $3,200 market loss of cargo plus a $208 loss of tariff income to shippers. At Lower Monumental, the average number of lockages for grain shipments per year is 1515. Using this figure and assuming that during 50 percent of the year the projects are operated at MOP or MOP +1, then 758 tows may have to light load. If each of those tows light loads one foot, the annual loss of tariff income to the shippers is $1,891,968 and the shipment to Portland of $29,000,000 worth of grain is delayed.

Impacts to commercial navigation continue even though the operation of three of the four lower Snake River projects has been temporarily adjusted to the 1 foot above MOP target range (MOP+1 to MOP+2 elevation range, referred to as the MOP+1 operating criteria). Without this temporary seasonal adjustment, impacts would have been more severe (see section 1.5.3).

The Port of Clarkston also confirmed that shoaling and siltation is currently affecting the cruise lines using their facilities. The cruise ship, "Spirit of 98," stopped using the Port's Gateway dock in 2003 because of low depth. The Port reported that silt is getting into vessel cooling systems at MOP +1 and estimates that some ships could not operate at MOP.

In an effort to provide a balanced view of regional opinions, it is noted that comments have been received that express opposing views with regard to the economic consequences of an impaired navigation channel. The National Wildlife Federation (NWF) has questioned the Corps economic information and resubmitted economic information that they feel supports their position that the impacts from delayed dredging would be minor. All comments and responses can be found in appendix E, Public Involvement.

Even though the comparisons are based on the earlier navigation system benefit estimate (1998 dollars) and compared to the expected navigation system cost, the Snake River navigation system is still economically justified. The costs of the navigation system include: (1) the operating costs of the locks; (2) the navigation share of the joint operating costs of the four dams; (3) the expected rehabilitation and repair of the locks; and (4) channel maintenance. Each of these cost categories was annualized to compare to the average annual benefits. The estimated annual costs of the navigation system are: (1) $2.7 million for the navigation share of the four dams; (2) $1.4 million for anticipated rehabilitation and repair; and (3) $0.6 million for the average annual channel maintenance. This amounts to a total average annual cost of $4.7 million. This analysis demonstrates that the system's average annual benefits significantly exceed the annual costs of maintaining the navigation system. Therefore, the system is economically viable and warrants continued maintenance.

These costs and benefits were developed for the system as authorized and were not evaluated on a foot-by-foot, reach-by-reach, nor year-by-year basis. Congress authorized these projects as a system and these projects all have navigation as a project purpose. The private/public navigation infrastructure was developed on the same system-wide basis.

1.5.5. Sediments

Several major tributaries enter the Snake River in the project area, and most are heavy sediment contributors in high runoff years. The Corps has been analyzing sediment buildup in the lower Snake River reservoirs since 1984. Sediment buildup occurs throughout all of the reservoirs, but only certain areas become problematic for navigation due to sediment deposition. Redistribution of coarse bed sediments, potentially due to recent varying project spill patterns, causes maintenance concerns in the upstream ends of the reservoirs where the water depths are shallower. There are also maintenance concerns at locations along the edges of the river where water velocities are slower and suspended material tends to settle out.

The reservoirs upstream of each project are likely to entrain the coarser bed load and all but the finest suspended sediment load. Because of this, the bed sediments found within the navigation approach channels likely are not being carried through the projects, rather, it is likely these are bed sediments that previously existed in the river immediately downstream of each dam. Examples of these locations are the downstream approach channels to the navigation locks and recreation areas. Because the final in situ densities of deposited sediments may be highly variable depending upon hydraulic conditions actually experienced at the time of deposition, the resultant volumes may be highly variable.

The quantity of sediment that collects in Lower Granite reservoir far exceeds quantities observed to be deposited in any of the other lower Snake River reservoirs. The upper reach of Lower Granite reservoir serves as the primary sediment trap for most of the material carried in suspension and as bedload in the free-flowing reaches of contributing rivers. Therefore, Lower Granite reservoir has more extensive maintenance concerns, and the following discussion focuses on conditions there.

1.5.5.1. Lower Granite Sedimentation

Lower Granite provides commercial navigation access to the cities of Lewiston, Idaho, and Clarkston, Washington. Because it is the most upstream of the lower Snake River projects, it is the primary sediment collection area for a large sediment-contributing drainage area that includes the Salmon, Grande Ronde, and Imnaha Rivers; the mainstem Clearwater River; and the local drainage of the Snake River between the Hells Canyon complex and Lower Granite. The Snake River's drainage area at Lower Granite is approximately 103,500 square miles. However, the Hells Canyon dam complex on the Snake River and Dworshak dam on the North Fork of the Clearwater River may be assumed to trap virtually all the sediment flowing into their pools. The drainage area at Hells Canyon dam is approximately 73,300 square miles, and the drainage area of the North Fork of the Clearwater River upstream of Dworshak dam is approximately 2,440 square miles. Therefore, the "net effective sediment contributing drainage area" for Lower Granite is approximately 27,760 square miles.

