DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-3755

REPLY TO
ATTENTION OF

CENWS-PM-PL-ER

Chief Joseph Dam Dissolved Gas Abatement Project
Douglas and Okanogan Counties, Washington

(Draft) Supplemental Finding of No Significant Impact

Proposed Action (Preferred Alternative) and Background.
The purpose of the proposed project is to provide a mechanism to minimize the harmful effects of spilling water at Chief Joseph Dam (CJD) (Douglas and Okanogan Counties, Washington) and Grand Coulee Dam (Grant County) on the Columbia River. The goal of the CJD Gas Abatement Study is to identify means for reducing Total Dissolved Gas (TDG) contributions from CJD, to the extent economically, technically, and biologically feasible. The preferred alternative is not expected to meet a 110% TDG saturation objective. Regional coordination has led to an objective of 120%. The gas abatement action is called for by the National Marine Fisheries Service (NOAA Fisheries) Biological Opinion of 2000 concerning effects of operation of the Federal Columbia River Power System.

The purpose of the proposed actions evaluated in the supplemental National Environmental Policy Act (NEPA) document is to support the overall project purpose, and to mitigate structural effects of operation of the flow deflectors.

The proposed actions documented in the referenced Environmental Assessment (EA) are needed to provide erosion protection for the right bank, create staging areas for contractor and Corps use, and enable the establishment of a concrete batch plant at CJD. These site preparation actions are necessary to support the installation of the flow deflectors at CJD. Information regarding the purpose and need for the installation of the flow deflectors can be found in the Chief Joseph Dam Dissolved Gas Abatement Project Final EA dated June 2000 (Corps, 2000).

The preferred alternative consists of the following elements:

1. Right Bank Armoring;
2. Establishment of Left Bank Temporary Barge Staging and Loading Areas;
3. Establishment of Staging Areas on the Right and Left Banks;
4. Construction of a Concrete Batch Plant in the Right Bank Staging Area.

Summary of Impacts.
Pursuant to the National Environmental Policy Act, an Environmental Assessment (EA) has been prepared for the proposed work. This document describes the environmental consequences of the proposed work, which are briefly summarized below.

Establishment of the on-site batch plant and associated aggregate stockpiles may result in elevated levels of dust and other particulate matter. Traffic, including trucks hauling aggregate, concrete, and other supplies may also generate dust as they pass over unpaved or dusty surfaces in and around the plant. However, the increase in dust and particulate matter is not expected to significantly impact air quality in the project vicinity for the following reasons: all exposed aggregate stockpiles and roads will be watered periodically, and all equipment will be cleaned regularly to minimize dust generation. In addition, some dumping and loading areas may be enclosed with fabric filters or bag houses, and aggregate stored on-site in stockpiles will most likely be contained within three-sided storage bunkers. Site layout and design will take into account the prevailing winds to minimize fugitive dust and will attempt to minimize travel distances within the site. Vehicle speed limits within the site may also be established. No long-term effects on air quality are expected as a result of the project implementation. Finally, the batch plant operator will be required to comply with all local, state, and federal laws to ensure air quality standards are not violated.

Placement of the armor rock on the right bank, driving pilings for the temporary pier, and barge operations in the near-shore area may cause short term, temporary increases in turbidity and associated decreases in water quality. The magnitude and duration of the turbidity is expected to be minor. Turbidity levels are expected to rapidly return to baseline conditions upon completion of the activities.

Water quality impacts could also occur as a result of the operation of the batch plant. However, the wash water from the batch plant will not be expected to reach the waters above or below CJD because batch plant facilities have developed a variety of operational configurations to control pollution related to waste water. The contractor will be required to have the appropriate water discharge permits from the State and to use best management practices (BMPs) in constructing and operating the batch plant.

Additional sediment may reach the waters below CJD as a result of surface water runoff in a storm event or from wind-blown dust. Any increase in turbidity will be short-term and localized. BMPs will be used to reduce the likelihood of sediment transport to the waters above and below CJD. Stormwater generated on-site will be controlled.

No significant impacts to water quality are expected as a result of the implementation of this project. In general, as stated in the 2000 EA, the gas abatement measures will improve dissolved gas conditions in the river at times when CJD must spill, and the supporting actions outlined herein will help ensure that occurs.

There may also be localized leaching of contaminants, specifically metals, if treated wood is used for the pilings and over water structures (e.g. pier decking). However, water quality impacts associated with leaching are expected to be minor because of the small amount of treated wood used and the large dilution factor of the receiving waters. In addition, the risk associated with immersed wood (e.g. pilings) decreases over a short period of time (days to weeks) as the reservoir of metals is depleted and leaching of metal contaminants drops off. A small amount of the released metal contaminants may also be incorporated into the sediment at the piling/sediment interface. However, the area impacted by the leached metals will be localized in areas immediately adjacent (within 10 feet) to small treated wood structures (Poston, 2001), and will not result in the introduction of significant levels of new contamination.

No significant impacts to fish or other aquatic organisms are anticipated as a result of the implementation of the proposed actions because water quality and construction related impacts will be minor and temporary.

There will be some disruptions to the Colville Confederated Tribes (CCT) fishery as a result of the project implementation. However, the impacts are expected to be minor and temporary in duration, and the Corps is working closely with the CCT to establish clear expectations. The CCT is supportive of the dissolved gas abatement project and associated actions.

Finally, there will be some temporary impacts to recreation opportunities in the project vicinity as a result of construction activities. Recreational use in the construction areas during the period of project construction will be limited due to safety and security concerns. Recreational traffic accessing Bridgeport State Park and the golf course east of the proposed right bank staging areas may be slowed due to the presence of large trucks along Half-Sun Way.

The construction activities are not expected to have long term effects on recreational opportunities in the project area. The staging areas on the right bank will be returned to the pre-project condition to the greatest extent possible. Restoration activities will include removing all foreign materials, re-establishing the former site grade, grass-seeding with appropriate reclamation grass species, and invasive species control.

Finding.

Based on the analysis detailed in the Environmental Assessment (attached), this project is not considered a major Federal action significantly affecting the quality of the human environment and does not require preparation of an environmental impact statement.

Date

Debra M. Lewis
Colonel, Corps of Engineers
District Engineer

CHIEF JOSEPH DAM

DISSOLVED GAS ABATEMENT PROJECT

DRAFT SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT AND FINDING OF NO SIGNIFICANT IMPACT

September 2004

US Army Corps of Engineers®
Seattle District

Chief Joseph Dam Dissolved Gas Abatement Project
Draft Supplemental Environmental Assessment and Finding of No Significant Impact

September 2004

Responsible Agencies: The responsible agency for this project is the Seattle District, U.S. Army Corps of Engineers.

Summary:
In 2000, the United States (U.S.) Army Corps of Engineers (Corps) completed an Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) under the National Environmental Policy Act (NEPA) for installation of flow deflectors at Chief Joseph Dam on the Columbia River in Washington. This EA is prepared as a supplement to document further available and necessary information.

