APPENDIX I, Agency Coordination Documents and Public Review Comments and Responses

Additional Water Storage Project, Final Feasibility Study Report & Final EIS

Howard Hanson Dam,
Green River, Washington
August 1998

prepared by
Seattle District
US Army Corps of Engineers

Tacoma Public Utilities

US Army Corps of Engineers®

APPENDIX I
AGENCY COORDINATION DOCUMENTS AND PUBLIC COMMENTS AND RESPONSES

TABLE OF CONTENTS

GARY LOCKE
Governor

STATE OF WASHINGTON
OFFICE OF THE GOVERNOR
P.O. Box 40002 • Olympia, Washington 98504-0002 • (360) 753-6780 • TTY/TDD (360) 753-6466

December 19, 1997

Colonel James M. Rigsby
District Engineer
Corps of Engineers
Post Office Box 3755
Seattle, Washington 98124-2255

Dear Colonel Rigsby:

I am writing to express my support for the Howard Hanson Dam Additional Water Storage Project. I believe the feasibility study process and final project address both environmental and regional municipal water needs in a balanced and creative manner. After reviewing this project, I believe the process used for this proposal could serve as a model for this state on how to make regional fish and municipal water decisions.

Let me note here that my continued support for the Howard Hanson project is contingent upon the completion of the National Environmental Policy Act review and the implementation of the adaptive management measures outlined in the October proposal. These approaches are desirable, in my view, because they offer flexibility and allow for adjustments as new information becomes available.

This project appears to have struck the right balance between our natural resources and the public's use of them. For those reasons, I look forward to working with the City of Tacoma, the Corps of Engineers, and other federal and state agencies in securing appropriate funding and permit approval for Phase I of the Howard Hanson Dam Additional Water Storage Project as currently defined. I believe this project represents an opportunity to create one of this region's largest fish and wildlife restoration efforts while providing clean and safe water to residents throughout the Puget Sound Region.

Sincerely,

Gary Locke

Gary Locke
Governor

cc: John Daniels, Jr., Council Chair, Muckleshoot Indian Tribe
Bern Shanks, Director, Department of Fish and Wildlife
Michael J. Spear, Regional Director, U.S. Fish and Wildlife Service
Will Stelle, Regional Administrator, National Marine Fisheries Service

Fym → file

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way, NE
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Seattle, Washington 98115-0070

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DIRECTOR OF UTILITIE
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November 19, 1997

F/NW

Mark Crisson, Director
Tacoma Public Utility
P.O. Box 11007
Tacoma, Washington 98411

Colonel James M. Rigsby
U.S. Army Corps of Engineers
Post Office Box 3755
Seattle, Washington 98124-3755

Dear Mr. Crisson and Colonel Rigsby:

As requested by the Tacoma Public Utilities' (TPU) letter of October 28, 1997, I am pleased to offer the National Marine Fisheries Service (NMFS) support for the approval and funding of Phase One of the Howard Hanson Additional Water Storage Project (AWSP) as outlined in the October 28, 1997 project description.

The AWSP has water supply goals and ecosystem restoration goals. It will store up to 20,000 ac.ft. of water from Tacoma's undeveloped second diversion water right. The project will also provide a downstream fish passage facility at the dam; the potential for restored salmon and steelhead populations in the upper watershed; habitat improvement; storage of water for fishery purposes; and a number of fishery amenities provided through a Tacoma agreement with the Muckleshoot Indian Tribe (MIT).

The City of Tacoma and the U.S. Army Corps of Engineers (Corps) have worked extensively over the past 7 years with federal and state agencies, MIT, and sports fishers on the feasibility studies associated with the AWSP. I appreciate your flexible and forthright manner in seeking common solutions. You have given an extraordinary effort to design project provisions to accommodate fishery conservation. Your willingness to change operational philosophies and strategies to favor fish demonstrate commitment to the public resource and leadership in the industry.

As you are aware, however, our support must be conditional at this time. It is contingent upon completion of National Environmental Policy Act review, satisfactory resolution of potential issues under the Endangered Species Act (ESA), and resolution of other outstanding issues identified cooperatively by the parties involved in this process.

In particular, the NMFS is responsible for implementing the ESA with regard to anadromous fish. The Green River chinook, which occurs downstream from the current project, may be listed as threatened or endangered under the ESA. A proposed federal project that may affect a listed species or its critical habitat is subject to consultation with NMFS under section 7 of the ESA, 16 U.S.C. § 1536, and actions by both federal and nonfederal entities are subject to the "take"

PUB 12/5/97, Water, Legal

prohibition of section 9, 16 U.S.C. § 1538. I understand that Tacoma will apply for an Incidental Take Permit (ITP) under section 10(a)(1)(B) of the ESA, 16 U.S.C. § 1539(a)(1)(B). To obtain an ITP, an applicant must develop a Habitat Conservation Plan (HCP) that meets the permit issuance criteria of section 10(a)(2), 16 U.S.C. § 1539(a)(2). I understand that Tacoma has committed to incorporating the following principles in the HCP, and the Corps has also committed to following these principles in the AWSP:

1) A clear commitment that Howard Hanson Dam refill and storage management will be dedicated and directed to fishery resource conservation and enhancement.

2) Continuous project operation during refill and storage management periods.

3) A state-of-the-art snow pack monitoring and runoff forecasting system.

4) Effective procedures for risk sharing between municipal supply and fishery resource needs, including use of municipal storage to meet fish needs, when storage flexibilities are not adequate.

5) Funding for, and implementation of, a fishery resource and flow monitoring program, and using results to effectively modify project procedures and design.

6) Restoration of fish habitat where appropriate and where significant benefits can be demonstrated.

Our ultimate support for the project will depend upon an agreement that meets permit issuance criteria and provides for satisfactory implementation of these principles.

My agency stands ready to provide information and assistance during your plan development. I look forward to working with both your organizations in the first phase development of the Howard Hanson Additional Water Storage Project.

Sincerely,

William Stelle, Jr.
Regional Administrator

cc: USFWS - D. Frederick
WDFW - B. Shanks, K. Terwilleger
Governor's Office - C. Smitch
Muckleshoot Indian Tribe - J. Daniels, Jr.
Trout Unlimited - F. Urabeck

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

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DIRECTOR OF UTILITIES
C: Water

November 12, 1997

Mark Crisson
Director, Tacoma Public Utilities
3628 South 35th Street
P.O. Box 11007
Tacoma, WA 98411-0007

Dear Mr. Crisson:

For the last 7 years the City of Tacoma and the Corps of Engineers have done numerous studies in pursuit of additional water supply from Howard Hanson Dam. The Department of Ecology has been active in helping design and comment on these studies. Since your feasibility study is near completion, you are looking for agency support to begin the engineering and design phase for the Howard Hanson Dam Additional Water Storage Project. We understand that our agency's support is necessary for the Corps of Engineers and Tacoma to secure federal and City funding for Phase 1 of this project.

The Department of Ecology supports the approval and funding of Phase 1 of the Howard Hanson Additional Water Storage project as described in your October 28, 1997 proposal. This support is contingent upon satisfactory completion of the National Environmental Policy Act review.

This project will serve two goals: 1) an ecosystem restoration goal to provide net positive resource benefits for Green River wild and hatchery salmon and steelhead, and 2) a water supply goal to provide a cost-effective and sufficient municipal and industrial water supply.

The ecosystem restoration involves a $34 million fish passage facility to allow downstream passage of salmonid fry and juveniles with a trap and haul facility for upstream passage of adults. Tacoma agrees to accept higher minimum instream flows than required by Ecology. The Corps will use adaptive management to restore fish and wildlife habitat affected by reservoir refill operation such as side channels and provide 5000 acre-feet of water for fisheries purposes each year. Additional water will be available for fish through Corps storage management and Tacoma's non-use of their first diversion water in low-flow situations.

Tacoma's water supply will be increased by storing up to 20,000 acre-feet in Howard Hanson Reservoir between February 15 and May 31. The water would be from Tacoma's second diversion water rights using 100 cfs from the Green River conditioned with minimum instream flows even higher than Ecology's existing minimum flows.

Ecology agrees to make the necessary adjustments to Tacoma's second diversion water right to allow storage of the water behind Howard Hanson Reservoir with higher minimum instream flow conditions. In addition, we agree to evaluate Phase 2 of the additional storage project if it becomes feasible.

Sincerely,

Tom Fitzsimmons
Director

United States Department of the Interior

FISH AND WILDLIFE SERVICE
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Western Washington Office
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Lacey, Washington 98503
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November 13, 1997

Colonel James M Rigsby
District Engineer
Seattle District, Corps of Engineers
Seattle, Washington 98124-2255

Re: Howard Hanson Additional Water Storage Project

Dear Colonel Rigsby:

The purpose of this letter is to state our support for the Corps of Engineers (Corps) and the City of Tacoma pursuing approval and funding for Phase One of the proposed Additional Water Storage Project (AWSP). For many years, the U.S. Fish and Wildlife Service (Service) has taken a strong interest in this project because of its potential effect on the fish and wildlife resources of the Green River Basin. In particular, we believe this project offers the most feasible means for restoring anadromous fish runs to the 100+ miles of historically used habitat located above Howard Hanson Dam and Reservoir. The project, as described in the Corps' and Tacoma's October 28, 1997 proposal, contains elements that the Service strongly supports, including fish passage facilities, habitat restoration, adaptive management provisions to address uncertainties, and operational modifications that would provide better protection for flows and the dependent fishery resources.

For the above reasons, we believe the AWSP has the potential to result in significant benefits for fish and wildlife. Important details are still under development and formal commitments have yet to be made. We are hopeful that the development of the project's specific details, involving both physical and operational features, continue to meet our expectations. As you should expect, our continued support for Phase One of the AWSP is contingent on the satisfactory development of project details during the National Environmental Policy Act review process.

My staff and I appreciate the efforts the Corps and the City of Tacoma have made in refining the project design to address our concerns. We look forward to working with you toward the development of a project that substantially meets the objectives and goals of all parties.

Sincerely,

David C. Frederick
Supervisor

gg/jmc
DOD/DA/CE/SEA/Howard Hanson AWSP

[An original letter sent to Mark Crisson, Tacoma Public Utilities]

c: NMFS, Lacey (Robert Turner)
WDFW, Olympia (Bern Shanks)
Muckleshoot Indian Tribe, Auburn (John Daniels, Jr.)

State of Washington
DEPARTMENT OF FISH AND WILDLIFE

Mailing Address: 600 Capitol Way N • Olympia, WA 98501-1091 • (360) 902-2200, TDD (360) 902-2207
Main Office Location: Natural Resources Building • 1111 Washington Street SE • Olympia, WA

November 17, 1997

Mr. Mark Crisson, Director
Tacoma Public Utilities
Post Office Box 11007
Tacoma, Washington 98411-0007

Colonel James M. Rigsby
U.S. Army Corps of Engineers
Post Office Box 3755
Seattle, Washington 98124-3755

Dear Mr. Crisson and Colonel Rigsby:

Tacoma Public Utilities' (TPU) October 28 letter requested our support for the proposed Howard Hanson Dam Additional Water Storage Project (AWSP). The major feature of this proposal is storage of up to 20,000 acre-feet of water from Tacoma's presently undeveloped second diversion water right. TPU and the U.S. Army Corps of Engineers propose additional features including construction of new outlet works for Howard Hanson Dam incorporating downstream fish passage facilities, habitat improvements above and below the dam, and the annual storage of an additional 5,000 acre-feet of water for steelhead incubation protection and other fisheries purposes. These elements would be implemented in combination with other features provided for in a 1995 agreement between TPU and the Muckleshoot Tribe, including construction of upstream fish passage facilities at the TPU diversion dam.

Together these passage facilities are expected to enable substantial restoration of salmon and steelhead to the upper Green River watershed above these dams. Reestablishment of anadromous fish to the upper Green River watershed has been our goal for many years. This is a historic opportunity and we are pleased to endorse moving forward with this effort through the next phase of engineering and design. However, as I am sure you appreciate, our endorsement at this time cannot be unconditional. Our support of the AWSP must be qualified in regard to potential actions under the Endangered Species Act (ESA), fulfillment of our responsibilities under the National Environmental Policy Act (NEPA), and successful completion of the issue resolution process in which we are now engaged.

Our goals in regard to the Green River in general, and the Howard Hanson project in particular, are to achieve maximum net resource benefits, including opportunities for harvest, for all fishery resources. These include steelhead, chinook, coho, and chum salmon. As stated in our letter of February 29, 1996, an essential aspect of the project from our perspective is protection and enhancement of downstream fish production, along with restoration of salmon and steelhead to the upper watershed and full mitigation for impacts to wildlife. Protection of downstream resources is also relevant to possible actions under the ESA, such as the potential listing of Green

River chinook. Fulfillment of our goal in this regard requires resolution of existing deficiencies including impacts associated with storage and diversion of the second supply water right. A central feature of means to accomplish this end is the proposed substantial expansion of flexibility in project refill and storage management, along with a major new emphasis on resource protection. To be successful, these new flexibilities require sweeping change in both existing hardware and current project operating policy. Significant progress has been made, especially over the last few weeks, and we believe these issues will be addressed based on implementation of the principles below.

As you know, there are problems with the existing project that result in persistent and substantial resource losses. Existing summer conservation pool capabilities and operating rules favor fall spawning salmon at the expense of spring spawning wild steelhead. Additional losses arise from other sources including project operations to achieve objectives in conflict with resource needs, uncertainties in runoff forecasting, staffing, and outlet control limitations. We must be certain these do not persist or carry over to the AWSP. Successful resolution of these issues, as well as additional concerns associated with the proposed project, depends to a high degree on dedication of project operation to resource needs. Therefore, our ultimate approval of the project will be based on further detailed agreement(s) that can be achieved as we further refine the project in the coming months.

In summary, realization of the resource benefit potential of the AWSP is absolutely dependant on commitment to and effective implementation of the following principles:

1) clear commitment that Howard Hanson Dam refill and storage management will be dedicated and directed to fishery resource conservation and enhancement;

2) provide for continuous project operation during refill and storage management periods;

3) state-of-the-art enhancement of snow pack monitoring and runoff forecasting;

4) effective procedures for risk sharing between municipal supply and fishery resource needs, including use of municipal storage to meet fish needs when storage flexibilities are not adequate;

5) fund and implement monitoring and use results to effectively modify project procedures and design; and

6) restore fish habitats where appropriate and where significant benefits can be demonstrated.

I wish to express my appreciation for the hard work you have done to formulate a project to meet regional water supply needs and restore salmon and steelhead to the upper Green River watershed above the TPU water diversion and Howard Hanson Dam. This is a formidable challenge. Our mutual efforts over the past years and especially the last few weeks have been fruitful. We look forward to continuing to work with you to complete the formulation of a project that truly fulfills these objectives.

Sincerely,

Bern Shanks, Ph.D.
Director

KT:GE:slt

cc: John Daniels, Jr., Muckleshoot Tribe
Curt Smitch, Governor's Office
David Frederick, U.S. Fish and Wildlife Service
Will Stelle, National Marine Fisheries Service
Frank Urabeck, Trout Unlimited

South King County Chapter
P.O. Box 3434
Federal Way, WA 98003

September 14, 1997

Col. James M. Rigsby
District Engineer
Seattle District
U.S. Army Corps of Engineers
P.O. Box 3755
Seattle, Washington 98124-2255

Dear Col. Rigsby:

The purpose of this letter is to advise you, in advance of the September 19 Alternatives Formulation Briefing, of our continued strong support for the Howard Hanson Dam additional water storage project, as presented in your July 1997 draft Feasibility Report/EIS.

South King County Chapter of Trout Unlimited (TU) has been a long-term partner with the Seattle District Corps of Engineers, Tacoma Public Utilities (TPU), Washington Department of Fish and Wildlife (WDFW) and the Muckleshoot Indian Tribe (MIT) in Green River wild steelhead and salmon preservation and restoration activities. We have participated in the additional storage feasibility study since its inception.

The TU promoted, but cooperatively undertaken, wild steelhead restoration project for the upper Green River watershed began in 1982 when the first wild steelhead fry were planted above Hanson Dam. The fry were produced by the MIT from wild steelhead brood stock captured by the chapter and the Green River Trout Club under WDFW supervision. Currently, around 80,000 fry are released annually in the upper watershed in late August or early September.

Surviving smolts exit through the existing outlet facilities about a year and half later. Because passage through the Corps project is problematic, the effectiveness of our wild steelhead restoration project has been limited. However, we have had as many as 130 adult wild steelhead return to the TU trap at the TPU water supply headworks (barrier to upstream fish migration) which is located 3.5 miles below Hanson Dam.

Obviously, we want to have the Hanson Dam fish passage improvements that would be provided by the increased storage project. The sooner the project goes forward the sooner the public will gain the benefits of upper river natural steelhead and salmon production.

TU believes the additional storage project has been well-formulated with unusually extensive and meaningful agency, tribal, public and scientific community input. The adaptive management strategy gives us confidence that likely unanticipated circumstances will be adequately and successfully addressed. The two phased approach provides further risk management opportunities.

Our membership believes that the risk to salmonids of negative project impacts will be further minimized through continued good planning and additional engineering and biological studies, including appropriate physical modeling of the fish passage facilities. However, we feel that any remaining risk should be borne by the project sponsor rather than the fish. Our expectations and basis for our support is that the project will result in a significant net gain for Green River wild steelhead and salmon production -- below and above Hanson Dam.

The multi-interest public involvement process that your office has developed over the last five years gives us considerable confidence that the Corps and Tacoma will do the right thing for fish. We expect this process to continue and pledge our chapter's support and timely input.

Frank Urabeck will be representing our chapter at the September 19 briefing. Please distribute copies of this letter to others attending the briefing.

Sincerely,

Joseph Madrano, President
South King County
Trout Unlimited

cc: Bill Robinson
Bob Johnson
Frank Urabeck
Bern Shanks

Agency Resolution Letters

State of Washington
DEPARTMENT OF FISH AND WILDLIFE

Mailing Address: 600 Capitol Way N • Olympia, WA 98501-1091 • (360) 902-2200, TDD (360) 902-2207
Main Office Location: Natural Resources Building • 1111 Washington Street SE • Olympia, WA

February 29, 1996

Colonel Donald T. Wynn
District Engineer
Seattle District, Corps of Engineer
Post Office Box 3755
Seattle, Washington 98124-2255

Mark Crisson
Director
Tacoma Public Utilities
Post Office Box 11007
Tacoma, Washington 98411-0007

Dear Colonel Wynn and Mr. Crisson:

For the past few years, Washington Department of Fish and Wildlife (WDFW) has been working with the Corps of Engineers, Tacoma Public Utilities, the Muckleshoot Indian Tribe, and other natural resource agencies to make improvements at Howard Hanson Dam. These include enhancing the fish and wildlife populations at the project vicinity and in the Green River both above and below the project, as well as making modifications to the dam for improved fish passage. In the past three months, staff has attended many meetings and shared written documents back and forth with the Corps of Engineers and Tacoma staff.

At the February 9 meeting, the latest draft proposal was presented. I stated WDFW's support of the first phase (through pre-construction, engineering, and design phase) of the Howard Hanson Dam Additional Water Storage Project as outlined in your February 9, 1996, proposal. This letter serves to reiterate that expression of support and is in anticipation of the Corps and Tacoma meeting the conditions of the proposal, our review of the project feasibility report, and our review of the Environmental Impact Statement.

Favorable progress has been made on identifying and resolving issues of concern. Key issues (e.g., the potential conflict between storage and outmigrant survival through and below the project) remain and may not be resolved until additional information is gathered. The proposal includes the establishment of a technical team to attempt to resolve these issues. Greater refinement is also needed in specific performance criteria, a monitoring program, and the adaptive management program. As you know, the most important aspects of the project from the Department's perspective are protection and enhancement of downstream fish production, restoration of fish production in the upper watershed, full mitigation for impacts to wildlife from the proposed changes to the project, and initiation of replacement for other outstanding project deficiencies and damages.

We look forward to working with you in the future to accomplish this project.

Sincerely,

Bob Turner

Robert Turner
Director

RT:DM:pd

cc: U.S. Fish and Wildlife Service
National Marine Fisheries Service
Muckleshoot Indian Tribe
Brad Caldwell, Washington Department of Ecology

United States Department of the Inte

FISH AND WILDLIFE SERVICE
North Pacific Coast Ecoregion
Office of the Assistant Regional Director
3773 Martin Way E., Bldg. C, Suite 101
Olympia, Washington 98501

EN-PL-CP
2E8
Derek

March 7, 1996

Colonel Donald T. Wynn
District Engineer
Seattle District Corps of Engineers
P.O. Box 3755
Seattle, WA 98124-2255

Dear Colonel Wynn:

I wish to express the U.S. Fish and Wildlife Service's (Service) support for the U. S. Army Corps of Engineers' (Corps) and the Tacoma Public Utilities' two-phase proposal, as outlined and presented at the February 9, 1996, meeting. Specifically, the Service supports Phase One of the Howard Hanson Additional Water Storage Project through the pre-construction, engineering, and design phase. We have a strong interest in the restoration of the fish and wildlife resources of the Green River and look forward to working with you, the National Marine Fisheries Service, Washington Department of Fish and Wildlife and the Muckleshoot Indian Tribe toward this goal.

The phased and adaptive management approaches being proposed are desirable because they offer the flexibility needed to make adjustments to the project as new information becomes available. The proposal has the potential to correct the fish passage problem at the existing Howard Hanson Dam, while reducing the impact from the pool raise to an acceptable level by including fish and wildlife habitat improvements both upstream and downstream from the dam.

We are encouraged by your staff's willingness to address the fish and wildlife concerns during the development of the project details. As we have previously discussed, there are several issues that must be satisfactorily addressed and resolved prior to the Service giving its final support for the implementation of the project. For example, agreement needs to be reached on the timing and rate of reservoir refill and the amount and allocation of the additional storage, because of their effect on fish and wildlife resources. However, we are confident that these and other concerns will be resolved during the National Environmental Policy Act review process.

We will participate in the review of the Corps' draft feasibility report and draft Environmental Impact Statement, and use these documents as the basis for preparing the Service's Coordination Act Report.

We look forward to working together with you on this project.

Sincerely,

Curt Smitch

Curt Smitch
Assistant Regional Director

CS:gg:jmc

[An original letter sent to Mark Crisson, Tacoma Public Utilities]

cc: Brad Caldwell, Washington Department of Ecology
Glen St. Amant, Muckleshoot Indian Tribe
Will Stelle, National Marine Fisheries Service
Robert Turner, Washington Department of Fish and Wildlife

rcc'd
25Mar96

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E.
BIN C15700 Bldg. 1
Seattle, WA 98115

MAR 19 1996

Colonel Donald T. Wynn
US Army Corps of Engineers - Seattle District
Attn: Mr. Derek Chow
P.O. Box 3755
Seattle, WA 98124-2255

Re: Howard Hanson Dam Additional Storage Project, Tacoma Public Utilities Water Division, Green River in King County, WA

Dear Colonel Wynn:

The National Marine Fisheries Service (NMFS) has completed its review of the Howard Hanson Additional Storage Project in which the Corps of Engineers proposes to store up to 20,000 acre feet of water in Howard Hanson reservoir using the City of Tacoma water right of 100 cfs between February 15 and June 30 of each year. Our comments are based upon NMFS' responsibility for the protection and enhancement of marine, estuarine, and anadromous fishery resources and their supporting habitats. NMFS staff have participated in development of the fish passage alternative and reviewing and commenting on the proposals for additional storage behind Howard Hanson Dam.

NMFS supports phase one of the Project through the pre-construction, engineering, and design phases. We believe that favorable progress has been made toward resolving fish passage problems and the downstream impacts associated with additional water storage. Establishment of a technical team to refine specific performance criteria for fish passage and delay, a monitoring plan, and an adaptive management program are all positive steps necessary to achieve the maximum benefits for anadromous fish at this project.

Thank you for the opportunity to comment on this proposal. I want to commend both you and your staff for the constructive approach they have brought to examining outstanding issues and exploring options for resolving those issues. We look forward to participating in the first phase development of the Howard Hanson Dam Additional Water Storage Project as outlined in your February 9, 1996 proposal. Questions regarding this letter should be directed to Bob Vreeland of my staff, at (206) 526-6172.

Sincerely,

William W. Stelle, Jr.
Regional Director

cc: WDFW - R. Turner
WDOE - Brad Caldwell
USFWS - C. Smitch
Muckleshoot Indian Tribe - Stanley Moses, Holly Coccoli
City of Tacoma - Mark Crisson

23 April 96

Planning Branch

Dr. Robert Whitlam
Department of Community Development
Office of Archaeology and Historic Preservation
Post Office Box 48343
Olympia, Washington 98504-8343

SUBJECT: Habitat Restoration Features, Howard A. Hanson Dam

Dear Dr. Whitlam:

The Seattle District Corps of Engineers proposes to store additional water at the Howard A. Hanson Dam under two separate projects. The project areas are located on the Green River in King County, Washington. During 1995, the Corps conducted a cultural resources survey between elevations 1,141 feet and 1,206 feet. The report by Larson Anthropological/Archaeological Services (Lewarch et al. 1996) was previously coordinated with your office. This study recorded and assessed four historic sites within the project area, none of which were determined eligible for the National Register of Historic Places.

As part of these projects, the Corps, and the city of Tacoma, also plan to implement habitat improvements on the Green River, primarily within the reservoir area. These improvements involve ground disturbing activities generally consisting of meadow creation; vegetation clearing and planting; creation and enhancement of wetlands and ponds; and creation of river side channels. At this time, the exact location for habitat improvement projects is still under study. However, we are enclosing maps which indicate areas currently under consideration. Some areas have previously been investigated for cultural resources, others have not.

The intent of this letter is to introduce this aspect of the proposed project and also to solicit your comments on our planned actions. We propose the following for your consideration. Each area planned for wildlife or fish habitat restoration will be reviewed by a staff archeologist. If the proposed activity will not cause subsurface impacts or will not have the possibility of affecting cultural resources, then no field work will be conducted. For activities that will cause subsurface disturbance, we expect to conduct cultural resources surveys in areas which have not been previously investigated. Fourteen archeological sites are recorded within the active reservoir drawdown zone. These sites were recorded in 1985 by Benson and Moura and have never been assessed for National Register eligibility. If any of the previously mentioned habitat improvement activities will affect these sites, we propose to conduct National Register assessments and treatment as appropriate. We anticipate conducting all cultural resources investigations in consultation with your office and the Muckleshoot Tribe.

We request your comments on the proposed fish and wildlife habitat restoration activities associated with the Howard Hanson projects. Thank you for your assistance and we look forward to working with you on this project.

Sincerely,

Karen S. Northup, Chief
Environmental Resources Section

Enclosure

CF with Enclosure:
Mrs. Virginia Cross, Chairperson
Muckleshoot Tribal Council
39015 172nd Avenue Southeast
Auburn, Washington 98002-9763

Mr. Walter Pacheco
Community Service Coordinator
Muckleshoot Tribe
39015 172nd Avenue Southeast
Auburn, Washington 98002-9763

GC 15Apr96
CELMER/EN-PL-ER
22Apr94
~~CHOW~~/EN-PL-PC

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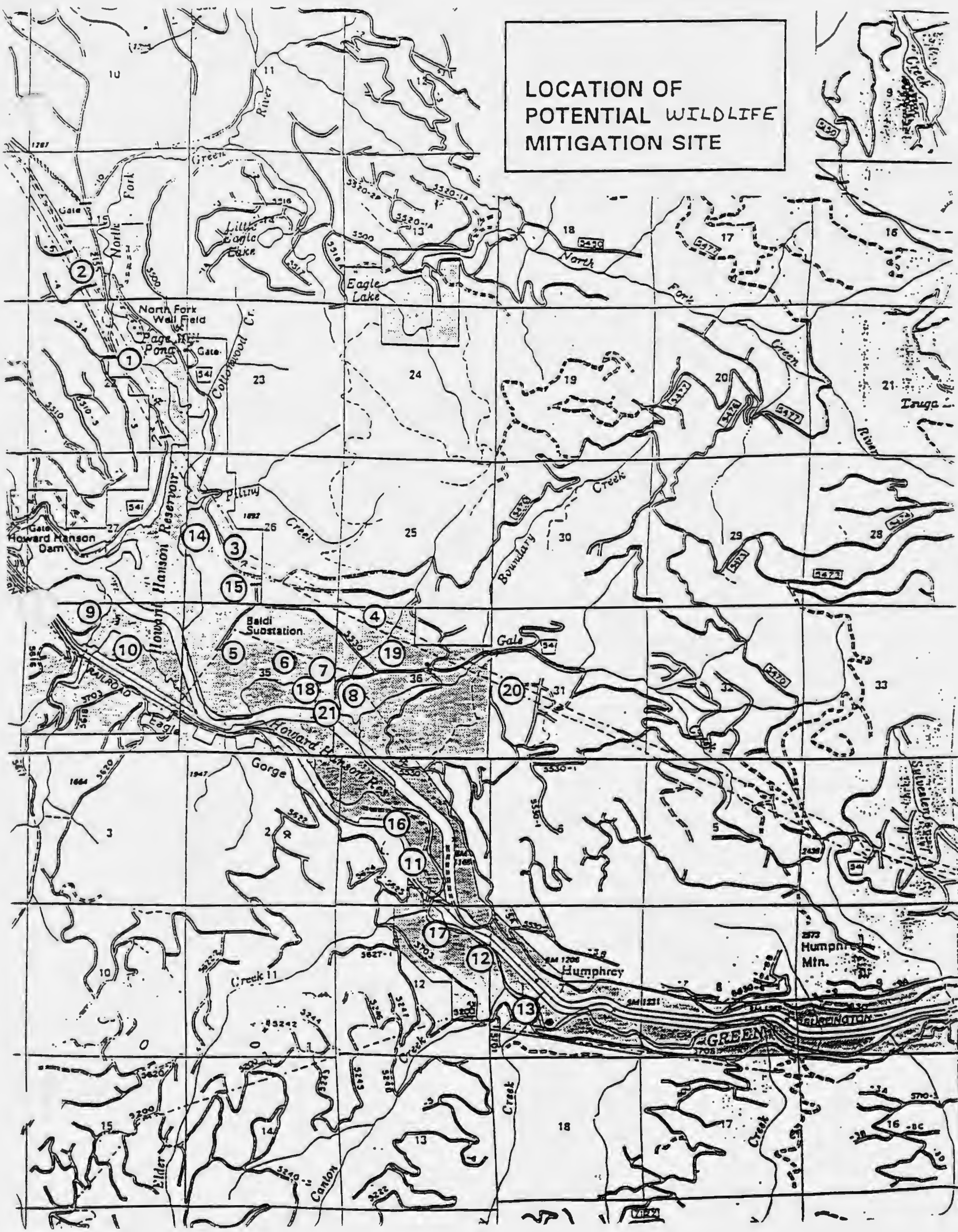
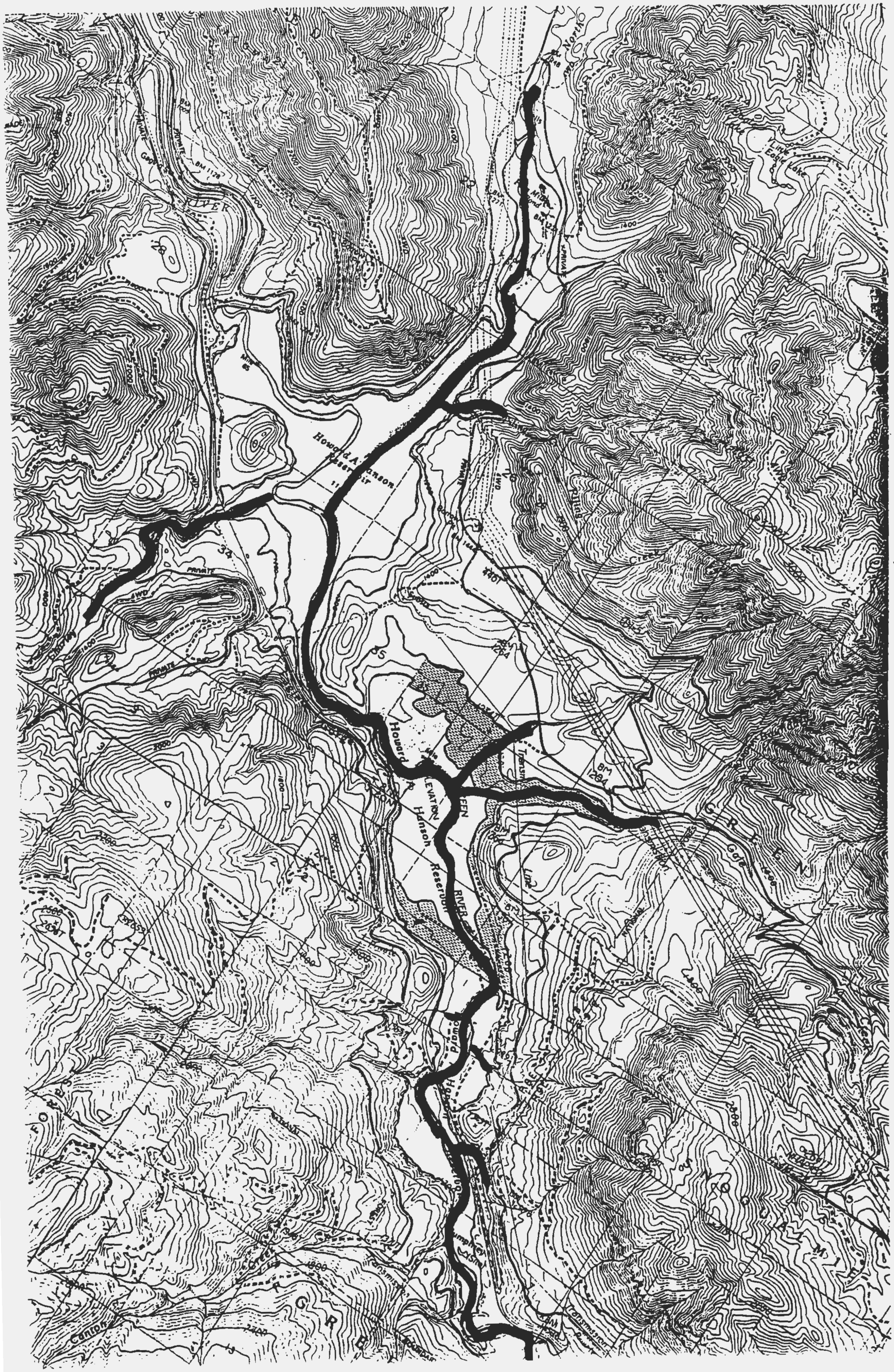
EN PL FILE

LOCATION OF POTENTIAL WILDLIFE MITIGATION SITE

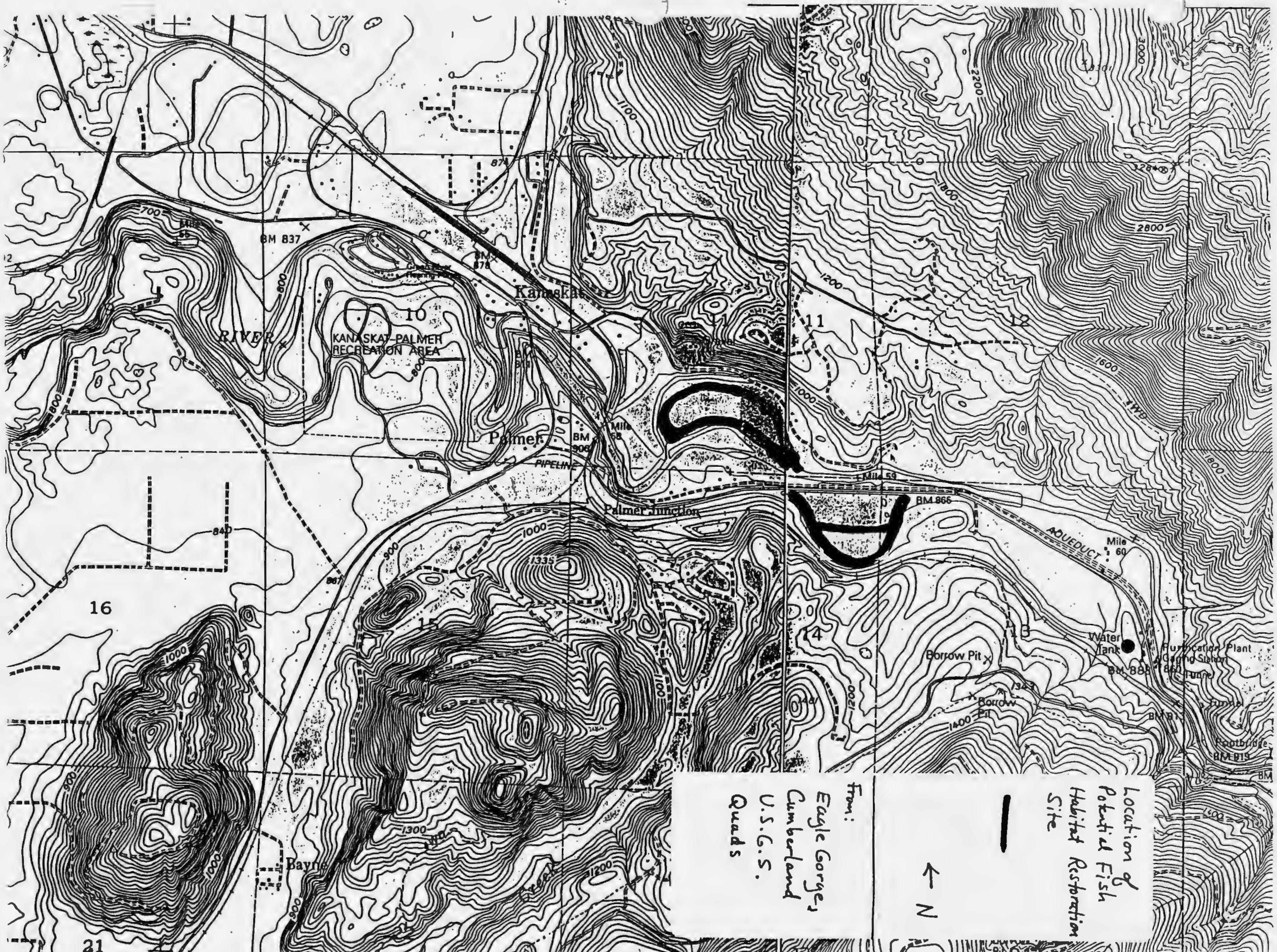




Location of Potential Fish Habitat Restoration Site

From: Eagle Gorge, Cougar Mt., Greenwater Quads } i.G.

N



Location of Potential Fish Habitat Restoration Site
From: Eagle Gorge, Cumberland U.S.G.S. Quads
N
Kanaskat
KANASKAT-PALMER RECREATION AREA
RIVER
Palmer
Palmer Junction
PIPELINE
AQUEDUCT
Bayne
Borrow Pit
Water Tank
BM 837
BM 866
Mile 59
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10
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5/6/96 KSN

STATE OF WASHINGTON
DEPARTMENT OF COMMUNITY, TRADE AND ECONOMIC DEVELOPMENT
OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION
111 21st Avenue S.W. • P.O. Box 48343 • Olympia, Washington 98504-8343 • (360) 753-4011

May 3, 1996

Ms. Karen S. Northup
Environmental Resources Section
Seattle District, Corps of Engineers
Post Office Box 3755
Seattle, Washington 98124-2255

Log: 043096-03
Re: Habitat Restoration Features,
Howard A. Hanson Dam

Dear Ms. Northup:

Thank you for contacting our office regarding the Habitat Restoration Features for the Howard A. Hanson Dam and your plan for addressing cultural resource issues. We concur with the approach outlined in your letter of April 29. We request you detail for us as an attachment the types of activities you believe would not cause subsurface impacts or will not have the possibility of effecting cultural resources.

Please feel free to contact me at (360) 753-4405 should you have any questions.

Sincerely;

Robert G. Whitlam, Ph.D.
State Archaeologist

RGW:tjt

MUCKLESHOOT INDIAN TRIBE

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6/14/96

June 3, 1996

Karen S. Northrup
Environmental Resources Section
Army Corps of Engineers - Seattle District
P.O. Box 3755
Seattle, WA 98124-2255

Re: Habitat Restoration Features, Howard A. Hanson Dam

Dear Ms. Northrup,

In reviewing your proposed mitigation for the Howard Hanson Dam Extra Storage Project, the proposed fish and wildlife enhancement projects will need to be monitored. This will assure there will not be any impacts on cultural resources. The Tribe fully supports the efforts to accommodate the needs of the natural resources affected by the project. The principle being that if the added storage is going to impact fish and game resources then all areas and all resources being impacted by the project as a whole should be considered. Some resources within the reservoir are not being considered, specifically those Archaeological sites that are below the 1141 foot level on the reservoir.