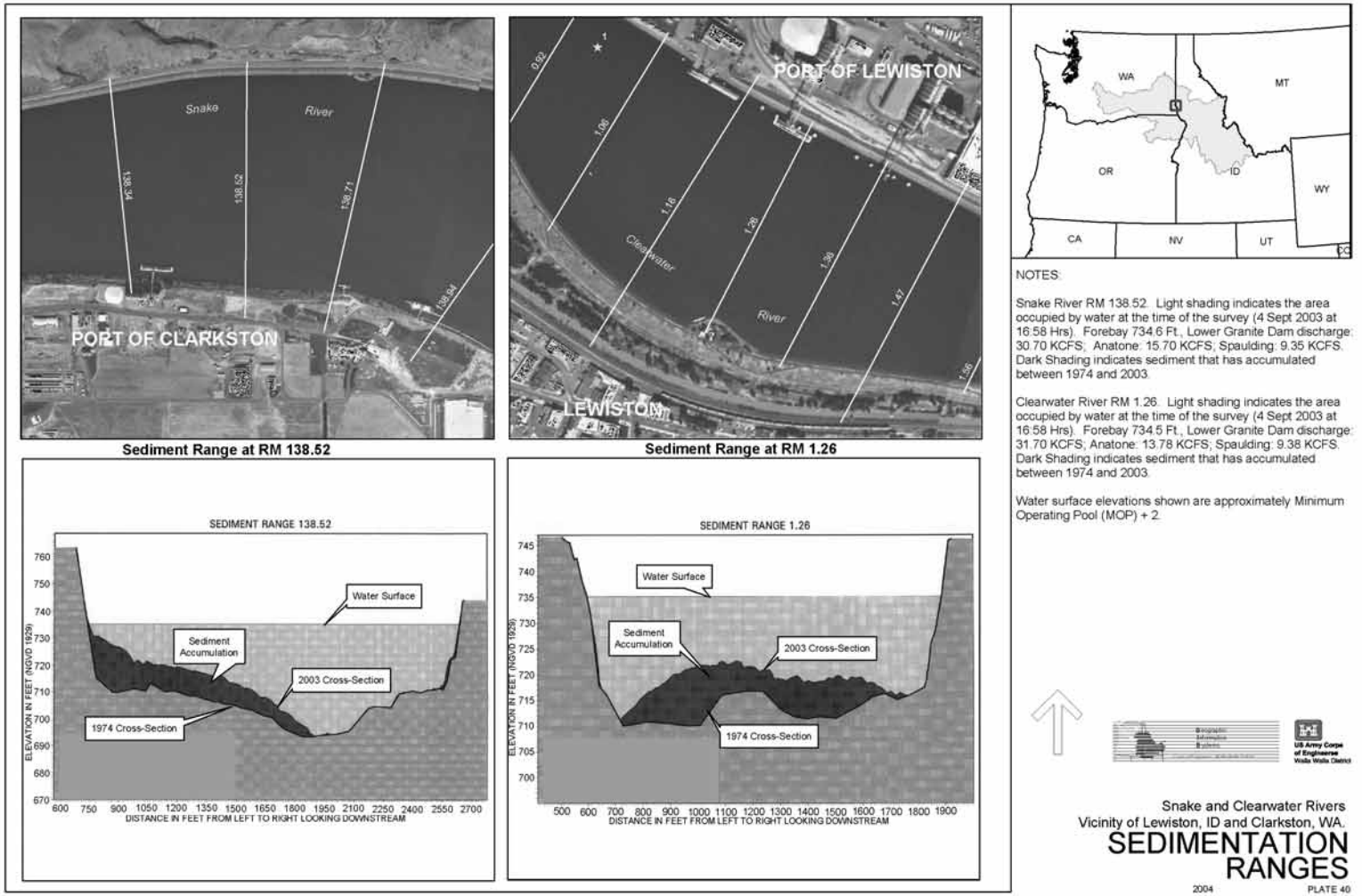
To monitor sedimentation in the Lower Granite reservoir, hydrographic surveys are taken on a regular basis to determine the locations and extent of shoaling. Over the years, shoaling typically occurs at the same locations in the reservoir. Based on extensive sediment range hydrographic surveys completed in 2000, the Lower Granite reservoir contained an estimated 68 million cy of sediment. This represented an increase of 21 million cy since 1995 and 8 million cy since the 1997 surveys. The overall average yearly sediment inflow, based on data collected by the U. S. Geological Survey (USGS) from 1972 through 1979 is approximately 2.3 million tons per year.