The Corps proposes to perform the following actions in support of the installation of flow deflectors at Chief Joseph Dam (CJD): re-armor the right (north) bank below Chief Joseph Dam to provide erosion protection for the right bank, create staging areas for contractor and Corps use, enable the establishment of a concrete batch plant at CJD, and pave a portion of the right bank just below the dam to mitigate the effects of additional spray resulting from the presence of the flow deflectors, as well as install a fence and guardrail.

The Corps proposes to replace the bank armor riprap in a small, eroded embayment at the end of the right bank training wall immediately below the spillway to fill in the embayment and to reduce the slope angle of the over-steepened existing bank armoring. Material would consist of approximately 3,000 CY of class V riprap and 5,000 CY of 6-ton derrick stone, to be placed on a 2.5:1 slope along approximately 220 lineal feet of shoreline starting behind the end of the training wall. The toe of the slope would extend minimally, if at all, beyond the alignment of the training wall, and will lie in the original design footprint.

In addition, the Corps proposes to set up an upland construction staging area(s) above the right bank near the dam, in areas used previously for this purpose. This staging area may be in one of two locations or possibly both, that were used previously for staging during original construction of CJD and during the Pool Raising Structural Modifications contract. There will also be a small upland staging area established on the left bank immediately below the dam in the area of the warehouse and commons buildings for a Corps construction trailer and possibly that of the contractor. A concrete batch plant to support the flow deflector construction will probably be established at one of the staging areas on the right bank.

Finally, the Corps has identified a temporary barge staging and loading area on the left bank near the existing warehouse. A temporary pier will be necessary to load personnel, equipment, and materials on workboats and barges. Corps engineers estimate that the pier will be approximately 12 to 15 feet wide and 60 feet long. The length of the pier will depend on the tailwater depth and the draft of the barge used.

In addition to these actions, it is possible that the Corps will choose a different flow deflector construction method as an alternative to the cast-in-place method described in the 2000 EA. Those methods are described herein.

There is also water quality information added concerning spill during the overall construction time frame, in relation to the addition and availability of flow deflectors over time.

The official comment period for the Supplemental EA is September 20, 2004 to October 20, 2004.

Please send comments, questions, and requests for additional information to:
Ms. Nicolle Rutherford
Environmental Resources Section (PM-PL-ER)
U.S. Army Corps of Engineers
P.O. Box 3775
Seattle, WA 98124-3755
Email address: nicolle.r.rutherford@usace.army.mil

TABLE OF CONTENTS

FIGURES

TABLES

1.0 INTRODUCTION

In 2000, an Environmental Assessment (EA) and a Finding of No Significant Impact (FONSI) (Corps, 2000a) were written by the U.S. Army Corps of Engineers, Seattle District (Corps) for construction and operation of proposed flow deflectors at Chief Joseph Dam (CJD) on the Columbia River in Douglas and Okanogan Counties, Washington. This supplement is being prepared pursuant to the National Environmental Policy Act (NEPA) Sec. 102(2)(c), to address details of necessary work pursuant to the flow deflector construction that were not fully known at the time of the earlier EA/FONSI. It incorporates by reference all applicable information contained in the 2000 EA.

This document is intended to meet procedural and documentation requirements of NEPA, the Council on Environmental Quality (CEQ) rules (40 CFR 1500-1508), and US Army Corps of Engineers implementing regulations (ER 200-2-2).

The spillway deflectors and their construction are described in the 2000 EA; some effects of that work are discussed in this document where appropriate. In the 2000 EA, the term "cofferdam" was used to describe the structure to be used to dewater the deflector construction sites on the face of the dam spillway. For accuracy, the "cofferdam" will hereinafter be referred to as the dewatering caisson.

2.0 PURPOSE AND NEED

The purpose of the proposed gas abatement project is to provide a mechanism to minimize the harmful effects of spilling water at Chief Joseph Dam (Douglas and Okanogan Counties, Washington) and Grand Coulee Dam (Grant County) on the Columbia River. The goal of the Chief Joseph Dam Gas Abatement Study is to identify means for reducing total dissolved gas (TDG) contributions from Chief Joseph Dam, to the extent economically, technically, and biologically feasible. The preferred alternative is not expected to meet an objective of 110% TDG saturation. Regional coordination has led to an objective of 120%.

The purpose of the proposed actions evaluated in this supplemental NEPA document is to support the overall gas abatement project, and to mitigate structural effects of operation of the flow deflectors.

The proposed actions documented in this EA are needed to provide erosion protection for the right bank, create staging areas for contractor and Corps use, provide specialty concrete for the flow deflectors, and ensure public safety. These site preparation actions are necessary to support the installation of the flow deflectors at CJD. Information regarding the purpose and need for the installation of the flow deflectors can be found in the Chief Joseph Dam Dissolved Gas Abatement Project Final EA dated June 2000 (Corps, 2000a).

The right (north) bank armor has eroded over the years, probably as a result of uneven spillway operation and/or a standard project flood. The right bank must be protected against high velocities, turbulence, waves, and spray that can cause erosion in order to prevent material from being entrained into the flow and pulled into the stilling basin as well as to prevent further undermining of the bank. If more of the right bank protective riprap is eroded, the fine glacial till materials will be exposed and will erode, undermining the stability of the bank. If there is sufficient erosion, the potential exists for the right bank to unravel, threatening the integrity of the dam. The proposed armoring lies within the original design footprint from the construction of the dam.

In addition, a vertical circulation cell that will be set up by the presence of skimming flow from the flow deflectors has the potential to pull large material into the stilling basin from a great distance away. It is likely that if the right bank is not armored with larger rock to prevent further erosion, material will be pulled from it over the end sill into the stilling basin where it can cause intense erosion of the apron. At Lower Monumental Dam on the Snake River in Washington, material greater than 24-inch diameter was pulled into the stilling basin from greater than 200 ft. downstream. It resulted in damage to the stilling basin that required placing 3,000 cubic yards (CY) of concrete to repair it. Therefore, it is essential to re-establish a stable slope and to reduce the chance of smaller stones being dislodged and becoming a source for material to be pulled up onto the stilling basin apron.

Staging areas are required to support the construction.

Moreover, a local source of specialty concrete is needed. Concrete for the flow deflectors will need to be a controlled-heat-of-hydration concrete to reduce the potential for cracking and separation. For the lower portion of the deflector, a standard concrete mix with a lower compressive strength will be utilized. However, the upper portion of the deflector requires a specialty higher strength concrete mix that is fiber-reinforced and contains flyash.