The Howard Hanson Dam Project has been impacting these archaeological sites since its operation. Those sites have previously been identified but not assessed for its significance. I do not see any reason not to complete a comprehensive assessment of the sites below the 1141 foot zone. If an assessment is not completed on those areas, they will ultimately be lost by the fluctuation of reservoir levels and the resultant erosion by water/wave action.

The Tribe therefore will recommend the areas below the 1141 foot level in the reservoir be included in the National Register assessments. As part of the mitigation of the Extra Storage Project this should be done. The mere fact that the operation has impacted these areas for years without mitigation is an issue that needs to be dealt with within the context of this project.

We are pleased to work with you on this project and look forward to our continued involvement.

Sincerely,

Walt P

Walter Pacheco
Community Services Coordinator

cc: LAAS
SHPO
ACE-Col.

ENDANGERED SPECIES COORDINATION

1. Biological assessments (BA's) for the Additional Water Supply Project have been prepared on three occasions--originally on July 27, 1992; again on September 6, 1996; and finally, on October 20, 1997. The U.S. Fish and Wildlife Service (FWS) did not concur with the conclusions in the first assessment regarding marbled murrelets and spotted owls (which was "no effect" for both of these species). The FWS requested the Corps to conduct surveys to confirm that these species are not present in the project area. The Corps utilized data from Washington Department of Ecology (DOE) spotted owl surveys, which confirmed that spotted owls are not present in the Charlie Creek drainage adjacent to the project area. Through coordination with the Tacoma Water Division forester, the Corps has determined that the forest age and structure in the project area is not suitable for spotted owl nesting. These findings were included in the 1996 BA.

The Corps invited one of Washington Department of Fish and Wildlife's experts on marbled murrelets to visit the project area in 1993. He indicated the project area contained only three very small stands of trees that had the potential for nesting by marbled murrelets; and, additionally, that the stands were too isolated from one another, and too far removed from viable habitat, to support nesting murrelets. He recommended, however, that we conduct a single year of murrelet surveys following the protocol developed by the Pacific Seabird Group (normally this requires two years of survey) to confirm that murrelets were not present. Following this advice, the Corps conducted a survey in the summer of 1994, which resulted in no detections of marbled murrelets in the project area. This information was then included in the 1996 BA.

The FWS expressed informal concurrence of the spotted owl and marbled murrelet effect conclusions ("not likely to adversely effect"), but indicated a lack of confidence with the information provided for bald eagles in the 1996 BA. The lack of confidence was a result of "new" downstream flow criteria that agencies had recently recommended. The effect of different flows downstream from Howard Hanson Dam on bald eagle food supply and foraging behavior was not addressed in that BA. Effects upstream of the dam were also somewhat in question, particularly with regard to clearing of the timber from the inundation zone of the higher reservoir. The FWS felt that this kind of information will not be available until the project criteria are well established, and the effect on steelhead and salmon can be determined (and therefore the effect on bald eagle prey supply can be assessed). At the time it appeared unlikely that adequate data (or even agency agreement) that would satisfy FWS as to bald eagle effects of the project could be achieved for several years; as a result, the Corps elected to withdraw the 1996 BA. This seemed to be appropriate, as construction of projects must follow completion of BA's (and consultation with FWS) by no more than 180 days; thus, even if consultation could be completed now, consultation would have to be reinitiated just prior to project construction, to assure that any changes in project design or operation, or changes to the endangered species list or the Act itself, would be considered. Thus, it made sense to withdraw the BA and reinitiate consultation at a time more appropriately timed to project construction, especially considering the unlikely resolution of key issues regarding fish and water management following implementation of the project.

However, Higher Authority pointed out in the Alternative Formulation Briefing of the project, that to move forward with the Feasibility Report and EIS without a completed BA and FWS concurrence would very likely not be in compliance with the Endangered Species Act. Furthermore, HA pointed out that it is in the Corps' best interest to complete Section 7 consultation at this time, so that reasonable and prudent measures proposed by FWS at this time would not "surprise" us in the future (i.e., if we did not complete coordination during Feasibility).

Thus, we re-initiated consultation with the FWS on October 20, 1997. However, FWS still was uncertain about downstream fish survival, and asked to delay a response to the BA until agencies could agree on an operation of the dam that would provide better certainty on fish survival. Common ground was reached in December, 1997, in the description of both "with project" and "without project" conditions. This allowed completion of the BA, and, more importantly, gave FWS confidence that it could issue a BO without fear of reproach for doing so while lacking key information. Thus, a revised edition of the third version of the BA was provided to the FWS in mid-January, 1998. As of this writing, FWS has not written its BO.

In addition, at least two species of fish--bull trout and the Puget Sound evolutionary significant unit of chinook salmon--may be listed in the next two or three years. In the meantime, data will be gathered that will help us assess the potential effects of the project on these species, should they be listed. Resource agencies will also continue to work to find workable solutions to restoring anadromous fish runs in the Green River.

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-2255

REPLY TO
ATTENTION OF

Planning Branch

Mr. David C. Frederick, State Supervisor
USDI (Fish and Wildlife Service)
Fish and Wildlife Enhancement
Olympia Field Office
510 Desmond Drive, Suite 101
Lacey, Washington 98503-1273

OCT 17 1997

Reference: Howard Hanson Dam Additional Water Supply Project, Feasibility Level Study

Dear Mr. Frederick:

The Seattle District, Corps of Engineers, is preparing a draft environmental impact statement and feasibility report for the referenced action. Pursuant to the Endangered Species Act, a biological assessment (BA) addressing potential impacts to bald eagles, marbled murrelets, spotted owls, gray wolves, and grizzly bears, plus two candidate species, at the Howard Hanson Dam project in King County,Washington, has been prepared and is enclosed for your review and concurrence. A biological assessment was previously sent to you in September, 1996. This BA was withdrawn, after discussion with your agency, because operational plans for the project were still being discussed and it was not possible to address downstream impacts to bald eagle prey base, until a final operation had been determined. We have now identified the operational criteria that would be in use during Phase I of the project, and are re-submitting our BA at this time, as we would like to include both the BA and your biological opinion in our Feasibility Report and EIS, due for completion in mid-December, 1997. The early identification of any conservation measures not already proposed in the BA would help us to refine budgets and schedules for the plan development stage of the project.

The enclosed BA represents the opinion of the Seattle District, Corps of Engineers, that the proposed project would not likely adversely affect the listed and candidate species found and potentially found in the vicinity of the Howard Hanson Dam project.

If you have any questions about the BA, please contact Mr. Ken Brunner at (206) 764-3479.

Sincerely,
Cyrus M. McNeely
Cyrus M. McNeely
Chief, Environmental Resources Section

Enclosure

HOWARD HANSON DAM ADDITIONAL WATER STORAGE PROJECT
BIOLOGICAL ASSESSMENT
JANUARY 15, 1998

1.0 BACKGROUND

The city of Tacoma, Washington receives a majority of its municipal and industrial water supply from the Green River through their diversion structure at river mile (RM) 61.0. The Howard A. Hanson Dam (HHD), a U.S. Army Corps of Engineers dam, is located within the City of Tacoma's watershed on the upper reach of the Green River, at RM 64.5. HHD provides winter flood control and summer low flow enhancement. The reservoir behind HHD has never been filled to its authorized elevation of 1206 feet, but maintains an established conservation pool elevation of 1141 feet during spring and early summer for fishery low-flow augmentation, until inflow can no longer keep up with outflow, at which point the reservoir slowly drains to its winter minimum of approximately 1070 feet.

Tacoma recognizes the need for an additional water supply, especially during the summer months, not only because of the high water demand during this time of the year, but also because natural flow withdrawals are constrained to protect fish. The existing storage is entirely dedicated to fish needs and therefore not available to Tacoma. A certified reconnaissance study completed by the U.S. Army Corps of Engineers determined that additional water storage behind HHD is the most viable source of municipal and industrial water supply for Tacoma and its service area. The conservation pool would be increased in two phases: the first phase would increase the annual conservation (summer) pool elevation by 26 feet, to an elevation of 1167 feet. The second phase (which would occur at least five years after implementation of Phase I) would raise the annual conservation pool to elevation 1177'. Both of these pool raises results in loss of terrestrial and wetland habitat adjacent to the existing reservoir; the project also results in downstream in-stream effects. Finally, the project also includes fish passage over HHD, resulting in the re-introduction of anadromous salmonids to the upper watershed.

The U.S. Fish and Wildlife Service (USFWS) in a letter dated January 22, 1996 identified five federally listed animal species and two candidate species which may occur in the project vicinity. Included in this list were bald eagles (*Haliaeetus leucocephalus*), marbled murrelets (*Brachyramphus marmoratus marmoratus*), northern spotted owls (*Strix occidentalis caurina*), gray wolves (*Canis lupus*) and grizzly bears (*Ursus arctos*). Spotted frogs (*Rana pretiosa*) and bull trout (*Salvelinus confluentus*) were listed as candidates (with 15 other species; in a Notice of Review on February 28, 1996, the USFWS dropped many species from the candidate list; for the Howard Hanson project, only the bull trout and spotted frog remain as candidate species). The potential impacts to these listed and candidate species as a result of the Howard Hanson reservoir inundation project are outlined in this biological assessment.

2.0 GENERAL PROJECT IMPACTS

Phase I would result in the inundation of about 325 acres of terrestrial and wetland habitats, while Phase II would inundate 153 acres of habitat. Most plants in the inundation zones would die during the first season of inundation, although a few species of plants that are more tolerant of inundation would survive for a longer period than species intolerant of inundation. The City of Tacoma intends to remove some merchantable timber from the inundation zone, and leave the remainder of trees. This point is currently being debated by resource agencies, who would prefer to see no trees cut from the inundation zone, in order to provide habitat for juvenile salmonids. In the event that merchantable trees are cut, the Corps of Engineers and the City of Tacoma will inventory the inundation zone and designate particular trees which are not to be cut, even in the merchantable areas. In addition, to insure that suitable perches will be maintained for raptors, dead snags would be retained and allowed to fall as they rot.

3.0 PROJECT IMPACTS ON LISTED SPECIES

3.1 Bald Eagle

3.1.1 Habitat Requirements/Population Status

The bald eagle is listed as threatened in Washington on the Federal list of endangered, threatened, and proposed animals and plants. The bald eagle (*Haliaeetus leucocephalus*) is found only in North America and ranges over much of the continent, from the northern reaches of Alaska and Canada down to northern Mexico. Bald eagles migrate to wintering ranges in Washington State in late October and are most commonly found along lakes, rivers, marshes, or other wetland areas west of the Cascades, with an occasional occurrence in eastern Washington.

The characteristic features of bald eagle breeding habitat are nest sites, perch trees and available prey. Bald eagles primarily nest in uneven-aged, multi-storied stands with old-growth components (Anthony, et al. 1982). Factors such as tree height, diameter, tree species, position on the surrounding topography, distance from water, and distance from disturbance also influence nest selection. Live, mature trees with deformed tops are often selected for nesting and nests are often re-used year after year (USFWS, 1995). Snags, trees with exposed lateral branches, or trees with dead tops are often present in nesting territories and are critical to eagle perching, movement to and from the nest and as points of defense of their territory. Perches used for foraging are normally close to water where fish, waterfowl, seabirds, and other prey can be captured.

3.1.2 Known Occurrences in the Project Vicinity

Bald eagles have been sighted every month of the year near the reservoir, however, no nests have been confirmed in the project area. The bald eagle is year round resident within the Howard Hanson reservoir area. Although its behavior in the area is not documented, it most likely feeds on waterfowl that winter on the lake; up to two hundred ducks may be on the reservoir at any one time, providing a readily available food source for bald eagles. The forests surrounding the reservoir provide a large number of perches and potential nest trees. Food is the limiting resource, and no more than four bald eagles have been seen in the vicinity of the reservoir at any one time during the winter. Another potential limiting factor is the seasonal drawdown of the reservoir during the winter (to 1070 feet) which leaves a broad, unvegetated band between the forest and the reservoir and may discourage use by bald eagles; however, the real effect of the drawdown on eagle use has not been investigated and is unknown. The reservoir is refilled during spring and is usually raised to 1141' by mid-May.

Anadromous salmonids historically were probably a more important food source in the Green River watershed for bald eagles prior to construction of Howard Hanson Dam than they are now. The dam blocked upstream passage and ended spawning above the dam. At least one account indicates as many as 15 bald eagles at Eagle Gorge prior to construction of the dam, which may well have been because of spawning salmon at that location (Eagle Gorge is now part of the reservoir behind Howard Hanson Dam). The Additional Water Supply project would not only result in higher reservoir levels, but would also result in altered downstream flows. The issues surrounding flows in the Green River and the various stocks of salmon are complex. Because salmon have historically been important to bald eagles (and still provide eagles with a food source downstream from the dam), the following discussion goes into some detail on the existing (baseline) condition of salmon stocks in the Green River, and the expectations following implementation of Phase I, and then Phase II, of the Additional Water Supply project. Chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), chum (*O. keta*), cutthroat trout (*O. clarki*), and steelhead (*O. mykiss*) are the five main salmonid species supported by the Green River. In addition, char (*Salvelinus spp.*) may be found in the watershed, but there is little information to substantiate their status.

3.1.3 Effects of the Action—Phase I

3.1.3.1 Perches

Only the merchantable timber existing in the inundation zone will be logged prior to inundation. In addition, prior to logging, potential perch trees would be marked so that they would not be cut. Thus, a relatively small number of living perch trees will be removed from the existing habitat. Although the time frame for the reservoir operation would remain nearly the same, the position of perches and forest, and the configuration of the reservoir shoreline would be changed; a rough estimate, based on use of a 1"=800' topographic map, is that the forest would be as much as 800 feet further removed from the low pool than under existing winter conditions. In areas of steep banks, the shoreline may be as little as 30-50 feet further removed. Artificial perch poles will be erected in specific locations within the inundation zone to compensate for the loss of existing key perches. According to the USFWS (1993), artificial perches have been used by many raptor species and are important to wintering bald eagles in situations where natural perches are lacking.

3.1.3.2 Food Supply

A number of factors could affect waterfowl numbers on Howard Hanson reservoir. First of all, there are few (resident) fish larger than 6" in the reservoir, although there are anadromous salmonids in the reservoir that were outplanted in the upper watershed that have reached lengths of 10" (Ging, 1998). Bald eagles typically do not eat fish less than 6" in length, as it is not worth the energy expended to catch them. Outplanting above the reservoir may not continue for coho and chinook salmon without the project, and if this occurs, fish resources in the reservoir (for bald eagles) would decline. Also, removal of trees would potentially result in less protection of the reservoir from wind, and may make the reservoir less attractive to waterfowl due to rougher water. On the other hand, for the first few years of inundation to 1167', the reservoir will be more productive with the introduction of nutrients from the newly inundated strip of forest land between 1141' and 1167' elevations; should this occur, waterfowl may be enticed to stay because of the enhanced food supply--it is impossible to predict whether wind or food supply would have the greater effect on waterfowl numbers, or whether these effects would in fact occur. Experience with other reservoirs indicates that the nutrients first increase, then are depleted after a few years and the reservoirs become less productive *(Appendix F, Section 2)*. For this analysis, we would expect a fairly similar scenario to occur in Howard Hanson Reservoir: resident fish populations (cutthroat and rainbow trout, mountain whitefish) as well as those of wintering waterfowl would initially go up with the increase in nutrients, then fall again as nutrients decline over a period of years. Anadromous fish populations should diverge from the above pattern given the new fish passage facility; as natural production improves the number of juvenile salmonids should increase, while adult numbers (and carcasses) should increase dramatically. This increase in juvenile salmonid number and release of ocean-derived nutrients from carcasses could also result in increased resident fish number and size. Lastly, we would not expect the number of either resident fish or waterfowl to drop below current wintering populations, since the reservoir will maintain its current winter operation.

Food supply for bald eagles is expected to significantly increase in the upper watershed not only as a result of restoration efforts, but also as a result of increased nutrients present in the reservoir following inundation. Currently, no anadromous adult salmon exist in the upper watershed, though several million juveniles are outplanted in an effort to restore runs to the Green River. One objective of the fish restoration project would be to boost the summer/fall adult salmon population to up to 10,000 individuals (estimated total escapement; *Appendix F, Section 2*) within 20 years. This increase in fish number will bring about a large increase in available nutrients, carcasses, and fish greater than 6" in size. In addition, restoration efforts within the reservoir (including establishment of sedge meadows in the currently barren "bathtub ring" exposed during drawdowns) is expected to increase the population of nesting waterfowl, which currently is quite small (fewer than 10 nesting pairs). Thus, food supply for bald eagles in the upper watershed would be heightened.

Downstream, the situation is less predictable. In general, survival of anadromous salmonids in the stream is influenced by many factors, including winter flooding and scour of incubating eggs, flow levels during juvenile emigration in the spring, minimum baseflows during summer and fall, maximum and minimum water temperatures, dissolved oxygen supply, quality of instream and riparian habitats, suspended sediment levels, and predation. Once they leave their natal streams, survival of juvenile salmon and steelhead is dependent on a number of physical and biological factors including estuary habitat quantity and quality, predation by fish, mammals or marine birds, climatic change such as elevated ocean temperatures, and by harvest by commercial, sport, or tribal fisheries.

The Howard Hanson Dam project provides primary control of mainstem flows in the Green River, which may have secondary effects on water temperature, turbidity, and predation of juvenile anadromous salmonids. The current population status of lower river anadromous stocks can be somewhat related to operation of Howard Hanson Dam. Tradeoffs occur as a result of the operational change to providing additional storage (filling the reservoir in spring to early summer) for late summer and fall discharges to the river: less water is provided to the Green River below Howard Hanson Dam in spring and early summer, which may result in reduced spawning (steelhead) and hatching (steelhead and salmon) success. The following analysis discusses these effects on the various salmon stocks and the resulting effects on bald eagles.

Phase I of the AWS project includes implementation of all restoration features which include the downstream fish passage facility, habitat restoration projects above and below the dam, and storage of 20,000 ac ft of M&I water supply. As part of the Second Supply Project, Tacoma will implement a mitigation agreement that will include an upstream fish passage facility, a fish restoration facility which will provide up to 500,000 coho and chinook and 350,000 steelhead fingerlings, and improved instream flows during summer and fall.

3.1.3.3. Coho Salmon. Puget Sound/Strait of Georgia coho salmon stocks have been candidate species for listing under the Endangered Species Act. A preliminary stock status review considered that "listing is not presently warranted" (WDFW 1997). The lower and middle Green River basin coho run is mixed with Soos Creek hatchery stocks, but the upper Green River portion of the run may be native. The runs of wild, natural spawned fish have not met escapement goals (8,700 fish) in the recent past (SASSI, 1993). Adult coho spawn in the Green River from September through January; spawning generally occurs in tributaries and side channels. The fry emerge from March through June and rear in side channels and pools of the mainstem and its tributaries for one year before migrating down to the Duwamish estuary and out to Puget Sound. Since 1983, hatchery fingerlings have been planted above HHD. Fry-to smolt survival rates for these planted fish have been lower than other watersheds (Dilley and Wunderlich 1993). These lower fry-to-smolt survival rates are probably a result of high stocking rates and low survival rates of smolts (25% or less) migrating through Howard Hanson Dam and Reservoir (*Appendix F, Section 2*). Historically, an estimated 9-27,000 coho salmon spawned in the watershed above the Tacoma Diversion Dam (Grette and Salo 1986). Currently, there is no established escapement goal for the upper Green River above the Diversion Dam.

3.1.3.4. Chinook Salmon. Puget Sound/Strait of Georgia chinook salmon stocks have been candidate species for listing under the Endangered Species Act. A preliminary stock status review considered that Puget Sound Chinook are "likely to become endangered" (WDFW 1997). A tentative NMFS decision date for proposed listing of chinook ESU's is expected for January of 1998. Summer/fall chinook of the Duwamish/Green River basin are distinguished from other Puget Sound chinook stocks by geographic isolation. The lower and middle Green River basin chinook run is mixed with Soos Creek Hatchery stocks, but the upper Green River portion of the run may be native. Coded-wire tag recoveries indicate that some hatchery strays are spawning naturally in the river (SASSI 1993). The Muckleshoot Indian Tribe is preparing to conduct genetic stock identification of the run in 1998.

Adult returns to the Green River and its tributaries have averaged 7,600 from 1987 to 1992 with an increasing trend (SASSI 1993). The runs have met escapement goals (5800 fish) in the recent past but harvest has been severely curtailed due to lower than expected smolt-to-adult survival rates. Stock status is rated healthy. Adult chinook spawn in the Green River from August through November, with peak spawning in September and October; spawning generally occurs in the mainstem from RM 28 to the Diversion Dam and in the largest tributaries. The fry emerge from January through March and rear in side channels and pools of the mainstem for days to months before migrating down to the Duwamish estuary and out to Puget Sound: peak emigration occurs from March to June. Since 1983, hatchery fingerlings have been planted above HHD. Fry-to smolt survival rates for these planted fish have been lower than other watersheds (Dilley and Wunderlich 1993). These lower fry-to-smolt survival rates are probably a result of high stocking rates and low survival rates of smolts migrating through Howard Hanson Dam and Reservoir. Historically, an unknown number of chinook salmon spawned in the watershed above the Tacoma Diversion Dam: an estimated 100-400 adult chinook were captured at the Diversion Dam after its completion from 1911-1913 (Grette and Salo 1986). Currently, there is no established escapement goal for the upper Green River above the Diversion Dam.

3.1.3.5. Chum Salmon. Puget Sound chum salmon are candidate species for listing under the Endangered Species Act. A preliminary stock status review considered that Puget Sound fall/summer/winter chum salmon are presently not warranted for listing (WDFW 1997). Two chum stocks are recognized in the Green River system (SASSI 1993). The Crisp (Keta) Creek fall chum stock originated from releases of Quilcene and Hood Canal stocks from the Keta Creek hatchery in the early 1980's. This stock is considered healthy. The Duwamish/Green stock has been considered a remnant native stock, but their status is unknown. A genetic stock inventory conducted by the Muckleshoot Indian Tribe found that the natural spawners were composed of Hood Canal and South Puget Sound hatchery stocks with no evidence of a native stock component (M. Mahovolitch, pers. comm.). The natural spawning run is considered to be in a rebuilding state and an adult escapement goal has not been established.

Adult chum salmon migrate up the Green River from early November to the first week of December. Spawning occurs from mid November through December, in the mainstem Green River between Burns Creek and Crisp Creek (SASSI 1993). Recent surveys have found spawners up to the RM 45 in side channels of Flaming Geyser State Park (B. Furstenberg, King County, pers. comm.) . Muckleshoot Tribal biologists surveyed the Green River during 1996 and reported significant chum spawning in side channels in the middle and lower Green River reaches. The fry emerge from mid-February to July and rear from days to weeks in side-channel and mainstem backwater habitats. The peak downstream migration of chum salmon fry occurs from late March through May.

3.1.3.6. Winter Steelhead. Puget Sound steelhead have been candidate species for listing under the ESA. A stock status review considered that Puget Sound steelhead are not presently warranted for listing. Steelhead are differentiated into two types: winter steelhead and summer steelhead. Winter and summer steelhead are differentiated by timing of adult return but share common juvenile behavior patterns. Winter steelhead adults return to the Green River from November through early June and summer adults from April through November (Caldwell 1994). Winter steelhead are native to the Green River while summer steelhead are non-native to the Green River (Skamania River) and are primarily maintained by hatchery plants. Winter steelhead spawn from January through June with the peak in spawning in April and May. Spawner escapements for wild winter steelhead has been close to or exceeds goals (2100 fish) in most years, and the status of the stock is healthy. A limited number of summer steelhead spawn in the Green River, usually from mid-January to early April. Many of these fish spawn below the Palmer rearing ponds at RM 56. A significant difference between steelhead and Pacific salmon life history is that not all steelhead die after spawning. Steelhead are capable of repeat spawning. Repeat spawning in Washington ranges from of 4.4 to 14.0 percent of total spawning runs (Wydoski and Whitney 1979).

Both winter and summer juvenile steelhead rear in freshwater for one to two years, mostly two, before migrating to the ocean. Juvenile downstream migration occurs from April through July, with peak migration in mid-April (*Appendix F, Section 5*). Since 1982, hatchery fingerlings have been planted above HHD. Fry-to smolt survival rates for these planted fish have not been estimated but probably follow the trend for coho and chinook salmon, which have been lower than other watersheds (Dilley and Wunderlich 1993). The lower fry-to-smolt survival rates are probably a result of high stocking rates and low survival rates (25%<) of smolts migrating through Howard Hanson Dam and Reservoir. Historically, an estimated 500-5200 adult steelhead were captured at the Diversion Dam after its completion from 1911-1913 (Grette and Salo 1986). Since 1991, a temporary fish trap has been operated at the Diversion Dam, returns of steelhead have ranged from 30 to 150 adults. These fish are either released above the dam for natural spawning, or a select few are used to rear fry for outplanting in the upper watershed to attempt to maintain the small run. Currently, there is no established escapement goal for the upper Green River above the Diversion Dam.

3.1.4 Effects of the Proposed Project. The combined mitigation and restoration features of the AWS project and the Tacoma Mitigation Agreement will reconnect the upper Green River providing additional habitat that could support an adult spawner escapement of 1) 6500 coho salmon with production of 160,000 smolts; 2) 1300 winter steelhead with production of 25,000 smolts; and 3) 2300 chinook salmon with production of 890,000 smolts (*Appendix F; Section 2*). Recovery potential varies by stock, but it is assumed that even without recovery-additional production of all stocks will occur through long-term supplementation if necessary. As part of the Mitigation Agreement between Tacoma and the Muckleshoot Tribe a Fish Restoration Facility – a "naturalized" rearing facility for re-establishing salmon and steelhead in the upper Green River – is available for long-term supplementation that will maintain some level of increased adult fish production from natural reared juveniles planted in the Upper Green River. Current production plans include rearing of 500,000 coho and chinook salmon and 350,000 steelhead fingerlings. Either the natural spawned fish or supplemented fish will provide a net positive benefit in returning adult salmon and steelhead that can provide increased feeding opportunities from the Diversion Dam to the headwaters of the Green River.

Per discussion with agency and tribal biologists, it has been agreed that the Second Supply Water Right diversion of 100 cfs through June 30 is assumed as the without project condition. Since this is considered the without project condition, conceptually there should be no difference between without and with project conditions as the storage volumes are the same. However, for impact analysis purposes, the springtime storage of the additional 20,000 ac ft for M&I water supply has been modeled for the historic record (years 1964-1995) to assess impacts on off-channel rearing habitat and instream migration of chum, chinook, and coho salmon and steelhead smolts. The net effect is that improved reservoir fill and release conditions should result in no decrease or an actual minor increase in total side-channel habitat area and instream survival of emigrating chinook, coho, and steelhead smolts that originate from the upper and lower watershed areas (*Appendix F; Sections 5 and 7*). Chum salmon fry are the smallest emigrant in the lower watershed and the most likely species and lifestage that would be impacted by increased storage. Modeled results showed a small decrease in chum fry survival over the period of record.

Overall, for the lower watershed, the modeling results suggest impacts of spring refill should have a neutral to slight net benefit to salmon and steelhead habitat and survival of early lifestages. Outside of the neutral impact or potential improvements from spring refill, one possible outcome from adaptive management in Phase I is the immediate implementation of yearly storage (5 in 5 years) of the 5,000 ac ft of Section 1135 low flow augmentation water: dependent on consensus of agency, tribal, Corps and TPU staff. Per requirement of the Muckleshoot/Tacoma Mitigation Agreement, drought year storage (1 in 5 years) will continue to be used for maintaining summer and fall minimum flows (250 cfs), in non-drought years (4 in 5 years) the 5,000 ac ft is available for use at anytime and is planned to augment flows during steelhead egg incubation in June and July. This flow augmentation will probably decrease redd dewatering and increase overall steelhead egg-to-fry survival with attendant increases in adult survival.

Lastly, there are three fish habitat restoration projects planned for Phase I including 1) annual placement of 3,900 cubic yards of gravel in the Middle Green River at Flaming Geyser (dependent on sediment transport model or monitoring); 2) side-channel reconnection in the Upper Green River at Palmer that will restore up to 3.2 acres of off-channel habitat; and 3) 3.5 miles of river and stream habitat improvement in tributaries above the inundation pool (from 1,177 to 1,240 feet elevation). These three projects should provide a clear net benefit for salmon and steelhead with improved instream and off-channel habitat for areas above and below HHD.

3.1.5 Conservation Measures
Mitigation plans propose creating nearby meadows and improving adjacent forested habitats to promote shrub understory growth. The majority of bald eagle natural perch sites will be retained and in the specific areas where that is not possible, artificial perches will be erected. Food supply may shift slightly, from a current reservoir focus to an upper watershed focus, where adult salmonids will be introduced. Food supply in the reservoir may increase temporarily following each pool raise, but would be expected to decline again to near existing levels. Downstream from HHD, the food supply (spawned salmon carcasses) would likely not increase, and may slightly decrease following implementation of the Additional Water Supply Project. Food supply for bald eagles over the entire area influenced by the project (both upstream and downstream) is not expected to decline, but would instead increase as restoration efforts are taken to increase the number of adult salmon in the upper watershed (to 10,000 individuals). As a result of the proposed mitigation and restoration plans, and retention of natural perch sites, we anticipate that the bald eagle population within the sphere of influence of HHD will not be adversely affected.

3.1.6 Determination of Effect—Phase I
A determination of not likely to adversely affect is made. Mitigation measures (as described in the previous paragraphs) are expected to offset any potential adverse effects.

3.1.7 Effects of the Action—Phase II

3.1.7.1 Perches
Phase II would inundate about one half the acreage that Phase I would inundate, but would nevertheless result in the loss of additional perch trees, and widen the distance between the winter pool and the wooded shoreline. As with Phase I, perch trees in the inundation zone would be retained, and artificial perches would be erected if the number of existing perches was not adequate.

3.1.7.2 Food Supply
Although anadromous salmon would be re-established in the upper watershed in Phase I, implementation of Phase II introduces a degree of uncertainty as to the long-term viability of salmon runs in the Green River Watershed. The additional pool raise means less water enters the Green River in the spring and early summer, potentially reducing juvenile

outmigrant survival, de-watering side channels and steelhead redds. This potential adverse impact has been incorporated into restoration projects, reservoir operations, and conceptual Phase II mitigation projects. Restoration features accomplished in Phase I (side channel reconnection, gravel nourishment, reconnection of the Upper Green River with fish passage, and 5,000 ac ft flow augmentation), reservoir operations tied to results of adaptive management monitoring (maximum refill rates, mimic natural hydrology, use of freshets), side channel mitigation projects designed to mitigate for modeled Phase II impacts by improving existing habitat and creating new channels (Section 8, Fish Appendix, 4-projects to mitigate for 8.4 acres), and 9,600 ac ft of summer/fall flow augmentation water will offset Phase II effects, and salmon populations are expected to remain as they were following implementation of Phase I.

With a larger reservoir, juvenile passage through the reservoir will likely take longer and could result in fewer fish reaching the passage facility. Wetlands created in Phase I will be inundated, and less area would be available for replacement of those wetlands—possibly resulting in smaller numbers of waterfowl nesting in the reservoir. These factors result in a likelihood of reduced food supply in the reservoir for bald eagles, though the reduction is expected to be negligible.

3.1.8 Conservation Measures
Conservation measures around the reservoir for Phase II would be similar in type to those implemented during Phase I, including additional sedge meadow creation, forest manipulations, snag retention and creation, and watershed stream habitat improvements. Conservation measures in the lower river would include: improvements in side channel habitat (habitat quality improvements, restoration of relic side channels), continued additions of gravel and large woody debris, spring-reservoir releases adaptively managed to protect important salmonid life-stages (based on monitoring results), and storage and release of 9,600 ac ft for optimal rearing and spawning flows in the summer and early fall.

3.1.9 Determination of Effect—Phase II
Implementation of Phase II of the HHD Additional Water Supply project is not likely to adversely affect bald eagles.

3.2 Northern Spotted Owl

3.2.1 Habitat Requirements/Population Status
The northern spotted owl (*Strix occidentalis caurina*) was federally listed as threatened throughout its range on July 23, 1990. Spotted owls can be found throughout the west slope of the Washington Cascades below elevations of 4,200 feet. Preferred owl habitat is composed of closed-canopy coniferous forests with multi-layered, multi-species canopies dominated by mature and/or old-growth trees (Federal Northern Spotted Owl Recovery Plan). Habitat characteristics include moderate to high canopy closure (60-80%); large (>30" dbh) overstory trees; substantial amounts of standing snags, in-stand decadence,

and coarse woody debris of various sizes and decay classes scattered on the forest floor (Gore et al. 1987, Mulder et al. 1989, Thomas et al. 1990 and others).

Owls do not build their own nests but rely on naturally occurring nest sites, such as broken top trees and cavities. In western Washington, spotted owls nest most often in cavities of trees with a dbh greater than 20 inches. In fact, there is much evidence that spotted owls require old-growth forests for reproduction; Forsman, et al (1987) (in FR, June 23, 1989) "found that 1282 [of 1502 owl observations] were in old-growth, 22 in mature forest, 131 in old-growth/mature forest, and 67 in stands less than 100 years of age, demonstrating an overwhelming preference for old growth."

3.2.2 Known Occurrences in the Project Vicinity

In 1989 and 1990, a single spotted owl was detected in the Charley Creek drainage, approximately one mile from the reservoir. This detection prompted the Washington Department of Natural Resources (DNR) to conduct a formal spotted owl survey from 1992-1994. The survey did not find any further spotted owl activity within the Charley Creek drainage, nor within a 1.8 mile radius of the project reference center as designated in the 1992 survey (site #204, reference #8759). The absence of owl activity within the consecutive three year study period by DNR satisfies the USFWS survey guidelines (March 7, 1991) for arriving at the determination that spotted owls do not exist in the project vicinity. In addition, spotted owl surveys by DNR not only resulted in no detections of spotted owls, but in numerous detections of barred owls (*Strix varia*), a species that successfully competes against spotted owls in young and mid-age forests. The abundance of barred owls in the watershed is further evidence that the forests there are not ideal spotted owl habitats.

3.2.3 Effects of the Action

Suitable spotted owl habitat within the project area is limited due to extensive recent logging activities. The Federal Register (June 23, 1989) points out that recorded home range sizes used by adult spotted owls vary from 300 acres to more than 19,000 acres. Ecological theory suggests that the 300 acre home range(s) as likely ideal habitat, requiring little foraging effort, while the 19,000 acre home range would certainly be marginal habitat, as the pair was required to search far and wide for food. The mature conifer forests in the project area are fragmented and small in total area--only 49 acres of the 627 acre project area were mapped during vegetation mapping for the project; the larger proportion of forest in the project area is deciduous forest and mixed deciduous and coniferous forest. The suitable habitat at the project area is not only too small, it is also not quite old enough to be truly good spotted owl nesting habitat. Findings from the 1995 City of Tacoma Green River Watershed stand inventory (Ryan, 1995) indicate that 40% of the total acres (9,375 acres) of deciduous and coniferous forests are between the ages of 70-80 yrs., forests less than 70 yrs. comprise 50% of the total acreage and forests greater than 80 yrs. make up 10% of the acreage. These calculations take into account all land owned by Tacoma within the watershed; not just the land adjacent to the reservoir. The age class breakdown is still the same for the land within 1/4 mile of the reservoir, however, with the only difference being that the greatest percentage of trees within this area are between 60-70 yrs. of age rather than 70-80 yrs. (Ryan, personal comm., 1996). Fourteen acres of this "mature" conifer forest would be inundated in Phase I, and another 6 acres would be inundated in Phase II.

The upper end of the inundation zone was logged 15-20 years ago and the lower end of the reservoir along Charley Creek and the North Fork was logged 1-10 years ago. Thus, much of the vertical structure required for nesting (in the form of large limbs and tree crotches) is still lacking and there are few fallen and decayed logs that might support prey species.

Lack of suitable spotted owl habitat, coupled with the DNR and Corps survey information (see section 3.2.2) provide a reliable assurance that the habitat within the project area is not critical to spotted owl survival. Loss of approximately 20 acres (total in both Phase I and II) of nearly mature coniferous forest (and about 311 acres of mixed and deciduous forest) is thus not expected to adversely affect spotted owls in this region.

3.2.4 Conservation Measures

Because spotted owls are not present in the area and suitable habitat does not exist, no conservation measures are indicated at this time. Nevertheless, some of the mitigation measures to be undertaken are intended to accelerate the maturation process of forest stands, through the creation of openings in the forest canopy, supplementation of large woody debris, and creation of snags.

3.2.5 Determination of Effect

A determination of not likely to adversely affect is made for both Phase I and Phase II.

3.3 Marbled Murrelet

3.3.1 Habitat Requirements/Population Status

The marbled murrelet (*Brachyramphus marmoratus marmoratus*) was officially listed as a threatened species on October 1, 1992. Murrelets inhabit shallow marine waters and, like spotted owls, nest in mature and old-growth forests. All nest locations in Washington have been located in old-growth trees that were greater than 32 inches in diameter at breast height (dbh) (USFWS Planning Aid Report, 1994). Nest stand characteristics generally include a second story of the forest canopy that reaches or exceeds the height of the nest limb, thereby providing a protective enclosure surrounding the nest site. A single, large, closed-crowned tree, which provides its own protective cover over the nest site may also be used by murrelets (USFWS, 1993). Large, moss-covered limbs in tall trees are utilized for egg-laying. Marbled murrelet nests have been located in stands as small as approximately seven acres (Hamer and Nelson, 1995) and are generally within 50 miles of marine waters. In Washington State, marbled murrelet abundance was found to be highest in areas where old-growth/mature forest comprised more than 30 percent of the landscape.

3.3.2 Known Occurrences in the Project Vicinity

Available information suggests that the habitats around HHD are marginal for marbled murrelet nesting (Ritchie, 1994). Reasons for this determination include that fact that HHD is approximately 30-40 miles from Puget Sound; and few large trees exist in the project area. The primary factor that may be limiting in the project area is the availability of moss-covered branches. Marshall (1988) reports that moss does not grow on Douglas fir trees until the trees are 150 years old. In Oregon, it is reported that a seral stage of coniferous forest called "mature" begins at 80 years of age and continues to about 175 years, when it becomes "old growth" (Marshall, 1988). Thus, as the forest in the project area is still relatively young (70-80 yrs. old), few branches of sufficient size for murrelet nesting exist. However, western hemlocks of relatively young age (70-100 yrs.) do have moss-covered branches; but these trees are few and in only three scattered locations of less than an acre each. To date, no marbled murrelet nest has been found in a stand size of less than 7 acres (U.S. Forest Service, 1996; Hamer and Nelson, 1995). Another limiting factor may also be the fragmentation of conifer forests in the project area; it may be that marbled murrelets require large, unbroken stands of conifer forests. Murrelet detections have been found to increase in areas where old-growth and mature habitat comprise over 30 percent of the landscape and decline when clear-cut and open meadow habitat occur over 25 percent of the landscape (Hamer and Cummins 1990). Marshall (1988) reports that:

> "the species' reliance on old-growth or trees nearing old-growth status is based on: (1) All nests found in coniferous forest biomes were in trees representing old-growth characteristics; (2) downy young have been found only in old-growth forests and fledglings in or near old-growth; (3) inland observations of adult marbled murrelets are associated with old-growth and mature forests; and (4) during the nesting season, marbled murrelets occur mainly offshore opposite old-growth or mature forest stands in the southern parts of their range."

A query of the WDFWS Priority Habitats and Species (PHS) database in December 1995 revealed no record of any known marbled murrelet activity in the vicinity of the reservoir. During 1994, marbled murrelet surveys were conducted following protocol developed by the Pacific Seabird Group (Ralph et al. 1994). The surveys were conducted in the reservoir area within three stands identified by Bill Ritchie (WDFWS), Tim Bodurtha (USFWS) and Ken Brunner (Corps) as marginally suitable for murrelet nesting. Bill Ritchie recommended that only a one-year survey would suffice--just to be sure no murrelets were in the area--based on his observations that: 1) there was no suitable murrelet nesting habitat within several miles of the three isolated stands; 2) none of the stands are greater than one acre in size; and 3) there are very few potential perches in the three stands (one of the "stands" only has one tree of sufficient size); and 4) no other murrelets had been detected in the Green River watershed, making these marginal sites even less likely to be occupied. Thus, only one year of survey was conducted. No marbled murrelets were detected during the survey. Marbled murrelet surveys were also conducted in a five to ten acre stand located north of the Tacoma Diversion Headworks Dam in 1994 and 1995, also following murrelet survey protocol. This stand supported approximately four to six conifers per acre that were larger than 50 inches dbh, with several trees supporting moss covered branches and limbs at least seven inches in diameter. No marbled murrelet activity was detected during either survey year (Beak 1994; Beak 1995). Numerous murrelet surveys have also been conducted over the past three years by timberland owners and the U.S. Forest Service (USFS) in the upper Green River drainage and the Huckleberry ridge area. No detections have been recorded during these surveys.