Since sediment transport data was last collected in 1979, no major conditions (e.g., conditions such as construction of new major water resources projects) that would significantly modify sedimentation information have changed within the upstream portions of the Snake River basin. The sediment transport data contains information ranging from a very low flow year (1977) to a very high flow year (1974), representing a wide range of hydrological conditions. The data reasonably represent current basin conditions with respect to sediment transport into the lower Snake system from the Snake and Clearwater Rivers.

Because of in-situ variability in densities of deposited sediments, the resultant volumes may be highly variable depending on actually experienced hydraulic conditions at the time of deposition. Sediment buildup between the years 1974 (pre-project) and 2003 is illustrated in figure 1-3. The light shading within a cross-section in the figure represents the area occupied by water at the time of the 2003 survey [forebay water surface elevation at 735 feet and a discharge of 40,000 cubic feet per second (cfs) below the confluence]. The dark shading in the bottom of some sections in the figure shows the amount and distribution of existing sediment above the 1974 channel bottom. Hydrographic surveys taken in 2003 and 2004 continue to show sediment buildup similar to that observed in previous surveys.

Over time, sediment buildup has reduced the proportion of the navigation channel providing the authorized depth. Survey results from August 2004 show that the total surface area of the Federal navigation channel having depths less than 14 feet in the Snake and Clearwater River confluence area has risen from approximately 38 acres in 2003 to approximately 52 acres in 2004. Water depths in the Federal navigation channel near the Port of Clarkston berthing area and in the turning basin near the Port of Lewiston berthing area are currently much less than the 14-foot authorized depth, and are now as shallow as 8.5 feet and 10.6 feet, respectively, based on a MOP water surface elevation. Navigation channel depths less than 14 feet substantially impact access to port facilities. Based on survey data from 2001 and 2004, plates 1A and 1B visually illustrate locations within the Federal navigation channel in the confluence area where water depths were less than 14 feet and the increase in shoaling in the area that occurred from 2001 to 2004.

Figure 1-3. Lower Granite Pool Sediment Ranges: 1974 and 2003 Surveys Compared



1.5.5.2. Lewiston Levee System

The deposition of sediments at the upstream end of the Lower Granite reservoir also has an impact on the effectiveness of the backwater levee system that was constructed near the city of Lewiston, Idaho. This backwater levee system was constructed as part of the Lower Granite project in lieu of relocating the business district of Lewiston. It was designed as an upstream extension of the dam to allow the Lower Granite reservoir to pass an SPF event while protecting Lewiston from inundation by such a flood. The current buildup of sediment decreases the ability of these levees to withhold a significant flood event from Lewiston.

In 2001, the Corps performed a "risk-based analysis (Corps 2002a, appendix C) related to the Lewiston levee system. The Corps made this analysis with the assumption that navigation dredging with downstream in-water disposal and no levee raise would occur. The analysis concluded that, "While the Lewiston levee system has a low probability of being overtopped now (0.002 or two-tenths of one percent), this value did increase by the year 2074 to a probability of 0.012 (1.2 percent annually) on the Clearwater River side. On the Snake River side of the levee, the current probability of overtopping was estimated at 0.001, with this increasing to 0.025 by the year 2074." If the assumed navigation maintenance were not to occur, these levee overtopping probabilities would increase and their exact quantification would require the completion of additional risk-based analysis.

The Lewiston levee system was designed to provide a minimum freeboard of 5 feet during an SPF event of 420,000 cfs, as computed on the Snake River downstream of the confluence of the Clearwater River. Sediment deposition has gradually reduced channel capacity, so that an SPF event would not pass without encroaching into the levee freeboard and increasing the risk of overtopping. Less than 3 feet of the originally designed 5 feet of levee freeboard remain. The 2001 risk-based analysis (Corps 2002a, appendix C) identified the Lewiston levee system's probable non-failure point as being 5 feet below the top of the levee, and the probability of failure below that point as 0.001. Currently approximately 365,000 cfs, or approximately 87 percent of the original designed discharge, can be passed through the project and still maintain the 5 feet of freeboard as originally designed, thereby maintaining the pool level at or below the probable non-failure point.