After the installation of the flow deflectors, there will be additional spray on the bank that may contribute to bank instability as well as pose a public safety hazard. Paving the right bank will allow water to sheet flow down to the larger riprap on the lower bank where it can drain back to the river. As described earlier, the native material of the right bank beneath the existing riprap is fine glacial till that is subject to erosion if exposed to an excessive amount of water. At the time of the dam construction, the riprap on the bank was sufficient protection. However, irrigation activities on the plateau above the right bank have increased the water flow through the hillside, contributing to potential instability. With increased spray on the right bank as a result of the flow deflector installation, it is necessary to minimize the additional flow of water through the hillside to protect the bank. Finally, it is necessary to ensure public safety. In spill events, there will be a significant amount of water spraying on the bank, reducing visibility and creating slippery conditions.

The proposed project is in support of the NOAA Fisheries' Federal Columbia River Power System (FCRPS) December 2000 Biological Opinion (BiOp), reasonable and prudent alternative (RPA) action number 136.

3.0 PROJECT AREA DESCRIPTION

The project area is the Columbia River from Lake Roosevelt (Grand Coulee reservoir) through Grand Coulee Dam, Lake Rufus Woods (Chief Joseph Dam reservoir), Chief Joseph Dam, Lake Pateros (Wells Dam reservoir), and downstream to Priest Rapids Dam, because, as was discussed in the 2000 EA, effects are not expected below Priest Rapids (river mile 397). This document will refer to the river below Chief Joseph Dam as the mid-Columbia by generally accepted usage, although reference to stocks of steelhead and Chinook salmon below the dam in this part of the river includes use of the term Upper Columbia Evolutionarily Significant Unit (ESU).

Figures 1 and 2 show the area in the local vicinity of the dam, with locations of the work discussed in this Environmental Assessment, and areas potentially impacted.

4.0 ALTERNATIVES

4.1. No Action

NEPA requires each EA include an analysis of the "no-action" alternative, against which the effects of "action" alternative(s) can be compared and evaluated. Under the no-action alternative, site preparation actions would not occur.

The no-action alternative does not meet the project purpose and need. Without conducting the site preparation actions, it will not be possible to successfully conduct the installation of the flow deflectors as required by NOAA Fisheries' 2000 FCRPS BiOp, RPA action number 136.

4.2. Preferred Alternative

4.2.1. Right Bank Armoring

The Corps proposes to replace the bank armor riprap in a small, eroded embayment at the end of the right (north) bank training wall immediately below the spillway to fill in the embayment and to reduce the slope angle of the over-steepened existing bank armoring (Figures 3 and 4). Material would consist of approximately 3,000 CY of class V riprap and 5,000 CY of 6-ton derrick stone, to be placed on a 2.5 horizontal (H) to 1 vertical (V) slope along approximately 220 lineal feet of shoreline starting behind the end of the training wall (Figure 5). The toe of the slope would extend minimally, if at all, beyond the alignment of the training wall. The riprap placement will lie in the original design footprint. Rock would be placed individually in the water, probably using an excavator or crane on the right bank.

As-built drawings indicate that the original riprap was capped with 5-ton derrick stone (Figures 6 and 7). Photos from the 1950's following dam construction confirm the embayment did not exist in the early years after the dam construction. Riprap size and gradations for replacement of the existing riprap were determined using USACE hydraulic design guidance for riprap downstream of stilling basins (HDC 712-1). Riprap was sized to withstand the projected standard project flood of 500,000 cubic feet per second (cfs) requiring 6-ton derrick stone.

In order to access the riverbank, it will be necessary to ramp down to the water's edge. The ramp will be constructed on the existing slope starting from the lower, gravel paved access road approximately 250 linear feet downstream of the downstream end of the erosion. The ramp will be approximately 12 feet wide, and will have a 1.5H:1V slope (Figure 5). The ramp will be constructed out of class V riprap (approximately 27" minus rock) and surfaced with an approximate six-inch lift of three- inch minus crushed gravel for driveability. The ramp will terminate at the water's edge where a construction work pad will be placed around the edge of the erosion upstream to the training wall. The work pad will be about 15 feet wide and will have a slope of approximately 1.75H:1V (Figure 5). The replacement armoring (6-ton derrick stone) will be placed on the existing over steepened slope from the work pad. The work pad will be regraded as the construction progresses downstream so as to leave a uniform thickness of armor rock.

The right bank repair should occur before the flow deflector installation begins. The Corps plans to conduct this work in October 2004; work may begin in mid-September if the Colville Confederated Tribal steelhead fishery is complete. The right bank armoring will take a total of 4 to 6 weeks. The duration of the in-water work will be approximately 1 to 4 weeks.

4.2.2. Left Bank Temporary Barge Staging and Loading Area

The Corps has identified a temporary barge staging and loading area on the left bank near the existing warehouse approximately 600 feet downstream from the confluence of Foster Creek (Figures 8, 9, and 10). The right bank is generally too high and steep for a suitable location for water access. The left bank in the vicinity of the warehouse is low, and the approach to the river relatively flat.

To create the barge landing and loading area, it will be necessary to ramp down to the water's edge with a road and/or to install a temporary pier/floating dock. Construction of an access road to the bank and a temporary ramp or floating dock will be necessary to load personnel, equipment, and materials on workboats and barges. Corps engineers estimate that the pier will be approximately 12 to 15 feet wide and 60 feet long. The length of the pier will depend on the tailwater depth and the draft of the barge used. The contractor may elect to build the pier from treated wood, untreated wood, plastic, concrete, steel or other metal, or a combination of these materials. The pier will likely attach to a concrete abutment on the land that transitions to the access road. The access road will probably be comprised of gravel and other fill material.

4.2.3. Establishment of Staging Areas on Right Bank and Left Banks

The Corps proposes to set up an upland construction staging area(s) above the right bank near the dam, in areas used previously for this purpose (Figures 1, 2, 11, and 12). This staging area will be in a location that was used previously for staging during original construction of CJD and during the Pool Raising Structural Modifications contract. The proposed staging area is relatively flat. There will also be a small upland staging area established on the left bank in the area of the warehouse/commons for a Corps construction trailer and possibly that of the contractor. This staging area is shared space for the Chief Joseph Dam Project and other contractors. Space is limited.

The primary staging area will most likely be the high ground on the right bank just to the north of the CJD axis. This site is large, perhaps 40 to 50 acres, and was also used as a staging area during the original construction of CJD. This site is the closest to the gas abatement deflector construction site at the CJD spillway. Concrete trucks from a batch plant that may be located at this site could run directly from the staging area to the CJD spillway along the right abutment access road without encountering public traffic on Half Sun Way. Trucks bringing materials to this staging area would have to use Half Sun Way for access to the site.

The contractor will need to run power, water, and phone lines to the site. This will entail laying water lines and either underground or aerial power lines. The contractor may choose to truck in potable water. The Corps is coordinating with the Washington State Department of Ecology and the Colville Confederated Tribes for obtaining a temporary water use permit for the operation of the batch plant.

The left bank staging area is small and is located near the commons (Figure 13). Power and water are available at the site. The site is too small for use as a construction staging area, but it is a good location for the contractor's and the Corps' administrative offices. The contractor would share the limited space with CJD project personnel and other contractors.