3.3.3 Effects of the Action

Based on the surveys conducted in 1994 and 1995, no marbled murrelets occur within the project vicinity. Potential marbled murrelet habitat is lacking, as the coniferous forest in the project area is generally 60-80 years of age. There is no old-growth forest in the project vicinity; and only a few trees with suitable nest-site characteristics exist in the reservoir area. In particular, within the inundation zone of Phase I is one small stand with about one acre of suitable nest trees. No other potential nest stand is within the inundation zone. Clearly, because of the relatively young age of most of the trees in the reservoir vicinity, murrelets are not likely to nest in the project area now; however, given Tacoma's plan to retain the forests intact, combined with the mitigation measures aimed at advancing the succession of certain forest stands, marbled murrelets may nest in the project vicinity in the future. The proposed pool raise and consequent loss of forested habitat is not expected to adversely affect marbled murrelets, especially as forest management will lead to stands that provide the necessary structure for murrelet nesting, although it is expected that appropriate nesting structure in the project vicinity will take many years to develop.

3.3.4 Conservation Measures

None indicated at this time.

3.3.5 Determination of Effect

The proposed pool raise is not likely to adversely affect marbled murrelets in either Phase I or Phase II.

3.4 Gray Wolves

3.4.1 Habitat Requirements/Population Status

The gray wolf (*Canis lupus*) is listed as an endangered species in Washington State and can utilize a broad spectrum of habitats, as long as they include an abundance of prey (generally ungulates), suitable denning and rendezvous sites, as well as areas away from human disturbance (USFWS, 1995). The availability of prey may be the primary factor in determining habitat suitability (Stevens and Lofts, 1988). Den sites are most commonly burrows in sandy soils, but can be located in a variety of settings, from downed logs and hollow trees to rock caves. Rendezvous sites tend to be near a source of open water in small meadows with limited visibility.

3.4.2 Known Occurrences in the Project Vicinity

No gray wolves have been observed in the reservoir area. The closest known surveys to be conducted for gray wolves have been in selected areas on Huckleberry Ridge between the Green River and White River drainages in 1993. During those surveys, no wolves were heard and evidence of wolf use of the area was not observed.

3.4.3 Effects of the Action

None.

3.4.4 Conservation Measures

As gray wolf habitat will not be impacted, no conservation measures are indicated at this time.

3.4.5 Determination of Effect

The project would not likely to adversely affect gray wolves in either Phase I or Phase II.

3.5 Grizzly Bears

3.5.1 Habitat Requirements/Population Status

The grizzly bear (*Ursus arctos*) is a federally-listed threatened species. It is not closely associated with late-successional forests, but inhabits vast areas of diverse habitat types, including alpine meadows. The presence of an abundance of berries, fish and other food is necessary to support these large omnivores. Other items include mountain goat, deer, and elk. Grizzly bears have large home ranges of up to 1,004 square miles. They usually move down to lower elevations after emerging from their high elevation denning areas in the spring. Most often, grizzly bears are found in remote areas where human activity is limited and roads are few or closed to access, especially to hunting.

3.5.2 Known Occurrences in the Project Vicinity

No grizzly bears or sign of grizzly bears have been reported in the Howard Hanson Reservoir area. However, in 1993, the WDFW verified tracks of grizzly adult, cub and an unknown aged bear near Kapowsin, Pierce County. No other sightings of grizzly bear have been documented for this area.

3.5.3 Effects of the Action

None.

3.5.4 Conservation Measures

As grizzly bear habitat will not be impacted, no conservation measures are indicated at this time.

3.5.5 Determination of Effect

The project would not likely adversely affect grizzly bears in either Phase I or Phase II.

3.6. Spotted Frog

3.6.1 Habitat Requirements/Population Status

The spotted frog (*Rana pretiosa*) is listed as a candidate species in Washington State. The frog populations have declined dramatically in western Washington and Oregon. In Washington, the species is known to occur at several locations east of the Cascades (Leonard et. al 1993). It is believed that the non-native bullfrog (*Rana catesbeiana*) and other aquatic predators have seriously reduced these populations. Adult spotted frogs are found in or near perennial water bodies such as springs, ponds, lakes, or slow moving streams and are often associated with emergent, non-woody vegetation (Leonard et. al 1993). It is rare to find a spotted frog more than one meter away from water and they tend to sit in the shallows, half submerged, or they float in deeper water, clinging to aquatic vegetation with their head visible. Spotted frogs eat invertebrates, and adults can eat other small frogs (Light 1986a).

3.6.2 Known Occurrences in the Project Vicinity

The project area lies within the historic range of the spotted frog. Sightings in Thurston County are the only confirmed observations of spotted frogs in 23 years in western Washington lowlands.. Within the project area, perennial water sources with adjacent emergent vegetation could provide suitable spotted frog habitat. Nevertheless, due to the rare documented occurrence of the spotted frog in western Washington lowlands, the spotted frog is not expected to occur in the project area.

3.6.3 Effects of the Action

Spotted frogs are not known to exist in the reservoir area and thus would not be directly impacted by the pool raise. Potential spotted frog habitat may be displaced, however.

3.6.4 Conservation Measures

Wildlife habitat restoration opportunities investigated for this project which would benefit spotted frogs are the creation of sub-impoundments for amphibians and the establishment of additional vegetation in the drawdown zone. Sub-impoundments are designed to flood during high reservoir pool elevations and maintain surface water by containment during reservoir drawdown. Sub-impoundments offer an increase in habitat by trapping and holding water for a longer period of time and by making open water habitat for amphibians available for longer periods after reservoir drawdown.

3.6.5 Determination of Effect

If spotted frogs occur within the project area, they may initially be displaced from suitable habitat during reservoir inundation. However, spotted frogs are not expected to occur in the project area as they have only been reported at one site in western Washington lowlands over the past 23 years. The project is not likely to affect spotted frogs in either Phase I or Phase II.

3.7 Bull Trout

3.7.1 Habitat Requirements/Population Status

The bull trout (*Salvelinus confluentus*) is listed as a candidate species in Washington State. It is found in interior and some coastal drainages from northern California to southeast Alaska (Stolz and Schnell, 1991). It is estimated that at least 77 distinct populations of bull trout exist in the state of Washington (WDW, 1992) Bull trout in the Puget Sound region and coastal streams are anadromous. Groundwater influence and proximity to cover are reported as important factors in spawning site selection. Bull trout characteristically occupy high quality habitat, often in less disturbed portions of a drainage. Necessary key habitat features include channel stability, clean spawning substrate, abundant and complex cover, cold temperatures, and lack of barriers which inhibit movement and habitat connectivity (Reiman and McIntyre, 1993).

3.7.2 Known Occurrences in the Project Vicinity

Historically, bull trout were found in the thousands in the middle Green (RM 35) (Grette and Salo, 1985). Their occurrence in the upper Green River has not been verified. The U.S. Forest Service conducted recent surveys in the upper Green River drainage and several tributaries (Sunday Creek and Pioneer Creek) and found no evidence of bull trout (Goetz, pers. comm., 1996). Plum Creek has also completed surveys in other upper Green River tributaries with no verification of bull trout presence (Plum Creek Watershed Analysis and Steve Toth, pers. comm. 1995). The habitat in these areas was considered somewhat degraded due to past timber harvests. Stream temperatures in the survey area may also be warmer than temperatures required by bull trout in the late summer (Goetz, 1989 and 1994).. Bull trout were reported in the Green River in 1964 and in the Duwamish in 1994 (E. Warner, pers. comm.)

3.7.3 Effects of the Action

Raising of the reservoir is not expected to affect bull trout as use of this reach by bull trout has not been proven. However, char (genus *Salvelinus*) have been documented in Page Mill Creek and are presumed to be brook trout (*S. fontinalis*) (Wunderlich and Toal, 1992). In order to verify this, a presence and absence survey in Page Mill Creek will be conducted by 1998. If bull trout do occur in the upper Green River watershed, they could utilize the mainstem for spawning, but spawning typically occurs in low gradient areas of cold water (<9-12 C) and in second to fourth order streams (approximately 20 to 50 cubic feet per second) (Goetz, 1994). Although Page Mill Creek is the only likely spawning area within the project that meets all habitat suitability requirements, this stream has been so extensively modified by logging, development, and establishment by brook trout, that bull trout, if historically present, were extirpated long ago. If bull trout are present in the upper Green River watershed they could utilize portions of the reservoir for rearing.

3.7.4 Conservation Measures

If bull trout existed in the project area, and their spawning habitat was outside the project, they would benefit from fisheries enhancement associated with the project. Fish passage will be improved along the entire length of Page Mill Creek, large woody debris will be placed in the lower reaches of the reservoir tributaries, riparian vegetation will be added and a more defined stream channel for Gale Creek in the upper reservoir will be established. Floating islands of large woody debris may also be designed to provide in-reservoir cover.

3.7.5 Determination of Effect

Presently, there is no documented use of the mainstem Green River or major tributaries by bull trout. Raising of the reservoir level in either Phase I or Phase II should not adversely affect bull trout, as no documented observations of bull trout have been made in the area.

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January 28, 1998

Colonel James M. Rigsby
District Engineer
Seattle District, Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124-2255
Attention: Ken Brunner

Re: Howard Hanson Biological Assessment
FWS Ref: 1-3-98-I-0021

Dear Colonel Rigsby:

This letter is in response to your Biological Assessment (BA) for the Howard Hanson Additional Water Storage Project, dated January 15, 1998, and received by us via email on the same day. The BA, along with the information provided by phone by your staff on January 7 and 8, 1998, now provides sufficient detail on the project's design and operation for us to complete our review. We received an earlier version of the Corps of Engineers ' (Corps) BA on October 21, 1997, but could not complete our review because the project design was still evolving.

The Corps determined that the proposed Howard Hanson Additional Water Storage Project would not likely adversely affect the bald eagle (*Haliaeetus leucocephalus*), northern spotted owl (*Strix occidentalis caurina*), marbled murrelet (*Brachyramphus marmoratus marmoratus*), gray wolf (*Canis lupus*) and grizzly bear (*Ursus arctos*). The U. S. Fish and Wildlife Service (Service) concurs with your determination.

The Service's concurrence is based upon: (1) the implementation of the conservation measures described in the BA; (2) the Corps' statement that phase 2 of the project (conservation pool raise to elevation 1,177 feet, MSL) will not be implemented until it is demonstrated that this action will not adversely affect the Green River's salmon and steelhead resources; and (3) the retention of all merchantable and large trees within the larger conservation pool unless logging can be accomplished without adversely impacting the restoration of the anadromous fish runs upstream of the project.

This concludes informal consultation pursuant to Section 7(a)(2) of the Endangered Species Act of 1973, as amended. This project should be re-analyzed if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not considered in this consultation; if the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat this was not considered in this consultation; and/or if a new species is listed or critical habitat is designated that may be affected by this project.

If you have further questions about this letter or your responsibilities under the Act, please contact Gwill Ging at (360) 753-6041.

Sincerely,

Nancy J. Gloman

Nancy J. Gloman
Acting Supervisor

gg/jmc
c: NMFS, Lacey
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WDFW, Mill Creek
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REPLY TO
ATTENTION OF

Technical Services Branch

Mr. Steven Landino
National Marine Fisheries Service
510 Desmond Dr., Suite 103
Lacey, Washington 98503-1273

MAY 26 1998

Dear Mr. Landino:

The Corps of Engineers, in partnership with the City of Tacoma Water Division is planning to raise the elevation of the reservoir behind Howard Hanson Dam, on the Green River, Washington, in order to provide additional municipal water supply, as well as to provide low flow augmentation for fish in the Green River below the dam. A second project purpose is ecosystem restoration, with a goal of restoring anadromous fish runs to the upper Green River above Howard Hanson Dam. The project would be implemented in two phases: Phase 1 would begin in 2004, while Phase 2 is dependent upon monitoring and evaluation, and agency concurrence that impacts to anadromous fish would be minimal. This letter transmits a biological assessment (BA) that addresses the effects of the project on the proposed Puget Sound chinook salmon ESU (*Oncorhynchus tshawytscha*), as well as on two candidate species: Puget Sound coho (*O. kisutch*), and sea-run cutthroat (*O. clarki clarki*).

The BA concludes that Phase 1 of the proposed action is not likely to jeopardize the continued existence of the chinook salmon in the Green River, and is not likely to adversely affect coho or sea-run cutthroat. These determinations are based on project impacts as well as implementation of restoration measures in Phase 1. In order to offset certain project effects, we will implement mitigation measures in addition to restoration measures.

If you have any questions, or wish to discuss project details, please call Mr. Fred Goetz at (206) 764-3515, or Mr. Ken Brunner at (206) 764-3479.

Sincerely yours,

SG Martin for

Cyrus M. McNeely
Chief, Environmental Resources Section

cf:
Fransen
Poon

cc:
Goetz (ED-TB-ER)
Brunner (ED-TB-ER)
McNeely (ED-TB-ER)
Loll (PM-CP)
Hickey (Tacoma Water Division)

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-2255

REPLY TO ATTENTION OF

CENWS-ED-TB-ER

Mr. William Stelle, Jr., Director
National Marine Fisheries Service
Northwest Regional Office
7600 Sand Point Way NE
Building #1
Seattle, Washington 98115-0070

Dear Mr. Stelle:

The Seattle District Corps of Engineers needs to be expeditious in proceeding with the Howard Hanson Dam Additional Water Storage (HHD AWS) study, an effort which will result in a project of considerable potential benefit to the population status of wild salmonids in the Green River basin. Accordingly, I would like to ask your prompt acceptance of our plan to not include the biological assessment (BA) that we will prepare to consider impacts on the Puget Sound ESU of chinook salmon, recently proposed as threatened, in the draft EIS. The reasons for proceeding in this manner are set forth below. We have appreciated and benefited from the timeliness you and your staff have previously extended to the Corps and our sponsor, the City of Tacoma, in our coordination and correspondence (enclosure). I hope for the same courtesy in our current request.

We recently completed a Section 7 consultation process with the U.S. Fish and Wildlife Service for species under their purview. Until your proposal on March 10, 1998, there had been no anadromous fish proposed or listed that could be affected by the HHD AWS project. The recent proposal of Puget Sound chinook comes at a time when we are under a strict schedule to complete the draft feasibility report and environmental impact statement (DFR/EIS). The DFR/EIS is scheduled to be mailed for public comment on April 13. This tight schedule leaves us insufficient time to request a species list from you, prepare a biological assessment (BA), receive your concurrence, and include all of the above in the DFR/EIS. To inform reviewers, we would indicate in the DFR/EIS that the Section 7 process for Puget Sound chinook salmon is in process and would be completed prior to finalizing the DFR/EIS. Although the BA would not be included in the draft DFR/EIS for public review, we believe this would be acceptable because we think we have a good understanding of the issues as a result of extensive coordination with you and your staff, and because we have thoroughly addressed the issues in our previous correspondence, as well as in the DFR/EIS. Indeed, our project planning is largely dedicated to the continued existence and improvement in population status of wild salmonids in the Green River system, and we believe that, with implementation of the HHD AWS project, there will be renewed hope for protection and recovery of wild salmonids in the Green River basin.

We understand that for a proposed species, our determination will be in the form of "jeopardy" or "no jeopardy", and that your concurrence is not required in the case of proposed species. However, since our project would not be constructed until 2001, the chinook may well be listed prior to completion of our project. We understand that the Section 7 coordination process will need to be reinitiated prior to commencement of construction of the project. As such, your opinion of the effect of our project on Puget Sound chinook would be appreciated, to give us an early indication on the direction our project should take. Your opinion will be solicited with the transmittal of our BA.

Accordingly, I am requesting your agreement with our proposal to prepare the BA concurrently with public review of the DFR/EIS, and complete the Section 7 process before we finalize the DFR/EIS. I would appreciate receiving this concurrence by March 31, 1998.

If you would like to discuss this issue with us, please contact me at (206) 764-3624. I or my staff will be happy to address any concerns you may have on this issue.

Sincerely yours,

J. Steven Foster
Chief, Civil Projects and Planning Branch

enclosure

cf:
Landino
Fransen
Poone

HOWARD HANSON DAM ADDITIONAL WATER STORAGE PROJECT
BIOLOGICAL ASSESSMENT
MAY 22, 1998

1.0 BACKGROUND

The city of Tacoma (Tacoma Public Utilities (TPU), Washington receives a majority of its municipal and industrial water supply from the Green River through their diversion structure at river mile (RM) 61.0. The Howard A. Hanson Dam (HHD), a U.S. Army Corps of Engineers dam, is located within the City of Tacoma's watershed on the upper reach of the Green River, at RM 64.5. HHD provides winter flood control and summer low flow augmentation (LFA). The reservoir behind HHD has never been filled to its authorized elevation of 1206 feet, but maintains an established conservation pool elevation of 1141 feet[1] during spring and early summer for fishery low-flow augmentation, until inflow can no longer keep up with outflow, at which point the reservoir slowly drains to its winter minimum of approximately 1070 feet.

At present, the Corps stores approximately 25,400 acre-feet (ac-ft) of water behind HHD for downstream LFA during the summer and fall. An additional 5,000 ac-ft of water for LFA is authorized through a Section 1135 restoration project. Tacoma presently diverts 113 cubic feet per second (cfs) of water, at their diversion dam, to provide M&I water to Tacoma under their first diversion water right (FDWR). Tacoma is also authorized to divert 100 cfs of M&I water under its Second Supply Water Right (SSWR). This 100 cfs SSWR is conditioned by the Tacoma Public Utilities/ Muckleshoot Indian Tribe (TPU/MIT) Agreement, which establishes minimum in-stream flows for the Green River through each calendar year. These flows exceed the current state established minimum flows.

Tacoma recognizes the need for an additional water supply, especially during the summer months, not only because of the high water demand during this time of the year, but also because natural flow withdrawals are constrained to protect fish. The existing storage is entirely dedicated to fish needs and therefore not available to Tacoma. A certified reconnaissance study completed by the U.S. Army Corps of Engineers determined that additional water storage behind HHD is the most viable source of municipal and industrial water supply for Tacoma and its service area. Under the Additional Water Storage (AWS) project, the conservation pool would be increased in two phases: the first phase would increase the annual conservation (summer) pool elevation by 20 feet, from 1147 feet[1] to an elevation of 1167 feet storing Second Supply Water and implement a series of restoration projects. The second phase (which would occur at least five years after implementation of Phase I) would raise the summer conservation pool an additional

[1] The existing summer conservation pool maintains an elevation of 1141 ft, beginning in the year 2000 a follow-on restoration project (HHD Section 1135) will store an additional 5,000 ac ft for flow augmentation raising the summer conservation pool to 1147 ft.

10 feet to elevation 1177 feet. Implementation of Phase II is dependent on results of Phase I restoration projects, ability to minimize impacts to lower river habitat from storing additional water, and concurrence of agency and tribal biologists. Both of these pool raises results in loss of terrestrial and wetland habitat adjacent to the existing reservoir; the project also results in downstream in-stream effects, particularly during Phase II.

Restoration of anadromous fish to the Upper Green River is the keystone of the AWS project ecosystem restoration. Phase I of the AWS project includes construction of a downstream fish passage through HHD, resulting in the re-introduction of anadromous salmonids to the upper watershed: the City of Tacoma will have concurrently completed an a fish ladder and upstream truck and haul project to pass adult salmon and steelhead around both dams. Three habitat restoration projects will also be implemented in Phase I these include annual placement of 3,900 cu yd of gravel in the Middle Green River, restoration and reconnection of a ¾ mile long side channel at RM 58-59, and improvement of large tributary habitat above the Phase II inundation pool. The inclusion of these restoration features -- improved fish passage, increased instream flows, and fish and wildlife habitat -- provides a historic opportunity to restore and maintain self-sustaining and harvestable runs of salmon and steelhead for the Green River. The phased implementation and adaptive management measures proposed for the project allow for the flexibility to make adjustments to ensure the protection of fish and wildlife.

The U.S. Fish and Wildlife Service (USFWS) in a letter dated January 22, 1996 identified five federally listed animal species and two candidate species which may occur in the project vicinity. Included in this list were bald eagles (*Haliaeetus leucocephalus*), marbled murrelets (*Brachyramphus marmoratus marmoratus*), northern spotted owls (*Strix occidentalis caurina*), gray wolves (*Canis lupus*) and grizzly bears (*Ursus arctos*). Spotted frogs (*Rana pretiosa*) and bull trout (*Salvelinus confluentus*) were listed as candidates (with 15 other species; in a Notice of Review on February 28, 1996, the USFWS dropped many species from the candidate list; for the HHD project, only the bull trout and spotted frog remain as candidate species). The potential impacts to these listed and candidate species as a result of the Howard Hanson reservoir inundation project are outlined in the January 15, 1998, biological assessment (BA) found in Appendix H of the HHD AWS Draft Feasibility Report (FR) and EIS.

Since submittal of the January 15, 1998, BA, National Marine Fisheries Service (NMFS) has proposed listing Puget Sound chinook salmon (*Oncorhynchus tshawytscha)* as a threatened species. Natural spawning chinook salmon occur below the project and can be affected by reservoir operations while hatchery chinook salmon are released above the project and could continue to be stocked as part of a basin recovery effort if the AWS project proceeds. Puget Sound coho salmon (*O. kisutch*) and sea-run coastal cutthroat (*O. clarki clarki*) are also listed as candidate species and both are found below and within the project area. The potential impacts to these proposed and candidate anadromous fish species are outlined in this May 22, 1998, biological assessment and will be included in

Appendix I of the HHD AWS Final FR/EIS. The discussion of bald eagle effects is retained in this BA, as much of that discussion pertains to impacts to anadromous fish.

2.0 BASELINE CONDITION AND GENERAL PROJECT IMPACTS

The baseline condition for this project includes conditions as a result of all current operating projects and facilities. These include: 1) the existing HHD project, which is used for flood control during the late fall and winter and for spring storage of 25,400 ac-ft of water for summer LFA; 2) the HHD Section 1135 Fish and Wildlife Restoration Project, which authorizes storage of an additional 5,000 ac-ft of water for LFA, a "without project" feature; 3) TPU's Pipeline Projects, Pipeline No. 1 (P1), which was constructed to carry Tacoma's FDWR, and 4) Pipeline No. 5 or the Second Supply Water Right (P5 or SSWR), which will carry TPU's SSWR. TPU was granted a permit, under Section 404 of the Clean Water Act, to construct P5. Construction is scheduled to be complete by 2003, before the HHD AWS project is scheduled to be implemented, this is a "without-project" feature. Impacts resulting from Tacoma's P1 and P5 projects have already been mitigated for or are being considered for Endangered Species Act compliance through a Habitat Conservation Plan (HCP) that Tacoma is currently pursuing: contact Paul Hickey or John Kirner at TPU for further information.

Phase I of the AWS project would result in the inundation of about 325 acres of terrestrial and wetland habitats (including 79 acres of riparian and 11.5 acres of stream habitat), while Phase II would inundate an additional 153 acres of habitat (42 acres riparian and 5.9 acres stream). Most plants in the inundation zones would die during the first season of inundation, although a few species of plants that are more tolerant of inundation would survive for a longer period than species intolerant of inundation. The City of Tacoma would like to remove some merchantable timber from the inundation zone, and leave the remainder of trees. This point is currently being debated by resource agencies, who would prefer to see no trees cut from the inundation zone, in order to provide habitat for juvenile salmonids. The project is currently described as leaving all trees flooded by the new inundation pool(s). In the event that merchantable trees are cut, the Corps of Engineers and the City of Tacoma will inventory the inundation zone and designate particular trees which are not to be cut, even in the merchantable areas. The Corps would amend this BA and transmit it to NMFS for concurrence. In addition, to insure that suitable perches will be maintained for raptors, dead snags would be retained and allowed to fall as they rot.

As related to anadromous fish, five adverse impacts were identified under the AWSP feasibility study resulting from storing 20,000 ac ft of the SSWR in Phase I and 32,000 ac-ft of additional storage (beyond the SSWR) in Phase II during the winter and spring. These impacts are found in two distinct areas: 1) within the HHD project boundary, at the dam and within the reservoir; and 2) in the lower watershed, from HHD to the estuary. The impacts within the project boundary from increased pool size in Phase I and II are: 1) potential decreased survival of a proportion of juvenile salmon and steelhead migrating through the larger pool, and 2) stream and riparian habitat inundated by the pool raise. The phased nature of the AWS project presumes there will are no impacts to the lower watershed during Phase I spring refill since Phase I storage uses water (SSWR) that Tacoma would have otherwise have diverted from the mainstem river between February and June. The impacts from Phase II additional storage (32,000 ac ft) in the lower watershed from spring refill are: 1) dewatering of steelhead eggs, 2) reduced survival of outmigrating juvenile salmon and steelhead, and 3) disconnection of side-channel habitat from the mainstem river.

The AWS project includes Ecosystem Restoration as a project purpose. A series of aquatic habitat limiting factors have been identified in the Green/Duwamish Basin that the AWS project could address which include 1) reconnection of the Upper and Lower Green River with fish passage over and/or through the Tacoma Diversion Dam and HHD; 2) low flows during summer and fall; 3) water temperatures that exceed state water quality standards; 4) lack of large woody debris in tributary and mainstem areas; and 5) reduction of peak flows with reduced sediment transport. Phase I includes a series of restoration projects (habitat improvement <u>beyond</u> mitigation requirements) that address part(s) of each of these limiting factors including:

1. <u>Downstream Fish Passage.</u> A new intake tower with new fish collection and transport facility (capable of passing up to 1250 cfs within NMFS screening criteria) would be built including: a wet-well, a floating fish collector, a fish lock, a discharge conduit, a fish transport pipeline and monitoring equipment. The facility will be adaptively managed based project monitoring and evaluation: a 15 year of reservoir and dam monitoring program is proposed (see *Appendix F, Part One, Section 10*). Upstream fish passage will be provided by TPU with a truck and haul facility at the barrier dam beginning in 2003. One objective of the fish passage project would be to boost the natural spawning adult salmon and steelhead population to up to 10,000 individuals within 20 years (estimated total escapement used for planning purposes; *Appendix F, Part One, Section 2*).
2. <u>Low Flow Augmentation.</u> Phase I provides for yearly storage of the 5,000 ac ft under the HHD Section 1135 project. Phase II provides an additional 9,600 ac ft of storage dedicated for low flow augmentation (LFA). Flow modeling suggests we have an 80% annual reliability of achieving storage of the combined 14,600 ac ft from both storage accounts.
3. <u>High Water Temperatures.</u> The new fish passage facility surface outlet allows blending of surface and deep-water releases which will ameliorate existing high temperatures resulting from dam discharges. Outflow releases will track the natural ambient rise and fall of seasonal temperature change. In the lower river, LFA can provide increased flow volume and velocities that can improve near-shore temperatures and intergravel flow.
4. <u>Lack of Large Woody Debris</u>. Habitat improvements above HHD include addition of large woody debris to mainstem and large tributaries of HH Reservoir extending from the Phase II summer pool elevation (1177 ft) up to 1240 ft elevation. Below HHD the Corps is proposing to truck and release at RM 59 an underdetermined number of

pieces of large wood collected out of HH Reservoir. Lastly, a ¾ mile long side-channel will be restored and reconnected to the mainstem between RM 58-59: several hundred pieces of large woody debris would be added to this off-channel habitat.

5. Sediment Transport. Since construction of HHD, peak flows have been reduced from 30,000 cfs to a maximum 12,000 cfs with a concurrent reduction of coarse sediment transport with storage of larger particles beyond HHD: at a rate of 3,900-11,700 cu yd/year (see *Appendix F, Part One, Section 4.b)*. This reduction in sediment transport is degrading spawning habitat (bed armoring) in the Middle Green River (RM 40-46) at a rate of 700-1,000 lineal feet of mainstem habitat per year (Fuerstenberg et al. 1996). In Phase I, annual placement of 3,900 cu yd of gravel would occur between RM 40-46 to retard the loss and maintain spawning habitat in the Middle Green.

3.0 PROJECT IMPACTS ON LISTED SPECIES

The National Marine Fisheries Service (NMFS) checklist for documenting environmental baseline conditions and effects of proposed actions on relevant environmental indicators was used to help assess the effects of the HHD AWS project on anadromous salmonid habitat. The NMFS checklist was applied to three areas of the Green River affected by the AWS project and is presented in Table 1.

Anadromous salmonids historically were found throughout the upper Green River watershed (221-231 square miles of the 483 square mile basin) and were probably a more important food source for bald eagles prior to construction of the Tacoma Diversion Dam (RM 61) and HHD (RM 64.5) than they are now. The dams blocked upstream passage of adult salmon, steelhead, and probably sea-run cutthroat trout and ended spawning in at least 106 accessible stream miles above the dams. Various authors have estimated that over 30,000 adult salmon and steelhead could be produced in the watershed above the dams (*Appendix F, Part One, Section 2*). From 1911-1914, a weir and egg take station was used to capture broodstock and establish hatchery runs of steelhead, coho and chinook salmon to compensate for the loss of spawning habitat above the Diversion Dam, with trap counts maintained for coho and steelhead. The average return for coho during those years was 5600 adults while steelhead was 1600 adults. Grette and Salo (1986) reported that historical production ranged from 9,000-25,000 for coho, 500-5200 for steelhead, and from 150 to 300 for spring chinook. The authors researched Washington Department of Game records and concluded that harvest and seasonal blockages below the trap could have resulted in underestimates of total returns. In 1929, an anonymous author for the Washington Dept of Game said that the upper watershed above the Tacoma Diversion Dam contained 90 percent of the spawning habitat in the Green River for coho salmon and steelhead (cited in Fuerstenberg et al. 1996).

At least one account indicates as many as 15 bald eagles at Eagle Gorge prior to construction of the dam(s), which may well have been because of spawning salmon at that location (Eagle Gorge is now part of the reservoir behind HHD). The AWS project would not only result in higher reservoir levels, but would also result in altered downstream flows. The issues surrounding flows in the Green River and the various stocks of salmon are complex. Because salmon have historically been important to bald eagles (and still provide eagles with a food source downstream from the dam), and because of the recent proposed listing and status review of salmon, the following discussion on bald eagle goes into some detail on the existing (baseline) condition of salmon stocks in the Green River, and the expectations following implementation of Phase I, and then Phase II, of the AWS project.

Chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), chum (*O. keta*), cutthroat trout (*O. clarki*), and steelhead (*O. mykiss*) are the five main salmonid species supported by the Green River. In addition, char (*Salvelinus spp.*) may be found sporadically in the watershed, but there is little information to substantiate their status as a native spawning and rearing stock.

3.1 Bald Eagle

3.1.1 Habitat Requirements/Population Status

The bald eagle is listed as threatened in Washington on the Federal list of endangered, threatened, and proposed animals and plants. The bald eagle (*Haliaeetus leucocephalus*) is found only in North America and ranges over much of the continent, from the northern reaches of Alaska and Canada down to northern Mexico. Bald eagles migrate to wintering ranges in Washington State in late October and are most commonly found along lakes, rivers, marshes, or other wetland areas west of the Cascades, with an occasional occurrence in eastern Washington.

The characteristic features of bald eagle breeding habitat are nest sites, perch trees and available prey. Bald eagles primarily nest in uneven-aged, multi-storied stands with old-growth components (Anthony, et al. 1982). Factors such as tree height, diameter, tree species, position on the surrounding topography, distance from water, and distance from disturbance also influence nest selection. Live, mature trees with deformed tops are often selected for nesting and nests are often re-used year after year (USFWS, 1995). Snags, trees with exposed lateral branches, or trees with dead tops are often present in nesting territories and are critical to eagle perching, movement to and from the nest and as points of defense of their territory. Perches used for foraging are normally close to water where fish, waterfowl, seabirds, and other prey can be captured.

3.1.2 Known Occurrences in the Project Vicinity

Bald eagles have been sighted every month of the year near the reservoir, however, no nests have been confirmed in the project area. The bald eagle is year round resident within the Howard Hanson reservoir area. Although its behavior in the area is not documented, it most likely feeds on waterfowl that winter on the lake; up to two hundred ducks may be on the reservoir at any one time, providing a readily available food source for bald eagles. The forests surrounding the reservoir provide a large number of perches and potential nest trees. Food is the limiting resource, and no more than four bald eagles have been seen in the vicinity of the reservoir at any one time during the winter. Another potential limiting factor is the seasonal drawdown of the reservoir during the winter (to 1070 feet) which leaves a broad, unvegetated band between the forest and the reservoir and may discourage use by bald eagles; however, the real effect of the drawdown on eagle use has not been investigated and is unknown. The reservoir is refilled during spring and is usually raised to 1141 ft by mid-May, although the pool is raised briefly to elevations of 1143-1147 ft most years for debris clearing.

3.1.3 Effects of the Action—Phase I

3.1.3.1 Perches

Only the merchantable timber existing in the inundation zone has been proposed for logging by Tacoma prior to inundation. In addition, if logging were to occur, potential perch trees would be marked so that they would not be cut. Thus, a relatively small number of living perch trees will be removed from the existing habitat. Although the time frame for the reservoir operation would remain nearly the same, the position of perches and forest, and the configuration of the reservoir shoreline would be changed; a rough estimate, based on use of a 1 in =800 ft topographic map, is that the forest would be as much as 800 feet further removed from the low pool than under existing winter conditions. In areas of steep banks, the shoreline may be as little as 30-50 feet further removed. Artificial perch poles will be erected in specific locations within the inundation zone to compensate for the loss of existing key perches. According to the USFWS (1993), artificial perches have been used by many raptor species and are important to wintering bald eagles in situations where natural perches are lacking.

3.1.3.2 Food Supply

A number of factors could affect waterfowl numbers on Howard Hanson reservoir. First of all, there are few (resident) fish larger than 6 inches in the reservoir, although there are anadromous salmonids in the reservoir that are annually outplanted in the upper watershed that have reached lengths of 10 inches (Ging, 1998). Bald eagles typically do not eat fish less than 6 inches in length, as it is not worth the energy expended to catch them. Outplanting of juvenile salmon and steelhead above the reservoir may not continue without the AWS project, and if this occurs, fish resources in the reservoir (for bald eagles) would decline. Also, removal of trees would potentially result in less protection of the reservoir from wind, and may make the reservoir less attractive to waterfowl due to rougher water. On the other hand, for the first few years of inundation to 1167 ft, the reservoir will be more productive with the introduction of nutrients from the newly inundated strip of forest land between 1147 ft and 1167 ft elevations; should this occur, waterfowl may be enticed to stay because of the enhanced food supply--it is impossible to predict whether wind or food supply would have the greater effect on waterfowl numbers, or whether these effects would in fact occur. Experience with other reservoirs indicates that the nutrients first increase, then are depleted after a few years and the reservoirs become less productive *(Appendix F, Part One, Section 2)*. For this analysis, we would expect a fairly similar scenario to occur in Howard Hanson Reservoir: resident fish populations (cutthroat and rainbow trout, mountain whitefish) as well as those of wintering waterfowl would initially go up with the increase in nutrients, then fall again as nutrients decline over a period of years. Anadromous fish populations should diverge from the above pattern given the new fish passage facility; as natural production improves the number of juvenile salmonids should increase, while adult numbers (and carcasses) should increase dramatically. This increase in juvenile salmonid number and release of ocean-derived nutrients from carcasses could also result in increased resident fish number and size. Lastly, we would not expect the number of either resident fish or waterfowl to drop below current wintering populations, since the reservoir will maintain its current winter operation.

Food supply for bald eagles is expected to significantly increase in the upper watershed not only as a result of restoration efforts, but also as a result of increased nutrients present in the reservoir following inundation. Currently, no anadromous adult salmon exist in the upper watershed, though one to three million juveniles are outplanted in an effort to restore runs to the Green River. One objective of the AWS project and TPU P5 mitigation fish passage improvements would be to boost the natural spawning adult salmon and steelhead population to up to 10,000 individuals within 20 years (estimated total escapement used for planning purposes; *Appendix F, Part One, Section 2*). This increase in fish number will bring about a large increase in available nutrients, carcasses, and fish greater than 6 inches in size. In addition, habitat improvement efforts within the reservoir (including establishment of sedge meadows in the currently barren "bathtub ring" exposed during drawdowns) is expected to increase the population of nesting waterfowl, which currently is quite small (fewer than 10 nesting pairs). Thus, food supply for bald eagles in the upper watershed would be heightened.

Downstream, the situation is less predictable. In general, survival of anadromous salmonids streams and the mainstem river is influenced by many factors, including winter flooding and scour of incubating eggs, flow levels during juvenile emigration in the spring, minimum baseflows during summer and fall, maximum and minimum water temperatures, dissolved oxygen supply, quality of instream and riparian habitats, suspended sediment levels, and predation. Once they leave their natal streams, survival of juvenile salmon and steelhead is dependent on a number of physical and biological factors including estuary habitat quantity and quality, predation by fish, mammals or marine birds, climatic change such as elevated ocean temperatures, and by harvest by commercial, sport, or tribal fisheries.

The HHD project provides primary control of mainstem flows in the Green River, which may have secondary effects on water temperature, turbidity, and predation of juvenile anadromous salmonids. The current population status of lower river anadromous stocks can be somewhat related to operation of HHD. Tradeoffs occur as a result of the reservoir operations that provide additional storage (and existing conservation storage) by filling the reservoir in late winter to early summer for release in summer and fall -- less water is provided to the Green River below HHD in during refill, which may result in reduced spawning (steelhead), hatching (steelhead and salmon), and juvenile downstream migration success. The following analysis discusses these effects on the various salmon stocks and the resulting effects on bald eagles.

Phase I of the AWS project includes implementation of all restoration features which include the downstream fish passage facility, habitat restoration projects above and below the dam, and storage of 20,000 ac ft of M&I water supply. As part of the Second Supply Project, Tacoma will implement a mitigation agreement that will include an upstream fish passage facility, a fish restoration facility which will provide up to 500,000 coho and chinook and 350,000 steelhead fingerlings, and improved instream flows during summer and fall[2].

3.1.4 Effects of the Proposed Project.

The combined mitigation and restoration features of the AWS project and the Tacoma Mitigation Agreement will reconnect the upper Green River providing additional habitat that could support an adult spawner escapement of 1) 6500 coho salmon with production of 160,000 smolts; 2) 1300 winter steelhead with production of 25,000 smolts; and 3) 2300 chinook salmon with production of 890,000 smolts (*Appendix F; Part One Section 2;* Corps of Engineers estimates used for planning purposes). Recovery potential varies by stock, but it is assumed that even without recovery additional production of all stocks will occur through long-term supplementation if necessary. As part of the Mitigation Agreement between Tacoma and the Muckleshoot Tribe a Fish Restoration Facility – a "naturalized" rearing facility for re-establishing salmon and steelhead in the upper Green River – is available for long-term supplementation that will maintain some level of increased adult fish production from natural reared juveniles planted in the Upper Green River. Current production plans include rearing of 500,000 coho and chinook salmon and 350,000 steelhead fingerlings. Either the natural spawned fish or supplemented fish will provide a net positive benefit in returning adult salmon and steelhead that can provide increased feeding opportunities from the Diversion Dam to the headwaters of the Green River.

With a larger reservoir, juvenile passage through the reservoir to the dam will likely take longer and could result in fewer fish reaching the fish passage facility: there are no comparable small to moderate sized reservoirs available to reasonably assess the effects of an enlarged reservoir on outmigrant survival (*Appendix F, Part One, Section 2*). Reservoir and dam passage mitigation was included in the selection of the fish passage facility. The fish passage facility outflow capacity was increased to the maximum

[2] As defined in the 1995 Mitigation Agreement between the Muckleshoot Tribe and TPU. Negotiations between these parties in late winter and spring 1998 may alter these number.

volume technically feasible (from 560 cfs to 1250 cfs within NMFS screening criteria), this increased outflow capacity will greatly improve surface attraction of the facility and should decrease smolt mortality. A combination of flow management and monitoring will also be used to "optimize" operation of the project so survival of smolts through the project can be maximized. Flow management strategies include: minimizing the storage of water during the peak outmigration period, mid-April to end of May; and releasing periodic artificial freshets or mimicking natural freshets. Monitoring of smolt outmigration and predator abundance/distribution will be implemented so adaptive measures can be employed to maintain or improve smolt survival.