1.5.6. Relevant BiOps

1.5.6.1. FCRPS BiOps – 2000 and 2004

In December 2000, NOAA Fisheries issued a revised Biological Opinion (BiOp) for the operation of the FCRPS, which provided recommendations for the operational and structural modification for the Corps' and Bureau of Reclamation FCRPS projects (NOAA Fisheries 2000a). The 2000 FCRPS BiOp was involved in a litigation challenge, *National Wildlife Federation v. National Marine Fisheries Service* (NMFS), CR 01-640-RE (D. Or. filed May 5, 2001). In June 2003, the District Court remanded the 2000 FCRPS BiOp to NOAA Fisheries to address reliance on Federal mitigation actions that have not undergone Section 7

consultation under the ESA and reliance on range-wide, off-site, non-Federal mitigation actions that are not reasonably certain to occur. As part of the remand process, the Action Agencies prepared an updated proposed action (UPA) (Corps et al. 2004) for NOAA Fisheries' consideration. The UPA focuses on actions that will contribute toward meeting the performance standards described in the 2000 FCRPS BiOp (NOAA Fisheries 2000a) and avoiding jeopardy to the listed species. On November 30, 2004, NOAA Fisheries issued its revised 2004 FCRPS BiOp[1] (NOAA Fisheries 2004). The Corps signed a *Record of Consultation and Statement of Decision* in January 2005, which defines how the Corps is operating under the UPA and the 2004 FCRPS BiOp.

The UPA includes operations for the FCRPS projects to benefit fish. One of the project-specific operations for Lower Granite to Ice Harbor includes:

> Operate at minimum operating pool (MOP) elevation from April 3 until small numbers of juvenile migrants are present unless adjusted to meet authorized project purposes. For Lower Granite, operate at MOP until enough natural cooling has occurred in the Lower Granite forebay, generally after October 1.

Adjustments to this operation can be implemented through the adaptive management process described in the UPA, which includes coordination through the TMT.

1.5.6.2. 2004-2005 Routine Maintenance Dredging in the Lower Snake River Reservoirs

The most recent BiOp issued for navigation channel maintenance by NOAA Fisheries to the Corps, *Routine Maintenance Dredging in the Lower Snake River Reservoirs, Snake River Basin, Asotin, Garfield, Walla Walla, and Whitman Counties, Washington, Nez Perce County, Idaho* (NOAA Fisheries Nav. Maint. Biop. 2004b), is dated March 15, 2004. NOAA Fisheries authorized dredging, with conservation measures, in the confluence of the Snake and Clearwater Rivers, in access channels to the Ports of Lewiston and Clarkston, in navigation lock approaches at Lower Monumental and Lower Granite, and in several boat basins and recreation areas. Based upon the localized negative effects resulting from the proposed action compared to the adverse environmental baseline conditions of the FCRPS critical habitat and passage for juvenile salmonids, the Corps determined that the proposed action was likely to adversely affect the ESA-listed evolutionarily significant units (ESUs) of threatened Snake River fall chinook (*Oncorhynchus tshawytscha*), threatened Snake River spring/summer run chinook (*O tshawytscha*), and threatened Snake River Basin steelhead (*O. mykiss*). NOAA Fisheries concluded in the BiOp for 2004 navigation channel maintenance that implementation of the proposed project is not likely to jeopardize the continued existence of the previously noted ESUs or result in destruction or adverse modification of designated critical habitat, including an incidental take statement, which

[1] On May 26, 2005, the District Court for the District of Oregon found the 2004 FCRPS BiOp invalid. The Corps has reviewed the ruling in light of the issues identified in the opinion and believes the research, conclusions, and recommendations in the EIS are based on the best science and information available and are still valid.

includes Reasonable and Prudent Measures and Terms and Conditions that were designed to minimize take. The proposed navigation channel maintenance action was not implemented The Corps was enjoined from performing the maintenance dredging on November 1, 2004 [*National Wildlife Federation, et al. v. National Marine Fisheries Service, et al*. No. C02-2259L (W.D. Wash. 2004)]. A complete administrative record of this consultation is on file at the Washington State Habitat Branch Office of NOAA Fisheries.

1.5.7. Programmatic Sediment Management Plan

Since the late 1990s, the Corps and EPA have been working on the development of a programmatic plan to clarify and adopt processes and procedures for managing sediment for the long-term in the lower Snake River projects and the McNary project on the mid-Columbia River. The first effort to accomplish this involved the development of the 2002 *Dredged Material Management Plan/Environmental Impact Statement: McNary Reservoir and Lower Snake River Reservoirs* (Corps 2002a). This effort resulted in a legal challenge that halted dredging under that plan.

In 2003, the Corps initiated the development of a Programmatic Sediment Management Plan/Supplemental EIS to further address non-dredging measures and to expand the evaluation process. After further evaluation, the Corps decided to stop development of the planned Supplemental EIS. The Corps and EPA plan to reevaluate the best approach to address the long-term sediment management needs and anticipate going forward with the development of a new plan within the year.

Although, an NWF comment (see appendix E) received on the draft EIS stated the Corps had "given up its efforts to develop a 20 year programmatic sediment management approach," that is not the case. The Corps stopped the development of the "supplemental EIS" that was to supplement to the 2002 Dredged Material Management Plan. As referenced above, the development of the Programmatic Sediment Management Plan is anticipated to go forward within a year, as a stand alone EIS. It will not be a supplemental EIS.