Finally, an area that extends approximately 370 feet from the face of the dam on the right bank will be fenced off for contractor use during the flow deflector construction (Figure 14). The space is needed for a truck turnaround and for the settling basins for the dewatering system. Fishing access along the training wall will be maintained by installing a permanent metal stairway down the right bank that enables members of the public to traverse the riprap down to the training wall. However, fishing may be periodically restricted within 75 feet of the dam along the training walls on both the right and left banks for safety reasons while the contractor loads and unloads materials for the flow deflector construction.

Other potential staging area improvements include work on the access roads, bollard protection for existing piezometers, grading, drainage, and widened turning areas.

4.2.4. Construct a Concrete Batch Plant On-Site

The contractor will most likely construct a concrete batch plant above the right bank in one of the proposed staging areas. Raw materials would be transported in from the closest practicable sources, and mixed concrete would be transported from the batch plant to the top of the spillway for deflector construction. The batch plant will cover several acres (3+).

Temporary batch plant facilities typically consist of silos containing fly ash, lime, and cement; heated tanks of liquid asphalt; sand and gravel material storage areas; mixing equipment; above ground storage tanks containing concrete additives and water; and designated areas for sand and gravel truck unloading, concrete truck loading, and concrete truck washout.

4.2.5. Right Bank Spray Mitigation

The Corps proposes to pave a small area on the right bank just below the dam and behind the training wall (Figure 15). In addition, a seven-foot chain link fence and guardrail (or permanent jersey barriers) may be installed at the top of bank at the edge of the parking/picnic area. The fence and guard rail would extend from where the guardrail ends now along the top of the bank to where the ground surface is level with the stairs on the training wall, which is about 50 feet short of the training wall. As described earlier, a permanent metal stairway will be installed to maintain fishing access along the right bank training wall.

4.2.6. Concrete Cast-In-Place Flow Deflectors

The Corps proposes to construct the flow deflectors from concrete that will be cast in place. Each spillbay will be isolated using dewatering caissons as described in the 2000 EA. To form the deflector and to ensure that it is flush with the face of the dam, some concrete will need to be chipped from the sloping face of the dam to create a smooth, vertical surface.

4.3. Pre-Cast Concrete Deflectors or Stainless Steel Deflectors

As an alternative to casting deflectors in place, the Corps is also considering the use of pre-cast concrete flow deflectors or the use of stainless steel flow deflectors. Using pre-cast concrete deflectors would necessitate reshaping the dam ogee to accommodate the sloped face of the dam, requiring additional, extensive hydraulic modeling to ensure dam safety. The use of stainless steel to create the flow deflectors is a novel and innovative idea which might save considerable cost, but would require extensive research and development to pursue. If either of these alternatives is pursued, the environmental impacts of the project will be similar or less than those described herein or in the 2000 EA. At this time, the Corps is continuing with the flow deflector design using cast-in-place concrete.

4.4. Alternatives Considered But Eliminated From Further Analysis

Several alternatives were considered and eliminated because they failed to meet one or more of the project needs. These alternatives, and the reasons they were rejected, are described briefly below. Because they were rejected early in the design process, these alternatives are not evaluated in detail in subsequent sections of this document.

4.4.1. Extend The Right Bank Training Wall

Extending the right bank training wall would be an effective way to armor the right bank slope, but it would be much more expensive than flattening the riprap toe slope and replacing the eroded riprap. Excavating to rock and dewatering for the foundations for the extended wall would impact a much larger area in the river during construction, but its footprint in the river after construction would be similar to flattening the riprap toe or replacing the eroded riprap. There would be water quality issues not associated with the preferred alternative (armoring with derrick stone) because of the need to do extensive in-water work to place a cofferdam in which to construct the wall. There are also uncertainties regarding foundation requirements and construction methods at this time.

This alternative was discarded because it is not a cost effective way to protect the right bank, and the environmental impacts associated with the extension would be much greater than those associated with the rock armoring.

4.4.2. Extend The Toe Of The Existing Riprap Armor Beyond Original Footprint

The existing slope is steeper than designed and potentially unstable. Heavier spills at CJD expected after the spill tradeoff with Grand Coulee Dam may increase the potential for additional steepening of the toe of the riprap armoring, accelerating the slope failure. Erosion of the right bank riprap must be prevented to ensure that loose material is not available to be entrained into the stilling basin by deflector-induced re-circulating flows. Flattening the slope of the toe with additional riprap beyond the original footprint is unnecessary, and would result in regulatory issues by going beyond repair of an existing structure, as well as additional, unnecessary impacts.

4.4.3. Routine Use of the City of Bridgeport Boat Ramp For Project Construction in Lieu Of Establishing a Temporary Pier at CJD

A public boat ramp is located in the City of Bridgeport park on the south side of the Columbia River approximately 3 miles downstream from the construction site at CJD. This ramp will probably be utilized for the initial and seasonal launching and removal of workboats and barges. The dewatering caissons required to provide a dry work area around the flow deflectors may also be launched from this site. However, this boat ramp is too far away for the frequent water access to the construction site that will be required to transport personnel, equipment, and materials. In addition, utilizing the boat ramp for frequent access would require constructing a temporary floating dock and result in unacceptable construction traffic though the park and the City of Bridgeport.

4.4.4. Establish A Staging Area Above the Right Bank South of Half Sun Way

This site is larger than the site by Highway 17, but smaller than the site just north of the CJD spillway. It was also previously used as a staging area during the original construction of CJD. Water and power may be available at the site. Concrete trucks from a batch plant located at the site would have to use Half Sun Way to reach the CJD spillway. Current uses of the site include a system of nature trails, wildlife mitigation areas, and a visitor's center. It is also the location for a proposed Colville Confederated Tribes fish hatchery. This location was rejected as a potential staging area in light of the negative impacts that it would have on the recreational activities in the area and the wildlife mitigation areas.

4.4.5. Use of Off-Site Concrete Batch Plants

The nearest concrete plant is located in Brewster, WA, about 15 minutes from the dam. It is unlikely that it will be able to produce the specialty concrete that is necessary for the top of the flow deflectors. The desired concrete for the flow deflectors will need to be a controlled-heat-of-hydration concrete to reduce the potential for cracking and separation. For the lower portion of the deflector, a standard concrete mix with a lower compressive strength will be utilized. However, the upper portion of the deflector will be constructed of specialty fiber-reinforced concrete using a higher strength concrete that contains flyash. Approximately 4,500 cubic yards of concrete will be necessary for the flow deflectors. The nearest concrete plants that could produce the specialty concrete are in Omak, Okanogan, or Chelan. Travel time from these locations is excessive. Coming from these distances, the concrete would be too old, compromising its quality and integrity.

5.0 AFFECTED ENVIRONMENT

Generally, the affected environment was described in the earlier EA, and that documentation is hereby incorporated by reference. Additional pertinent details are provided in the following sections.