Per discussion with agency and tribal biologists, it has been agreed that the Second Supply Water Right diversion of 100 cfs through June 30 is assumed as the without project condition. Since this is considered the without project condition, conceptually there should be no difference between without and with project conditions as the storage volumes are the same. However, for impact analysis purposes, the springtime storage of the additional 20,000 ac ft for M&I water supply has been modeled for the historic record (years 1964-1995) to assess impacts on off-channel rearing habitat and instream migration of chum, chinook, and coho salmon and steelhead smolts. The net effect is that improved reservoir fill and release conditions should result in no decrease or an actual minor increase in total side-channel habitat area and instream survival of emigrating chinook, coho, and steelhead smolts that originate from the upper and lower watershed areas (*Appendix F; Sections 5 and 7*). Chum salmon fry are the smallest emigrant in the lower watershed and the most likely species and lifestage that would be impacted by increased storage. Modeled results showed a small decrease in chum fry survival over the period of record.

Overall, for the lower watershed, the modeling results suggest impacts of spring refill should have a neutral to slight net benefit to salmon and steelhead habitat and survival of early lifestages. Outside of the neutral impact or potential improvements from spring refill, one outcome from adaptive management in Phase I is the immediate implementation of yearly storage (5 in 5 years) of the 5,000 ac ft of Section 1135 low flow augmentation water: dependent on consensus of agency, tribal, Corps and TPU staff. Per requirement of the Muckleshoot/Tacoma Mitigation Agreement, drought year storage (1 in 5 years) will continue to be used for maintaining summer and fall minimum flows (250 cfs), in non-drought years (4 in 5 years) the 5,000 ac ft is available for use at anytime and is planned to augment flows during steelhead egg incubation in June and July. This flow augmentation will probably decrease redd dewatering and increase overall steelhead egg-to-fry survival with attendant increases in adult survival.

Lastly, there are three fish habitat restoration projects planned for Phase I including 1) annual placement of 3,900 cubic yards of gravel in the Middle Green River at Flaming Geyser (dependent on sediment transport model or monitoring); 2) side-channel reconnection in the Upper Green River at Palmer that will restore up to 3.2 acres of off-channel habitat; and 3) 3.5 miles of river and stream habitat improvement in tributaries above the inundation pool (from 1,177 to 1,240 feet elevation). These three projects should provide a clear net benefit for salmon and steelhead with improved instream and off-channel habitat for areas above and below HHD.

3.1.5 Conservation Measures

Mitigation plans propose creating nearby meadows and improving adjacent forested habitats to promote shrub understory growth. The majority of bald eagle natural perch sites will be retained and in the specific areas where that is not possible, artificial perches will be erected. Food supply may shift slightly, from a current reservoir focus to an upper watershed focus, where adult salmonids will be introduced. Food supply in the reservoir may increase temporarily following each pool raise, but would be expected to decline again to near existing levels. Downstream from HHD, the food supply (spawned salmon carcasses) would likely not increase, and may slightly decrease following implementation of the AWS Project. Food supply for bald eagles over the entire area influenced by the project (both upstream and downstream) is not expected to decline, but would instead increase as restoration efforts are taken to increase the number of adult salmon in the upper watershed (to 10,000 individuals). As a result of the proposed mitigation and restoration plans, and retention of natural perch sites, we anticipate that the bald eagle population within the sphere of influence of HHD will not be adversely affected.

3.1.6 Determination of Effect—Phase I

A determination of not likely to adversely affect is made. Mitigation measures (as described in the previous paragraphs) are expected to offset any potential adverse effects.

3.1.7 Effects of the Action—Phase II

3.1.7.1 Perches

Phase II would inundate about one half the acreage that Phase I would inundate, but would nevertheless result in the loss of additional perch trees, and widen the distance between the winter pool and the wooded shoreline. As with Phase I, perch trees in the inundation zone would be retained, and artificial perches would be erected if the number of existing perches was not adequate.

3.1.7.2 Food Supply

Although anadromous salmon would be re-established in the upper watershed in Phase I, implementation of Phase II introduces a degree of uncertainty as to the long-term viability of salmon runs in the Green River Watershed. The additional pool raise means less water enters the Green River in the spring and early summer, potentially reducing juvenile outmigrant survival, de-watering side channels and steelhead redds. This potential adverse impact has been incorporated into restoration projects, reservoir operations, and conceptual Phase II mitigation projects. Restoration features accomplished in Phase I (side channel reconnection, gravel nourishment, reconnection of the Upper Green River with fish passage, and 5,000 ac ft flow augmentation), reservoir operations tied to results of adaptive management monitoring (maximum refill rates, mimic natural hydrology, use of freshets), side channel mitigation projects designed to mitigate for modeled Phase II impacts by improving existing habitat and creating new channels (Section 8, Fish Appendix, 4-projects to mitigate for 8.4 acres), and 9,600 ac ft of summer/fall flow augmentation water will offset Phase II effects, and salmon populations are expected to remain as they were following implementation of Phase I.

With a larger reservoir, juvenile passage through the reservoir will likely take longer and could result in fewer fish reaching the passage facility. Wetlands created in Phase I will be inundated, and less area would be available for replacement of those wetlands—possibly resulting in smaller numbers of waterfowl nesting in the reservoir. These factors result in a likelihood of reduced food supply in the reservoir for bald eagles, though the reduction is expected to be negligible.

3.1.8 Conservation Measures

Conservation measures around the reservoir for Phase II would be similar in type to those implemented during Phase I, including additional sedge meadow creation, forest manipulations, snag retention and creation, and watershed stream habitat improvements. Conservation measures in the lower river would include: improvements in side channel habitat (habitat quality improvements, restoration of relic side channels), continued additions of gravel and large woody debris, spring-reservoir releases adaptively managed to protect important salmonid life-stages (based on monitoring results), and storage and release of 9,600 ac ft for optimal rearing and spawning flows in the summer and early fall.

3.1.9 Determination of Effect—Phase II

Implementation of Phase II of the HHD Additional Water Supply project is not likely to adversely affect bald eagles.

3.2. Chinook Salmon

Table 1 provides an overview of baseline conditions and effects of the proposed project on aquatic habitat indicators using the NMFS checklist for relevant indicators. Additional discussion of project effects on anadromous fish is contained in the Bald Eagle sections above.

3.2.1 Habitat Requirements/Population Status

On March 10, 1998, Puget Sound/Strait of Georgia chinook salmon stocks were proposed as a threatened species for listing under the Endangered Species Act. Summer/fall chinook of the Duwamish/Green River basin are distinguished from other Puget Sound chinook stocks by geographic isolation. The lower and middle Green River basin chinook run is mixed with Soos Creek Hatchery stocks, but the upper Green River portion of the run may be native. Coded-wire tag recoveries indicate that some hatchery strays are spawning naturally in the river (SASSI 1993). The Muckleshoot Indian Tribe is preparing to conduct genetic stock identification of the run in 1998.

Adult returns to the Green River and its tributaries have averaged 7,600 from 1987 to 1992 with an increasing trend (SASSI 1993). The runs have met escapement goals (5800 fish) in the recent past but harvest has been severely curtailed due to lower than expected smolt-to-adult survival rates. Stock status is rated healthy. Adult chinook spawn in the Green River from August through November, with peak spawning in September and October; spawning generally occurs in the mainstem from RM 28 to the Diversion Dam and in the largest tributaries. The fry emerge from January through March and rear in side channels and pools of the mainstem for days to months before migrating down to the Duwamish estuary and out to Puget Sound: peak emigration occurs from March to June. Since 1983, hatchery fingerlings have been planted above HHD.

3.2.2 Known Occurrences in the Project Vicinity

Upper Watershed

Historically, an unknown number of chinook salmon spawned in the watershed above the Tacoma Diversion Dam: an estimated 100-400 adult chinook were captured at the Diversion Dam after its completion from 1911-1913 (Grette and Salo 1986). Historical information on the Headwaters anadromous fish assemblage and the potential number of returning adults comes from trapping of adults (from hatchery egg take) at the Tacoma Diversion Dam in the early part of the century. The authors researched Washington Department of Game records and concluded that harvest and seasonal blockages below the trap could have resulted in underestimates of total chinook returns.

No spawner escapement goal has been established for the Upper Watershed by WDFW or the Muckleshoot Tribe, however, for planning purposes the Corps has estimated a potential escapement of 2300 adults. Since 1982, juvenile chinook salmon have been outplanted throughout the upper Green River from lower Green River hatchery brood stock. Fry-to smolt survival rates for these planted fish have been lower than other watersheds (Dilley and Wunderlich 1993). These lower fry-to-smolt survival rates are probably a result of high stocking rates and low survival rates of smolts migrating through HHD and Reservoir.

As part of the without-project condition, it is assumed that the Fish Restoration Facility (FRF) is in place and that the upstream trucking and release of adult chinook has begun (see Paragraph1.6.3 in the DFR/EIS). Chinook salmon juveniles rear in the reservoir and larger tributaries above the reservoir and migrate through the reservoir and dam. It is presumed that adult chinook salmon will be released in or near the reservoir and that spawning could occur in the inundation area or more likely in the mainstem and larger tributaries above this zone.

Restoration of chinook salmon to the upper Green River is dependent on project features and operations and on a number exogenous factors, including – climactic conditions, habitat quantity and quality above the project, successful operation of the FRF and upstream adult transport, lower river habitat quantity and quality, and ultimately adequate numbers of naturally spawning adults which are determined by ocean rearing conditions and fish harvest levels. Project features that can affect chinook salmon, primarily juveniles, include the operation of the fish passage facility, the size (Phase I or II pool) and rate of refill of the reservoir, the presence and abundance of terrestrial, avian or aquatic predators, and the frequency, timing, and size of freshet releases (natural or artificial), and low flow augmentation.

Lower Watershed

Historically, chinook salmon were found in the lower and middle Green River in the ten's of thousands: 55,000 were counted during spawner surveys in the late 1930s and early 1940s (Fuerstenberg et al. 1996). There is limited documentation for their presence and abundance in the upper Green River (see above).

The WDFW completed a stock status report in 1993 and concluded that at that time chinook salmon in the Green River were healthy; determination under the Endangered Species Act may be different. A Genetic Stock Inventory (GSI) sample of various parts of the river was conducted in the fall of 1997, this sample will be analyzed to determine what parts of the Green River population may still contain segments of wild Green River chinook salmon. This analysis could be important in establishing the final assessment of the Green River stock as wild, wild and hatchery, or hatchery, which could affect their protection and recovery if Puget Sound chinook salmon are listed as a threatened species. Currently, natural spawner escapement to the lower river is 5800 adults. Most of the natural spawning occurs in the mainstem river between RM 28 up to RM 60 at the Tacoma Diversion Dam. Rearing of Lower Watershed spawned juveniles occurs from RM 60 all the way to the mouth of the river. Dam and reservoir operations that affect flow releases and sediment transport also affect life stages of chinook from adult upstream migration, to spawning and egg incubation, fry emergence, juvenile rearing and, lastly, to juvenile (smolt) migration to the ocean.

3.2.3 Effects of the Action

Upper Watershed

Under the phased development juvenile fish planting would continue in the Upper Watershed until the escapement goal for naturally spawning adult chinook salmon is reached: trucking of adult salmon around the two dams would continue. After the escapement goal is met, chinook production in the Upper Watershed would be self-sustaining with sufficient numbers of juvenile salmon surviving passage through the dam and reservoir and returning as adults to perpetuate themselves for the life of the project. HHD would continue to be adaptively managed based on monitoring and evaluation results.

The pool raise will reduce the amount of natural spawning and rearing habitat in the watershed with a loss of 64,200 smolts in Phase I and 32,100 smolts in Phase II, respectively. The riparian and stream habitat lost to inundation will be fully mitigated (see Section 4 of the DFR/EIS) and these features, along with enlarged reservoir surface area could off-set these losses. Fish passage would be the restoration facility, alternative 9A8 described in Section 4 of the DRF/EIS capable of passing the median daily flow for the majority of the outmigration season; mid-April through October. With this facility, and the enlarged reservoir, estimated smolt survival through the reservoir and dam should approach 65%: baseline conditions presume chinook survival is less than 25%. This survival rate is considered conservative, given that the Corps has little to no information on juvenile chinook survival through impoundments in smaller river basins.

Chinook smolts may survive at a much higher rate especially given additional measures that will be implemented to improve smolt survival such as 1) leave all trees along the new reservoir shoreline; 2) use of woody debris in streams above, within, and below the reservoir; 3) mimicry of natural flow fluctuations with natural or artificial freshets; and 4) selective removal of predatory fish if monitoring suggests this is necessary. The estimated survival rate (65%) could enable restoration of self-sustaining runs, but there is greater uncertainty with this species relative to coho and steelhead. Achievement of self-sustaining runs will be dependent on continuing refinement of fish passage facility and reservoir operations, implementation of the habitat improvement projects, and possibly on continued curtailment of chinook harvest to a lower rate for wild stocks.

Lower Watershed

Chinook salmon spawn and rear in the mainstem, some side-channels and larger tributaries from the Diversion Dam to RM 28. Under Phase I there should be a neutral impact or slight improvement in the population status of this run. Water temperatures during late summer and fall will be improved, woody debris would be added at Kanaskat and the side channel restoration at RM 58-59 will provide a large, protected spawning and rearing area. Also, if adaptive management is successful, gravel movement out of the reservoir could be reinitiated and would provide suitable sized materials for spawning habitat in the Kanaskat reach.

Implementation of gravel nourishment in the Middle Green River should retard bed armoring and replace suitable sized spawning gravels in this gravel-starved reach providing valuable spawning habitat for this mainstem spawning stock. Spring refill may reduce this benefit from decreasing peak flows during the seaward migration of juvenile chinook. Under Phase II, there would be a slight reduction in the population status due to the additional storage of water and further reduction in peak flows affecting spring migration of juvenile chinook and by dewatering of off-channel habitat. Low flow augmentation during late summer and early fall could offset this impact.

3.2.4 Conservation and Mitigation Measures

In Phase I, all habitat restoration features will be implemented as will the fish passage facility. Mitigation includes modifying reservoir operations to mimic natural hydrology patterns and to avoid or minimize impacts to Lower Watershed fish. Operational modifications will include – 1) minimum lower river baseflows during spring refill; 2) maximum refill rates; 3) passing natural and creating artificial freshets; and 4) use of the "dampening dam"[3]. A variety of habitat improvements will be used to mitigate for the loss of riparian and stream habitat inundated by the Phase I pool including: 1) leave of all trees around the reservoir; 2) planting of inundation tolerant plants; 3) use of LWD and boulders to maintain stream habitat within the reservoir; 4) LWD placement in larger tributaries above the reservoir; 5) creation of riparian reserves; 6) forest management to accelerate late successional forest characteristics in riparian areas; and 7) replacement of culverts around the reservoir and in 3 additional stream above the reservoir. A 15-year monitoring and evaluation program will be used in an adaptive management program to refine reservoir operations and to maximize efficiency of the fish passage and habitat improvement projects. Lastly, if monitoring suggests the need, selective removal of avian or piscine predators will be initiated based on agency and tribal recommendation.

In Phase II, adaptive management will continue to be used to modify reservoir operations to avoid and minimize impacts to smolts emigrating through the reservoir and to eggs, fry, and smolts using habitat below the project. Low-flow augmentation can be used to maintain baseflow in summer and fall. Like Phase I, a mixture of habitat improvements will be implemented to mitigate for the inundation of riparian and stream habitat. Adaptive management monitoring and evaluation will continue through Phase II.

3.2.5 Determination of Effect

Phase I is not likely to jeopardize the continued existence of the Green River chinook salmon population.

At the earliest, Phase II is scheduled to commence 5 years after Phase I, and is not likely to jeopardize the continued existence of the Green River chinook salmon population. However, it is likely there will be a negative effect.

3.3. Puget Sound Coho.

[3]The "Dampening Dam" is a concept of adaptively storing water during spring refill above the conservation pool and M&I storage rule curves for use in protecting instream resources. The dampening dam was experimentally used this spring: water was stored earlier than normal for a planned release of an artificial freshet of approximately 5,000 ac ft on April 18.

Table 1 provides an overview of baseline conditions and effects of the proposed project on aquatic habitat indicators using the NMFS checklist for relevant indicators. Additional discussion of project effects on anadromous fish is contained in the Bald Eagle sections above.

Puget Sound/Strait of Georgia coho salmon stocks are a candidate species for listing under the Endangered Species Act. A preliminary stock status review considered that "listing is not presently warranted" (NMFS preliminary status review as cited in WDFW 1997).

3.3.1 Habitat Requirements/Population Status/Known Occurrence in Project Area

The lower and middle Green River basin coho run is mixed with Soos Creek hatchery stocks, but the upper Green River portion of the run may be native. The runs of wild, natural spawned fish have not met escapement goals (8,700 fish) in the recent past (SASSI, 1993). Adult coho spawn in the Green River from September through January; spawning generally occurs in tributaries and side channels. The fry emerge from March through June and rear in side channels and pools of the mainstem and its tributaries for one year before migrating down to the Duwamish estuary and out to Puget Sound. Since 1983, hatchery fingerlings have been planted above HHD. Fry-to smolt survival rates for these planted fish have been lower than other watersheds (Dilley and Wunderlich 1993). These lower fry-to-smolt survival rates are probably a result of high stocking rates and low survival rates of smolts (25% or less) migrating through HHD and Reservoir (*Appendix F, Section 2*). Historically, an estimated 9-27,000 coho salmon spawned in the watershed above the Tacoma Diversion Dam (Grette and Salo 1986).

No spawner escapement goal has been established for the Upper Watershed by WDFW or the Muckleshoot Tribe, however, for planning purposes the Corps has estimated a potential escapement of 6500 adults.

3.3.2 Effects of the Action

Upper Watershed

Under the phased development with environmental restoration juvenile fish planting would continue in the Upper Watershed until the escapement goal for naturally spawning adult coho salmon is reached. After the escapement goal is met, coho production in the Upper Watershed would be self-sustaining with sufficient numbers of juvenile salmon surviving passage through the dam and reservoir and returning as adults to perpetuate themselves for the life of the project. HHD would continue to be adaptively managed based on monitoring and evaluation results.

The pool raise will reduce the amount of natural spawning and rearing habitat in the watershed with a loss of 6500 smolts in Phase I and 3250 smolts in Phase II, respectively: the USFWS estimated the loss of smolt production by species but provided no overall estimate for adult habitat (Wunderlich and Toal 1992). The riparian and stream habitat inundated will be fully mitigated (See *DFR/EIS, Section 4*) and these features, along with enlarged reservoir surface area could off-set these losses. Fish passage would be the restoration facility, alternative 9A8 described in *Section 4* of the *DFR/EIS*, capable of passing the median daily flow for the majority of the outmigration season; mid-April through October. With this facility, and the enlarged reservoir (which could reduce survival), estimated smolt survival through the reservoir and dam should approach 85-90%. Such a high survival rate will likely enable restoration of self-sustaining runs and could eliminate the need for permanent supplementation of the Upper Watershed run with hatchery fish. However, achieving a self-sustaining run will be dependent on continuing refinement of fish passage facility and reservoir operations, implementation of the habitat improvement projects, and probably on continued curtailment of coho harvest to a lower rate for wild stocks.

Lower Watershed

Coho salmon spawn and rear in the mainstem, side-channels, and tributary streams below the Tacoma Diversion Dam. Under Phase I there should be a neutral impact to slight improvement in the population status of this run. Water temperatures during late summer and fall will be improved, woody debris would be added at Kanaskat, and the side channel restoration at RM 58-59 will provide a large, protected spawning and rearing area. Also, if adaptive management is successful, gravel movement out of the reservoir could be reinitiated and would provide suitable sized materials for spawning habitat in the Kanaskat reach.

Implementation of gravel nourishment in the Middle Green River should retard and replace suitable sized spawning gravels in this gravel starved reach. Spring refill may reduce this benefit from decreasing peak flows during the seaward migration of juvenile coho. Reservoir operations will mimic natural hydrology and attempt to avoid or minimize impacts to Lower Watershed fish. Operational features will include – 1) minimum baseflows during spring refill; 2) maximum refill rates; 3) passing natural and creating artificial freshets. Under Phase II, there would be a slight reduction in the population status due to the additional storage of water and further reduction in peak flows affecting spring migration of juvenile coho and by dewatering of off-channel habitat. Low flow augmentation during summer through early fall could offset this impact. Four side-channel projects are proposed to mitigate for dewatering of 8.4 acres of side-channel habitat.

3.3.3 Conservation and Mitigation Measures

In Phase I, all habitat restoration features will be implemented as will the fish passage facility. Mitigation includes modifying reservoir operations to mimic natural hydrology patterns and to avoid or minimize impacts to Lower Watershed fish. Operational modifications will include – 1) minimum lower river baseflows during spring refill; 2) maximum refill rates; 3) passing natural and creating artificial freshets; and 4) use of the "dampening dam"[4]. A variety of habitat improvements will be used to mitigate for the loss of riparian and stream habitat inundated by the Phase I pool including: 1) leave of all trees around the reservoir; 2) planting of inundation tolerant plants; 3) use of LWD and boulders to maintain stream habitat within the reservoir; 4) LWD placement in larger tributaries above the reservoir; 5) creation of riparian reserves; 6) forest management to accelerate late successional forest characteristics in riparian areas; and 7) replacement of culverts around the reservoir and in 3 additional stream above the reservoir. A 15-year monitoring and evaluation program will be used in an adaptive management program to refine reservoir operations and to maximize efficiency of the fish passage and habitat improvement projects. Lastly, if monitoring suggests the need, selective removal of avian or piscine predators will be initiated based on agency and tribal recommendation.

In Phase II, adaptive management will continue to be used to modify reservoir operations to avoid and minimize impacts to smolts emigrating through the reservoir and to eggs, fry, and smolts using habitat below the project. Low-flow augmentation can be used to maintain baseflow in summer and fall. Like Phase I, a mixture of habitat improvements will be implemented to mitigate for the inundation of riparian and stream habitat. Adaptive management monitoring and evaluation will continue through Phase II.

3.3.4 Determination of Effect

All restoration projects are implemented in Phase I. Overall, Phase I is likely to beneficially affect the Green River coho salmon population.

Phase II is likely to adversely affect Green River coho salmon. Impacts include 1) inundation of rearing and spawning habitat in reservoir tributaries (1167-1177 ft), 2) potential reductions in smolt survival through the enlarged reservoir (relative to Phase I); 3) by possible dewatering of coho salmon redds in side-channel and mainstem margins; and 4) decreased survival of emigrating smolts in the Lower Watershed.

3.4 Sea-Run Cutthroat

Table 1 provides an overview of baseline conditions and effects of the proposed project on aquatic habitat indicators using the NMFS checklist for relevant indicators. Additional discussion of project effects on anadromous fish is contained in the Bald Eagle sections above.

Sea-run cutthroat trout is a candidate species for listing under the Endangered Species Act.

3.4.1 Habitat Requirements/Population Status

Sea-run cutthroat spawn in small tributaries of large or small streams with a drainage area of less than 13 km (Pauley, 1989). Cutthroat (sea-run, fluvial, and resident populations) are known to spawn in numerous river systems throughout western Washington (Pauley, 1989). The population status of sea-run cutthroat is unknown, but believed to be declining. Sea-run cutthroat are often repeat spawners, which means they migrate downstream and back to sea as adults. In general, cutthroat trout are considered headwater specialists with a freshwater distribution and habitat use associated with higher elevation, lower order streams. Stream surveys by the US Forest Service and Plum Creek have shown that cutthroat trout are found in most accessible streams in the upper Green River. There are at least two adfluvial, natural lake-dwelling and migratory, populations in the Green River – one is in Lake Sawyer and the second is Eagle Lake.

3.4.2 Known Occurrences in the Project Vicinity

Little is known about the occurrence of sea-run cutthroat in Middle and Upper Green River sub-basins. Resident and fluvial migratory fish are present throughout the Green River basin. It is unclear if these remaining stocks retain a genetic component for anadromony. Wunderlich and Toal (1992) speculated that adfluvial cutthroat trout use HH Reservoir during the summer conservation pool, spawning in nearby tributaries during spring refill. The authors observed large rainbow and cutthroat trout at tributary confluences. Surveys of the upper reservoir by the WDFW have shown that juvenile cutthroat rear along the shoreline but trout greater than 8 inches in size were not caught (T. Cropp, undated, WDFW). Surveys in the lower 0.5 miles of the reservoir have shown no large trout and limited numbers of juvenile trout (Dilley 1993). The effects of seasonal drawdown of the conservation pool (exposing the heavily sedimented and degraded inundated stream reaches) on habitat use and movement of juvenile and adult cutthroat have not been documented.

There has been little success in maintaining viable runs of sea-run cutthroat above impoundments in west-coast river basins. Even in Lake Washington, where runs of steelhead and salmon have been maintained for 80 years, it appears the sea-run component is virtually extinct. WDFW observers at the Ballard Locks have noted few returning adults (B. Winters, pers. comm., WDFW). Restoration efforts on the Cowlitz River to recover sea-run cutthroat above a series of impoundments have not been successful to date.

3.4.3 Effects of the Action

Upper Watershed

If migratory or resident cutthroat trout in the project area still retain anadromy as a genetic trait, both adult and juvenile sea-run cutthroat could be adversely impacted by the increase in pool size (inundating spawning habitat within 1147-1167 ft pool for Phase I) and earlier refill of the project. Conversely, with the habitat restoration proposed above the project, and if restoration of coho and chinook salmon is successful, cutthroat trout populations are expected to improve. However, if resident or fluvial cutthroat (along with rainbow trout) were to become significant predators of emigrating juvenile salmon and steelhead, it would be prudent to consider selective removal of larger trout if the restoration of salmon and steelhead is a priority. The Upper Watershed is closed to fishing so resident trout populations above the Diversion Dam are unfished.

Lower Watershed

Cutthroat populations below the project will benefit from the improved outflow temperature releases from the dam to approximately RM 57. Phase I refill operations should improve conditions for smolt emigration by mimicking the natural hydrology. Truck and haul of large wood from the reservoir to release below the dam will improve LWD in the Palmer area. In the Middle Green River gravel nourishment will provide improved spawning conditions from RM 41-47. If Phase II occurs, refill would have negative impacts on smolt emigration but flow augmentation should improve low-flow conditions for juvenile rearing and late spring/early summer spawning: refill constraints would include minimum baseflows, maximum refill rates, and use of artificial freshets to maintain instream migration conditions.

3.4.4 Conservation Measures

No conservation measures were specifically proposed for this species since the project goal is restoration of anadromous fish stocks above the project and avoiding or minimizing impacts to anadromous fish below the project.

3.4.5 Determination of Effect

Given the uncertainty of sea-run cutthroat being in the project area, and with the project emphasis on anadromous fish recovery, the project is not likely to adversely affect sea-run cutthroat trout.

3.5 Chum Salmon

Table 1 provides an overview of baseline conditions and effects of the proposed project on aquatic habitat indicators using the NMFS checklist for relevant indicators. Additional discussion of project effects on anadromous fish is contained in the Bald Eagle sections above.

3.5.1 Habitat Requirements/Population Status

Puget Sound chum salmon (*O. keta*) are not a candidate species for listing under the Endangered Species Act, as such, this discussion is more general to the project impacts for this species. Two chum stocks are recognized in the Green River system (SASSI 1993). The Crisp (Keta) Creek fall chum stock originated from releases of Quilcene and Hood Canal stocks from the Keta Creek hatchery in the early 1980's. This stock is considered healthy. The Duwamish/Green stock has been considered a remnant native stock, but their status is unknown. A genetic stock inventory conducted by the Muckleshoot Indian Tribe found that the natural spawners were composed of Hood Canal and South Puget Sound hatchery stocks with no evidence of a native stock component (M. Mahovolitch, pers. comm.). .The natural spawning run is considered to be in a rebuilding state and an adult escapement goal has not been established.

3.5.2 Known Occurrences in the Project Vicinity

Adult chum salmon migrate up the Green River from early November to the first week of December. Spawning occurs from mid November through December, in the mainstem Green River between Burns Creek and Crisp Creek (SASSI 1993). Recent surveys have found spawners up to the RM 45 in side channels of Flaming Geyser State Park (B. Fuerstenberg, King County, pers. comm.) . Muckleshoot Tribal biologists surveyed the Green River during 1996 and reported significant chum spawning in side channels in the middle and lower Green River reaches. The fry emerge from mid-February to July and rear from days to weeks in side-channel and mainstem backwater habitats. The peak downstream migration of chum salmon fry occurs from late March through May.

3.5.3 Effects of the Action and Conservation/Mitigation Measures

Lower Watershed

Under Phase I there should be a slight improvement in the population status of this run. Implementation of gravel nourishment in the Middle Green River should retard and replace suitable sized spawning gravels in this gravel starved reach. If adaptive management is successful, gravel movement out of the reservoir could be reinitiated and would provide suitable sized materials for spawning habitat in the Kanaskat reach: however, it is uncertain whether chum salmon spawn as far as Kanaskat. Spring refill may reduce the benefit from gravel nourishment by decreasing peak flows during the seaward migration of juvenile chum. Reservoir operations will mimic natural hydrology and attempt to avoid or minimize impacts to Lower Watershed fish. Operational features will include – 1) minimum baseflows during spring refill; 2) maximum refill rates; 3) passing natural and creating artificial freshets.

Under Phase II, there would be a slight reduction in the population status due to the additional storage of water and further reduction in peak flows further affecting spring migration of juvenile chum salmon and by dewatering of off-channel habitat. Low flow augmentation during fall could offset this impact. Four side-channel projects are proposed to mitigate for dewatering of 8.4 acres of side-channel habitat.

3.5.4 Determination of Effect

Phase I is not likely to adversely effect the Green River chum salmon population.

Phase II storage may adversely effect the chum salmon stock. Low flow augmentation and side-channel habitat improvements could off-set this loss.

3.6 Winter Steelhead

Table 1 provides an overview of baseline conditions and effects of the proposed project on aquatic habitat indicators using the NMFS checklist for relevant indicators. Additional discussion of project effects on anadromous fish is contained in the Bald Eagle sections above.

3.6.1 Habitat Requirements/Population Status

Puget Sound steelhead (*O. mykiss*) are not a candidate species for listing under the ESA, as such, this discussion is more general to the project impacts. A stock status review considered that Puget Sound steelhead are not presently warranted for listing. Steelhead are differentiated into two types: winter steelhead and summer steelhead. Winter and summer steelhead are differentiated by timing of adult return but share common juvenile behavior patterns.

3.6.2 Known Occurrences in the Project Vicinity

Winter steelhead adults return to the Green River from November through early June and summer adults from April through November (Caldwell 1994). Winter steelhead are native to the Green River while summer steelhead are non-native to the Green River (Skamania River) and are primarily maintained by hatchery plants. Winter steelhead spawn from January through June with the peak in spawning in April and May. Spawner escapements for wild winter steelhead has been close to or exceeds goals (2100 fish) in most years, and the status of the stock is healthy. A limited number of summer steelhead spawn in the Green River, usually from mid-January to early April. Many of these fish spawn below the Palmer rearing ponds at RM 56. A significant difference between steelhead and Pacific salmon life history is that not all steelhead die after spawning. Steelhead are capable of repeat spawning. Repeat spawning in Washington ranges from of 4.4 to 14.0 percent of total spawning runs (Wydoski and Whitney 1979).

Both winter and summer juvenile steelhead rear in freshwater for one to two years, mostly two, before migrating to the ocean. Juvenile downstream migration occurs from April through July, with peak migration in mid-April (*Appendix F, Section 5*). Since 1982, hatchery fingerlings have been planted above HHD. Fry-to smolt survival rates for these planted fish have not been estimated but probably follow the trend for coho and chinook salmon, which have been lower than other watersheds (Dilley and Wunderlich 1993). The lower fry-to-smolt survival rates are probably a result of high stocking rates and low survival rates (25%<) of smolts migrating through HHD and Reservoir. Historically, an estimated 500-5200 adult steelhead were captured at the Diversion Dam after its completion from 1911-1913 (Grette and Salo 1986). Since 1991, a temporary fish trap has been operated at the Diversion Dam, returns of steelhead have ranged from

30 to 150 adults. These fish are either released above the dam for natural spawning, or a select few are used to rear fry for outplanting in the upper watershed to attempt to maintain the small run. No spawner escapement goal has been established for the Upper Watershed by WDFW or the Muckleshoot Tribe, however, for planning purposes the Corps has estimated a potential escapement of 1300 adults.

3.6.3 Effects of the Action and Conservation/Mitigation Measures

Upper Watershed

Under phased development juvenile fish planting from the FRF or similar facility would continue in the Upper Watershed until the escapement goal for naturally spawning steelhead is reached. After the escapement goal is met, steelhead production in the Upper Watershed would be self-sustaining with sufficient numbers of juvenile steelhead surviving passage through the dam and reservoir and returning as adults to perpetuate themselves for the life of the project. HHD would continue to be adaptively managed based on monitoring and evaluation results.

The pool raise will reduce the amount of natural spawning and rearing habitat in the watershed with a loss of 990 steelhead smolts in Phase I and 500 smolts in Phase II, respectively. The riparian and stream habitat inundated will be fully mitigated (see *DFR/EIS, Section 4*) and these features, along with enlarged reservoir surface area could off-set these losses. Fish passage would be the restoration facility, alternative 9A8 described in Section 4 of the DFR/EIS, capable of passing the median daily flow for the majority of the outmigration season; mid-April through October. With this facility, and the enlarged reservoir, estimated smolt survival through the reservoir and dam should approach 90%. Such a high survival rate will likely enable restoration of self-sustaining runs and will eliminate the need for permanent supplementation of the Upper Watershed run with hatchery fish. However, achieving a self-sustaining run will be dependent on continuing refinement of fish passage facility and reservoir operations, implementation of the habitat improvement projects, and possibly on short-term curtailment of steelhead harvest to a lower rate for wild stocks.

A 15-year monitoring and evaluation program will be used in an adaptive management program to refine reservoir operations and to maximize efficiency of the fish passage and habitat improvement projects.

Lower Watershed

Steelhead spawn and rear in the mainstem, a few side-channels, and larger tributary streams below the Tacoma Diversion Dam. Under Phase I there should be a neutral impact or slight improvement in the population status of this run. Water temperatures during late summer and fall will be improved by dam releases and the side channel restoration at RM 58-59 will provide a large, protected spawning and rearing area. Also, if adaptive management is successful, gravel movement out of the reservoir could be reinitiated and would provide suitable sized materials for spawning habitat in the Kanaskat reach.

Implementation of gravel nourishment in the Middle Green River should retard and replace suitable sized spawning gravels in this gravel starved reach. Spring refill may reduce this benefit from flows during the peak spawning period of adult steelhead. Under Phase II, there would be a slight reduction in the population status due to the additional storage of water and further reduction in peak flows during spring emigration of juvenile steelhead and by possible dewatering of steelhead redds. Low-flow augmentation during late spring to mid summer could offset this impact.

3.6.4 Determination of Effect

All restoration projects are implemented in Phase I. Phase I is likely to beneficially effect the Green River steelhead population.

Phase II is likely to adversely effect the Green River steelhead population. Impacts include 1) loss of spawning and rearing habitat in tributaries inundated by the larger reservoir (1167-1177 ft); and 2) by possible dewatering of steelhead redds in the Lower Watershed.

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Table 1. NMFS checklist for documenting environmental baseline and effects of proposed actions on relevant indicators. Three tables are prepared for three distinct areas of the Green River – 1) Table 1.a. Lower and Middle Green River, RM 0-57; 2) Table 1.b. Upper Green River (Palmer Reach) from HHD to beginning of Green River Gorge, RM 57-64.5; and Table 1.c. Upper Green River above HHD, RM 64.5-88. Unless otherwise noted, restoration actions are just that – actual restoration projects (beyond what is necessary for mitigation) that are implemented by year 1 of Phase I.

Table 1.a. Lower and Middle Green River, RM 0-57

		Environmental Baseline			Effects of the Actions		
Pathways	Indicators	Properly Functioning	At Risk	Not Properly Functioning	Restore	Maintain	Degrade
Water Quality:							
	Temperature			Max summer temps exceed 64F almost every year in mainstem spawning areas; nearshore temperatures are 1-4 F higher in juvenile rearing areas	Dam releases unlikely to improve temps downstream of RM 57; Phase I 5,000 ac ft of flow augmentation could marginally improve temps and Phase II 9,600 ac ft could do more		
	Sediment/ Turbidity	Turbidity low to protect water diversion				Short-term impacts after pool raise from bank-calving; to maintain turbidity levels - retain flooded timber, plant inundation tolerant plants	
	Sediment Transport			Peak flows reduced and gravel and coarse sediments are stored behind HHD; loss of 700-1,000 linear ft of mainstem habitat per year (by reduction of 3,900-11,700 cu yd. of coarse sediment transport/yr.)	Gravel nourishment is planned for below Green River Gorge (RM 45) at 3,900 cu yd./year to maintain 400,000 ft2 of spawnable area; this is considered maximum nourishment amount possible so flood protection is not affected		
	Chemical Contamination		Agriculture discharges in Middle Green	Toxic sediments in Lower Green		Flow augmentation could dilute agriculture discharges but does nothing for toxics	
	Nutrient Transport/ Salmon Carcasses		Lowered numbers of wild spawning populations from historical levels[1]		Increased spawning habitat in Middle Green River from gravel nourishment	Phase II storage potentially impacts embryos and fry by reducing instream flows in late winter; avoidance and mimization dependent on monitoring and evaluation; mitigation options include refill baseflows, low-flow flow augmentation and side-channel impro	
Habitat Access: Physical Barrier—Flow-related, depth too shallow for adult upstream migration; reduction of spring freshets affecting juvenile downstream migration							
	Upstream Passage		Drought conditions have led to delay and at least one year of actual entrapment of chinook salmon in lower river pools during upstream migration through the lower river		Phase I and Phase II flow augmentation can increase base-flows and/or provide summer freshets to improve upstream migration		
	Downstream Passage		Recent reservoir refill operations have included capture of natural freshets which may reduce survival of outmigrating juveniles; no monitoring has occurred to date		Proposed reservoir operations include maximum refill rates, mimicking natural hydrology by passing natural and artificial freshets; with a Phase I 2-year pre & 5-year post-project monitoring and evaluation program of juvenile migration		

Habitat Elements:					
Substrate		No documentation of gravel availability RM 45 57, bed armoring to cobble-size and channel downcutting is apparently limiting gravel sized sediments and spawning availability in the river from RM 41-47		Gravel nourishment is planned for below Green River Gorge (RM 45) at 3,900 cu yd./year	
Large Woody Debris	Riparian zone is largely intact RM 36-57	Increasing loss or riparian zone RM 32-36 from levee constrictions	Little to no riparian zone below RM 32		Project operations will not affect lower and middle river riparian zones
Pool Frequency		Bedrock and boulder created pools RM 45-57, fewer pools RM 32-45	Little or no pools RM 11 32		Project operations are planned so as not to affect lower and middle river pool frequency
Pool Quality		Bedrock/boulder pools from RM 45-57; RM 32-45 little LWD	Below RM 32 little LWD, shallow depths, no riparian zone	Phase I and Phase II flow augmentation is expected to improve quality with increased flows	
Off-channel Habitat		Historic side-channels largely inaccessible & greatly reduced area;	Virtually no side-channel habitat below RM 32, or estuarine wetlands (98% loss)	Phase I monitoring and evaluation includes 3 years pre-project and 1-5 years post-project assessment of reservoir operations on habitat and fish use	<u>Phase II mitigation</u> includes mitigation for 6.4 acres of habitat dewatered during spring refill
Refugia			Bedrock and boulder created pools RM 45-57; little LWD; no off-channel habitat below RM 32: temperatures at risk		Phase I and Phase II flow augmentation could improve quality with increased flows; Phase II refill reduces off-channel habitat and requires mitigation
Channel Condition and Dynamics					
Width/Depth Radio		RM 45-57 may have limited areas exceeding 10	Areas below RM 30 largely >12		Project operations should not affect lower and middle river width/depth ratios
Streambank Condition			>90% stable however, reduced peak flows have reduced bank erosion but increased channel downcutting and levee construction has constrained RM 0-32		Project operations should not affect lower and middle river width streambank stability
Floodplain Connectivity			Severe reduction from dam dampening; levee confinement from RM 0-32		Phase I Project operations should not affect lower and middle river floodplain connectivity, Phase II dewaters 6.4 acres during spring refill; appropriate mitigation will be applied

Flow/Hydrology				
Peak/Base Flows	Base-flows reduced by diversion but reliability of minimums is increased from HHD and from pending MIT/Tacoma mitigation agreement	Peak flows – severe reduction from dam dampening; freshets have been reduced for refill reliability	Base-flows improved from MIT agreement and yearly 5,000 ac ft in Phase I; Phase I freshets improved with refill maximums and artificial freshets; Phase I monitoring and evaluation includes 2 years pre-project and 5 years post-project evaluation of juvenil	Peak flow reduction not affected by new project operations; in Phase II freshets in late winter could be reduced but spring freshets maintained with max. refill rates or artificial freshets
Watershed Conditions				
Road Density and Location	Some valley bottom roads			Maintain density, provide access to off-channel area with new culvert/river diversion
Riparian Reserves		Loss of LWD sources from above HHD	Transport of limited no. of LWD from HHD reservoir	

1. Fuerstenburg et al. (1996) compared escapements from 1930's to late 1980's and early 90's.
2. Although the new Diversion Dam has a fish ladder and truck and haul, upstream salmon and steelhead release would be limited or eliminated without improved downstream fish passage at HHD.
3. Dam survival through the new fish passage could be greater than 95% and collection efficiency could exceed 95% for migrants that have survived transport through the reservoir; reservoir survival is less certain.