5.1. Physical and Geologic Environment

Flow along the right bank during spillway use creates an eddy that has gradually eroded the armor rock from behind the end of the concrete training wall that extends downstream from the spillway (Figures 3 and 4). Aerial photographs document this phenomenon, which dates back to the 1950s. Use of the first spillway bay along the right bank has generally been avoided, possibly contributing to the eddying condition.

Some rock debris has been observed in underwater surveys of the concrete stilling apron below and adjacent to the spillway. Some of the rock may have originated from the erosion of smaller rock from the right bank armoring as a result of the localized eddying described in the previous paragraph. Some of the debris may be a result of back currents along the bottom, created during spill, carrying small rocks from downstream of the apron.

5.2. Water Quality

The Washington Department of Ecology (Ecology) and the Colville Confederated Tribes (CCT) determine water quality criteria for the Columbia River at Chief Joseph Dam. In general, the water quality in the Columbia river above and below the project is good with periodic exceedances of Ecology and CCT criteria occurring for temperature and total dissolved gas (Corps 2004). Based on these periodic exceedances, Ecology placed the Columbia River above and below Chief Joseph Dam in 2002/2004 Category 5 (polluted waters that require a TMDL) TMDL list for temperature and TDG.

Ecology has classified the Columbia River above and below Chief Joseph Dam as a salmon and trout spawning non-core rearing and migration aquatic life use water body, while the CCT has classified the Columbia River as a Class I water body above Chief Joseph Dam and a Class II water body below the dam. Water quality standards for TDG and temperature for Chief Joseph Dam are presented in Table 1. At Chief Joseph Dam, the State of Washington and the CCT have a similar TDG standard of 110%. However, Washington allows exceedance of the 110% TDG criterion to facilitate fish passage spills as shown in Table 1. For example, Chief Joseph Dam was granted a TDG water quality criteria waiver by Ecology for the 2003 spill season for the purpose of managing system spill for improved fish conditions. In addition, the TDG criterion established by Washington State and the Colville Tribe does not apply to flows above the seven-day, ten-year frequency (7Q10) flood flow of 222 kcfs.

Table 1. Washington Department of Ecology (Ecology) and Colville Confederated Tribes (CCT) water quality standards for Total Dissolved Gas and Temperature.

Parameter/Project	Regulator	Standard
Total Dissolved Gas		
Chief Joseph Dam	Ecology	Shall not exceed 110% of saturation at any point of sample collection, except during spill season for fish passage in which total dissolved gas shall be measured as follows: (1) Must not exceed an average of 115% as measured in the forebay of the next downstream dam. (2) Must not exceed an average of 120% as measured in the tailrace of each dam; TDG is measured as an average of the 12 highest consecutive hourly readings in any one day, relative to atmospheric pressure. (3) A maximum TDG one-hour average of 125% as measured in the tailrace must not be exceeded during spillage for fish passage.

	CCT	Shall not exceed 110% of saturation at any point of sample collection.
Temperature		
Chief Joseph Dam	Ecology	Measured by the 7-day average of the daily maximum temperatures. Shall not exceed 17.5°C. When temperature exceeds the criteria or is within 0.3°C of the criteria, and the condition is due to natural conditions, then human actions may not cause an increase of more than 0.3°C.
	CCT	Class I: Shall not exceed 16.0°C due to human activities. When natural conditions exceed 16.0°C, no temperature increase will be allowed which will raise the receiving water by greater than 0.3°C. Class II: Shall not exceed 18.0°C due to human activities. When natural conditions exceed 16.0°C, no temperature increase will be allowed which will raise the receiving water by greater than 0.3°C.

5.3. Social/Economic

5.3.1. Treaty Fishing Access for Colville Confederated Tribes

Members of the CCT make regular use of access areas immediately below the dam on both sides of the river for hook and line fishing. Please see figures 2, 16, and 17 for fishing access areas on the left (south) (Figures16 and 17) and right (north) (Figure 2) banks. The CCT fishers primarily target summer/fall Chinook[1] salmon for ceremonial and subsistence purposes. Primary fishing time is July through September. The 10-year average harvest is 500 summer chinook and 130 steelhead (630 total fish) (Pakootas, 2002). The area that would be armored on the right bank is part of the tribal fishing area. Other fishing areas may be affected also during the construction of the spillway deflectors.

5.3.2. Cultural Resources

The Chief Joseph Dam project has over 150 prehistoric archaeological sites, many of them contributing to the significance of the Rufus Woods Lake Archaeological District (RWLD), which was determined eligible for the National Register of Historic Places (NRHP) in 1978. A search of the NRHP, the Washington Office of Archaeology and Historic Preservation (OAHP) electonic historic database, and inspection of other background materials confirmed that the gas abatement project's area of potential effects ("APE") does not include the RWLD or any known prehistoric or historic archaeological sites or other potential historic properties. Corps archaeologists and archaeological contractors have inventoried the APE on several occasions over the past 20 years, but have found no evidence of cultural resources. Field inspection and a sequence of historical aerial photographs show that the proposed contractor staging area above the right bank is disturbed to considerable depth by grading and filling from use of that area by

[1] Note that the word "Chinook" as it refers to salmon has been capitalized since the 2000 EA.

previous activity. The right training wall, barge access mooring area, and alternate proposed contractor staging areas are all in graded and/or filled locations (Figure 18) No historic properties are recorded at the boat ramp in the City of Bridgeport, WA. Although some historic foundations are near the city of Bridgeport boat launch ramp barge deployment site, the proposed barge launching there would not affect them., and they are not listed on either the State or National Register of Historic Properties.

5.4. Recreation and Other Public Use

Public recreational use occurs near the proposed staging area, though it is not developed specifically for that purpose. An alternate area nearby to the west is located such that public road use would be affected.

There are trails in the immediate vicinity of the staging areas above the right bank. These are used by the general public for recreation, and are paved for light use (Figure 2).

6.0 ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

The effects of the proposed actions are compared against the baseline conditions associated with the no-action alternative. Unless otherwise indicated in the following discussion of environmental effects, the no-action alternative will not affect climate and air quality, physical and geologic environment, water quality, sediment, biological resources, cultural resources, or recreational and public use at the project site.

6.1. Climate and Air Quality

Establishment of the on-site batch plant may result in elevated levels of dust and other particulate matter. Most dust emissions occur during the unloading and conveying of concrete and aggregates and during the loading of concrete mixes. Traffic, including trucks hauling aggregate, concrete, and other supplies may also generate dust as they pass over unpaved or dusty surfaces in and around the plant. Aggregate stockpiles are another potential source of dust.

Every effort will be made to minimize dust generation, including daily or periodic watering of exposed aggregate stockpiles and roads, and cleaning of equipment. In addition, some dumping and loading areas may be enclosed with fabric filters or bag houses, and aggregate stored on site in stockpiles will most likely be contained within three-sided storage bunkers. Site layout and design will take into account the prevailing winds to minimize fugitive dust and will attempt to minimize travel distances within the site. Vehicle speed limits within the site may also be established. No long-term effects on air quality are expected as a result of the project implementation.

6.2. Physical and Geologic Environment

Reinforcement of the right bank armoring and filling in the small scalloped embayment at the end of the training wall will enable CJD to conduct spill operations evenly across all spillway bays. That embayment is a result of erosion following initial construction. Spilling from all bays will result in more linear flow along the right bank, reducing the eddying and preserving the armoring.

Entrainment of rock debris onto the stilling apron from downstream should be decreased with the placement of the larger armor rock on the bank. The armor rock is of a large enough size that the hydraulics that occur during spillway operations should not be able to dislodge the rock, reducing the potential for damage to the stilling basin.

Paving the right bank below the dam and behind the training wall will reduce the flow of water through the fine glacial till of the hillside, reducing the potential for creating instability in the right bank.

6.3. Water Quality

In the unlikely event that spill is required during the first year of construction of the flow deflectors, TDG levels could be either raised or lowered compared to present configuration and operation. If spill is required before any deflectors are completed, it is probable that there will be increases in TDG levels over those experienced under current conditions. Fewer spillbays will be available for spill as a result of deflector construction and spillbay maintenance activities. Therefore, increased TDG levels may result because of the uneven spill and an increased volume of water over through fewer bays. However, if spill is required after one or more deflectors are constructed, it is more likely that TDG will be the same or lower, since bays with deflectors will be available for spill, and would offset the concentration of spill on fewer bays that would be expected due to construction and maintenance activities. Neither of these scenarios is likely to occur. Analysis of long-term TDG data shows that spills and associated high TDG levels are most likely to occur in the spring and early summer, and that the risk of high TDG is negligible from October through February downstream of Grand Coulee Dam (Pickett et al., 2004). First-year construction of deflectors is not planned to begin until July, near the end of the spill season, which historically peaks in mid-June (Corps, 2000b).

At the end of the first year of construction, the Corps anticipates completion of six flow deflectors and the ability to spill (if necessary) over four of the completed deflectors. Hydraulic modeling is planned to determine the spill pattern that will optimize reductions in TDG. At low spill levels (less than approximately 30,000 cfs), most of the spill is likely to be directed onto the flow deflectors (dependent upon results of hydraulic modeling to ensure dam safety), resulting in reduced levels of TDG. At higher spill levels, the spill will be spread out over bays with deflectors and bays without deflectors. However, the expectation is that TDG levels will not exceed those generated in the current condition of no flow deflectors, and that the levels are likely to be less. In all subsequent construction years, TDG levels as a result of spill should decrease as the number of completed flow deflectors increases.

Placement of the armor rock on the right bank, driving pilings for the temporary pier, and barge operations in the near-shore area may cause short term, temporary increases in turbidity and associated decreases in water quality. The magnitude and duration of the turbidity is expected to be minor. Turbidity levels are expected to rapidly return to baseline conditions upon completion of the activities.

There may also be localized leaching of contaminants, specifically metals, if treated wood is used for the pilings and over water structures (e.g. pier decking). However, a study by the Corps (1997, in NOAA 1998) showed that even with the worst case scenario, leaching from Ammoniacal Copper Zinc Arsenate (ACZA) wood, in conjunction with background concentrations of 2 ug/L water column copper, would not exceed NOAA's recommended guideline of 7 ug/L (NOAA, 1998). The study showed that projects using less than 100 piles would not result in water column copper concentrations that exceed 7 ug/L (at water pH between 7 and 8). Background levels of dissolved copper at CJD were 0.6 ug/L in forebay samples taken in the late winter and spring of 2004 (Corps, 2004) and fewer than 100 piles will be used to build the dock. Therefore, it is unlikely that water column copper levels will exceed the levels recommended by NOAA for the use of treated wood in aquatic environments. In addition, field studies indicate that any toxicity associated with the release of metals into the water column is minimized by dilution of the receiving waters, and diminishes with the age of the structure (Poston, 2001). Finally, the risk associated with immersed wood (e.g. pilings) decreases over a short period of time (days to weeks) because the reservoir of metals is depleted and leaching of metal contaminants drops off (Poston, 2001). The proposed pier will be a small, temporary structure in a dynamic riverine environment with strong currents, thus minimizing the likelihood of a significant increase in pollutant levels. Upon completion of the flow deflector construction project, the pier and associated pilings will be removed. The preferred alternative for construction of the pier is to use steel pilings.

Water quality impacts could occur as a result of the operation of the batch plant. Waste water from batch plant operations is usually generated from truck wash systems, washing of central mixing plant, stormwater runoff from the ready-mix plant yard, waste water generated from water sprayed dust control and conveyor wash down.

Wash water from batch plants is usually highly alkaline (up to pH 12) and is highly toxic to fish and other aquatic life. However, the washwater from the batch plant will not be expected to reach the waters above or below CJD for the following reasons: batch plant facilities have developed a variety of operational configurations to control pollution related to waste water. This includes settling ponds, storm water detention/retention facilities and water reuse systems. Wash pits are used for settling and aggregate recovery. Unlined ponds are used for effluent evaporation and percolation to ground water. Some batch plants use completely closed loop systems. The contractor will be required to have the appropriate water discharge permits from the State and to use best management practices (BMPs) in constructing and operating the batch plant.

Every precaution will be taken to prevent the discharge of petroleum products, chemicals, or other material into the water. Fuel spill kits with absorbent pads will be onsite at all times. A spill prevention control and countermeasures (SPCC) plan will be created prior to the commencement of any construction activities that will identify and recognize potential spill sources at the site, outline BMPs, delineate responsive actions in the event of a spill or release, and identify notification and reporting procedures. Implementation of the SPCC will minimize the effect of construction activities on the quality of the adjacent waters. Per standard contract specifications required by the Corps, the contractor will be required to implement the described BMPs. In addition, a SPCC plan is typically a requirement for any action requiring a 401 (Clean Water Act) water quality certification or a National Pollutant Discharge Elimination Permit (NPDES) permit. If necessary, both of these permits will be acquired as part of the proposed project.

BMPs, including silt fencing, stabilized construction entrances, the use of straw bales, the establishment of roadside ditches that contain gravel check dams and straw bales, and dust control methods (e.g. sprinkling the site with water until the surface is wet, clearing only the area necessary, covering bare ground with gravel or grass-seed, etc.) will be used to reduce the likelihood of sediment transport to the waters above and below CJD. Stormwater generated on-site will be controlled.

No significant impacts to water quality are expected as a result of the implementation of this project. Monitoring will be carried out at an appropriate frequency during construction in order to detect problems. In general, as stated in the 2000 EA, the gas abatement measures will improve dissolved gas conditions in the river at times when CJD must spill, and the supporting actions outlined herein will help ensure that occurs.