Table 1.b. Upper Green River (Palmer Reach) from HHD to beginning of Green River Gorge, RM 57-64.5

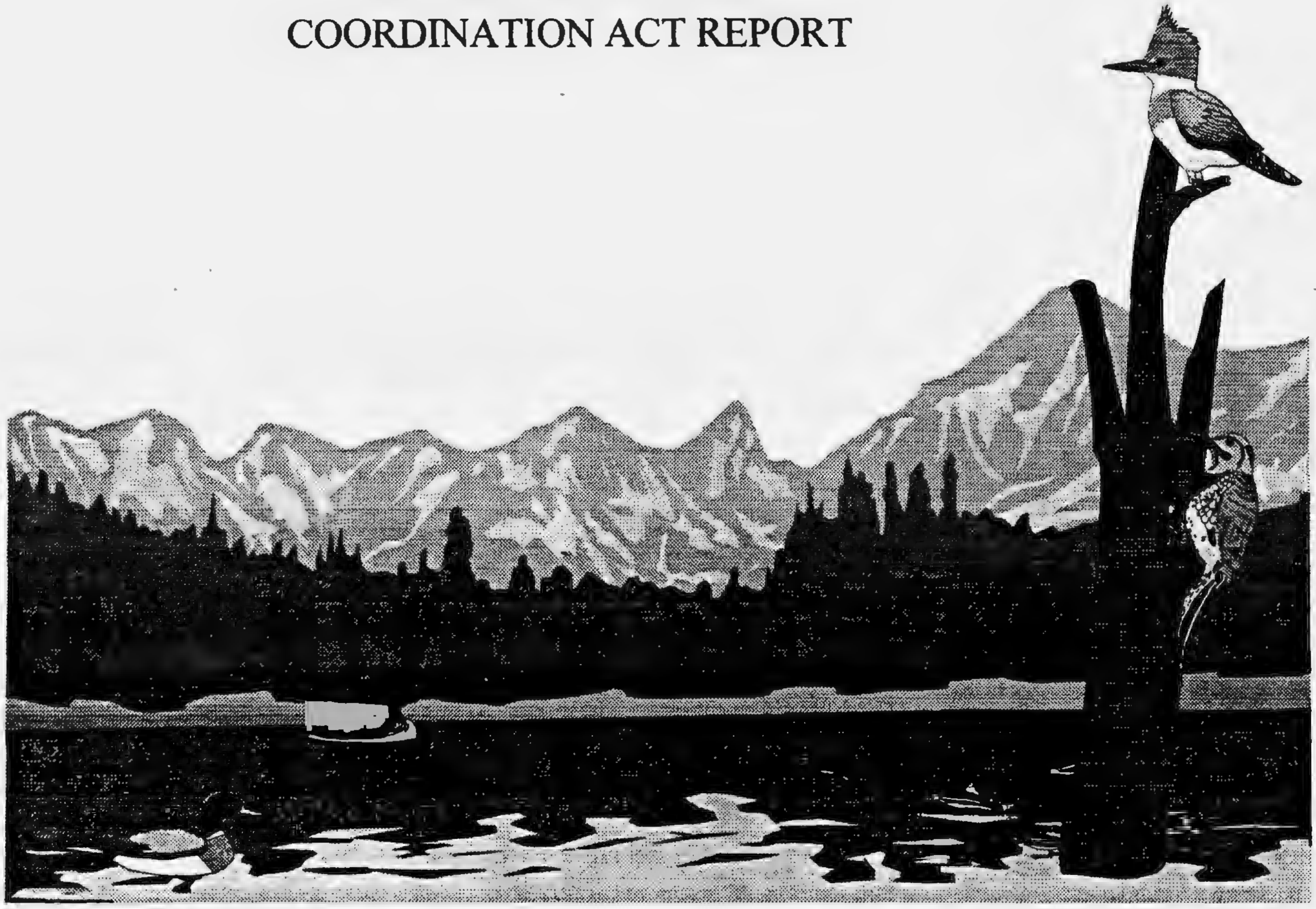
Pathways	Indicators	Environmental Baseline			Effects of the Actions		
		Properly Functioning	At Risk	Not Properly Functioning	Restore	Maintain	Degrade
Water Quality:							
	Temperature		Dam releases exceed 63 F in summer and 60 F in fall using deep-water outlets		With surface and deep-water outlets – modeled temps show reduce Summer releases below [illegible] & Fall releases below 58 F		
	Sediment/ Turbidity	Turbidity low to protect water diversion				Short-term impacts after pool raise from bank-calving; to maintain turbidity levels - retain flooded timber, plant inundation tolerant plants	
	Sediment Transport			Peak flows reduced and gravel and coarse sediments are stored behind HHD	A 3/4 mile long side-channel will be restored, will attempt re-initiate gravel transport		
	Chemical Contamination	Low levels				Low levels	
	Nutrient Transport/ Salmon Carcasses		Lowered numbers of wild spawning populations from historical levels[1]		Increased spawning habitat & potential carcasses – reconnection of U. Green River, side-channel restoration at RM 58-59		
Habitat Access:	Physical Barriers						
	Upstream Passage		Temporary Tacoma Fish Ladder and Truck and Haul above HHD for steelhead; New Diversion Dam will have Fish Ladder and Truck and Haul but use is uncertain[2]		New Diversion Dam Fish Ladder and Truck and Haul above HHD implemented with the MIS/Lock downstream fish passage facility[2]		
	Downstream Passage	Current Tacoma Diversion Dam has had a poorly screened intake; New Diversion Dam has a screened, new juvenile bypass system		Coho smolt survival through HH Dam and Reservoir is 28% of below-dam-releases; chinook is probably lower	New Diversion Dam has a screened, new juvenile bypass system; HHD MIS/Lock Facility could increase HH Dam survival to [illegible] for coho and chinook[2] monitoring and evaluation include 15 years of post-project study of dam passage		
Habitat Elements:							
	Substrate		Dominant is cobble with few gravels and little new recruitment (see sediment transport)		New side-channel with gravel placement; attempt re-initiation of gravel movement		
	Large Woody Debris		Riparian zone is largely intact RM 57-64.5, no transport from above HHD, all wood is collected in reservoir and removed		Proposed [illegible] collecting, truck and haul of a limited no. of logs, release between RM 59-60; add LWD to side-channel		
	Pool Frequency		Bedrock and boulder created pools, little LWD, little to no off-channel pool		Restore side-channel at RM 58-59 with pools, truck and haul LWD		

Pool Quality		Little LWD, little to no off-channel pools		Side-channel pools with LWD, truck and haul LWD		
Off-channel Habitat			Historic side-channels largely inaccessible & greatly reduced area	Restore a 3/4 mile long side-channel; Phase II mitigation for 2.0 acres dewatered includes parallel side-channel restoration on right bank		
Refugia		Bedrock and boulder created pools; little LWD; little to no off-channel pool; temperatures at risk		Restore 3/4 mile side-channel at RM 58-59 with pools/LWD; truck and haul LWD; reduced dam temperatures		
Channel Condition and Dynamics						
Width/Depth Radio		Limited areas may exceed 10			Unclear if LWD transport could reduce below 10	
Streambank Condition	>90% stable, reduced peak flows have reduced bank erosion but increased channel downcutting				Maintain bank stability, transport LWD	
Floodplain Connectivity			Severe reduction from dam dampening and road construction on left bank	Reconnect side-channel with river diversion and culverts through road berm		
Flow/Hydrology						
Peak/Base Flows		Base-flows reduced by diversion but reliability of minimums is increased from HHD	Peak flows -- severe reduction from dam dampening; freshets have been reduced for refill reliability	Base-flows improved from MIT agreement and yearly 5,000 ac ft in Phase I; freshets improved with refill maximums and artificial freshets	Peak flow reduction continues	
Watershed Conditions						
Road Density and Location		Some valley bottom roads			Maintain density, provide access to off-channel area with new culvert/river diversion	
Riparian Reserves			Loss of LWD sources from above HHD	Transport of limited no. of LWD from HHD reservoir		

1. Fuerstenburg et al. (1996) compared escapements from 1930's to late 1980's and early 90's.
2. Although the new Diversion Dam has a fish ladder and truck and haul, upstream salmon and steelhead release would be limited or eliminated without improved downstream fish passage at HHD.
3. Dam survival through the new fish passage could be greater than 95% and collection efficiency could exceed 95% for migrants that have survived transport through the reservoir; reservoir survival is less certain.

HOWARD HANSON
ADDITIONAL WATER STORAGE PROJECT

U.S. FISH AND WILDLIFE
COORDINATION ACT REPORT



U.S. Fish and Wildlife Service
North Pacific Coast Ecoregion
Western Washington Office
Lacey, WA

July 1998

U.S. Fish and Wildlife Service

Fish and Wildlife Coordination Act Report

HOWARD HANSON ADDITIONAL WATER STORAGE PROJECT

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INTRODUCTION

This Coordination Act Report (CAR) presents the U.S. Fish and Wildlife Service's (Service) conclusions on the benefits and adverse impacts to fish and wildlife that can be expected to occur if Howard Hanson Dam and Reservoir (HHDR) are used to store additional water and the proposed mitigation/restoration measures for fish and wildlife are provided. This report is based on the project description and the related information provided in the Corps of Engineers' (Corps) draft environmental impact statement and on the biological studies that have been conducted over the last seven years during the feasibility phase of this project. This CAR is being provided under the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended: 16 U.S.C. 661, et seq.) and fulfills Section 2(b) of this Act.

The Corps of Engineers (Corps) and the City of Tacoma (Tacoma), the federal and local sponsors, respectively, propose operational and structural modifications of Howard Hanson Dam and Reservoir to improve the dependability of Tacoma's water supply and to correct fish and wildlife problems caused by HHDR.

The Corps' Howard Hanson Dam and Reservoir (formerly called the Eagle Gorge Dam and Reservoir) was authorized by the Flood Control Act of 1950, and was completed in 1962. It was constructed without any provisions for fish passage because the Tacoma Diversion Dam, built in 1913 and located just 3.5 miles downstream, was already a total barrier to upstream fish migration. The HHDR's authorized purposes include flood control, low flow augmentation, irrigation and water supply, although the project is not currently operated for irrigation or water supply.

Tacoma, which currently obtains a major part of its water supply from the Green River, seeks to address its future water demand by utilizing up to 22,400 acre-feet of the storage capacity of HHDR when it is not needed for flood control. Water would be stored during the late winter and spring, held and then used during the summer and early fall when Tacoma's water demand is higher.

The project sponsors propose to include several project features designed to correct existing fish and wildlife problems caused by the construction of the dam and by the current operation, and to mitigate impacts that would result from increasing the size of the conservation pool. The main project element involves the construction of downstream fish passage facilities at HHDR. These improvements, along with the fish passage facilities being planned at Tacoma's diversion dam under a separate agreement, would restore anadromous fish access to more than 100 miles of their former habitat. Other project elements include adoption of an adaptive management approach to project operation, storing additional water for flow augmentation, improving habitat both downstream from HHDR and above the conservation pool, and monitoring the effects of the new project.

The Service has participated in the development of the proposed project since the mid 1980's. We have been actively involved in both the design and implementation of the fishery and terrestrial wildlife studies, as well as the selection of the proposed project elements.

PROJECT LOCATION AND SETTING

The area affected by the proposed project includes HHDR, the proposed mitigation lands, the 64.5 miles of the Green River below HHDR that would be subjected to a modified flow regime, and the 106 miles of habitat upstream from HHDR that would again be accessible to anadromous fish by the proposed action. (See figure 1).

The HHDR project is located on the Green River in King County, Washington, about 64.5 miles upstream from the mouth of the Green-Duwamish River System (Figure 1). Howard Hanson Dam is about 35 miles southeast of Seattle and about 25 miles east of Tacoma. The project lies entirely within the City of Tacoma's municipal watershed, and is closed to public access.

The Green/Duwamish River Basin covers an area totaling 483 square miles and extends from its highest point (5,750 feet MSL) at Blowout Mountain near Stampede Pass in the Cascade Range to sea level at Elliott Bay in Central Puget Sound. The Green/Duwamish River is about 90 miles long and flows generally in a northwestern direction toward its mouth at Seattle.

The topography and character of the Green/Duwamish River Basin varies dramatically between its headwaters and mouth. The upper watershed is undeveloped and managed almost entirely for timber production. The terrain is generally steep and forested, timbered mainly by conifers except along the river and stream channels where deciduous and mixed forest stands dominate. Few manmade structures confine or restrict the river channels in the upper basin. In the middle basin below the Green River Gorge (River Mile 47) where a noticeable break in the terrain occurs, the Green River reaches the gentle slope of the valley floor. Much of the original forest land has been converted to farmland, and levees increasingly confine the river channel. Most of the lower basin has been highly altered by the clearing of the original forest lands and the filling of freshwater and estuarine wetlands and intertidal flats, and now consists largely of industrial and residential development. The river channel is highly restricted along both banks by levees or rock revetment, and is periodically dredged between its mouth and River Mile 5.5 for navigation.

A detailed description of the basin and the anthropomorphic changes are contained in the Corps' Green/Duwamish Basin Restoration Report and in Fuerstenberg et al. (1996).

PROJECT BACKGROUND

HOWARD HANSON DAM

The dam is an earth-filled structure composed of rolled rock fill, a sand and gravel core, and rock shell protection. The dam is 235 feet high, has a total length of 675 feet, and is 960 feet thick at its base and 23 feet thick at the crest.

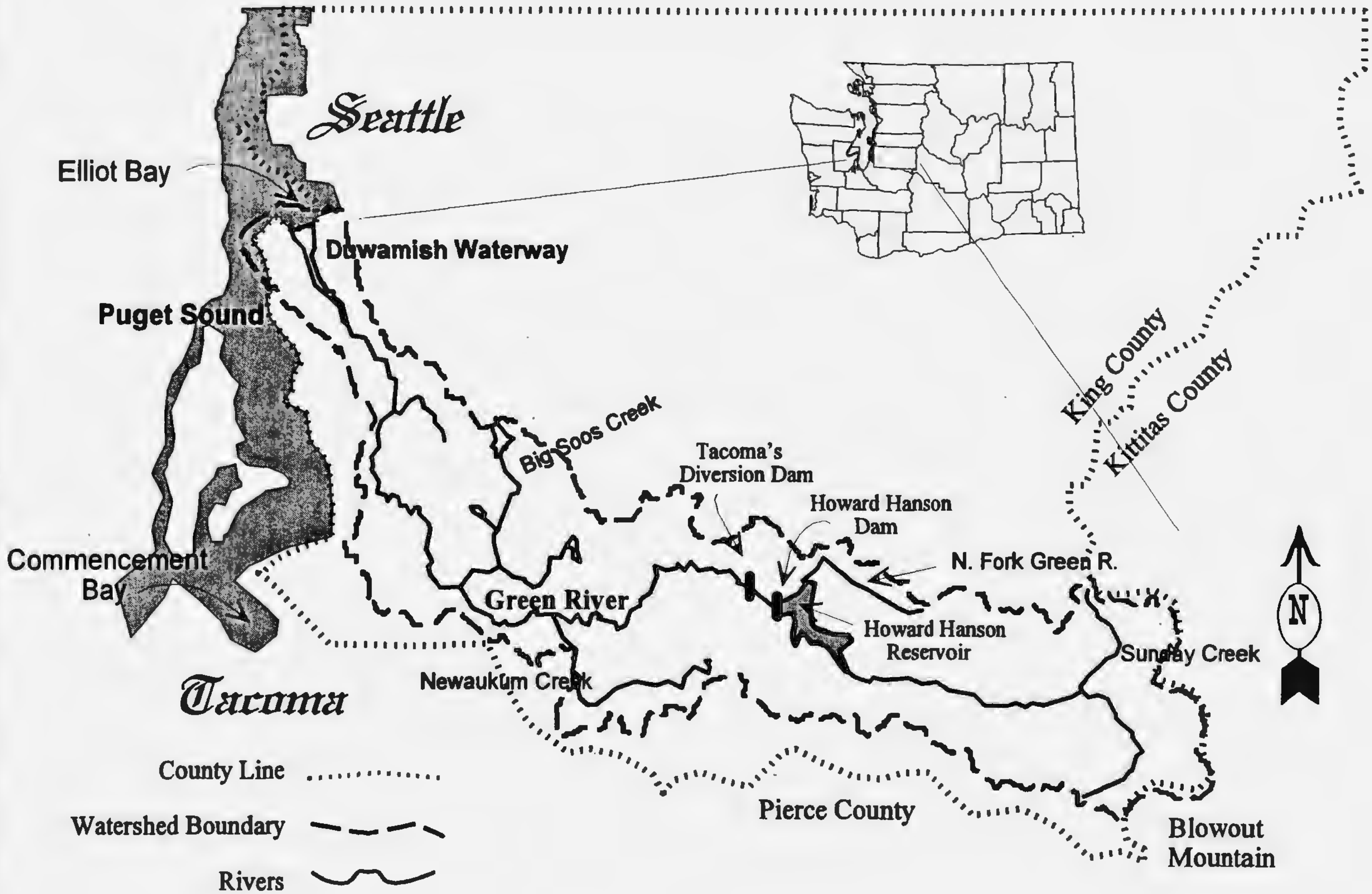

Figure 1. Howard Hanson Additional Water Storage Project Vicinity Map

Regulated releases (non-spill events) are made through either the 19-foot diameter horseshoe shaped tunnel that is controlled by two radial gates at elevation 1,035 feet mean sea level (MSL), or through a 48" diameter bypass pipe at elevation 1,070 feet MSL. The tunnel outlet is used to pass flood flows and flow releases that exceed the capacity of the 48" diameter outlet. Low flow releases during the summer conservation period are made through the bypass pipe. The spillway has not been needed to pass flood flows since the project was constructed.

HOWARD HANSON RESERVOIR

The reservoir is approximately four miles long at its present full conservation pool volume of 25,400 acre-feet, corresponding to a water surface elevation of 1,141 feet MSL. The reservoir is normally filled to its full conservation pool by June 1. At this pool level, the surface area of the reservoir totals 732 acres. The reservoir level recedes over the summer and early fall, as water is released from storage to meet the existing project's minimum instream flow goal of 110 cfs below the Tacoma Diversion Dam. By November 1, the reservoir is essentially emptied to provide for the full flood control capacity of 106,000 acre-feet. To date, only 85 percent of the flood control storage capacity has been needed. As a consequence of flood control regulation during the winter and early spring, the reservoir level fluctuates dramatically, responding to the temporary retention of high flow events from rainfall and snow melt. Releases from HHD are regulated to limit the river flow at the Auburn gage to a maximum of 12,000 cfs during flood events. Although the reservoir could be emptied completely, a minimum storage of about 1,200 acre-feet is retained to avoid the higher turbidity levels that would result from the erosion of the accumulated reservoir sediments.

Since 1962, the Corps has tried several reservoir refill strategies in an effort to address several objectives, including the protection of fish migration, spawning, egg incubation, and water quality, while still meeting its authorized project purposes. Because of the existing operational and physical constraints, none of the strategies have been totally satisfactory from a fishery protection perspective. For example, the Corps has delayed reservoir refill so that outmigrating fish from the upper basin are not forced to sound to great depths to find the outlet to HHD. While this strategy benefits the upper basin migrants, it subsequently causes adverse impacts to spawning steelhead and lower river smolts because of the reduced flows that result later in the season when refill does occur. Delaying reservoir refill means that a greater volume of water must be stored in May if the 25,400 acre-feet target is to be achieved. This time period often coincides with the time frame when runoff is typically receding.

Water quality constraints have occasionally affected the refilling of the reservoir. The Corps and Tacoma presently operate under terms of an agreement which specifies that the existing project will not worsen Tacoma's water quality from pre-dam conditions. Specifically, Tacoma was originally concerned about the potential for the reservoir to retain turbid water and to prolong the period that the water would be unsuitable for its water supply use. In response to Tacoma's concerns, the Corps has occasionally interrupted the refilling of the reservoir to accelerate the flushing of turbid water.

PROPOSED ACTION

The recommended plan includes raising the level of the reservoir to provide 22,400 acre-feet of storage for Tacoma's water supply and 9,600 acre-feet of storage for instream flow augmentation, habitat improvements, a downstream fish passage facility at HHD and measures to mitigate the effect of raising the reservoir pool level.

The project sponsors have proposed a phased approach because of fishery concerns related to the withdrawal of more water from the Green River and the uncertainty of safely passing fish through a larger impoundment. Phase 1 includes the construction of the HHDR fish passage facility, the implementation of a number of habitat restoration elements, and limiting the additional storage in HHDR for Tacoma's water supply to 20,000 acre-feet. Phase 2 involves going forward with the recommended storage plan, or some reduced plan in response to the results of the phase 1 monitoring, as well as the implementation of a number of habitat restoration elements. The implementation of phase 2 would depend on the project sponsors demonstrating to the resource agencies and Muckleshoot Indian Tribe (Tribe) that increasing the size of the reservoir and further reducing the flows in the river during the spring period could be accomplished without impacting the anadromous fish resources.

PHASE 1

Phase1 includes the following elements:

- The addition of ecosystem restoration as an authorized project purpose.
- The storage of up to 20,000 acre-feet for Tacoma's water supply.
- The construction of a downstream fish passage facility at HHD.
- Riparian and stream habitat improvements to mitigate 78.2 and 11.5 acres, respectively, that would be inundated by the higher reservoir pool level.
- Three restoration projects consisting of the annual placement of spawning gravel in the middle reach of the Green River, the reconnection of a side channel near Palmer, and the improvement of stream and river habitats above HHDR to address original project impacts.
- The correction of a seepage problem along the right abutment of the dam.
- The adoption of an adaptive management approach to reservoir refill and release.

- Increases in staffing at HHDR (up to 24 hrs per day, 7 day per week operation would occur during periods of the spring refill/steelhead spawning season, as needed) to allow more precise adjustments in achieving targeted stream flows.

- Establishment of seventy-nine acres of pastures to provide replacement forage for elk.

- Management of about 143 acres of late successional forest (LSF) to include thinning, snag and down wood creation, and under planting.

- Retention of inundated trees between elevation 1,147 feet and 1,167 feet to provide interim snag and perch sites and maintain some of the function of a riparian zone.

- Planting of sixty-nine acres of water tolerant plants such as sedges to provide ground cover and forage in the inundation zone.

- Mitigation for forested wetland and riparian zone losses, focused on creating two subimpoundments near the mouths of Cottonwood Creek and Gale Creek, respectively.

- Management of the abandoned railroad grade to create several sub-impoundments.

- Monitoring and evaluation of project operation on fish and wildlife, as well as a commitment to implement corrective measures, if needed.

The Storage of Tacoma's Pipeline 5 Water Right

Tacoma proposes to store up to 20,000 acre-feet of its existing Pipeline 5 (P5) water right behind Howard Hanson Dam during the February 16 to June 30 period for later use in the summer and fall when its water demand is higher. Tacoma's P5 water right allows it to divert up to 100 cfs, in addition to its P1 water right of 113 cfs, when the minimum instream flow requirements, as specified in its agreement with the Muckleshoot Indian Tribe, are met. Under Phase 1 of the proposed project, the quantity of water Tacoma would be allowed to divert from the Green River would not change, but the timing of when the water is stored and used would be different from the direct diversion and use condition. (See discussion on page 11.)

Downstream Fish Passage

The recommended alternative for providing downstream fish passage at HHD involves the construction of a fish collection and transport facility, designed to operate over the majority of reservoir levels and flows up to 1,250 cfs, the 50 percent daily exceedance flow during April and May. At flows between 1,250 cfs and 1,600 cfs, the fish collection facility could be operated, but it would exceed the fish passage velocity criteria. Operation in this flow range would be contingent upon the monitoring results and evaluation of juvenile fish passage through the facility. Flow in excess of 1,600 cfs would be passed through the existing unscreened radial gate outlets.

The main features of the fish collection and transport facility are: (1) a new intake tower; (2) a floating fish collector that supports a modular-inclined screen; (3) a fish lock for temporary holding, and (4) a fish transport conduit and pipeline for returning fish back to the river.

Riparian and Stream Habitat Improvements to Mitigate Pool Raise Impacts

Four projects are being considered for mitigating the 78.2 acres of riparian forest lands that would be affected by the phase 1 pool raise. These projects consist of leaving trees within the inundation pool, planting water tolerant vegetation, preserving riparian forest at a ratio of five acres preserved for each acre impacted, and managing Tacoma's riparian forest lands to achieve greater fish and wildlife benefits.

Nine stream improvement projects are being considered to mitigate the pool raise impacts to 11.5 acres of stream habitat. The projects include the replacement of culverts, adding boulders and large woody debris to improve habitat diversity, and the planting of vegetation to improve channel stability.

The proposed mitigation and restoration projects are summarized in Appendix A of this document, and presented in detail in the Corps' Feasibility Report and EIS (Section 8, Appendix F).

Habitat Restoration

Three restoration elements are proposed to address a portion of the existing project's impact on spawning gravel availability and stream habitat. Since 1962, HHD has blocked the transport of spawning gravel from the upper basin which has resulted in the armoring of former salmon and steelhead spawning habitats. Over 8 miles of stream and side channel habitat have been inundated by the filling of the reservoir.

Gravel augmentation is proposed to replenish areas presently deficient of suitable substrate for salmon and steelhead spawning, and to halt the channel bed armoring that is extending downstream. The Corps proposes to place a minimum of 3,900 cubic yards of gravel annually to rehabilitate and maintain 400,000 square-feet of spawning habitat in the middle reach of the Green River.

The second restoration element involves reconnecting a former side channel to the main channel in the vicinity of the Tacoma Diversion Dam near Palmer. The reconnected side channel will restore about 3.2 acres of fishery habitat.

The last element consists of a group of stream habitat improvements that would be implemented along 3.5 miles of tributaries within the HHDR flood control pool between elevations 1,177 feet and 1,240 feet MSL. Proposed improvements include the placement of boulders, rootwads and other large woody debris, and riparian zone management for late successional forests.

Adaptive Management

An adaptive management approach to reservoir refill and release is proposed as a project element so that the project can be operated to better address the complex fishery protection and management issues while still meeting the project's flood control and water supply objectives. The decisions would be made jointly through a group process similar to the one that has been used in recent years to address reservoir refill. Group participants would include the Corps, Tacoma, the Service, WDFW, the Muckleshoot Indian Tribe, King County, Trout Unlimited and recreation organizations.

Under the proposed approach, reservoir refill would be spread out over a longer period, would begin much earlier in the year than under the existing operation, and would be weighted toward the beginning of the refill cycle. Refill would start as early as February 16, instead of mid-April, depending on the flood control needs, and would be completed about June 1. With the exception of the February period when flood control constraints limit reservoir storage, the highest refill rate would occur in March (400 cfs), decline to 300 cfs in April, and drop to 200 cfs in May and June. The maximum storage rate, however, would be constrained by the need to maintain semi-monthly determined base flow targets. It is expected that modifications to the proposed operating criteria will be made jointly by the project sponsors, resource agencies and Tribe, as additional information is collected during the project's first phase.

The storage and release of the 5,000 acre-feet for fishery purposes would also be adaptively managed. Under some circumstances, it may be undesirable to store the entire 5,000 acre-feet because the adverse impact to the fishery from storage may exceed the future benefits. The management of the 5,000 acre-feet includes Corps and local sponsor involvement, although the resource agencies and Tribe would ultimately decide on how it is used.

Reservoir storage in excess of the amount authorized by the existing and proposed projects or allowed by Tacoma's P5 water right must be evacuated from the reservoir by June 30. Excess storage could result from unused water stored for artificial freshets releases, accounting updates, or project operation needs such as debris removal. The release of the excess water would be adaptively managed for fishery purposes but constrained by the June 30 evacuation requirement.

Monitoring and Evaluation

Monitoring and evaluation are significant components of the proposed project and will be used as the primary basis for both adaptive management and phase 2 implementation decisions. The uncertainties with regard to fisheries management, fish migration and behavior, as well as the many permutations of flow, reservoir storage, snow pack, and spawner density and location precludes the development of a single project operations plan that would provide satisfactory protection for the Green River's fish and wildlife resources.

The specific monitoring and evaluation elements that would be included as part of the project are described in detail in the Corps' Feasibility Report and EIS (Section 10 of Appendix F, Part 1).

The issues and topics that would be addressed include: (1) juvenile outmigration timing and survival (lower river, reservoir); (2) attraction to and survival through the fish passage facility; (3) side channel accessibility and use; (4) the success of habitat improvement measures; (5) maximum refill rates; (6) base flow targets; (7) flow augmentation to protect steelhead spawning and incubation; (8) predation on juvenile salmonids; (9) the benefit of releasing artificial freshets; and (10) water quality.

The Corps has proposed 15 years of monitoring and evaluation, but acknowledges this time period could be extented, depending on the actual impacts observed. In addition, the monitoring of project facilities and structures would continue beyond this time frame under the Corps' Operations and Maintenance authority. A yearly listing of estimated cost for each monitoring element is included in the Corps' Feasibility Report and EIS. Pre and post-construction monitoring plans are scheduled for development during the plans and specifications (PED) phase between the years, 1999 and 2000.

PHASE 2

The proposed plan anticipates phase 1 lasting between 5 and 8 years. The implementation of phase 2 would depend on the phase 1 monitoring results demonstrating that both the withdrawal and storage of additional water (up to 32,000 acre-feet) would not impact the anadromous fish resources. The phase 2 elements include:

- The storage of up to an additional 2,400 acre-feet for Tacoma's water supply, which would then total 22,400 acre-feet of storage.

- The withdrawal of up to an additional 22,400 acre-feet of water by Tacoma, concurrent with its diversion of 100 cfs for the P5 project.

- The storage of up to 9,600 acre-feet for flow augmentation. The specific use of this water would be determined jointly by the resource agencies and the Tribe.

- Riparian and stream habitat improvements to mitigate 42.1 and 5.9 acres, respectively, that would be inundated by the higher reservoir pool level. Eleven riparian and stream habitat projects have been developed for evaluation in meeting both the phase 1 and phase 2 mitigation requirements. The final selection of specific projects to mitigate the phase 2 impacts will likely be deferred until phase 1 implementation.

- Side channel improvements to mitigate the loss of 8.4 acres. Four side channel mitigation projects are proposed to mitigate this loss; three are located in the middle Green River, one is located in the upper Green River.

- Pasture improvements/creation totaling 10 acres.

- An additional 65 acres to be managed as late successional forest.
- Eighteen acres of sedges to be planted in the upper inundation zone.
- The creation of another sub-impoundment near Elder Creek along with wetland plantings.

ALTERNATIVES

A large number of alternatives has been considered and evaluated during the project planning period that has now exceeded 13 years. Project alternatives will be only cursorily discussed in this report, but are addressed in detail in the Corps' Feasibility Report and EIS.

WATER SUPPLY

The project sponsors have considered a variety of water supply options, including the development of well fields, demand management, water transfers from other systems, and other new storage and/or diversion facilities beside the AWSP. These other water supply alternatives have received only limited attention and development. No attempt has been made by the Service to evaluate other alternatives or compare them to the proposed action.

FISH PASSAGE

Ten downstream fish passage alternatives were developed to the 10 design level for review by the Fish Passage Technical Committee (FPTC) and by the resource agencies and Tribes. The five members of the FPTC were selected by the resource agencies, Tribe, Tacoma and the Corps, and included Ken Bates of the WDFW, Steve Rainey of the NMFS, Ed Donahue of Fish Pro, Inc., Phil Hilgert of R2 Resource Consultants, and Milo Bell, a retired Corps researcher. The range of alternatives included retrofitting the existing outlet, constructing new passage facilities at the dam, constructing a collection facility at the upper end of the reservoir, and combinations or variations of these options. The selection of the preferred alternative was based on (1) the scientific understanding of fish passage needs; (2) the potential for restoring fish runs upstream of HHD; (3) technical feasibility and incremental analysis in meeting the restoration objective; and (4) consistency with the Corps' Ecosystem Restoration Authority.

FISHERY HABITAT MITIGATION/RESTORATION

The project sponsors have developed a single mitigation proposal, consisting of twelve riparian or channel improvement projects to offset the impacts that would result from the AWSP. It is possible that the list may change and require in-kind substitution, if engineering or other constraints affect the feasibility of a specific project.

A description of the proposed projects can be found in Section 4 of the Corps' Feasibility Report and EIS Report and in Appendix F (Part 1).

PHASE 2 STORAGE

The phase 2 proposed storage includes 22,400 acre-feet for Tacoma's water supply and 9,600 acre-feet for fishery flow augmentation purposes. Under Phase 2, Tacoma's water storage would occur concurrently with its direct diversions under its P1 and P5 water rights. The 32,000 acre-feet is considered a maximum storage volume that can be adjusted downward to reflect the phase 1 monitoring and evaluation results.

WILDLIFE MITIGATION

A terrestrial mitigation plan has been developed and reviewed by the project participants and will be the same for each project alternative. Limited habitat types in the project area that will be impacted include elk winter forage, optimal thermal cover, late successional forest and forested wetlands. The Habitat Evaluation Procedure (HEP) as discussed later in the document, was used to identify and quantify specific habitat losses. Target species used for this evaluation were elk, pileated woodpecker, wood duck, and red-backed vole. Twenty-six specific sites have been identified for consideration as mitigation sites in addition to TPU lands that will be managed for mature forest. The site descriptions and proposed restoration measures are in the wildlife resources section.

RELATED ACTIONS

There are several other proposals or actions that are being considered under separate processes or authorities that have a bearing on the proposed project because of their effect on instream flows, fish passage, habitat quality, and spawner escapement.

MUCKLESHOOT INDIAN TRIBE - TACOMA PUBLIC UTILITIES SETTLEMENT AGREEMENT

This agreement removed the Muckleshoot Indian Tribe's objection to Tacoma's proposed Pipeline 5 project, which involves the diversion of an additional 100 cfs from the Green River. Upon construction of the new pipeline, Tacoma is responsible for: (1) funding the construction and operation of a new tribal fish production facility (or monetary compensation at the tribe's prerogative); (2) constructing upstream and downstream fish passage facilities at its diversion dam near Palmer; and (3) curtailing the use of its Pipeline 1 water right, if necessary to meet the minimum instream flow targets, as defined in the agreement. The Muckleshoot Indian Tribe has requested assurances from the Corps, Tacoma, USFWS, NMFS and WDFW that the AWSP and its fish and wildlife mitigation measures will not undermine the MIT-TPU Settlement Agreement intended to mitigate the impacts of the first and second water supply diversions on treaty fish and wildlife.

HOWARD HANSON SECTION 1135 RESTORATION

Under the authority provided by Section 1135 of the 1986 Flood Control Act, the Corps conducted a study of potential modifications to HHD to improve fish and wildlife habitat within the reservoir and downstream from the existing project. The recommended plan was approved for implementation in 1997. Proposed measures include: (1) storing up to an additional 5,000 acre-feet of water for flow augmentation; (2) providing greater protection to the fishery resources by following an adaptive management approach for reservoir refill and release; (3) improving fish and wildlife habitat within the reservoir drawdown zone and tributaries by planting inundation tolerant species and through the placement of coarse woody debris and floating bush piles; (4) improving fish passage on tributaries to HHDR; and (5) enhancing forage for elk. None of these measures have been implemented to date, except for the storage 5,000 acre-feet of water in drought years. The storage of additional water in non-drought years, occurring in four out of five years, has not been implemented.

The storage in HHD would be increased to 30,400 acre-feet for flow augmentation purposes, but the additional 5,000 acre-feet could be used for a wider range of fishery protection purposes, e.g., attraction flows, protection of incubating eggs, etc. The use of the additional water, however, is constrained by the existing TPU-MIT agreement by limiting the spring time use to 2,500 acre-feet while reserving a like amount for low flow augmentation in the summer and fall. The existing 25,400 acre-feet of storage is reserved to insure that the 110 cfs minimum instream flow can be met with a 98 percent reliability. The option to store the additional 5,000 acre-feet in non-drought years would take effect with the implementation of Phase 1 of the AWSP. The annual decision on whether to store additional water during the non-drought years would be coordinated with the project sponsors, but would ultimately be determined jointly by the resource agencies and the Tribe.

GREEN/DUWAMISH RIVER BASIN RESTORATION

Under the Corps' Section 216 Study, the Corps and King County conducted a reconnaissance level basin study for ecosystem restoration opportunities in the Green/Duwamish River Basin. The Corp's primary focus in ecosystem restoration is on those ecological resources and processes that are directly associated with the hydrologic regime of the watershed. The purpose of the study was to identify restoration opportunities of the Green/Duwamish River ecosystem and to evaluate potential restoration strategies. More than 50 restoration options were identified during the reconnaissance phase. Some of the options overlap with those being considered for implementation under the AWSP and may result in substitutions. The Corps has proceeded into the feasibility phase of the study and potentially could construct restoration projects under its Section 216 authority before phase one of the AWSP is implemented.

NATIONAL MARINE FISHERIES SERVICE'S ESA LISTING OF PUGET SOUND FALL CHINOOK SALMON

The National Marine Fisheries Service has proposed that Puget Sound fall chinook salmon be listed as threatened under the provisions of the Endangered Species Act (March 9, 1998 Federal Register). The listing, if it occurs, could result in changes to the current fishery management practices for chinook salmon, as well as possibly restrict and/or prescribe the options for restoring runs upstream of Howard Hanson Dam. For example, greater numbers of adult salmon may be available to return to the upper watershed if the listing results in reduced harvest rates. On the other hand, the listing could limit or preclude supplementation as an option for re-establishing and maintaining the upper basin population. Potentially, the NMFS could preclude the reintroduction of chinook salmon above HHD if the mortality rate from reservoir passage is concluded to be too high. It is unknown at this time what conservation measures would be required in the event chinook salmon are listed.

The Corps and Tacoma have initiated discussions with the National Marine Fisheries Service NMFS) regarding the proposed listing of Puget Sound fall chinook salmon. Tacoma has indicated it would like to develop a Habitat Conservation Plan to address the relevant issues early in the process. The Corps is expected to request conferencing with NMFS for the same reason.

BIOLOGICAL RESOURCES

FISHERY RESOURCES

At least 47 species of fish are known to use the Green/Duwamish River, based on the fish surveys conducted by Masuda, et al. (1968), Meyer et al. (1980), USFS (1996), Warner and Fritz (1995), Wunderlich and Toal (1992). They include anadromous, freshwater, estuarine and marine species. Table 1.

Anadromous fish species known or expected to occur in the system include chinook salmon (*O. tshawytscha*), coho salmon (*O. kisutch*), chum salmon (*Oncorhynchus keta*), pink salmon (*O. gorbuscha*), steelhead (*O. mykiss*) and sea-run cutthroat trout (*O. clarki*) and sea-run char (*Salvelinus* spp.). Naturally spawning populations returning to the Green/Duwamish system have all declined dramatically in response to the loss of habitat and/or overfishing. Major losses of habitat occurred with the filling of the Duwamish Estuary, channelization, levee construction, and the construction of the Tacoma Diversion Dam. Presently, significant numbers of chinook, coho and chum salmon and steelhead trout are released from State and Tribal hatcheries.

Fall chinook salmon are managed for natural production, with an escapement goal of 5,800 fish. Spawner escapement has averaged about 7,600 fish and has ranged between 5,000 and 10,500 fish (Warner et al. 1995). Significant numbers of hatchery fish are released annually from the WDFW Green River Hatchery (3.2 million young-of-the-year and 300,000 yearlings) and the Tribe's Keta Creek Hatchery (up to 2 million young-of-the-year). The hatchery component is believed to equal or exceed the naturally produced component of the total run (Hage unpublished). In recent years, between 500,000 and 1.8 million chinook salmon have been planted annually upstream of HHD (Hickey 1996). Spring chinook salmon occur now in only very low numbers.