6.4. Sediment

In the event that treated wood is used to establish the temporary pier, released metal contaminants may be incorporated into the sediment. Metals will not degrade in the long term, but they may become physically sequestered, mineralized, or chemically sequestered, thereby reducing their bioavailability. Numerous studies have found that the impacts of leached metals to sediments are localized in areas immediately adjacent (within 10 feet) to small treated wood structures (Poston, 2001).

Any increase in sediment contamination as a result of using treated wood to build the temporary pier is not expected to result in a significant increase in background contaminant levels.

Additional sediment may reach the waters below CJD as a result of surface water runoff in a storm event or from wind-blown dust. Any increase in turbidity will be short-term and localized.

BMPs, including silt fencing, stabilized construction entrances, dust control methods (e.g. sprinkling the site with water until the surface is wet, clearing only the area necessary, covering bare ground with gravel or grass-seed, etc.) will be used to reduce the likelihood of sediment transport to the waters above and below CJD. In addition, the contractor will be required to control stormwater generated on-site.

No significant impacts to the sediments within the project area are anticipated as a result of this project.

6.5. Biological Resources

6.5.1. Fish

While most of the following references are to salmonids, the information can be extrapolated to all fish populations in the vicinity of the project.

The effects of increased levels of TDG on fish was described in detail in the June 2000 EA.

Construction activities may cause short term, temporary increases in turbidity and associated decreases in water quality. The magnitude and duration of the turbidity is expected to be minor, and turbidity levels are expected to rapidly return to baseline conditions upon completion of the rock placement. Under most scenarios of this type, fish and other motile organisms encounter localized suspended sediment plumes for exposure durations on a temporal scale of minutes to hours (Clarke and Wilber, 1999). If an adult salmonid enters the project area during any portion of the in-water work, it will be mobile and able to avoid any turbidity plumes. The life history stages of salmonids requiring the lowest suspended sediment concentration—spawning, incubation, and fry rearing—do not occur in the project action area.

Numerous physiological effects of increased suspended sediment concentrations on salmonids have been documented. However, these physiological responses appear to be reversible if the exposure has been short-term; recovery occurs when the stressor is removed or the fish escapes the plume (Servizi, 1990).

The proposed pier will be a small and temporary structure that will probably be constructed of treated wood or steel. The allowable copper levels set by NOAA Fisheries are unlikely to be exceeded as a result of the pier installation. Juvenile salmonids, the most sensitive to metals, occur rarely or not at all in the project area. In addition, the construction contractor will be required to follow the *Best Management Practices for the Use of Treated Wood in Aquatic Environments* (WWPI, 1996).

All piles will be driven with a vibratory hammer to reduce potential impacts to salmonids and other fish in the vicinity. If an impact hammer is required to install the piles, the contractor will be required to utilize a sound attenuating system like a bubble curtain. Any effects of noise disturbance associated with construction work are expected to be discountable.

Piers can reduce primary and secondary production through shading effects (Kahler *et al*., 2000, Hass *et al*., 2002), and may reduce the substrate available to benthic organisms, important prey items for many species of fish. Piers may also affect behavior of juvenile salmonids by altering their migratory paths and reducing their ability to avoid predators and to search for prey (Hansen *et al.* 2003; Helfman 1981). Shading effects on primary and secondary production from the pier and reduction in availability of benthic habitat will be temporary. Juvenile salmonid migration is not expected to be significantly impacted, if at all, because of the lack of this life stage in the project area and the temporary nature of the impacts.

No significant impacts to fish are anticipated as a result of the implementation of the proposed actions.

6.5.2. Other Aquatic Organisms

Benthic invertebrate production around the new pier may be reduced. New pilings may reduce the substrate available to benthic aquatic organisms, and leaching of contaminants, specifically metals, may negatively impact the survival, growth and reproduction of benthic organisms. However, these impacts will be localized and temporary, and will not significantly alter the benthic ecosystem of the area.

6.6. Social/Economic

6.6.1. Treaty Fishing Access for Colville Confederated Tribes

Tribal fishing may be disrupted to some extent by construction. Fishing in the area immediately down stream of the right bank training wall may be interupted at the end of the 2004 season during the rock armoring, but fishing access will be maintained in the area behind the right bank training wall. As described earlier, the primary tribal fishery occurs from July to September, but may extend into October depending on the steelhead return. After discussions with the CCT, the Corps plans to start the rock armoring work on or after October 1.

Some existing access points (i.e. trails and concrete stairs, pads) may be altered by the rock placement. If access points are obscured or destroyed, the Corps will restore or improve the access.

Other fishing sites might be affected by construction of the flow deflectors in 2005-2007. At this time, the Corps anticipates some restrictions/closures near the head of the training walls close to the dam to accommodate contractor activities. On the right bank, an area that extends approximately 370 feet from the face of the dam will be fenced off for contractor use during the flow deflector construction. This security boundary during construction excludes access by the public to 5 parking spaces, the comfort station, a covered picnic area, and the water fountain. The space is needed for a truck turnaround and for the settling basins for the dewatering system. Several parking spaces at the termination of the spillway access road will still be available for use, and overflow parking is available at the top of the spillway access road. However, there may be times when the parking spaces at the termination of the spillway access road are unavailable due to the movement of equipment into and out of the staging area. When this occurs, fishermen should still be able to drive down the spillway access road to drop off/pick up coolers and fishing gear, but will need to park at the top of the spillway access road. Sanitary facilities will be provided for use while the comfort station is inaccessible. Fishing access along the training wall will be maintained by installing a permanent metal stairway down the right bank that enables members of the public to traverse the riprap down to the training wall. As previously discussed with members of the CCT, fishing may be periodically restricted within 75 feet of the dam along the training walls on both the right and left banks. The Contractor will be required to provide advance notice prior to closing these areas. Otherwise, there should be fishing access along the majority of both banks during the flow deflector construction. No other restrictions/closures are anticipated at this time. However, as construction proceeds, unforeseen events may necessitate additional closures and/or restrictions. The Corps will maintain close coordination with the CCT to address issues as they arise, and to identify alternate fishing locations and other potential mitigation actions to allow continued opportunities for the CCT to meet its ceremonial and subsistence needs.

6.6.2. Cultural Resources

No effect on historic or prehistoric National Register eligible properties would result from the proposed construction, including use of the proposed staging and work areas, as no such properties are present. A technical report documenting the finding and supporting facts is being prepared for coordination with the CCT THPO and Washington SHPO in accordance with Sec. 106 of the National Historic Preservation Act procedures in 36 C.F.R. Part 800.

6.7. Recreation and Public Use

Recreational use in the construction areas during the period of project construction will be limited due to safety and security concerns. Some trails may be unavailable to the public, and fishing access on the right bank may be limited at times, particularly during the rock armoring work. Recreational traffic accessing Bridgeport State Park and the golf course east of the proposed right bank staging areas may be slowed due to the presence of large trucks along Half-Sun Way.

The construction activities are not expected to have long term effects on recreational opportunities in the project area. The staging areas on the right bank will be returned to the pre-project condition to the greatest extent possible. Restoration activities will include removing all foreign materials, re-establishing the former site grade, grass-seeding with appropriate reclamation grass species, and invasive species control.

7.0 ENVIRONMENTAL COMPLIANCE

Please reference the Chief Joseph Dam Dissolved Gas Abatement Project Final EA and FONSI for a complete list of laws and regulations previously addressed, and the associated assessment of compliance.

LAWS AND REGULATIONS RELATING TO THE PROPOSED ALTERNATIVES	ISSUES ADDRESSED	CONSISTENCY OF PREFERRED ALTERNATIVE
National Environmental Policy Act (NEPA) 42 U.S.C. 4321 et seq.	Requires all federal agencies to consider the environmental effects of their actions and to seek to minimize negative impacts.	Consistent per FONSI and EA document.
Clean Water Act (CWA) 33 U.S.C. 1251 et seq.; Section 404	Requires federal agencies to protect waters of the United States. Disallows the placement of dredged or fill material into waters (and excavation) unless it can be demonstrated that it is the least environmentally damaging practicable alternative. This restoration activity is proposed under the authority of a Nationwide 27 permit.	A Section 404(b)(1) evaluation was prepared for fill in waters of the United States in relation to the flow deflector construction. The rock armoring of the right bank is an exempt activity per 33 CFR 323.4(a)(1)(i)(2).
Clean Water Act Section 401	Requires federal agencies to comply with state water quality standards.	The rock armoring is exempt from 404, therefore no 401 water quality certification is required for that activity. However, as described in section 6.3, no long-term negative impacts to water quality are expected as a result of the placement of the armor. All other construction activities will be consistent with 401 water quality certification as issued by the Washington Department of Ecology and/or the Environmental Protection Agency (EPA).
Clean Air Act	Requires states to develop plans, called State implementation plans (SIP), for eliminating or reducing the severity and number of violations of National Ambient Air Quality Standards (NAAQS) while achieving expeditious attainment of the NAAQS. The Act also requires Federal actions to conform to the appropriate SIP.	Consistent -The area is in attainment or is unclassified for all pollutants. The contractor will be required to comply with WAC 173-400-113 that outlines requirements for new sources in attainment or unclassified areas.
Endangered Species Act 16 U.S.C. 1531 et seq.;	Requires federal agencies to protect listed species and consult with US Fish & Wildlife or NOAA Fisheries regarding the proposed action.	Consistent – proposed actions are in support of NOAA Fisheries BiOp of 2000, RPA 136.

LAWS AND REGULATIONS RELATING TO THE PROPOSED ALTERNATIVES	ISSUES ADDRESSED	CONSISTENCY OF PREFERRED ALTERNATIVE
National Historic Preservation Act 16 U.S.C. 461;	Requires federal agencies to identify and protect cultural and historic resources.	Consistent upon determination of No Effect by the State Historic Preservation Officer and the Colville Tribal Historic Preservation Officer

8.0 REFERENCES

Clarke, D.G. and D.H. Wilber. 1999. *Assessment of Potential Impacts of Dredging Operations Due to Sediment Resuspension.* DOER Technical Notes Collection, U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Haas, M.A., C.A. Simenstad, Jr., J.R. Cordell, D.A. Beauchamp, B.S. Miller. 2002. Effects of large overwater structures on epibenthic juvenile salmon prey assemblages in Puget Sound, Washington. Prepared for the Washington State Transportation Commission, Washington Highway Administration. Final research report No. WA-RS 550.1. 114 p. (http://depts.washington.edu/trac/bulkdisk/pdf/550.1.PDF).

Hanson, J., M. Helvey, and R. Strach (editors). 2003. Non-fishing impacts to essential fish habitat and recommended conservation measures. Version 1. National Marine Fisheries Service (NOAA Fisheries), Alaska Region, Northwest Region, Southwest Region. Available online at http://swr.nmfs.noaa.gov/EFH-NonGear-Master.PDF.

Helfman, G.S. 1981. The advantage to fish of hovering in shade. Copeia 2:392-400.

Kahler, T., M. Grassley, and D. Beauchamp. 2000. A summary of the effects of bulkheads, piers, and other artificial structures and shorezone development on ESA-listed salmonids in lakes. Final report, 13 July, 2000. Prepared for the City of Bellevue, Washington by the Watershed Company, Kirkland, Washington, and Washington Cooperative Fish and Wildlife Research Unit, Univ. of Washington, Seattle, WA, 78p.

National Marine Fisheries Service (NOAA). 1998. Position Document for the Use of Treated Wood in Areas within Oregon Occupied by Endangered Species Act Proposed and Listed Anadromous Fish Species. Portland, Oregon.

Pakootas, J. 2002. Letter from Colville Confederated Tribes Business Council Chairman to Administrator, Bonneville Power Administration, dated 30 Sep 2002.

Pickett, P., H. Rueda, and M. Herold. 2004. Total Maximum Daily Load for Total Dissolved Gas in the Mid-Columbia River and Lake Roosevelt. Prepared jointly by the U.S. Environmental Protection Agency and the Washington State Department of Ecology in cooperation with the Spokane Tribe of Indians. Washington Department of Ecology Publication Number 04-03-002.

Poston, T. 2001. Treated Wood Issues Associated with Overwater Structures in Marine and Freshwater Environments. Washington Department of Fish and Wildlife, Washington Department of Ecology, and Washington Department of Transportation. Olympia, Washington.

Servizi, J.A. 1990. "Sublethal Effects of Dredged Sediments on Juvenile Salmon." In *Effects of Dredging on Anadromous Pacific Coast Fishes,* Workshop proceedings, C.A. Simenstad (ed.), Washington Sea Grant, Seattle, WA, September 8-9, 1988.

U.S. Army Corps of Engineers (Corps). 2000a. Chief Joseph Dam Dissolved Gas Abatement Project Final Environmental Assessment and Finding Of No Significant Impact. June 2000. Available online at http://www.nwd-wc.usace.army.mil/nws/hh/gas/pdfs/Abatement_EA.v3.1.pdf

U.S. Army Corps of Engineers (Corps). 2000b. Chief Joseph Dam, Columbia River, Washington, Gas Abatement Study, General Reevaluation Report. May 2000. Available online at: http://www.nwd-wc.usace.army.mil/nws/hh/gas/pdfs/GRRFinal.pdf

U.S. Army Corps of Engineers (Corps). 2004. Chief Joseph Dam Columbia River, Washington Hatchery Water Supply Study.

Washington Dept. of Ecology. 2004. Washington State's water quality assessment [303(d)], list for 2002/2004. Available online at: http://www.ecy.wa.gov/programs/wq/303d/2002/2002-index.html

WWPI. 1996. Best Management Practices for the Use of Treated Wood in Aquatic Environments. Western Wood Preservatives Institute, Vancouver, Washington.