Green River coho salmon are essentially managed as a hatchery stock, even though there is a natural escapement goal of 8,700 fish. As a consequence of the higher harvest rate, the natural escapement goal is rarely met. The run size has ranged between 3,000 and 23,000 fish and is maintained primarily through hatchery releases (Warner et al. 1995). The Tribe's Keta Creek Hatchery produces about 600,000 yearling and up to 2 million young-of-the-year coho, annually. About 500,000 yearlings are also produced at the WDFW Green River Hatchery. In recent years, between 485,000 and 1.3 million coho salmon have been planted annually upstream of HHD (Hickey 1996).

Green River chum salmon runs are supported by both natural and hatchery production. The combined run size has averaged a few thousand fish, which is markedly smaller than the run size of over 11,000 estimated by Williams et al. (1975) from the mid-70's, or Fuerstenberg's et al. (1996) annual escapement estimate of 12,750 for the 1938 to 1942 period. In the last few years, however, chum salmon escapement surveys conducted by the Muckleshoot Indian Tribe have placed the run at over 10,000 fish, annually. A minimum of 500,000 chum salmon fry are released annually from the Keta Creek Hatchery.

Pink salmon (*O. gorbuscha*) historically used the system but have dropped to such low numbers that they are now functionally extinct from an ecological perspective. Pink salmon have not returned in large numbers since the 1930's (Warner et al. 1995).

The Green River supports both a summer and winter run of steelhead, and is one of the top steelhead producing streams in western Washington. The winter population is larger and is composed of both a hatchery and wild stock. About 220,000 hatchery smolts, originally derived from Chambers Creek stock, are released annually from the WDFW's Palmer Hatchery. In addition, up to 90,000 smolts are produced at the Tribe's Keta Creek Hatchery. In recent years, between 55,000 and 84,000 steelhead have been planted upstream of HHD (Hickey 1996). The wild run is considered healthy, and because of its different spawning timing, does not interbreed with the hatchery stock to a significant degree. The escapement goal for the wild run is 2,000 fish. Between 1975 and 1985, the total run size of wild and hatchery stocks, combined, has averaged 11,000 annually (Grette and Salo 1986). Since 1988, the total run size has declined to an average of about 4,700 fish (Cropp 1996). The summer run originated from plants of Skamania steelhead smolts beginning in 1965, and is maintained by the annual release of about 80,000 hatchery smolts. The summer run catch (sport and tribal) has ranged from a low of 396 in 1991 to a high of 3,461 in 1981 (Cropp 1996).

Table 1 Fish species found in the Green/ Duwamish River

Common Name	Scientific Name	Common Name	Scientific Name
Chum salmon	*Oncorhynchus keta*	Northern sculpin	*Icelinus borealis*
Coho salmon	*O. kisutch*	Sharpnose sculpin	*Clinocottus acuticeps*
Chinook salmon	*O. tshawytscha*	Surf smelt	*Hypomesus pretiousus*
Pink salmon	*O. gorbuscha*	Pacific herring	*Clupea harengus pallasi*
Sockeye salmon	*O. nerka*	Shiner perch	*Cymatogaster aggregata*
Steelhead trout	*O. mykiss*	Striped seaperch	*Embiotoca lateralis*
Cutthroat trout	*O. clarkii*	Pile perch	*Rhacochilus vacca*
Dolly Varden	*Salvelinus malma*	Longfin smelt	*Spirinchus thaleichthys*
Bull trout	*S. confluentus*	Threespine stickleback	*Gasterosteus aculeatus*
Brook trout	*S. fontinalis*	Pacific snake blenny	*Lumpenus sagitta*
Mountain whitefish	*Prosopium williamsoni*	Crescent gunnel	*Pholis laeta*
Largescale sucker	*Catastomus macrocheilus*	Saddleback gunnel	*P. ornata*
Longnose sucker	*Catastomus catastomus*	Penpoint gunnel	*Apodichthys flavidus*
Pacific lamprey	*Lampetra tridentata*	Bay goby	*Lepidogobius lepidus*
Western brook lamprey	*Lampetra richardsoni*	Bay pipefish	*Syngnathus griseolineatus*
River lamprey	*Lampetra ayresi*	Walleye pollock	*Theragra chalcogrammus*
Longnose dace	*Rhinichthys cataractae*	Pacific tomcod	*Microgadus proximus*
Speckled dace	*R. osculus*	Starry flounder	*Platichthys stellatus*
Northern squawfish	*Ptychocheilus oregonensis*	English sole	*Parophrys vetulus*
Prickly sculpin	*Cottus asper*	Butter sole	*Isopsetta isolepis*
Torrent sculpin	*Cottus rhotheus*	Hybrid sole	*Inopsetts ischyra*
Riffle sculpin	*Cottus gulosus*	Sand sole	*Psettichthys*
Pacific staghorn sculpin	*Leptocottus armatus*	Pacific sandlance	*Ammodytes hexapterus*
Buffalo sculpin	*Enophrys bison*		

Information is very limited on abundance and distribution of sea-run cutthroat trout, Dolly Varden and bull trout. Historically, the Green River is believed to have supported large numbers of each of these species (Grette and Salo 1986) but now supports remnant populations at best.

The use of the Duwamish-Green River systems by marine and estuarine fish species occurs primarily within the lower 10 miles, although some species like starry flounder that have a tolerance for freshwater, may use habitats upstream of the saltwater wedge. The saltwater wedge can extend upstream to R.M. 10 during low runoff and high tides (Santos and Stoner 1972 in Corps 1995a). More than twenty estuarine and marine species occur in the lower river, including surf smelt, Pacific herring, pile perch, Pacific tomcod, and starry flounder.

The Green River and its tributaries upstream of HHD support resident populations of rainbow trout, cutthroat trout, mountain whitefish, and several species of sculpins. Brook trout are also known to occur in Page Mill Pond and Page Mill Creek. There is no evidence to support a conclusion that bull trout presently occur upstream of Howard Hanson Dam, based on stream surveys conducted by the U.S. Forest Service, the USFWS, and the Plum Creek Corporation (Goetz, pers. comm., 1996).

Adult steelhead and juvenile chinook and coho salmon and steelhead have been planted upstream of HHD to take advantage of the underutilized spawning and rearing habitat. Wild or naturally produced adult steelhead, numbering between 20 and 133, have been collected at the fish trap at Tacoma's diversion dam since 1992, and released upstream of HHD. In recent years, between 500,000 and 1.8 million chinook salmon, 485,000 to 1.3 million coho salmon, and 55,000 to 84,000 steelhead juveniles (i.e., fry, yearlings, presmolts) have been planted annually upstream of Howard Hanson Reservoir (Hickey 1996).

A more detailed description of the Green/Duwamish River's fishery resources, including a historical perspective, can be found in Appendix F of the Corps' Feasibility Report and EIS for the AWSP, the Corps' Green/Duwamish River Basin Restoration Report, and in Fuerstenberg, et al. 1996.

WILDLIFE AND BOTANICAL RESOURCES

The wildlife in the project area are species that are commonly associated with lowland coniferous and deciduous forests of western Washington. This report will discuss only selected species of high interest to the project participants. Information on wildlife use within the project area is limited to the qualitative observations made by federal and state wildlife biologists, and Tacoma Public Utilities and Corps personnel.

Elk

Elk (*Cervus elaphus*) are the largest animal in the Green River watershed. The watershed is a prime habitat for hundreds of elk. A limited harvest is allowed in the area that helps assure a high success rate. Special harvest regulations are in place that allow bulls to attain a larger average size. These "trophy" animals make the special permits highly sought after by recreational hunters. Because of these reasons, elk have received the greatest attention of the wildlife using the project area. Important areas of the high quality wintering habitat and critical calving grounds, especially near the McDonald farm will be impacted by this project.

Elk counts have been conducted for several years in the upper Green River. Data from pre and post hunting season counts included herd numbers, compositions, and locations. The data showed that the river bottom lands and old homestead farms such as McDonald's farm and Baldi field are important foraging areas for elk. Sixty to 70 elk use the farm for summer range. The number of elk increases substantially during the winter because of elk migrating into the area for winter range.

McDonald's farm and Baldi field are located on the north shore of the reservoir with a mainly southern aspect. Both are located in Sec. 35, T21N, R08E, with Baldi field being slightly west and north of McDonald's farm.

A 1994 mark/recapture population estimate (Gove 1994) placed the Green River watershed herd at 612 elk. This estimate was completed after the fall hunting season and therefore reflects a reduction in numbers due to hunting mortality. Raedeke and Associates (1995) calculated a pre-hunt total of 734 animals by adding in the harvest numbers, and the assumed losses to wounding and winter kill. More recent information has indicated that the population has crashed to about 225 animals.

The elk that use the project vicinity may range outside of the Green River watershed into the Cedar River basin to the north and the Greenwater River basin to the south. The project affects only the landbase immediately adjacent to the reservoir but may affect the way in which elk utilize the available habitat. Any mitigation or restoration of elk habitat will need to keep in mind the migration patterns of these animals.

Many studies have described elk habitat in Western Washington. Several major types of habitats are recognized in these studies. They include forage, cover (hiding, thermal, and optimum thermal), and breeding and calving habitats. In lands managed for timber production, such as the project area, the limiting factor for elk is usually optimal thermal cover or winter range.

Raedeke and Associates (1996) proposed a modified version of the Wisdom model (Wisdom *et. al.1986)* for use as a basis to assess impacts to elk. This modified model was adopted by the HEP team and used for the development of the project mitigation proposal. It defines three types of cover: optimal thermal cover, thermal cover and hiding cover.

Optimal thermal cover is extremely important in providing winter range. It is defined as forested areas that have an average diameter at breast height (dbh) of 21" and 70 percent or greater canopy closure. Usually found in old growth forests, the larger limbs and canopy cover prevent a snow buildup on the ground by sublimation and interception of snow. Ground forage is available through the winter due to the lack of snow buildup. These forest stand conditions also modify the ambient temperatures by keeping the area warmer in winter and cooler in summer. There is little optimal thermal cover in the area immediately surrounding the reservoir.

Winter range can also be provided in areas with a southern aspect at low elevation. These areas maintain a warmer microclimate in the winter and provide high quality forage during most of the winter season. This type of winter range component is found within the project boundary at McDonald's farm and other similar areas.

Thermal cover can modify extremes in temperatures but may not provide forage in winter due to a lack of effective snow interception. Canopy closure is at least 70 % but tree height can be as short as 40'.

Shorter vegetation such as shrub-scrub and saplings provides hiding cover that elk can use to escape human disturbance. The tree density is such that sight distances are reduced significantly. It usually does not provide climate modification or forage.

Elk Exclosure Cages and Pellet Group Transects

The importance of the vacated farmed meadow (McDonald's farmsite) to elk as a foraging site is well known. It is likely that most of the site would be destroyed by the proposed pool raise. A vegetative study was completed during fiscal year 1994 to quantify this loss. The data collected in fiscal year 1994 answered the question of what kind of forage is growing on the meadow area. To answer the question of how much forage exists, it was proposed to construct and deploy elk exclosure cages on McDonald's farm and the Baldi field pastures.

In December 1995, Corps personnel, two volunteers, and a Service biologist constructed 10 elk exclosure cages. The exclosures were cone shaped and constructed out of wire mesh. In February 1996, five exclosures were installed in the different plant community types on each pasture area before the beginning of the growing season.

Placement location was selected to avoid exclosures being too close to each other and to sample different vegetative communities within the pasture. Details of the entire project will be found in Appendix F (part two) of the Corps' Feasibility Report and EIS.

The caged-plot vegetation was sampled by clipping. The clippings were analyzed and compared with elk pellet content analysis. This data is key to determining what the elk are eating compared with availability.

In plant communities along the shoreline, various species of sedge grow in small patches. Elk browsed some sedge species more than others. It was speculated that this may be due to elk seeking out certain minerals contained in those particular sedges. To decide if this was occurring, an analysis of the mineral content of the different sedge species and other forage is being conducted by the Wildlife Habitat Laboratory, at Washington State University.

The most interesting information to date is that the ash content in plants at McDonald's farm is three times higher than it is in Baldi field. This high ash content may be causing some malnutrition in the elk since ash inhibits the elk digestive system. A nutritionist from the Starkey Range Experiment Station indicated that this ash may be a result of surface grit on the plants (Ken Brunner 1998 personal communications). This type of ash tends to pass through the digestive tract of elk without being utilized and thus causes no problems to the animal.

Other Mammals

Cougar (*Felis concolor*) studies have been conducted for several years in the vicinity including the upper Green River watershed. Concentrations of cougars occur in the vicinity of McDonald's farm probably due to the abundant elk and deer in the area. The cougar population in the area is reported to be one of the highest densities in the United States (Spencer 1996 cited in COE 1996). The population is estimated at about 15 cougars, which are preying on a population base of just over 1200 deer and elk. A similar number of cougars (15 - 20) are found in the Yellowstone area where they prey on around 21,000 deer and elk.

Other large mammals known or likely to occur within the project include: black-tailed deer (*Odocoileus hemionus*), and black bear (*Ursus americanus*).

Furbearers in the project area include beaver (*Castor canadensis*), river otter (*Lutra canadensis*), mink (*Mustela vison*), raccoon (*Procyon lotor*), coyote (*Canus latrans*), muskrat (*Ondatra zibethicus*), marten (*Martes americana*), weasels (*Mustela* spp.), and red fox (*Vulpes vulpes*). Other small mammals include Douglas squirrel (*Tamiasciurus douglasii*), Townsend chipmunk (*Eutamius townsendi*), deer mice (*Peromyscus maniculatus*), red-backed voles (*Clethrionomys gapperi*), pika (*Ochotona princeps*), snowshoe hare (*Lepus americanus*), shrews and moles.

Birds

Waterfowl of many varieties are common on the lake during the spring and fall migration seasons. Mallards (*Anas platyrhynchos*), Canada geese (*Branta canadensis*), and American widgeons (*Anas americana*) have been seen feeding and resting on the grassy area of McDonald's farm. Wood duck (*Aix sponsa*), green-winged teal (*Anas crecca*), and northern pintails (*Anas acuta*) have been observed on the reservoir. Hooded mergansers (*Lophodytes cucullatus*) and common mergansers (*Mergus merganser*) are common. Wintering waterfowl include common goldeneyes (*Bucephala clangula*), ring-necked duck (*Aythya collaris*) and bufflehead (*Bucephala albeola*). Many of these waterfowl may nest near the reservoir.

Harlequin ducks (*Histrionicus histrionicus*) are ocean ducks that breed along larger fast moving streams, often miles from the ocean. Breeding harlequins have been observed between Howard Hanson dam and the headworks reservoir. They may nest near the reservoir but most information about nesting behavior shows that they prefer heavily vegetated riparian zones near fast moving water.

Common loons (*Gavia immer*) were observed nesting in Howard Hanson in the early 1990s and again in 1997 (Brunner pers. com). The WDFW has placed loon nesting platforms on the reservoir since 1993. Nesting habitat has been successfully developed using these techniques just to the north in the Cedar River watershed. It is likely that with enhancement efforts aimed specifically at loons, successful nesting may occur more frequently.

Raptors found within the project boundary include red-tailed hawk (*Buteo jamaicensis*), Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*Accipter striatus*), and several owl species. Bald eagles (*Haliaeetus leucocephalus*) have been seen foraging at the reservoir. No nests are known to occur immediately around the reservoir at this time.

Ospreys *(Pandion haliaetus)* have been seen foraging at the reservoir each year. They have not nested along the reservoir but nesting has been observed along the Green River between Howard Hanson dam and the headworks. If mitigation measures (such as leaving snags within the inundation zone and anadromous fish reintroduction) are successful, it is likely that ospreys will begin nesting near the lake.

Many other birds use the area. Golden eagles (*Aquila chrysaetos*) have been observed over Grass Mountain and Huckleberry Mountain south of the project about 4 -6 miles. Great blue herons (*Ardea herodias*), belted kingfishers (*Ceryle alcyon*), western flycatchers (*Empidonax difficilis*), black-capped chickadees *(Parus atricapillus*), and violet green swallows (*Tachycineta thalassina*) are common. Ten species of warblers, three species of vireos and five species of woodpeckers have also been observed (COE 1996).

Amphibians

Amphibians observed within the project include the Pacific chorus frog (*Pseudacris regilla*), the Cascade frog (*Rana cascadae*) and the red-legged frog (*Rana aurora*). The Pacific chorus frog has been observed rearing in the reservoir. Other amphibians that may be affected by the proposed project include rough-skinned newts (*Taricha ganulosa*), Northwest salamanders (*Ambystoma gracile*), and Western toads (*Bufo boreas*). These species typically reproduce in slow moving or still water. Several, such as the Pacific chorus frog and the Western toad, use ephemeral ponds.

Reservoir edges with sufficient aquatic and terrestrial vegetation may be used by these species for reproduction and rearing. Breeding and egg laying by most of these species occurs in midwinter to late spring depending on the elevation and latitude. In particular, Northwest salamanders, and red-legged frogs lay eggs in water less than 3 feet deep. Incubation times vary depending on water temperature. Amphibians using the project area may breed from late February through May. Early spring surveys around the lake perimeter have found egg masses for both Northwestern salamanders and red-legged frogs (Aitken, 1997a, pers. com.).

Tailed frogs (*Ascaphus truei*) are inhabitants of fast flowing cold mountain streams. The larval period may last from 2 to 3 years depending on location. The first year tadpoles prefer temperatures $<10°$ C while the 2nd year tadpoles prefer a warmer 10 - 22°C (De Laming and Bury 1970). Several streams within the project area exhibit these characteristics and may contain tailed frogs. Upper watershed amphibian surveys found tailed frogs in several tributaries to the Green River.

Several amphibian surveys were conducted in the upper watershed during 1997 by Service and Plum Creek biologists (Levy 1997 per. com.). The most common species found was the western red-backed salamander *(Plethodon vehiculum)*. Ensatinas were also found during these surveys. Several Larch Mountain salamanders (*Plethodon dunni*) were positively identified in a proposed Plum Creek harvest unit during the spring of 1997. Three additional Larch Mountain salamander sites were found during subsequent surveys (Tate 1997 pers. com).

Threatened and Endangered Species

In a letter dated January 22, 1996, the Service identified five federally listed animal species and two candidate species that may occur in the project vicinity. Included in this list were the bald eagle (*Haliaeetus leucocephalus*), marbled murrelet (*Brachyramphus marmoratus marmoratus*), northern spotted owl *(Strix occidentalis caurina*), gray wolf (*Canis lupus*) and grizzly bear (*Ursus arctos*). Spotted frogs (*Rana pretiosa*) and bull trout (*Salvelinus confluentus*) were listed as candidate species. Of these species, only the bald eagle has actually been observed within the project boundary or within the Green River riparian corridor downstream from HHDR. Up to four bald eagles have been observed within the vicinity of the reservoir, and use of this area occurs throughout the year. There are no known bald eagle nest sites near the project.

HABITAT TYPES

The project area is in the western hemlock vegetation zone. Most of the forested project lands, however, are deciduous or mixed deciduous/coniferous. In the deciduous forests along the streams and flatter parts of the reservoir perimeter, red alder (*Alnus rubra*) dominates with inclusions of big-leaf maple (*Acer macrophyllum*) and black cottonwood (*Populus trichocarpa*). Mixed deciduous/coniferous forests include western hemlock *(Tsuga heterophylla*) and western red cedar (*Thuja plicata*). In most of the younger coniferous forest, Douglas fir (*Pseudotsuga menziesii*) is the dominant tree species because of extensive reforestation on harvest units. Various densities of naturally regenerated western hemlock and western red cedar occur as a component in the upland stands. Western hemlock, the climax species, is rarely dominant because of fire and reforestation efforts. Older stands that were established during a less intensive management era are dominated by western hemlock.

Timber harvest in the upper Green River has been extensive. It started in the 1880s and continues to this day. All of the stands within the project have been logged at least once. The oldest stands date from 1888 although most stands are much younger than this (see Table 2).

Table 2. Age distribution of forest cover-types on City of Tacoma Lands near Howard Hanson Dam and Reservoir(adapted from Raedeke Associates 1996) Includes all forested land that Tacoma owns.

Age Class (Years)	Deciduous and Coniferous Forests (Acres)	Percent of Total Area	Cumulative Percent of Total Area
1	591	6	6
10	415	4	10
20	1141	12	22
30	578	6	28
40	562	6	34
50	570	6	40
60	990	11	51
70	2063	22	73
80	1560	17	90
90	522	6	96
100	383	4	100
Total	9375	100	

The cover types occurring within the inundation zone of the reservoir include deciduous, coniferous, and mixed forest stands; forested and scrub-shrub wetlands; emergent marsh; mudflats; grasslands; and talus slope/rock. (See Table 3). These cover types were used in the Habitat Evaluation Procedures (HEP) study, which was conducted in 1986 and then suspended. The study was later reinitiated, with a draft report published in 1994 and most recently updated in 1996 (Brunner personal communication).

Table 3. Revised area of cover-types in the HEP Study Area, Howard Hanson Dam, Additional Water Storage Project. (adapted from Raedeke Associates 1996)

Cover-type	Code	Study Area (acres) [1]	Existing Reservoir Area (acres) [2]	Inundated Area (acres) [3]	Upland Area (acres) [4]
Conifer Forest	FC	48.76	0.37	22.17	26.19
Young Conifer	FCY	12.49	0.0	0.0	12.49
Young Conifer and Grass	FCY/G	9.77	0.0	.68	9.09
Young Conifer and Shrub	FCY/S	27.31	0.0	13.66	13.65
Deciduous Forest	FD	468.40	12.90	194.75	260.75
Deciduous Forest - Alder	FD-1	108.84	.64	52.90	55.30
Deciduous Forest - Cottonwood	FD-2	14.30	0.0	7.01	7.29
Young Deciduous Forest	FDY	34.99	.58	16.21	18.20
Young Deciduous Forest & Grass	FDY/G	20.29	0.0	.34	19.95
Mixed Forest	FM	218.68	4.65	95.87	118.16
Grass	G	29.14	1.9	15.82	11.42
Grass and Shrubs	G/S	2.51	0.0	.79	1.72
Shrub	S	5.6	0.0	1.02	4.58
Palustrine Forest	PFO	15.03	1.12	12.19	1.72
Scrub/Shrub	PFF	16.88	7.7	7.42	1.76
Inundated Grass	PEM	125.76	108.48	17.26	.02
Mudflat	MF	62.57	53.13	9.43	.01
Moss and Quack Grass	FL	81.51	81.31	.20	0.0
Open Water	POW	487.99	435.96	26.23	25.80
River Channel	R	28.4	.05	2.64	25.71
River Bed	RB	42.86	22.42	9.69	10.57
Talus Rock	T	11.61	1.09	4.62	5.9
Total		**1873.69**	**732.3**	**510.9**	**630.28**

[1] Habitats below El. 1220 feet. ~Minimum elevation of inundated habitats is approximately El. 1070 feet, the winter flood pool level. (Upstream of the dam only)

[2] Habitats below El. 1141 feet, the surface of the Conservation Pool.

[3] Habitats between El. 1141 feet and El. 1 177 feet, the proposed Conservation Pool with Phase 2 implemented. El. 1180 has been used in some determinations.

[4] Habitats between El. 1177 feet and El. 1220 feet

Source: Ryan, 1995. Areas revised following HEP Team visit, spring 1995.

(Note all of these acreages are estimates from orthophotos and GIS maps.)

FUTURE WITHOUT THE PROJECT

The Service has assumed the following conditions for our "future without the project" analysis:

- HDR will not be retrofitted with fish passage improvements.
- The Corps' future operation of HHDR will incorporate the knowledge gained from the planning of the AWSP and will also include the refinement of the rule curve used for meeting the 98% reliability of the 110 cfs minimum flow.
- Reservoir refill will begin earlier and will be adaptively managed for the protection of the lower river fishery resources.
- The storage of an additional 5,000 acre-feet for fishery protection uses will be implemented under the Corps' Section 1135 authority.
- Juvenile chinook and coho salmon, and steelhead trout will not be planted upstream of HHDR.
- Tacoma will fully develop its P5 water right and implement the provisions of the TPU/Tribe Agreement.
- At least some of the habitat restoration projects proposed under the AWSP will be implemented.
- Puget Sound fall chinook will receive additional protection, either through an ESA listing by the NMFS or by implementation of the WDFW wild salmonid policy.

FISHERY RESOURCES UPSTREAM OF HHDR

Without the AWSP and the significant fish passage improvements it would provide at HHDR, the Service concludes that only resident fish species (rainbow and cutthroat trout, mountain whitefish, and sculpins) would utilize reservoir, mainstem and tributary habitats upstream of HHDR. It is unlikely that WDFW, Tribe or Trout Unlimited would continue their programs of planting significant numbers of chinook and coho salmon and steelhead trout upstream of HHDR because of the poor fish survival through the dam and the entrapment of smolts within the reservoir.

Fish passage studies conducted by the Service (Dilley and Wunderlich 1992, 1993) indicate that juvenile chinook and coho salmon exiting the reservoir through the higher outlet suffer high injury or mortality rates. Mortality and injury rates, combined, typically exceeded 50 percent. Too few steelhead were collected to conduct an analysis, but given their surface orientation and large size as smolts, they can be expected to have similar or even higher mortality and injury rates.

The large radial gate outlets at the bottom of the dam were assumed to cause less injury because of their greater flow capacity and absence of sharp angles within the structure. The Service studies confirm that fish exiting the reservoir through the radial gates have high survival and low injury rates (Dilley and Wunderlich 1992, 1993). However, these outlets are often closed or deeply submerged by late spring. Even when the gates are open, significant numbers of chinook and coho salmon are trapped in the reservoir because they are either unable to find, or are unwilling to descend the more than 90 foot depth to reach, the radial gate outlets. Juvenile coho and chinook salmon and steelhead trout typically occupy the upper portion of the Howard Hanson Reservoir water column (Dilley 1993, 1994, Cropp undated). Elevated ATPase levels from chinook and coho salmon smolts taken from the reservoir throughout the summer indicate that these fish were physically ready for their entry into the marine environment, but were unable to exit during their normal migration period (Dilley and Wunderlich 1992, 1993). It is generally believed that fish that migrate outside their normal "window of opportunity" survive poorly because they are out of sync with their prey resources and the environmental conditions to which they have evolved (Bilton et al. 1982, Holtby et al. 1989).

FISHERY RESOURCES DOWNSTREAM OF HHDR

The primary concern expressed by the resource agencies and Tribe is the effect of future HHDR operation and Tacoma's P5 water right withdrawal on chinook, coho and chum salmon and steelhead. These factors are also expected to impact the estuarine, marine and resident fish using the lower river and the Duwamish estuary, but the consequences are poorly understood. Consequently, the discussions in this report will be directed toward evaluating the project's impact on anadromous fish.

On the basis of the "without the project" assumptions discussed later, we conclude the anadromous fish stocks will remain at current levels or increase slightly. Gains resulting from improving the HHDR mode of operation, basin restoration efforts, and higher minimum instream flows would offset the losses resulting from future development in the watershed and additional withdrawals under Tacoma's P5 water right. The consequence of an Endangered Species Act (ESA) listing or implementation of the WDFW's wild salmonid policy on the numbers of salmon and steelhead returning to the Green River is open to debate. But given the increasing emphasis on protecting and restoring naturally reproducing populations of salmon and steelhead, it is reasonable to expect that greater numbers of fish will be allowed to spawn naturally in the river. This may require the marking of all hatchery fish, the use of selective fishing gear that allows the release of wild fish, or further harvest restrictions. We assume hatchery production will remain at current levels, but recognize it could easily change because of constraints related to ESA or the WDFW's wild salmonid policy.

The primary factors affecting the fishery resources downstream of HHDR are:

- Fishery management decisions by the WDFW and the Tribe.

- Habitat modifications resulting from water diversions, development, restoration, and the operation of HHDR.

The future management of the Green/Duwamish fishery resources by the WDFW and Tribe is unclear. The issues relating to harvest management, including allocation and natural versus hatchery production, are complicated and agreement has not been reached between WDFW and the Tribe over the details of future management. The Service, however, has assumed in this report that either the WDFW's "Wild Salmonid Policy" will be implemented or the NMFS will list Puget Sound fall chinook salmon under the provisions of the ESA. Either of these actions would result in greater emphasis on natural production, and could result in greater numbers of naturally produced fish. Hatchery production, however, could decline if the fishery managers or the NMFS conclude that the current level of production adversely affects the naturally produced stocks.

In the absence of the AWSP, we have assumed that Tacoma would still fully develop its P5 water right. The development of alternative storage options, e.g. well field recharge like the Oasis Project, would likely delay full utilization of Tacoma's P5 water right. We made no attempt in this report to predict the length of the delay for inclusion in our analysis. Given the large numbers of people moving into the Puget Sound area, and the increased demand for new water supplies, we assumed the delay factor would be small and therefore insignificant over the long term. Therefore, the effects of Tacoma's P5 water right on the lower river's flows and fishery resources are considered to be essentially the same under both the "future with the project" and "future without the project" conditions.

Upon Tacoma's full use of its P5 water right, flows downstream from its diversion dam will generally be lowered by 100 cfs during the winter and spring from current conditions. This flow reduction will negatively impact chinook salmon juveniles because survival has been shown to be positively correlated with higher migration flow (Wetherall 1971, Warner et al. 1996). A similar relationship is likely for chum salmon. In contrast, juvenile coho salmon and steelhead trout, and adult chinook salmon should benefit from the higher summertime and early fall base flows, required by Tacoma's P5 settlement agreement with the Tribe. In very dry years, Tacoma is required to curtail withdrawals under its P1 water right to insure that the base flows are maintained.

Lower river fish populations will continue to be impacted by losses of habitat, independent of the AWSP, as more people move into the Puget Sound region, placing additional demands on land and water. On the other hand, habitat improvement measures like those proposed in the Green/Duwamish Basin Restoration Project would offset some of the habitat loss caused by future development. Cancellation of the AWSP would mean that this project's habitat restoration elements (including spawning gravel augmentation and side channel reconnection) would require an alternative funding source for implementation.

The Corps has stated it would be willing to refine its refill rule curve to incorporate the new information developed during the planning of the AWSP. The Service believes a refined rule curve or set of curves to define refill rates under various hydrologic conditions would result in fewer flow related impacts to the fishery resources when compared to existing conditions. Presently, the Corps allows considerable flexibility on both the rate and start of refill but is strict on requiring that refill be completed no later than June 1 to insure that the 110 cfs minimum instream flow can be met with a 98 percent reliability. Although the 98 percent reliability would be maintained, the storage volume or completion date could be adjusted, if supported by further analysis, to allow more flexibility to protect the fishery resources. Greater flexibility to manage the lower river flows would also occur because it would no longer be necessary to delay reservoir refill to provide upper basin migrants with better dam passage conditions.

WILDLIFE AND VEGETATION RESOURCES

Forest succession will change the habitat type and plant species composition over time. The City of Tacoma has published a forest land management plan (TLMP) that prescribes various timber management treatments (Ryan 1996) on Tacoma's forested land base. The TLMP has divided Tacoma's holdings into three management zones: the natural management zone, the conservation management zone, and the commercial management zone. Vegetative manipulation in these zones will also change the habitat quantity and quality in the project area.

Forest management of the natural zone will be directed at preserving the vegetative cover and developing old growth habitat for associated wildlife species. It contains 3,779 acres. Six stands older than 180 years (old growth) with a total of 62 acres are located within this zone. There will be no timber harvest within this zone.

Management in the conservation zone is directed at maintaining or improving vegetative cover for fish and wildlife habitat. This zone contains a total of 3,000 acres. It lies between commercial forest lands and the natural zone to buffer it from areas of intensive forest management which may impact wildlife habitat or water quality. The long-term goal is to develop mature multi-storied forest stands. Timber harvest of up to 41 acres annually may be conducted to manipulate habitat and the animals dependent on it.

Forest management in the commercial zone will be directed at maximizing timber volume within environmental constraints at a sustainable level. This zone contains a total of 2,246 acres. Up to 39 acres per year could be harvested in this zone.

Most of the following discussion (except where specifically noted) assumes that the TLMP will be adopted. The reason for this is that without the management scenarios presented in the TLMP, the assumption would be that timber harvest would be the primary goal of the forested land base. Mitigation for three of the target species, wood duck, pileated woodpecker, and the red tree vole, would be difficult if not impossible. With the plan's emphasis on recreating "old growth" conditions in the natural and conservation zones, mitigation for these species is feasible.

To assess impacts to wildlife species, the Habitat Evaluation Procedure (HEP) was used. This is a habitat-based method for accounting for wildlife habitat data that allows a comparison of existing habitat condition with a prediction of future conditions. This methodology helps to identify potential impacts and assess needed mitigation measures of a particular project. A detailed description of the HEP is contained in Ecological Services Manual ESM 102 (USFWS 1980).

Due to concern by the HEP team about the adequacy of available elk models, Raedeke Associates Inc. was hired to develop a modified elk model that would better fit the Green River watershed situation. Raedeke's (1994) approach used a modified Wisdom model (Wisdom et al. 1986), to assign generalized forage values to specific vegetation types.

Details of the HEP can be found in several documents. The first is *A Review of the Habitat Evaluation Procedures: Howard Hanson Reservoir* (Resources Northwest 1991). The second is the Corps' October 12, 1994 second draft of the HEP analysis, *Howard Hanson Dam Additional Water Supply Habitat Evaluation Procedures (HEP)*. The third is the draft of the wildlife appendix to the COE's EIS on the *Howard Hanson Dam Additional Water Supply Project.* Information discussed below is drawn from these and other documents. The elk model and its use in developing mitigation can be review in detail in *Mitigation Concepts for Terrestrial Wildlife* (Raedeke 1996).

Indicator species are those used in the HEP analysis to indicate (or represent) the habitat. These species also represent a guild of species that use the same habitat in similar ways. Ten indicator (evaluation) species (see Table 4) were selected for the study.

Table 4. Indicator Species and Habitat Types Represented by Them

SPECIES	HABITAT TYPES (also called cover types)
Pacific Chorus (Tree) Frog *(Pseudacris regilla)*	all habitat types listed
Green-winged Teal *(Anas carolinensis)*	FMM; FM; FCM; FCY; FDM; FDY; PEM; S; G;
Sharp-shinned Hawk *(Accipiter striatus)*	FMM; FM; FCM; PFO;
Downy Woodpecker *(Picoides pubescens)*	FMM; FM; FCM; FCY; FDM; FDY; PFO; PSS;
Pileated Woodpecker *(Dryocopus pileatus)*	FMM; FM; FCM; FDM; PFO;
Black-capped Chickadee (Parus atricapillus)	FMM; FM; FCM; FCY; FDM; FDY; PFO; PSS;
Mink (*Mustela vison*)	all habitat types within 100 meters of stream and reservoir
Douglas Squirrel (*Tamiasciurus douglasii*)	FMM; FM; FCM; PFO;
Red-backed Vole *(Clethrionomys gapperi)*	FMM; FM; FCM; FCY;
Rocky Mountain Elk *(Cervus canadensis)*	all habitat types listed
Wood Duck *(Aix sponsa)*	PFO
Species in shaded boxes are also target	

Habitat types are: FC = mature conifer; FCY = young conifer; FD = mature deciduous; FDY = young deciduous; FM= mixed forest =; PFO = palustrine forest (forested wetland); PSS = shrub swamp; PEM = emergent marsh; S = upland shrub; G = upland grassland; FMM = managed mature forest; FCM= mitigation site mature conifer; FDM= mitigation site mature deciduous.

Target species are species that are selected for a more in depth analysis or for mitigation needs because of the potential impact of the project on them. They are also selected because of their biological uniqueness or because they are important to the public. The target species for this project are the pileated woodpecker, red-back vole, Rocky Mountain elk, and wood duck (See Table 4). These species will be used to measure mitigation results for this project.

For the HEP analysis, the Corps has assumed that TLMP is not in effect and that 50 acres of timber harvest will occur each year on Tacoma lands in the HEP analysis area. HEP is an accounting system and in order to show the actual effects of the mitigation efforts it was necessary to set a baseline without the TLMP. The HEP tables will therefore show a mitigation gain over the current conditions which would have been largely masked by the effects of TLMP. Table 5 shows the AAHUs for the 4 target species based on these assumptions.

The effect of natural succession and habitat manipulation can make predictions of future animal use and impacts difficult. Since the project lies within the natural and conservation zones, the changes are mostly subtle and small in magnitude. The major elk grazing areas of McDonald's farm and the adjacent emergent wetlands will not show any significant changes. The forested openings will be lost over time as forest encroaches on the meadows and the canopy kills out the understory. The rights of way (ROW) will be managed for short vegetation and will gradually convert into a cover type dominated by shrubs with less forbs available. Thermal cover and optimal thermal cover will gradually increase throughout the natural and conservation zones.

Table 5. Habitat Units and AAHUs for project area without the Project. Assumes 50 acres of timber harvest each year. (TY = Target Year)

Target Species	Habitat Units					AAHUs
	TY 0	TY 1	TY 10	TY 25	TY 50	
Elk	237	277	245	260	281	268
Red Backed Vole	344	304	471	611	697	561
Pileated Woodpecker	486	439	475	1085	924	832
Wood Duck	6.6	6.6	6.6	6.6	6.6	6.6

Without the TLMP, speculation as to the fate of thermal and optimal thermal cover is problematic. If TPU does not manage their lands, but simply allows natural succession to proceed, optimal thermal cover development will be a slow process and may take 50 - 150 years to completely develop the multi-story canopy and diverse understory characterized by optimal thermal cover. If Tacoma manages their entire holdings for timber production, then thermal and optimal thermal cover will likely never develop.

The development of optimal thermal cover may be faster with Tacoma's proposed management within the natural and conservation zones. This management should also increase some of the old growth characteristics. The timber harvest in the commercial zone will significantly reduce the potential for old growth to develop due to the short rotational age proposed. It will also reduce the value of the natural and conservation zones for species that require large unfragmented habitat blocks.

Tacoma's TLMP implements timber harvest in the conservation zone only to benefit "wildlife". Since wildlife species vary widely in their habitat requirements the goal for one species may be quite different from another. If the goal is increasing elk and deer forage, then the loss of forested openings will be compensated by creating additional forage. If the goal is to recreate late successional forests, then forage may become limiting in future years.

The above discussion also applies to the other groups of animals that use the project area. Waterfowl and shorebirds will likely not see any change to their preferred habitat in the foreseeable future. The habitat for furbearers and other small mammals should not change significantly from the current condition. Animals that use old growth or mature forests may find more suitable habitat in time. Amphibian habitat should not change significantly over current conditions.

Riparian zone conditions will remain fairly static. The main change in the future will be an increase in the conifer component in the overstory and a reduction of deciduous overstory trees. Species that use the present riparian zones will continue to have this habitat available.

Snags within the proposed project boundary will increase both in size and in number over time. As the forest area matures, the closing canopy will kill smaller trees and provide snags of smaller diameter. Larger trees will begin to die as disease and insects attack the weaker trees and larger snags will result.

The four target species' HSI scores for the area without the project are shown in Table 6. Target year 0 represents the habitat value as it exists. TY10 shows the habitat value 10 years in the future. As discussed above, the changes in HSI scores for the area without the project are very minor. They show a minor increase in habitat value for the red-back vole and pileated woodpecker due to their heavy dependence on mature and old growth forest conditions.

Table 6. HSI scores for the target species at Target Year (TY0, TY 10,and TY 50) without the project.

Cover Type	Rocky Mountain Elk			Red-backed Vole			Pileated Woodpecker			Wood Duck		
	TY0	TY10	TY50	TY0	TY10	TY50	TY0	TY10	TY50	TY0	TY10	TY50
FC (mature conifer)	.1	.1	.1	.63	.63	.8	0	0.1	1	0	0	0
FCY (young conifer)	.25	.25	.25	.01	.01	.01	0	0	0	0	0	0
FD (mature deciduous)	.1	.1	.1	0	0	0	0	0.1	.4	0	0	0
FDY(young deciduous)	.25	.25	.25	0	0	0	0	0	0	0	0	0
FM (mixed forest)	.1	.1	.1	.18	.18	.18	.95	.95	1	0	0	0
FO (forested swamp)	.1	.1	.1	0	0	0	.45	.45	.45	0.5	0.5	0.5
SS (shrub swamp)	.25	.25	.25	0	0	0	0	0	0	0	0	0
EM (emergent marsh)	.5	.5	.5	0	0	0	0	0	0	0	0	0
S (upland shrub)	.25	.25	.25	0	0	0	0	0	0	0	0	0
G (upland grass)	.5	.5	.5	0	0	0	0	0	0	0	0	0

FUTURE WITH THE PROJECT

The Service believes it is premature to address phase two of the project at this time with regard to the fishery resources because the effects of withdrawing and storing more water need to be based largely on the monitoring and evaluation that will be conducted during phase one. Consequently, the following discussion is limited to the assessment of the phase one conditions.

The Service has assumed the following "future with the project" conditions in our analysis:

- Fish passage improvements at HHDR and Tacoma's diversion dam will be effective.
- Reservoir refill and release will be managed adaptively to protect and enhance the river fishery resources while facilitating fish passage through the reservoir and dam.
- Staff will be available to operate the project on a 24 hour, 7 day per week basis during reservoir refill and periods when operational changes are critical for fishery protection.
- Reservoir refill will be allowed to begin by February 15 with an allowable storage volume of between 3,000 and 5,000 acre-feet by the end of February.
- Target flows, preliminary 900, 750, and 575 cfs for wet, normal and dry years, respectively, have a higher withdrawal priority than Tacoma's P5 water right.
- Puget Sound fall chinook will receive additional protection, either through an ESA listing by the NMFS or by implementation of the WDFW wild salmonid policy.
- Permanent hatchery augmentation will not be precluded by the listing of Puget Sound fall chinook salmon.
- Trees in the expanded conservation pool, i.e., between elevations 1,141 and 1,177 feet MSL, will not be removed.
- The habitat improvement measures (mitigation and restoration) will be implemented.
- Lower river flows will not be impacted because of water quality constraints, i.e., turbidity.
- Tacoma's potential water quality concerns will not preclude the transport and release of sufficient numbers of adult steelhead and salmon to achieve the restoration objectives for the upper basin.

FISHERY RESOURCES UPSTREAM OF HHDR

The construction of a state-of-the-art fish passage facility at HHDR, in conjunction with the passage improvements that would be implemented at the Tacoma Diversion Dam under the TPU-Tribe agreement, is expected to solve the structural fish passage problems and facilitate the restoration of chinook and coho salmon and steelhead trout populations above HHDR. Sea-run cutthroat and Dolly Varden char should also benefit, but little is known about their current status in the basin, and therefore, it is difficult to predict how long it would take for these populations to respond. Smolt passage success through a larger reservoir and harvest management decisions that affect spawner escapement are the two main uncertainties relative to the restoration of self-sustaining populations of chinook and coho salmon and steelhead. Consequently, the restoration prospect is considered favorable for steelhead, fair for coho salmon and poor for chinook salmon, unless there is a significant change in the harvest management strategy.

The favorable restoration rating for steelhead is based on the low harvest rate on wild fish and because the juvenile outmigrants are expected to traverse Howard Hanson Reservoir and sustain only low mortality because of their larger size and greater swimming ability. The lower rating for coho salmon is related to the high harvest rates that presently occur in marine waters and in the Green/Duwamish system. The restoration of a self sustaining population would depend on reducing the harvest rate from the higher hatchery rate to the lower wild stock rate. On the favorable side, coho smolts are also relatively large and should sustain only minor mortality as they migrate through the reservoir. The restoration potential of chinook salmon in the upper basin is considered poor mainly because of potentially high reservoir passage mortality, habitat degradation from timber harvest and road construction, and because of the potential reluctance of one or both of the resource managers to lower the current harvest rate. The majority of chinook salmon juveniles migrate at less than one year of age when they are much smaller than either steelhead or coho salmon smolts. Consequently, reservoir passage mortality may be significant, but it is impossible to quantify because survival is dependent on the quality of rearing habitat in the reservoir, predator and prey abundance, transportation flows through the reservoir, and other factors.

Representatives from Tacoma have stated that Tacoma would like to harvest the merchantable timber in the enlarged conservation pool but would not proceed unless they could show this action would not adversely impact the fishery restoration efforts. The Service, other resource agencies and the Tribe have participated in discussions with Tacoma and stated the importance of leaving the trees to improve the survival of juvenile fish rearing and migrating through the reservoir. Trees, or large woody debris after they die from the higher pool, would provide escape cover, more surface area for attachment for aquatic insects, and greater diversity of habitat. The merchantable timber, primarily the larger conifers, are the same trees that are expected to provide the greatest fishery benefits over the long term because of their size, resistance to decay, and retention on site (Cowardin 1969, Burns and Dahlgren 1983, Gingrich 1997).

The proposed project would restore safe passage to at least 106 miles of former anadromous fish habitat and include habitat improvements along 3.5 miles of tributary habitat. While essentially all of the habitat upstream of HHDR is unaffected by residential or commercial development, significant degradation of fish habitat has resulted from timber harvest and road construction. The impacts (e.g., sedimentation, channel migration, scarcity of large woody debris, and elevated water temperature) from past timber harvest and road building will continue to affect recovery for years into the future. While the stream corridor will receive greater protection under current regulations and habitat conservation plans, the short rotation harvest of privately owned timber is expected to continue for several decades (U.S. Forest Service 1996). Over the long term, the Service is optimistic that the increasing emphasis on habitat protection and restoration will eventually result in significant improvements in the forest management practices and recovery of the upper basin.

The Corps has developed a range of anadromous fish production estimates for the upper watershed using a number of accepted methodologies, as well as corroborating their results against historic counts and estimates from other studies. The Service is comfortable with the Corps approach, given the stated assumptions in the Feasibility Report and EIS along with the understanding that the production estimates should not be considered absolute, but rather a basis from which to compare the fish passage alternatives. We believe the Corps' approach is appropriate for this stated purpose and for providing a common ground for discussing the potential production from the upper watershed. For this purpose, the Corps has made the production estimates shown in Table 7.

We believe significant changes in the current harvest management strategies for chinook and coho salmon would be necessary for these escapement levels to be reached under the self-sustaining and natural production approach. While these estimates could be improved by refining the parameters of the models used, it is unlikely that the additional effort would lead to different conclusions. The reader is directed to Appendix F of the Corps' Feasibility Report and EIS for the specific details on which the production estimates were based.

Table 7. Potential production potential of salmon and steelhead in the upper Green River and escapement goal necessary to sustain populations.

Species	Smolts	Adult Escapement
Coho	161,000	6,500
Steelhead	25,000	1,350
Fall Chinook	890,000	2,300

The escapement estimates have significant harvest management implications. The goal of restoring self-sustaining populations of anadromous fish is not possible for chinook and coho salmon, but likely for steelhead, under the current harvest management strategies. The natural production objective for Green River chinook salmon and the low numbers of harvestable wild or naturally produced fish has resulted in harvest management problems and disagreements between the Tribe and WDFW. The creation of self sustaining runs above HHDR would add to the problem by requiring additional harvest restrictions to protect the upper river stocks, which would likely become the weak stocks of the basin.

The goal of restoring self-sustaining populations of chinook and coho salmon may need to be relaxed if sufficient escapement to the upper basin cannot be achieved through a combination of habitat restoration and the reduction of sports, commercial and tribal harvest. Under this potential outcome, the USFWS would support the use of appropriate supplementation techniques to restore and maintain the upper basin runs, if supplementation is determined to be consistent with the NMFS' ESA recovery objectives.

The proposed fish passage facility includes design features that are intended to reduce the mortality associated with dam passage to less than 5%, a significant reduction from the "without the project" mortality rate that typically exceeds 50%. In addition, the surface intake should eliminate the entrapment of smolts in the reservoir that currently occurs because existing outlets become deeply submerged.

FISHERY RESOURCES DOWNSTREAM OF HHDR

The AWSP provides much greater flexibility in the management of instream flows by: (1) expanding the HHDR project's authorization to include resource protection as a project purpose; (2) eliminating or at least reducing the need to delay refill; (3) dedicating an additional 5,000 acre-feet of storage for fish protection; (4) including the "dampened dam" provision; (5) increasing the period that staff at HHDR would be available to make adjustments at the dam; and (6) relaxing the water quality constraints. The Service believes these factors, in addition to establishing target flows, would result in significant improvements in the flow regime and benefit to the downstream fishery resources, when compared to the "future without the project" conditions.

The existing project authorization is limited to insuring that 110 cfs is maintained with a 98 percent reliability, and therefore, does not allow for any discretionary use such as flow augmentation for protecting steelhead incubation. In addition, the priority on storing sufficient water for flow augmentation has caused flows in the lower river to drop so dramatically that steelhead redds have become dewatered (Engman, 1997 personal communication). The expansion of the authorized project purpose to include resource protection would give the resource agencies and the Tribe a greater role in decisions involving resource risks and tradeoffs.

The construction of a fish passage facility with a surface intake would eliminate the need to hold the reservoir level below 1,100 feet MSL until April 15th to assist fish in finding the exit to the reservoir. Without this constraint, the refilling of the reservoir could start earlier, resulting in a storage volume that is well above the refill rule curve, and preclude the need to make major increases in the storage rate to achieve full refill. For these reasons, we believe the flow fluctuation impacts to steelhead spawning and incubation would be reduced in both magnitude and frequency. Although this conclusion relies on the assumption that steelhead smolt survival will not be significantly reduced by their passage through the larger reservoir and thereby preclude early refill, we believe it is a likely assumption. Steelhead smolts are relatively large and have the swimming capability of migrating through the enlarged Howard Hanson Reservoir in one or two days.

The target flows of 900, 750, and 575 cfs for wet, normal and dry years, respectively, should provide valuable instream protection, but they are too low to address other important fishery issues such as juvenile outmigration and side channel connectivity.

The dedication of another 5,000 acre-feet of storage in non-drought years would provide additional fishery resource protection. For example, this water could be used for augmenting flows in the spring to assist steelhead spawning and incubation, in the fall to benefit chinook migration and spawning, or to create spring freshets to improve juvenile outmigration.

The Corps has also proposed an operational concept known as the "dampened dam" which has the potential to benefit both lower and upper river fishery resources. In concept, any undedicated water that is stored in the reservoir would be placed in the dampened dam account and be held either for fishery resource protection or to make up storage deficits in the dedicated accounts (P5 and 110 cfs minimum flow) that resulted from actions taken to protect fish, but were not actually required by agreements or permits. For example, the dampened dam account could be used to maintain a stable flow to protect steelhead spawning during periods when Tacoma meets the conditions for withdrawing its P5 water right. Or, water from the dampened dam account could be released to maintain desired base flows or to create freshets when natural runoff is insufficient. The dampened dam concept was tried on a test basis during the spring of 1998 to evaluate the effect of releasing artificial freshets on side channel utilization and juvenile outmigration. Preliminary results suggest that artificial freshets may be a useful tool in stimulating juvenile outmigration. While the storage of water in the dampened dam account does not come without risks to the fishery resources, we believe the benefits outweigh the impacts.

The staffing level at HHDR would increase under the proposed project to include both night time and weekend coverage during the refill and crucial release periods. The ability to make more frequent flow adjustments would provide for the preservation of the natural hydrograph as well as the implementation of more flexible refill strategies to protect fish in the lower river and to assist smolt migration through the reservoir.

The Corps and Tacoma have an existing agreement that specifies that the operation of the project (original project) will not impact Tacoma's water supply. As a consequence of this agreement, the Corps has occasionally released the turbid water from storage or has delayed reservoir refill to allow turbid inflows to pass through the reservoir. The downstream fishery resources have been impacted by the resulting fluctuations in river flow. During the AWSP discussions, the FWS and other resource agencies have requested that the existing practice of dumping or passing turbid water be changed. In response, Tacoma has stated that if actions that are taken to address its water quality concerns preclude storage, the lost storage will be deducted from its P5 account. This commitment is important because in its absence, the dumping or passing of turbid water through the reservoir would likely result in more frequent and severe flow fluctuations. Without this commitment, refill rates would need to be increased to make up for the precluded or lost storage volumes. Fishery resources would be most severely impacted if the storage makeup occurred in late spring after most of the runoff had occurred. The Service is satisfied that once this commitment is formalized, it will provide the needed assurance that the fishery resources will not bear the burden of addressing Tacoma's water quality issues.

WILDLIFE AND VEGETATION RESOURCES

The following discussion assumes that the Service recommendations are adopted and mitigation is successful. It also assumes that Phase 1 and Phase 2 impacts are similar in nature and differ only in the severity of those impacts. The recommendations of the Service are discussed later in this document and are intended to reduce the project impacts to terrestrial wildlife as much as possible. They are based on our understanding of the mitigation plan proposed by the Corps.

Phase 1 of the project will raise the level of the pool 20' to an elevation of ~1167' MSL and will inundate 255 acres of terrestrial habitat. Phase 2 of the project will raise the pool another 8 feet and will inundate another 148 acres (See Table 8). Inundation to these levels would occur over much of the growing season.

Major habitat types affected from Phase 1 would include emergent, shrub-scrub, and forested wetlands (90 acres, see note 1 Table 8), grassland and upland shrub (13 acres), mature deciduous forest (148 acres), mixed forest (49 acres), young deciduous forest (11 acres), young coniferous forest (1 acre) and mature coniferous forest (14 acres). Total forested area lost will equal approximately 230 acres. In Phase 2 additional habitat will be lost. Acreages of the major habitat types inundated will include wetlands (6 acres), grassland and upland shrub (3 acres), and forested habitat (144 acres).

The tree species that will be inundated (Douglas fir, Sitka spruce, western hemlock, western red cedar, black cottonwood, red alder, and big-leaf maple) will not survive within the inundation zone. Consequently, the proposed action would result in the loss of about 374 acres of forested habitats if both phases are implemented. This will adversely affect wildlife species (e.g., northern saw-whet owl, Townsend's warbler, Douglas squirrel) that are dependent on or prefer these habitats. Two of the HEP target species, pileated woodpecker and red-backed vole, will be impacted by this habitat loss.

The resultant habitat will probably consist of mud flats with some moss development and an unknown amount of emergent wetlands around the edges of the inundation zone. Some new habitats may evolve consisting largely of snags, sedges, rushes, grasses, and perhaps some shrub species, e.g. willows. This will benefit wildlife, such as cavity nesting birds, waterfowl, and amphibians, in the short term. Other species like black-tailed deer and elk, while losing cover or hiding habitat, may gain foraging habitat.

Table 8. Phase 1 and Phase 2 Habitat Area Impacts (these numbers are approximate and may change)			
Cover Type	**Acres Inundated by Phase 1**	**Acres Inundated by Phase 2**	**Total Acres Inundated by the project**
Mature Conifer	14	6	20
Young Conifer	1	14	15
Total Conifer	**15**	**20**	**35**
Mature Deciduous	148	86	234
Young Deciduous	11	5	16
Total Deciduous	**159**	**91**	**250**
Mixed Forest	49	28	77
Forested Wetland	7	5	12
Total Forested [3]	**230**	**144**	**374**
Shrub-Scrub Wetland	2	1	3
Emergent Wetland	10 [1]	0	10
Forested Wetland	7	5	12
Total Wetland [3]	**19**	**6**	**25**
Upland Shrub	1.5	1	2.5
Grassland	11.5	2	13.5
Total Habitat Lost [2]	**255**	**148**	**403**

[1] Vegetation on as many as 90 acres may be killed because of the effects of inundation.
[2] These figures differ from COE data because several cover types, i.e. riverbed and open water, were not included in this table.
[3] Forested wetlands are included in both the forested and wetland totals.

ELK

One of the species most impacted by this project would be elk. Elk graze heavily on the upper grass meadows in MacDonald farm. The emergent wetland vegetation in the upper reservoir is also heavily used. Deer use these areas to a lesser degree but along with elk use the natural forest openings and clear-cut areas for forage. The power line right of way (ROW) that is artificially maintained as grass/shrub habitat is heavily used by elk. The forage quality in the forest is rated low due to the lack of understory vegetation. Heavy canopy closure prevents the development of understory vegetation that can be used as forage. To mitigate for these losses, a number of actions will be implemented.

Mitigation for elk winter forage will focus on managing existing habitats to increase the habitat value. For example, intensive management (e.g. mowing and fertilizing) of existing grasslands should increase forage productivity. Converting forest stands to grass to achieve the goal of increased forage production will also be used.

Optimal thermal cover and late successional forests share many physical traits in common and can be enhanced by similar techniques. Thinning second growth forest stands will increase light to the forest floor and allow midstory and understory communities to develop. Increasing the amount of woody debris on the forest floor and creating snags would also help to move the forest stands toward a late successional stage.

For Phase 1, five sites (79 acres) were selected to be developed or managed as elk meadows. Five other sites would be developed as emergent wetlands to provide seasonal elk forage.

Sites 1, 2, 7, and 8, (Site numbers found in Appendix B) are located within an existing powerline right-of-way and maintained in grass and shrub habitat. Adjacent forest habitat would be converted to elk meadows at several of these sites. All of these areas would be managed as "tame" pastures (described in detail in Raedeke, 1996). Tame pastures would be plowed, seeded, fertilized and mowed as needed. Site 5 is adjacent to Baldi Field (an existing natural meadow area). Eighteen acres at this site would be converted to "tame" pasture habitat.

Sites 22, 23, 24 and 25 are located in the upper limits of the new conservation pool. Site 16 on the south side of the reservoir is a deciduous forest that would die as a result of the pool raise. At each of these sites, shallow marsh vegetation would be developed in the upper reservoir elevation zone by planting inflated sedge *(Carex vesicaria)*, Kellogg sedge *(C. lenticularis)*, and Columbia sedge *(C. aperta)*. Approximately 69 acres of emergent vegetation would provide early spring forage opportunities for elk. These sedges have been shown to survive various lengths of time submerged during the growing season.

Several acres would be managed for accelerated late-successional characteristics that would eventually provide optimal thermal cover for elk during extreme winter weather. These sites are identified under the pileated woodpecker discussion for both Phase 1 and 2.

In Phase 2, one elk meadow site would be developed to mitigate for the additional lost elk forage. Site 3 is a powerline right-of-way site that would be managed to provide 10 acres of "tame" pastures.

Except for the more inundation tolerant Columbia sedge, the sedge communities established for Phase 1 mitigation would be lost at Phase 2. Phase 2 mitigation would include re-establishment of 18 acres of sedges in the upper inundation zone. Sites 11, 23, 24 and 25 would be used to establish this acreage.

With the proposed elk mitigation, the resulting elk habitat may be of sufficient quality and quantity to offset the loss created by the project (Table 9). The assumption underlying this and the other mitigation proposals is that the techniques and methods used to create the projected increase in habitat quality or quantity are effective. The proposed mitigation achieves slightly more than a 1:1

ratio for AAHUs. This is usually the goal of a HEP analysis. Since the above assumption has not been proven for this site, the Service believes that monitoring results between phase 1 and phase 2 should determine if additional mitigation will be needed during the phase 2. If the expected results are achieved, we will be satisfied with the mitigation as proposed.

Table 9. Elk Habitat Value comparison between existing conditions, Phase 1, and Phase 2. (These numbers are approximate and may change in the future. They assume no TPU Land Management Plan in effect)

	Project Area Impact in lost AAHUs	AAHUs created by mitigation	Resulting Elk AAHUs (Mitigation - Impact)
Phase 1	78.09	81.96	3.87
Phase 2	27.85	30.37	2.52
Total	105.94	112.33	6.39

PILEATED WOODPECKERS, RED TREE VOLES AND OTHER LATE SUCCESSIONAL DEPENDENT SPECIES

Several species were chosen in the HEP to represent late-successional forest conditions. For the analysis and mitigation planning, pileated woodpecker and red tree vole, both target species, were used. Pileated woodpecker represents primary cavity nesters that need larger diameter snags (> 20-inches diameter) in a variety of decay stages. Optimum conditions for the red-back vole are considered to be mature coniferous forest with at least 60 percent canopy cover and 20 percent or more of the forest floor covered with woody debris at least 4" in diameter. The existing stands in the project area have very little downed woody debris. The average woody debris coverage was estimated to be approximately five percent.

Characteristics that are important to other late-successional dependent species include a multilevel and multi-species canopy dominated by large trees and a significant number of large broken top trees. The multi-layered canopy of different tree species increases the vertical diversity and results in many habitat niches for dependent species. These conditions also make the stand optimal thermal cover for deer and elk.

Mitigation for loss of potential or actual late-successional forest can be achieved using a variety of techniques. These techniques would be used in combinations on a site specific basis. Unless monitoring results or new information dictates, the techniques would remain the same for phase 1 and phase 2. These techniques are summarized as follows:

- Thin even-age class stands to stimulate mid-story and understory species development.

- Create and manage snags:

  Provide snags in small groups across the landscape, rather than a uniform distribution.

  Provide snags in a variety of size classes, decay classes, tree species and locations.

  Manage for natural snag development.

- Place downed woody debris:

  Provide coarse woody debris in a variety or size and decay classes.

  Select various methods of snag creation to provide a varied rate of downed woody material.

- Treat soil by adding lime and/or fertilizer.

- Selectively underplant shade tolerant tree species to accelerate development of a midstory canopy.

- Manage areas dominated by deciduous tree species to replace the deciduous species with conifers.

Sites 9, 10, 12, 13, 15, 18, 19 and 26 will be managed for late successional forest between the North Fork Green River and Gale Creek and on selected areas south of the reservoir. Stands along the Green River upstream of the reservoir may also be managed for late successional characteristics for fish mitigation. These stands will be incorporated into the total area dedicated to late successional management adjacent to the reservoir.

In the second phase, 65 acres of mixed and mature coniferous forest, on sites 14 and 26, will be managed for late successional characteristics. This may include riparian stands along the mainstem Green River upstream of the reservoir.

Mitigation for pileated woodpecker and red-backed vole would result in an increase in habitat after phase 1 is accomplished (Table 10). The loss of AAHUs for both species after phase 2 is completed is significantly greater than that gained by mitigation. The models for these two species is heavily dependent on large snags and downed woody debris.

Red-backed voles benefit primarily by the additional downed wood that decays and provides additional food resources. After Phase 2, the red-backed vole AAHUs are just marginally greater than the number lost. As we discussed previously, the assumptions about mitigation techniques have not been proven on site and could result in much less mitigation than our analysis shows. This is especially true in trying to re-create late forest succession (LSF) conditions in an even aged stand. For this reason, we encourage the Corps and TPU to explore additional mitigation measures to allow for error in the assumptions. This may not be possible to achieve because of the limited amount of LSF in the project vicinity, but mitigation should at least approach a ratio of 1:1 AAHUs lost versus gained.

Table 10. Pileated Woodpecker and Red-backed Vole (RV) Habitat Value comparison between existing conditions, Phase 1, and Phase 2. (assumes that the TPU Land Management Plan is not in effect)						
	Project Area Impact in lost AAHUs		AAHUs created by mitigation		Resulting AAHUs (Mitigation - Impact)	
	Pileated Woodpecker	Red-backed Vole	Pileated Woodpecker	Red-backed Vole	Pileated Woodpecker	Red-backed Vole
Phase 1	174.82	73.51	184.22	131.23	9.4	57.72
Phase 2	99.71	58.28	4.99	10.93	-94.72	-47.35
Total	274.53	131.79	189.21	142.16	-85.32	10.37

The pileated woodpecker analysis shows a serious decline in Phase 2 AAHUs. This unmitigated habitat loss is a concern to the Service since the pileated woodpecker functions as a keystone species. The large holes it excavates are used by many other species for nesting and den sites. The other late successional forest characteristics that are important to pileated woodpeckers are also key characteristics for many other species. We believe that in order to achieve mitigation, Tacoma should explore their entire land base in the upper Green River for potential mitigation sites.

Snag creation is not a hard science and useable snags can be difficult to create. Erecting artificial snags (large diameter dead trees) may be possible and may help to achieve a more balanced mitigation result. It is imperative that an intensive monitoring effort be accomplished between phase 1 and phase 2. Monitoring results should indicate which techniques to create snags are successful and to what degree predictions about snag usage are fulfilled.

Late successional forests are by definition mature to old-growth forest and do not develop in the short term. The 50 year project time frame used in this analysis may not substantially increase all of the characteristics for which the stands are being managed. However, the progression of these stands from younger seral stages to mature or even old growth conditions will provide niches for a wide variety of wildlife species. Other late successional dependent species will benefit from this type of management over the long term.

WOOD DUCKS AND OTHER FORESTED WETLAND/RIPARIAN ZONE SPECIES

Using the wood duck as a target species, almost 6 AAHUs would be lost in Phase 1 and 2. Mitigation by constructing and managing the subimpoundments gives an increase of almost 6 AAHUs in Phase 1 (Table 11). In Phase 2, the AAHUs lost are greater than the gain from mitigation for a net loss of almost 2 AAHUs. There is a net gain of almost 4 AAHUs between Phase 1 and Phase 2.

Seven acres of forested wetland and a substantial but unquantified amount of riparian zone habitat will be lost or impacted by the project. A total of 89 acres of wetland will be inundated during most of the growing season and as a result will be unavailable for use by wildlife. The year around value of both wetlands and riparian zones will be diminished by inundation due to the changes of diversity.

Inundation and reservoir fluctuation will prevent development of a diverse riparian zone. Riparian zone habitat values will be further reduced on tributary streams that flow into the reservoir. Since very few riparian zone plant species can survive inundation during the growing season, the complex nature of the riparian zone with its diverse plant species and habitat niches will be lost. Some of this value will remain at the upper edges of the inundation zone but most will become a very simple ecosystem with little habitat diversity.

Table 11. Wood Duck Habitat Value comparison between existing conditions, Phase 1, and Phase 2. (assumes no TPU Land Management Plan in effect)

	Project Area Impact in lost AAHUs	AAHUs created by mitigation	Resulting AAHUs (Mitigation - Impact)
Phase 1	3.31	9.18	5.87
Phase 2	2.43	.53	-1.9
Total	5.74	9.71	3.97

During the winter drawdown, the inundation zone will have almost no habitat value. It will create a barrier to movement for many animal species, especially smaller land bound species. Lack of ready water access reduces the value of the remaining riparian zone significantly. The drawdown and fluctuation may interfere with nutrient cycling and food webs. Deterioration of primary productivity may affect the food chain up to the top terrestrial predators.

Amphibian breeding may occur as early as February in the project vicinity. During this time the reservoir pool elevation will be drawn down for flood control and the resultant bare lake bed may prevent or inhibit movement of amphibians to and from the water edge for egg laying. If amphibians like the northwest salamander or red-legged frog do access the water for spawning, refilling the pool may create water conditions that reduce hatching or survival of the juveniles. Water temperatures and depth may change during the incubation period and create conditions that are detrimental to larval survival. Predator population may increase because of changes in water level conditions. The reservoir may act as a population sink if amphibians are drawn to the water for reproduction and the refill causes significant mortality.

Furbearers begin bearing young in late winter to early spring, during drawdown. The drawdown zone may interfere with this reproductive cycle. If denning sites are selected along the edge of the water zone, refill may flood burrows or make dens more accessible to predators due to the lack of vegetative cover.

Mitigation for riparian zone habitat loss would be monitored by both wildlife and fishery groups due to the high value for both groups of species. Riparian zone habitat would be restored or enhanced following the fishery mitigation plan. Forested wetland sites would be developed by creating sub-impoundments adjacent to forested areas. Snags and nest boxes would be created within and adjacent to the impoundments. The objective is to create stable water levels to promote aquatic plants and encourage use by birds, mammals, and amphibians. A stable water level would also encourage the development of a more diverse riparian zone adjacent to the subimpoundments.

THREATENED AND ENDANGERED SPECIES

The Corps addressed the AWSP's potential to impact federally listed species in its biological assessment, dated January 15, 1998. The Service's January 28, 1998, response concurred with the Corps' determination that the proposed project would not likely adversely affect the bald eagle (*Haliaeetus leucocephalus*), northern spotted owl (*Strix occidentalis caurina*), marbled murrelet (*Brachyramphus marmoratus marmoratus*), gray wolf (*Canis lupus*) and grizzly bear (*Ursus arctos*).

The Service's concurrence was based upon: (1) the expected implementation of the conservation measures described in the BA; (2) the Corps' statement that phase 2 of the project (conservation pool raise to elevation 1,177 feet, MSL) will not be implemented until it is demonstrated that this action will not adversely affect the Green River's salmon and steelhead resources; and (3) the retention of all merchantable and large trees within the larger conservation pool unless they can be harvested without adversely impacting the restoration of the anadromous fish runs upstream of the project.

DISCUSSION

The proposed project includes both restoration and mitigation elements to address impacts caused by the original construction of HHDR and from enlarging the conservation pool, respectively. The Service believes very significant elements have been included as part of the project and have the potential to restore anadromous fish runs upstream of HHDR, while reducing the unavoidable impacts to acceptable levels. The success of the restoration and mitigation efforts, however, depends heavily on the satisfactory development and implementation of these measures, especially the application of the adaptive management approach, as well as certain actions that are outside of the scope of this project, e.g., harvest management and/or the ability to use supplementation techniques. The following fishery resource discussion pertains to phase 1 of the project. The phase 2 fishery impacts have not been addressed in detail because the gross assumptions that would be required would only lead to highly arguable conclusions of little value at this time.

FISHERY RESOURCES

Biological, physical, and hydrologic studies conducted by the Service, WDFW, Tribe, Corps, Tacoma and others provide a good basis for understanding how HHDR affects both the upstream and downstream fishery resources and the physical and operational improvements that are needed to restore anadromous fish populations. Early work by Seiler and Neuhauser (1985) confirmed that juvenile salmonids passing through HHD suffered high mortality. To address the impacts of raising the conservation pool and the potential for restoring upper basin anadromous fish runs, the following studies or analyses were conducted: (1) the vertical and horizontal distribution of fish in the vicinity of the existing outlet (Dilley, 1994); (2) the travel time of chinook and coho salmon and steelhead smolts emigrating through Howard Hanson Reservoir (Aitkin, et al., 1996a; Warner, 1996); (3) the factors affecting juvenile salmonid travel time through the reservoir (Aitkin, et al., 1996a); (4) the timing and survival of juvenile fish passing through the Howard Hanson Dam (Dilley and Wunderlich, 1992, 1993); (5) the adult return rate of fish planted above and below HHD (Aitkin, 1996b, 1997b); and (6) the effect of raising the conservation pool on tributary habitat (Wunderlich and Toal, 1992). Other studies address lower river flow and habitat issues.

Fish Passage

The proposed fish passage facility contains state of the art features that are intended to optimize fish survival through HHD. The Service concurs that optimizing passage survival is necessary to improve the prospects for restoring naturally sustaining populations of anadromous fish. The Service continues to have a strong interest in restoration of anadromous fish runs above HHDR. The upper basin anadromous fish stocks will be subjected to the mortality associated with passage through both Howard Hanson Dam and Reservoir as well as the hazards faced by the lower river fish stocks. Although better spawning and rearing habitat in the upper watershed and the potential benefit of rearing within the reservoir may compensate for some of the passage losses, the upper basin stocks are likely to be the "weak stocks" of the Green River. Consequently, the rebuilding and continued protection of the upper river's weak stocks would likely require a more restrictive harvest management approach for the Green River or some reliance on hatchery supplementation which would require the lowering of the goal to restore self-sustaining runs. The need to maximize passage survival through the dam justifies the selection of this fish passage alternative over the lower cost options that provide less protection. The Service believes the proposed fish passage alternative is consistent with the objective of optimizing fish survival past the dam. We expect further refinements in project design will occur during the advanced engineering and design phase.

Smolt passage through Howard Hanson Reservoir remains one of the main uncertainties, especially in regard to juvenile chinook salmon delay and survival. The absence of a surface outlet and evaluation facility at HHD greatly limited the study design options for evaluating reservoir passage issues, and likely precluded the ability to obtain conclusive results. Still, the Howard Hanson study data and subsequent analysis suggest smolt passage through the reservoir is more heavily influenced by reservoir refill rates and flow volume, and less by reservoir volume or size (Aitken et al. 1996a, Goetz 1997). The proposal to start reservoir refill earlier and reduce the amount of water that would be stored during the primary outmigration period (April through May) should benefit smolts passing through the reservoir. The Service is also encouraged by the fact that Howard Hanson Reservoir is relatively small and that all of the flow will pass through the entrance to the passage facility with the exception of flood releases.

The survival rate of chinook salmon smolts, and to a lesser degree coho salmon and steelhead, as they pass through the reservoir, is unknown. The Corps in its analysis has assumed a reservoir survival rate of about 65 percent, 85 percent, and 90 percent, for chinook salmon, coho salmon, and steelhead, respectively. The actual survival rate will depend on such factors as: (1) the quality of the rearing habitat, including the availability of prey; (2) the abundance of predators; and (3) the amount of time needed to traverse the reservoir. These factors cannot be accurately quantified at this time. Optimistically, the actual survival rates could exceed the estimates used in the Corps' analysis as a result of the proposed mitigation and habitat restoration measures, including: (1) a state of the art fish passage facility; (2) habitat improvements upstream, within the reservoir zone, and downstream of HHDR; (3) predator control, as needed; (4) water temperature improvements by blending the outflow releases; and (5) the reconnection of side channels.

Even though there are outstanding questions that cannot be answered until Phase 1 evaluation, the Service believes the major improvement in fish passage survival at HHD will offset the reservoir passage mortality that could result from enlarging the reservoir in phase 1.

Fish Production Estimates

The Corps has stated that the fish production estimates are primarily intended to provide the basis for comparing the project alternatives, and to a lesser degree a general sense of the upper basin's fish production potential. Given this understanding, the Service is comfortable with the Corps' approach for analyzing the effect of the AWSP. The Corps' use of a variety of accepted methodologies (described in detail in Appendix F) for estimating potential fish production and the presentation of estimates from other studies, provided a range of estimates for juvenile and adult salmonid fish production. From these estimates, the Corps took what it considered to be the best estimate for each of chinook salmon, coho salmon and steelhead for use in the evaluation of the project alternatives. While it can be argued that the model parameters and assumptions (smolts per square meter, spawners per mile, etc.) are not precise enough, we doubt that further refinement of the models would result in different overall conclusions, i.e., the selection of the preferred fish passage alternative, and the conclusion that the Green River fishery resource would benefit from the AWSP.

Project Operation and Adaptive Management

The existing project has operational, physical, and biological constraints (e.g., June 1 refill deadline, reservoir storage solely for maintaining minimum instream flows, lack of fish passage facilities, competing protective measures for upper and lower basin fish stocks, etc.) that continue to limit the Corps' ability to adequately protect the fishery resources. The AWSP has the potential to eliminate or reduce many of these constraints and provide the flexibility needed to operate the project in a manner more favorable to fish.

An important element of the AWSP is the proposed adaptive management approach for operating the project. This approach has the potential to provide significant fishery resource protection and restoration, based on our review of CH2MHill's modeling runs, and with the assumption that parties making the fish related operations decisions have enough confidence in the historical and current data to act and to make the correct decisions. The model, through an iterative process, can show how to maximize specified desired conditions, e.g., rearing habitat in the spring, while still storing sufficient water to maintain minimum instream flows later in the year. It is unlikely that the level of benefits achieved by the model runs can be attained under real life conditions because the resource agencies and the Tribe would make more conservative decisions to reduce of the risk to the resource.

Still, the model results suggest that significant improvements in maintaining higher habitat levels can be achieved even with a conservative adaptive management approach when compared to the existing mode of operation.

While we are encouraged by the inclusion of the adaptive management approach as a project element, we note that the details are still under development and that commitments on its specific use are still needed. We believe the use of an adaptive management approach for operation of the AWSP will provide significant resource benefits, if it includes the scope and level of flexibility (e.g., baseflow targets, "dampened dam", discretionary use of water for resource protection, 24-hour capability on flow adjustments, etc.) that were presented by the project sponsors during the fall of 1997 project meetings.

Phased Approach

The Service supports the phased approach to project implementation because it defers the decision on whether to proceed with phase 2 until after the review of both the phase 1 monitoring results and the effectiveness of the adaptive management approach.

The fish passage facility (phase 1) will allow the collection of project specific information on the effect of increasing the reservoir size on juvenile passage delay and survival, as well as refill options to reduce the impact. Phase 1 studies are also expected to focus on the effect of additional water withdrawals on side channels usage, steelhead spawning and incubation, and the survival of both salmon and steelhead smolts. In addition, the resource agencies, Tribe and project sponsors will be able to see just how well the adaptive management approach to reservoir refill and release works under real life conditions. An even greater reliance on adaptive management is likely in phase 2 because of the additional storage of 12,400 acre-feet and withdrawal of 22,440 acre-feet from the river.

Habitat Mitigation/Restoration

We are satisfied with the conceptual approach the project sponsors have taken with regard to habitat mitigation and restoration, but note that plans are still under development and are not yet ready for a detailed review. The Service, other resource agencies and the Tribe have not yet participated in the detailed review of the proposed habitat improvement elements. Consequently, it is premature for the Service to provide detailed comments on the specific habitat improvement proposals. We believe the proposed project is likely to contain sufficient mitigation to offset the impacts caused by enlarging the size of the conservation pool, based on the Corps' proposed conceptual approach .

The project sponsors have also identified a number of habitat restoration options (gravel augmentation, side channel re-connection, and riparian/channel improvements) to partially offset the impacts caused by the construction of the existing project. The annual placement of 3,900 cubic yards of gravel would restore and maintain about 400,000 square feet of degraded spawning habitat largely caused by the dam's blockage of gravel from upstream sources. The reconnection of a side channel near Tacoma's Diversion Dam and the implementation of riparian and channel improvements would partially offset habitat losses that occurred by the filling of the original reservoir. The Service supports the implementation of all the restoration options.

Monitoring/Evaluation

The project sponsors have committed to the funding of a fifteen year monitoring and evaluation effort with the focus being directed at the issues and needs associated with phase one. About five million dollars has been budgeted for monitoring and evaluation. The monitoring of project facilities and habitat improvements for their serviceability would continue beyond the fifteen year period under the Corps' operations and maintenance authority. The identification of specific monitoring needs for phase two have been deferred to allow the review of the phase one monitoring results. It has been acknowledged by the project sponsors that additional monitoring and evaluation may be needed to address phase two issues.

The monitoring and evaluation plan is scheduled for development during the Corps' PED phase during 1999 and 2000. While the details of the plan will not be developed until that time, the Service is comfortable (from a planning perspective) with the level of effort and the scope of the issues that have been proposed in the Corps' Feasibility Report and EIS. We expect the proposed monitoring and evaluation plan to address the following issues: (1) juvenile outmigration survival (lower river, reservoir); (2) survival through the fish passage facility; (3) side channel accessibility; (4) habitat improvement measures; (5) maximum refill rates; (6) base flow targets; (7) flow augmentation to protect steelhead spawning and incubation; (8) predation on juvenile salmonids; (9) artificial freshets; and water quality.

WILDLIFE AND BOTANICAL RESOURCES

The Corps' analysis using the HEP results is acceptable to the Service and we support their conclusions. The HEP established pre and post project AAHUs for the four target species. The compensation goal for these species is to offset the AAHUs lost due to the project with a gain of an equal number AAHUs.

The quantification of AAHUs and the compensation for loss depends on a major assumption, i.e., the mitigation or management techniques used to accomplish the changes in habitat are successful at the anticipated level. Depending on the techniques and available evaluation data, this assumption may not be realized. This is especially true in techniques that are experimental in nature and do not have a body of empirical data to support the assumption.

The elk mitigation plan as proposed seems to do an adequate job of provide compensatory habitat. We especially support the efforts to improve forage on non-forested areas since we are concerned about the loss of any forested habitat in the upper Green River basin. The techniques to be used have been successful in other areas and should work quite well in the project area.

Late Successional Forest

We support the efforts to recreate and manage for late successional stage forests; however, this is not a proven technique. We believe that these techniques will provide at least some of the desired characteristics, but due to the length of time needed for many of the late successional characteristics to develop, results are unsure. Intensive monitoring will be needed over several decades to see if the assumptions about the results are true.

The Tacoma Land Management Plan (TLMP) (Ryan 1996) is a policy adopted by the city to protect water quality within the watershed. While the intent seems to be for the long term, policies and goals may change over time. Changes or abolition of this plan could drastically impact forage and other habitat values. This discussion assumes that the TLMP will be implemented and will remain in effect for the next 50 years. With the TLMP in place, the mitigation for pileated woodpeckers and red tree voles may be achieved, but may take several decades more than the 50 year life of the project.

Riparian Zone

The riparian zone is the most valuable of the terrestrial habitat types. The juxtaposition of water and land creates a habitat that brings upland and aquatic species together and produces the most diverse plant community of any upland habitat type. This ecotone, or edge, provides a transition that is highly productive and valuable to many diverse animal species. Some animal groups, such as some salamanders and most frogs, use this zone almost exclusively. Other animal groups use it variously for food, shelter, water, breeding, and rearing. Due to the long, narrow aspect of riparian zones, many animals use it as a migration corridor. Riparian zones provide a less variable humidity and temperature regime and promote greater plant diversity. Many riparian zones are also wetlands and provide sediment filtration, water purification, and flood control.

The value of this relatively small portion of the landscape cannot be overstated. A loss of riparian zone habitat reduces available resources not just in the small acreage it occupies, but also to adjacent habitats in either the upland or aquatic habitat component.

Snags

Snags are a critical element in forested habitats. Snags, dead tops, or dead limbs on larger trees provide the initial substrate for woodpeckers to feed upon and excavate holes for nesting. In western Washington, at least 100 species of wildlife use snags for part of their life cycle. When abandoned by woodpeckers, excavated holes are subsequently used by a variety of animal species, known as secondary cavity nesters, for nesting, rearing and cover. More than 50 species (39 birds and 14 mammals) are cavity dependent (Neitro *et al.*1985). Birds and mammals that use these abandoned woodpecker holes provide an important component of the forested ecosystem.

Pileated woodpeckers are the largest woodpeckers in the Pacific Northwest and require snags greater than 21" in diameter. There is some evidence that they prefer snags with a minimum diameter of 25" (See Table 12). To assure an adequate supply of large snags into the future, forest lands need to be managed on a long term rotation to produce trees of this size.

Other primary excavators, including red-breasted nuthatches, can use much smaller snags. The preferred sizes shown in Table 12 have been derived from several studies in old growth and mature forests where available snag sizes are much larger. In areas such as the proposed project area, smaller sized snags are frequently used, at least by the smaller species, for foraging and sometimes even nesting. Snags of marginal size are important components of second growth forest as foraging or nesting habitat, or as coarse woody debris when they fall to the forest floor.

Table 12. Sizes, Density and Utilization of Snags and Cavity Excavators (**adapted from Neitro, *et al.*1985**)

Woodpecker species	Preferred snag size (min. diameter)	Max Density (D)[1] (pairs/100 ac) Brush[2]	Forest	No. cavities excavated/pair/ year (C)	Snags Used (X)	No. snags needed/100 acres (S) Brush	Forest	Snags needed/14 acres project area Brush	Forest[4]
Downy Woodpecker	>11"		2	2	4	0	16	0	2.24
Red-breasted Sapsucker	>15"	3	11.3	1	4	12	45.2	1.68	6.328
Hairy Woodpecker	>15"	11	16	3	4	132	192	18.48	26.88
Northern Flicker	>17"	12	12	1	4	48	48	6.72	6.72
Red-breasted Nuthatch[3]	>17"					0	152		21.3
Pileated woodpecker	>25"		.5	3	4		6	0	0.84

[1]Formula calculation (D) x(C) x(X) = S
[2]Brush = Shrub/open sapling/pole seral stage
[3]Red-breasted nuthatch density and snags used/year not clearly defined.
[4]Assumes that as the stand grows older it will reach the forest seral stage in the future.

Conifer snags have a long useful life because they are much slower to rot. Cline, *et al.*(1980) set up a rating system for snags based on deterioration and condition. Stage 5, which was a very soft and deteriorated snag, could be older than 125 years for snags greater than 18" diameter at breast height (DBH). Larger snags tended to last longer and provide habitat for a longer period of time. Snags less than 12" DBH tended to break at or below the ground surface. Western red cedar and Douglas fir were the most persistent of all conifers. Because conifers grow to a much larger size, they can provide much larger snags that are useable by a wider variety of species. Snags from deciduous trees are more short-lived but are heavily used by both primary and secondary excavators. Rot is faster in deciduous trees and makes them available for excavators much quicker.

Data for the value of snags and standing trees in the inundation zone is not prolific but there are several studies that show a significant use of dead trees surrounded by water. Burns and Dahlgren (1983) indicated significant use by woodpeckers and secondary cavity nesters during summer. Woodpecker use was the same in the surrounding bottomland timber and the flooded areas but secondary cavity nesters showed higher use in the inundated trees. The difference in species diversity seemed to be related primarily to the lack of foliage. Four open-nesting bird species used the trees for perching and nesting. Foraging and perching were observed for several other bird species which nested in the adjacent uplands. Hair *et al.* (1978) showed a similar use of dead trees in beaver ponds. Standing dead trees suitable for feeding and nesting were probably the major factor in the over 200 percent increase in woodpecker density in the beaver pond sites. Secondary cavity nesters also used this habitat during the nesting season.

Cowardin (1969) found significant waterfowl use of dead trees and floating logs. Most of the use was loafing and perching, although there were broods produced in the flooded timber. His study area was flooded in the early 1940s. A significant number of snags were still remaining in 1969 during the Cowardin study. At present there are still 10 to 15 snags remaining. Longevity of these hardwood snags ranged up to 50 years. Although these are in very poor shape, there is an active bald eagle nest in one. There were enough snags standing as of the mid-1980s to support a great blue heron rookery (Gingrich per. com 1997). Ospreys have nested in the snags during the past 50 years.

CONCLUSIONS

The proposed AWSP offers the most feasible opportunity for restoring chinook and coho salmon and steelhead runs to their former habitat upstream of HHDR by retrofitting HHDR with a state-of-the-art fish passage facility, and by adopting an adaptive management approach to project operation. The Service believes the adverse impacts of phase 1 of the proposed project can be reduced to acceptable levels if appropriate mitigation is included. It is premature to assess the impacts of phase 2 because of the importance of the phase 1 monitoring results in determining whether larger storage volumes or greater water withdrawals would result in unacceptable and unmitigatible impacts. The Service believes a phased project is the appropriate approach for addressing these critical uncertainties.

RECOMMENDATIONS

The Service believes the phase 1 impacts of the proposed AWSP can be reduced to acceptable levels if the fish and wildlife mitigation and restoration measures that have been identified in the Feasibility Report and EIS are implemented and the following recommendations are incorporated into the AWSP. We are not providing our phase 2 fishery resource recommendations at this time because their development should be based on the phase 1 monitoring and evaluation results.

FISHERY RESOURCES

1. The fish passage facility should be designed to achieve maximum fish survival past HHD. The Service supports the Corps' proposed option, which includes a new intake tower, floating collection facility, modular incline screen, fish lock and bypass system. Additional refinements should be pursued during the advanced engineering and design phase to further enhance passage survival.

2. Impacts to riparian and stream habitats from enlarging the conservation pool need to be fully mitigated. The Service supports the Corps' mitigation approach, but we cannot specifically address the adequacy of the selected elements at this time because the details are still being developed. The Service requests the opportunity to participate in the development of the mitigation elements during the Corps' Plans and Specifications Phase.

3. All of the identified restoration elements should be implemented. The construction of HHDR adversely affected the natural transport of sediments necessary to replenish spawning habitat, inundated riparian and stream habitats, and eliminated most of the high flow events needed to create side channels. All of the restoration measures are needed to partially offset these impacts. The Service requests the opportunity to participate in the design refinement of the restoration elements during the Corps' Plans and Specifications Phase.

4. An adaptative management approach to project operation should be adopted and used to provide maximum flexibility to protect and enhance the fishery resources. At the very least, it should specifically address: (1) base flow targets; (2) adequate flow levels to protect steelhead spawning and incubation; (3) refill rates and storage volumes that maximize survival through the reservoir; (4) flows to maintain the optimal use of side channel habitat; and (5) the creation of artificial freshets, if needed.

5. The storage of up to 5,000 acre-feet in non-drought years should be implemented at the beginning of phase 1, as part of the adaptive management approach. The resource agencies and Tribe, in consultation with the Corps and Tacoma, should have the joint responsibility for making the decision on how much of this water to store in any given year (including the option of not storing additional water) after considering the current conditions.

6. The "dampened dam" approach, as describe in Appendix F of the Corps' Feasibility Report and EIS, should be included as a project feature.

7. Reservoir refill should begin by February 15 and target an end of February storage volume of 5,000 acre-feet. The Corps should conduct the appropriate analysis to resolve the flood control concern of King County, if necessary. The February storage of water would reduce the amount that would need to be taken during the period, March through May, when fishery impacts would likely be greater.

8. Initially, the Corps' proposed maximum refill rates (400 cfs in March, 300 cfs in April, and 200 cfs in May) should be used and evaluated.

9. The storage volume of 25,400 acre-feet should be further evaluated to determine if this quantity is necessary to provide the project authorized 98% reliability for maintaining a minimum instream flow of 110 cfs.

10. Continuous staff coverage at HHDR (i.e., personnel available on a 24 hour per day, 7 day per week basis) should be provided, as needed, during project refill and other critical periods, e.g., steelhead spawning, to allow more timely adjustments in project outflow to provide better protection of the fishery resources. More frequent coordination with the resource agencies and Tribe will also be necessary.

11. The Corps should continue to develop its hydrologic data base and refine its ability to accurately forecast runoff. The reliability of the snowpack surveys for use in predicting runoff should be improved.

12. All large trees within the enlarged conservation pool between elevation 1,141 and 1,177 feet MSL should be retained as fish habitat to improve the prospects for restoring self-sustaining runs of anadromous fish above HHDR.

13. Measures to protect Tacoma's water quality should not come at the expense of the fishery resources. If it is necessary to flush turbid water from storage or to delay refill to pass turbid water, the lost or precluded storage should be deducted from Tacoma's storage account, unless replacement can be accomplished without adversely affecting the fishery resources.

14. The trap and haul of sufficient adult steelhead and salmon to achieve the natural production objectives for the upper watershed should not be precluded by Tacoma's water quality concerns.

15. The Service, other resource agencies, and the Tribe should be given the opportunity to participate in the development of the monitoring and evaluation plan during the Corps' PED phase.

TACOMA LAND MANAGEMENT PLAN (TLMP)

1. The TLMP is the major component upon which most of the mitigation planning has been based. It is the recommendation of the Service that this plan be adopted as part of the mitigation package and used to further refine specific components of the plan.

2. The TLMP should be modified to reflect current recommendations for snag densities and coarse woody debris.

ELK AND OTHER SPECIES USING PASTURE AND FORAGE

1. The quality and quantity of elk forage should be increased by:

   a. Expanding existing meadows by reversing conifer encroachment.
   b. Creating new meadows within selected forest stands next to existing openings.
   c. Increasing forage value within power line right of ways (ROW).
   d. Increasing forage value in existing meadows.

   Techniques to be used are described in Raedeke (1996) and in previous Planning Aid Letters from the Service. The Service has provided suggested seed and fertilizer mixes previously (Bodurtha 1995).

2. Within the ROW, evergreen trees and shrubs should be planted to break up sight distances and screen the pasture areas from the roads. Tree species that should be considered include Pacific yew (*Taxus brevifolia*), Lodgepole pine (*Pinus contorta*), and Western white pine (*Pinus monticola*) since they are either naturally short or can be easily maintained at shorter heights. Several *Vaccinium* species should be considered since although they are deciduous, the leaves tend to persistent through much of the winter. In addition, yew and *Vaccinium* are preferred browse species and would provide additional forage value.

3. Sites should be selected from the list provided in Raedeke (1996) to provide the widest range of opportunity for forage production and diversity. The initial sites should be monitored closely until the initial assumptions for increased forage are realized. Although the techniques have been shown to be successful in other areas, they have yet to be proven for the specific site conditions in the project area. The loss of substantial elk habitat dictates that we make a concerted effort to at least replace this lost habitat.

4. A small area of each meadow should be used to test the techniques to determine which one would provide the best results in terms of enhancing productivity and increasing forage. For example, applications of various fertilizers on small tests plots could help indicate which fertilizer would be most appropriate.

5. To attract elk to the improved or created meadow sites, salt or mineral blocks could be placed in these areas in advance of the pool raise. Mineral and protein supplements have been used successfully to draw livestock to upland sites and to re-distribute use over a larger area.

6. It would appear from the proposed filling schedule that a substantial part of the inundation zone would be above the water line during the growing season in late August and September. We recommend that a fall planting of cereal rye, winter wheat, and perennial rye be tried on any mudflats that develop as a result of inundation. Cattle growers have used these grasses to provide winter food sources for grazing. White-tailed deer have been observed in Kansas using this food source along with the cattle. Cereal rye and winter wheat has been planted for and used by elk in Southwest Oregon (Gene Stagner personal observation). These cereal grains germinate quickly and provide rapid cover and forage throughout the winter. If the initial tests of these cereal grains show success in providing usable winter forage the Service recommends that this should become part of the annual management plan for forage.

7. Use a wide variety of plant species (black cottonwood, rushes, and other species of willows and sedges) to revegetate the drawdown zone. This will help increase the habitat diversity and subsequent use by fish and wildlife.

8. Optimal thermal cover is significantly lacking in the project area. The techniques used to improve pileated woodpecker habitat will also help re-establish optimal thermal cover. Under planting with shade tolerant shrubs and conifers will allow a more rapid development of winter forage base and better snow interception.

PILEATED WOODPECKERS, OTHER PRIMARY EXCAVATORS AND RED-BACKED VOLES

1. The development of late-successional characteristics should be accelerated using the following techniques:
   a. Provide at least .5 snags per acre $\geq$ 20" dbh for primary cavity nesters.
   b. Provide at least 11 snags per acre from 6" to 20" dbh for smaller woodpeckers and secondary cavity nesters.
   c. Provide raptor perch trees and snags at the edge of the reservoir. The trees and snags within the new conservation pool should be left standing because of their value to wildlife. Trees and snags will provide important perching and nesting habitat for birds, and hiding cover for fish when the reservoir is full.
   d. Thin even age class stands to stimulate mid-story and understory species development.
   e. Maintain the dominant trees in all aged stands and cut subdominant conifer and deciduous. During thinning it is important to retain some of the mid-level canopy if present.
   f. Leave felled trees on the ground to increase the coarse woody debris (CWD) component of the forest floor. This component of the forest ecosystem is especially important for the red-back vole, one of the target species. Many other forest species use a wide variety of CWD sizes.

g. Under plant with shade tolerant shrubs and conifers to allow a more rapid development of a multi-level canopy.

2. Manage the land base to develop natural snags as much as possible. In areas lacking in snags, create snags by topping live trees or installing artificial snags. Provide a wide variety of sizes and decay classes of snags. This will need to be a long-term effort due to the relatively young stands involved. Preferred trees species are Douglas fir and Western red cedar.

3. Our recommended topping technique is blasting above at least one live lower branch. The jagged top left by blasting seems to provide a more rapid snag development than does topping with a chainsaw.

4. In areas devoid of snags or cavities, it may be necessary for a short time period to provide nest boxes or constructed cavities. Since primary excavators rarely use nest boxes these should be provided in sizes and appropriate habitat to accommodate secondary cavity nesters such as wood ducks and bluebirds.

5. Artificial snags should be randomly erected within the natural and conservation zones to help mitigate the loss of pileated woodpecker AAHUs.

WOOD DUCKS AND OTHER WETLAND DEPENDENT SPECIES

1. Sub-impoundments should be created along the perimeter of the upper reservoir and other appropriate locations to function as shallow open water habitat during drawdown. This would help reduce the loss of riparian zone and wetland habitats and provide stable habitat areas for wood ducks, amphibians and other wetland dependent species. The close proximity between open water and forest habitats would result in greater diversity. The Service believes the creation of sub-impoundments would provide significant benefits to fish and wildlife, and therefore, should be included. This will especially benefit amphibians that breed in slack or slow moving water and utilize submerged vegetation for food and spawning substrate.

2. The creation of a sub-impoundment behind the old railroad grade should be included as a project element because of the significant wildlife benefits that would result from its implementation. An outlet structure that is capable of safely passing fish would be a necessary component of this restoration element.

3. Habitat within the upper reservoir subimpoundments should be improved (install wood duck nest boxes, place large woody debris, plant emergent vegetation and willow cuttings).

MONITORING AND EVALUATION

1. The Service recommends the development of a management plan specific to the project mitigation lands. This plan should be approved by appropriate agency representatives and include annual management evaluations and the development of an annual standard operating procedure (SOP) that would detail the specific management techniques to be applied during the next year. An annual report should be prepared that would include an outline of the activities on the sites, any evaluation and monitoring results, and recommendations for future work.

   The TLMP should be used as a basis to develop this plan since most of the goals and objectives for natural and conservation zone lands meld with the goals and objectives for mitigation of this project. The advantage in a specific management plan would be that there would be a standing committee of agency representatives to help evaluate proposals and results, and suggest changes in management to better fit new information or changes in objectives. A signed agreement would give some long term assurance that the goals and objectives for the project lands would not be arbitrarily changed due to changes in Tacoma's management philosophy.

2. A detailed monitoring plan should be developed after the decision has been made on specific restoration elements. For the first 5 years, annual reports should be prepared that contain the monitoring results of the preceding year so that refinements to the restoration program can be made, as needed. From year 6 to year 20 reports should be prepared every 5 years and every 10 years from year 20 to year 50.

   Monitoring is necessary to determine the effectiveness of the restoration efforts, whether the restoration plan needs to be modified, or if corrective measures need to be taken. The Service should participate in the review of the monitoring results and annual report.

3. A contingency plan and process are needed to guide management changes if the present techniques are not creating the desired conditions. An adaptive management approach should be used so that the desired future conditions for all species are met.

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APPENDIX A

Summary table of all aquatic restoration and mitigation management measures for the Howard Hanson Dam Ecosystem Restoration and Additional Water Storage Feasibility Study
(Source: Corps of Engineers)

Project Package Name	Activity Name	Project Number	Mitigation/ Restoration	Location
Howard Hanson Dam Fish Passage	Dam Fish Passage Alternative 4	FP-04	M/R	Howard Hanson Dam, Right Bank, Intake Tower, 1070-1177 ft Elevation
Headwaters Green River Habitat Mitigation	Mainstem and Sunday Creek Habitat Restoration	MS-04	M	Headwaters Mainstem below Sunday Creek Confluence
Headwaters Green River Habitat Mitigation	Tacoma Wildlands Set-asides in Conservation and Natural Forest Zones	MS-08, TR-09	M	Headwaters Floodplain, RM 71.3-80.1, Gale Creek 1240-1280 ft el., N. Fork 1240-1320 ft el.
Howard Hanson Reservoir Mitigation Zone	Mainstem and North Fork Channel Maintenance	MS-02, TR-04	M	Headwaters and North Fork in New Inundation, 1146-1177 ft Elevation
Howard Hanson Reservoir Mitigation Zone	Tributary Stream Channel Maintenance	TR-05	M	Tributaries to Reservoir in New Inundation, 1146-1177 ft Elevation
Page Mill Pond Mitigation	Page Mill Pond and Page Creek Maintenance	VF-05	M	North Fork Green Floodplain, Left Bank, 1147-1185 ft Elevation
Bear Creek Channel Improvement	Lower Bear Creek Stream Restoration	TR-01	M	Lower Bear Creek, Below HHD at RM 64
Headwaters Green River Habitat Mitigation	Headwaters Culvert Replacement	TR-10	M	Three tributaries in Headwaters Watershed, two small tribs and one large tributary
Middle Green River Side Channel Mitigation	Loans Levee Removal and Burns Creek Reconnection	LVF-03	M	Middle Green River Floodplain, Right Bank, RM 37.9-38.1
Middle Green River Side Channel Mitigation	Metzler and O-grady Connector Side Channel Improvement	LVF-04	M	Middle Green River Floodplain, Left and Right, RM 39-40.2
Middle Green River Side Channel Mitigation	Flaming Geyser North: Cutoff Channel Reconnection	LVF-06	M	Middle Green River Floodplain, Right Bank, RM 44.3
Upper Green River Side Channel Mitigation	Brunner Side-Channel Restoration	VF-03	M	Upper Green River Floodplain, Right Bank, RM 58
Howard Hanson Reservoir Restoration Zone	Mainstem, North Fork and Tributary Restoration	MS-03, TR-06, TR-07	R	Headwaters, North Fork, Reservoir Tributaries, 1177-1240 ft Elevation
Upper Green River Side Channel Restoration	Signani Side-channel Reconnection and Restoration	VF-04	R	Upper Green River Floodplain, Left Bank, RM 58.6-59.6.
Mainstem Green River Gravel Nourishment	Middle Green River Gravel Bar Nourishment	LMS-01, LMS-02, LMS-03, LMS-04	R	Middle Green Mainstem, 4 Alternate Locations, RM 40-45
Truck and Haul of Large Woody Debris	Collection and Transport or Reservoir Woody Debris	MS-09	R	Upper Green River, Left Bank, RM 59-60.3

APPENDIX B

,ocation and Description of Potential Terrestrial Mitigation Sites (Source: Corps of Engineers)				
Site #	Site Description	Treatment Type	Treated Area	Phase
1	BPA right-of-way; grassland and young deciduous forest maintained as shrubs	pasture.	18 acres	1
2	BPA right-of-way; grassland and young deciduous forest maintained as shrubs	pasture	45 acres	1
3	BPA right-of-way; grassland and young deciduous forest maintained as shrubs	pasture	15 acres	2
4	BPA right-of-way; grassland and young deciduous forest maintained as shrubs	pasture	14 acres	2
5	Baldi Field: 50 %of site is grassland, 30 % is mixed forest and 20 % is mature conifer forest.	pasture.	18 acres	1
6	Puget Sound Energy (PSE) ROW, and adjacent Conservation lands. 80% of site is young deciduous forest; 15 % mature deciduous forest and 5 % mixed forest.	pasture.	11 acres	2
7	PSE ROW, and adjacent Conservation lands. 60% of site is young deciduous forest; 40% is mature deciduous forest.	pasture	11 acres	1
8	PSE ROW, and adjacent Conservation lands. young deciduous forest and grassland	pasture	14 acres	1
9	Deciduous forest within the Conservation Zone.	LS forest	10 acres	1
10	Mature mixed forest within the Natural Zone.	LS forest	10 acres	1
11	Mature deciduous and mixed forest stands within the Natural Zone.	plant sedge LS forest	8 acres 2 acres	2
12	90 % young deciduous forest and 10 % young conifer forest in the Conservation and Natural Zones.	LS forest	10 acres	1
13	65 % mixed forest and 35 % deciduous forest within the Natural Zone.	LS forest	10 acres	1
14	60 % mature conifer forest and 40 % mixed forest in the Conservation Zone; small portion is within BPA ROW.	pasture. LS forest	5 acres 15 acres	2 2
:5	95 % mixed forest and 5 % mature conifer forest located in the Conservation Zone.	LS forest	15 acres	1
16	100 % deciduous forest in the Natural Zone.	plant sedge	10 acres	1
17	Koss Field: 80 % mature deciduous forest and 20 % grassland.	wetland pasture. impoundment	10 acres 9 acres 1 acre	2 2
18	85 percent mature deciduous forest, 10 percent mixed forest and 5 percent mature conifer forest on TPU Conservation Zone.	LS forest	5 acres	1
19	Mature conifer and mixed forest habitat in Conservation Zone	LS forest	15 acres	1
20	Mature deciduous forest habitat and emergent wetland in Conservation Zone	LS forest	9 acres	1
22	Mature alder-dominated deciduous forest adjacent to the 1147' pool in Natural Zone.	impoundment plant sedge. plant willows & Oregon ash	3 acres 5 acres 3 acres	1 2
23	70 percent /mixed forest and 30 percent mature conifer forest adjacent to the 1147' pool in Natural Zone.	plant sedge. plant willows & Oregon ash	20 acres 1 acre 6 acres	1 2
24	18 acres of grassland / emergent wetland (upper edge of McDonald field) and 12 acres mature mixed forest and forested wetland within the Natural Zone west of McDonald Creek.	wetland plant sedge plant shrubs plant sedge impoundment	2 acres 29 acres 4 acres 2 acre 6 acre	1 2
25	Grassland between McDonald Creek and Gale Creek.	plant sedge plant sedge	5 acres 2 acres	1 2
26	Forest stands located outside of the identified sites managed for LSF. Primarily between Cottonwood Cr. and Gale Cr., or upstream of the reservoir	LS forest	50 acres 100acre	1 2
-7	Mixed forest and forested wetland north of the old railroad berm in the upper end of the reservoir east of Gale Creek.	impoundment	5 acres	1

APPENDIX C

Response to the Muckleshoot Indian Tribe's May 6, 1998 letter

The following discussion responds to a number of the comments the Service received from the Muckleshoot Indian Tribe on our draft Fish and Wildlife Coordination Act report. Other comments were addressed in the main body of the report. The Service did not receive written comments on our draft report from the state or federal resource agencies.

1. The Service concurs that it is impossible to reliably predict the "with project" outmigration survival rates, or the net benefit for chinook salmon and other stocks of fish that would be produced in the upper basin, including the effect of enlarging the conservation pool under phase one. We are confident, however, that the survival rates through Howard Hanson Reservoir and Dam will be a significant improvement over the very low survival rates that now occur through the existing 48" diameter outlet. We also believe that lower Green River flows under phase one will be greater during the primary outmigration period, April through May, as a result of starting refill earlier. Consequently, we expect outmigration survival to benefit over the "without project" condition.

We, too, have significant concerns over the additional water withdrawals and increased departure from the natural flow regime that would likely occur in phase two. Because of the uncertainty of these factors on the fishery resources and the inability to test them in advance, we have deferred our assessment and position on phase two of the project until the monitoring/evaluation results from phase one and other relevant information are available for review. Please note that our draft CAR assessment of the fishery impacts related to the AWSP was limited to phase one.

2. The Service supports the AWSP's goal of restoring self-sustaining populations of anadromous fish to the Green River's upper basin. We have never suggested that the Tribe assume a disproportionate share of the burden for restoration. We note, however, that harvest rates (ocean, Puget Sound, and in river, combined) for chinook and coho salmon often exceed 50 percent and 70 percent, respectively. Consequently, we believe achieving the goal of restoring self-sustaining populations will very likely require changes in the current harvest management approach for commercial, recreational and tribal fisheries, unless the survival rate through the Howard Hanson Dam and Reservoir proves to be much higher than predicted. The Service does not oppose supplementation, but we believe all realistic efforts should be taken before lowering the restoration goal and relying on permanent hatchery supplementation to maintain the upper basin's anadromous fish runs. We support the use of temporary supplementation, if needed to initiate the restoration of the upper basin stocks, and if the proposed supplementation techniques are determined by the NMFS to be consistent with their objectives under the Endangered Species Act.

3. We believe it is premature to conclude that the restoration and maintenance of self-sustaining populations cannot be achieved. We have acknowledged in our draft CAR that the restoration of naturally self-sustaining populations of salmon to the upper basin will be difficult or impossible under the current harvest rates, in large part because of the loss or degradation of habitat and the additional mortality that would be sustained in passing through the reservoir. On the other hand, we are also optimistic that habitat restoration will occur over time as a result of the AWSP and other actions, including habitat conservation plans, the Section 1135 Green River Basin Restoration, conservation measures related to the Endangered Species Act, etc.

. We take our trust responsibilities to Indian Tribes seriously, as we do our fish and wildlife responsibilities under other mandates, regulations, and laws. We believe we have met these responsibilities and considered the tribes concerns by deferring our position on phase two, by supporting adaptive management to address project uncertainty, and by emphasizing that changes in harvest management will be necessary to achieve the restoration of self-sustaining populations of anadromous fish above Howard Hanson Dam. As stated earlier, the Service does not oppose supplementation, but considers it premature to drop the goal of restoring naturally self-sustaining populations of salmon and steelhead to the upper basin.

5. Comment noted. See discussion under MIT/TPU Settlement Agreement.

6. An increase in the number of planted fish below HHDR is one possible outcome of terminating fish plants to the upper basin. However, we do not consider it the only option, given the proposed chinook salmon listing by the National Marine Fisheries Service and the State's wild salmonid policy.

7. Comment noted.

8. The failure to meet the escapement goal for chinook salmon in three of ten years during the last decade and the tribe's decision to refrain from fishing in a number of years during the 1980's suggest to the Service that a harvest management problem exists. No apportionment of the responsibility for the shortfall was made in the CAR.

The Service does not share the Muckleshoot Tribe's optimism. Based on our recollection of project meetings and statements made by Tacoma and the Corps, we still believe it is very unlikely that the project sponsors would implement all of the elements that the Tribe has identified in the absence of the AWSP.

10. Comment noted.

11. The Green River no longer has a natural flow regime. Water diversions by Tacoma and flood control by the Corps have significantly altered the flow regime. Furthermore, the 25 percent reduction in flow from present conditions would be the result of Tacoma exercising its second supply water right, not the implementation of phase 1 of the AWSP. We accept Tacoma's claim that there are feasible alternatives for storing their second supply water right, if Howard Hanson Reservoir is not available.

Given the fact that the Green River is already an altered and highly controlled system, we support the adaptive management approach to reservoir refill which allows some opportunities for preserving or restoring the shape of the natural hydrograph, while making some flow adjustments to address real time fishery needs. The Service believes that risks of an increased departure from the natural flow regime by Phase 1 of the AWSP is low because the project can be made flow neutral by having Tacoma's second supply water right stored at Tacoma's permitted withdrawal rate, i.e., 100 cfs. At the present time, we see little value in the latter approach.

MUCKLESHOOT INDIAN TRIBE

FISHERIES DEPARTMENT

May 6, 1998

Mr. Gwill Ging
U.S. Fish and Wildlife Service
Western Washington Office
51 0 Desmond Drive S.E., Suite 102
Lacey, Washington 98503

RE: Howard Hanson Additional Water Storage Project (AWSP) Draft Coordination Act Report

Dear Mr. Ging:

Thank you for the opportunity to review the DCAR presenting the USFWS preliminary conclusions on the expected benefits and impacts to fish and wildlife of additional water storage at Howard Hanson Dam (AWSP) and the proposed project mitigation. Due to fieldwork timing, terrestrial concerns, especially elk, will not be addressed in this letter. They will be addressed in our comments on the Draft Environmental Impact Statement

The main project elements are 1) new storage of 20,000 acre-feet raising the total Phase I reservoir volume to approximately 50,000 acre-feet for municipal supply and flow augmentation purposes; and 2) a new state-of-the-art fish passage outlet at HHD. Other elements, not yet fully defined, include an adaptive management approach to reservoir operations, a number of fish and wildlife habitat mitigation projects, and a 15-year monitoring plan.

The Muckleshoot Tribe remains concerned about the impacts of this project on its treaty rights and resources reserved by the Point Elliot and Medicine Creek Treaties as affirmed in U.S. vs Washington 384 F. SUPP. 312 (W.D.Wash. 1974). Because of the central role of Green River fish and wildlife resources in the culture, economy and diet of the tribal community, the many environmental uncertainties, and the potential direct and indirect effects of the AWSP on treaty rights, the Tribe does not have a high degree of comfort with this project. We have communicated these concerns as clearly as possible over the course of the interagency technical review process for this project.

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As you know, the AWSP involves hard-to-assess offsets and trade-offs between species and life stages, between benefits and impacts, and between upstream and downstream resources. As an example, while the new dam outlet promises to restore access to more than 100 miles of anadromous habitat, the potential net gain is impossible to predict given the expected, non-quantifiable reduction in outmigration survival for chinook and other species that result from pool enlargement and lower river flows during spring months.

1 The Tribe is concerned that the AWSP will create new habitat limitations especially for chinook and chum. While it is certain that the AWSP will improve the reliability of the Tacoma water supply, we are not certain the new outlet or proposed habitat mitigation will offset the negative effects of increasingly artificial flow regulation, increased withdrawals, and an enlarged pool. Despite the benefits of flow augmentation to specific life stages of certain species, it is not clear that the overall productivity of the ecosystem can be protected under increasing departure from the natural flow regime. This increasing departure from natural flows is at odds with the growing literature on the importance of protecting natural flow regimes to maintain and restore native fish and their ecosystems.

We are concerned that the mitigation burden for AWSP impacts will be shifted from the project sponsors to the Green River terminal area treaty and sport fishery in the form of further harvest reductions. The DCAR repeatedly suggests that harvest restrictions will be required to compensate for the AWSP impacts on chinook in-reservoir and in-river survival and to facilitate chinook restoration to upper watershed habitat. In fact, the DCAR appears to recommend harvest restrictions alone as the preferred way to make the whole AWSP fisheries restoration work. For example on Page 30, the DCAR states

> *"Consequently, the restoration prospect is considered favorable for steelhead, fair for coho salmon, and poor for chinook salmon without a significant change in the harvest management strategy"* and *"The restoration of chinook salmon in the upper basin is considered poor mainly because of potentially high reservoir passage mortality and*
> 2 *because of resistance by one or more of the resource managers to lowering the current harvest rate".*

The Tribe does not oppose harvest restrictions and frequently imposes harvest restrictions when necessary to protect escapement. However, the Tribe is not eager to reduce its meager remaining treaty fisheries in order to restore fish runs above HHD without the ability to use supplementation to address habitat limitations arising from TPU water supply development and other factors. To illustrate our concern with regard to AWSP impacts alone, an estimated 28% of Green River fall chinook are harvested outside the terminal area by Canada. Should this fishery be eliminated entirely, which is doubtful, it would still not offset the 35% chinook in-reservoir mortality predicted for the AWSP by the

Corps of Engineers staff or make up for the added in-river mortality expected in the 63-mile long reach below HHD.

3 We request that the CAR include a more realistic assessment of the potential for naturally sustaining, (non-supplemented) upriver and downstream populations of chinook, coho and chum given cumulative losses and habitat impairment. Such an assessment should consider the near-total loss of the Duwamish salt marsh estuary, the impact of Duwamish contaminants on these fishes, the present and planned flow alterations, the additional in-river mortality occurring between the dam and the bulk of chinook spawning 20-30 miles downstream, stray rates of upper watershed fish into the lower watershed, and the poor quality of stream habitat above the dam. These factors indicate that use of careful supplementation will be necessary to re-establish and maintain the upper basin population and provide for lower river fisheries.

4 The Service has a trust responsibility to Indian Tribes to insure that treaty rights are not diminished and are meaningfully protected. A recent manifestation of this trust duty is found in the Secretarial Order of June 5, 1977. Given that the AWSP raises environmental and fisheries management issues of enormous consequence to the Tribe, we ask that evidence of the Service's trust responsibility be more clearly incorporated into the final CAR report. Below are our specific comments on the DCAR.

Page 12: NMFS ESA listing of Puget Sound Chinook Salmon

We agree that it is unknown what measures may be required by NMFS in the event that chinook salmon are listed. One possible outcome that should be mentioned in this section is whether NMFS will see any wisdom in allowing threatened fall chinook into the upper watershed to suffer a 35% mortality rate in the reservoir, when a higher survival rate is guaranteed in the lower river.

5 The CAR should state that the Tribe has requested reasonable assurances from the Corps, Tacoma, NMFS and WDFW to insure that the AWSP and its fish and wildlife mitigation measures will not undermine the 1995 MIT-TPU Settlement Agreement intended to mitigate the impacts of the first and second water supply diversions on treaty fish and wildlife. In the event that these assurances are not provided, the Tribe is aware that its ability to exercise its legitimate treaty rights may be in doubt as a result of this AWSP.

Page 13: Fishery Resources

The DCAR states that overfishing along with habitat loss has caused dramatic declines in naturally spawning anadromous fish in the Green River. The CAR should qualify this statement with regard to overfishing, or offer specific information about the nature, geographic location, and extent of overfishing on individual species, and the relative effect of marine survival trends. For example, since 1990 the average natural chinook escapement to the Green has averaged 1,000 fish more than the escapement goal. Steelhead, which are also managed for natural escapement, average about 700 fish over the goal of 2,000 annually. What evidence is there that overfishing has impacted sea run cutthroat trout, Dolly Varden/bull trout, and/or pink salmon? Recent aggressive chum salmon escapement surveys have placed the run at over 10,000 fish annually, although there is no escapement goal for the basin.

The hatchery production values should state which fish are currently planted in the upper watershed.

Page 11: Related Actions

In the discussion of the HHD Section 1135 Restoration, the DCAR should note the potential conflict between the MIT-TPU Settlement Agreement and the Section 1135 Project involving storage of an extra 5,000 acre-feet surcharge storage for flow supplementation purposes. The Agreement specified support for storage of 5,000 acre-feet during spring drought estimated to occur at a 1 in 5 year frequency, as recognized by May 1 snowpack levels at Stampede Pass and reservoir inflow. A maximum of 2,500 acre feet of surcharge storage can be used for flow augmentation during spring, the Agreement requires that the remainder is used during summer and fall for low flow augmentation. If more than 2,500 acre-feet is used during spring for steelhead incubation or other purposes, Tacoma is not obligated to provide the 250 c.f.s. critical instream flow at the Auburn gage as specified in the Settlement Agreement. The Tribe is disinclined to support annual storage of 5,000 acre-feet in non-drought years but is willing to defer this issue to the interagency adaptive management process pending analysis of potential impacts on chinook outmigration and other needs.

Page 23: Future Without the Project

The analysis should assume that some habitat restoration projects will be implemented particularly in the lower river as evidenced by several King County plans developed independently of the AWSP or as prompted by a County or other response to an ESA listing.

6 In addition the assumption that fish plantings above the reservoir will be discontinued ignores the obvious corollary, that plantings below the project will be increased. This has implications for the survival of these planted fish, and their contribution to lower river fisheries.

7 The statement that emphasis on restoring naturally reproducing populations of salmon and steelhead will lead to greater numbers of fish being able to spawn naturally in the river ignores the fact that chinook and steelhead are presently managed for optimal natural escapement.

Page 30: Future With the Project

The Service assumes that the fish passage improvement will be effective, but it is not known what level of improvement will bear out and for which species. We agree with the DCAR conclusion that fish passage mortality may be significant but is impossible to quantify because it is dependent upon reservoir rearing quality, predator/prey abundance, transportation flows through the reservoir, and other factors. Again, in contrast to the easily-predicted and obvious municipal water supply benefits, the AWSP is a difficult proposal to assess.

A key assumption held by both the Service and by the Tribe is that permanent supplementation will not be precluded by the listing of fall chinook salmon. Should this not be the case, our concerns with the AWSP will be further exacerbated as there will be no way to mitigate for habitat limitations arising from this project, existing water development and other impairments.

It should be acknowledged that the target flows of 900, 750, and 575 for wet, normal, and dry years, while providing some valuable instream protection, do not provide for high survival rates for chinook or chum outmigration, early coho rearing, nor fully provide for other spring flow functions in the lower river.

Page 31-33: Fishery Resources Upstream of HHDR

We note the Service's optimism that the eventual significant improvements in forest management practices and recovery of upper basin habitat will result from the increasing emphasis on habitat restoration and protection. In our experience to date, little protection and restoration has been evident. In this discussion, the CAR should note the poor to fair habitat rating of the upper watershed due to historic and continuing timber harvest activities on private land, and the high road densities averaging 3.6 miles/square mile and reaching 6 miles/square mile in some subbasins (US Forest Service Watershed Analysis for the Upper Green River).

In reference to the potential production estimates by the Corps, the DCAR states

> *"We acknowledge that significant changes in the current harvest management strategies for chinook and coho salmon would be necessary for these escapement levels to be reached".*

Here again, the DCAR suggests that harvest restrictions alone (as opposed to supplementation, or at least a combination of harvest restrictions and hatchery supplementation) are the key to make upper watershed fish recovery work.

8 The DCAR statement that *"the low numbers of harvestable natural chinook and the natural production objective for the Green River has resulted in conflicts between the Tribe and WDFW"* incorrectly suggests that the Tribe does not support the

8 escapement goal nor the concept of equitable harvest restrictions for necessary stock conservation. The Tribe fully supports the spawning escapement goal of 5,800 natural chinook and makes every effort to manage its fishery and to influence WDFW sport harvest decisions to meet this goal. The Tribe voluntarily ceased fishing for chinook for a period of four years in the 1980's for conservation purposes. The escapement goal for Green River naturally spawning chinook has been met 70% of the time over the last decade.

Page 33: Fishery Resources Downstream of HHDR

9 The elements 1 through 6 that offer greater flexibility and improvements in instream flow management are relatively low-cost items and could realistically be achieved without the AWSP.

Page 42-43: Discussion, Fishery Resources

We agree that the success of restoration and mitigation depends on the satisfactory development and implementation of these measures "*especially adaptive management, as well as certain actions outside the scope of the project, e.g. harvest management*". The phrase "and/or the ability to use supplementation techniques" should be added to this sentence.

10 While we agree there may be some compensatory rearing in the reservoir, we are not convinced that better spawning and rearing habitat exists in the upper watershed than in the lower watershed.

The DCAR suggests the Service has developed a bias in support of harvest restrictions and against the use of supplementation that bleakens and narrows the potential outcome of the AWSP and related actions for legitimate fish harvest opportunity. For example, on Page 42, the DCAR states

> " *the upper basin stocks are likely to be the "weak stocks" of the Green River. Consequently, the rebuilding and continued protection of the upper rivers weak stocks would likely require a more restrictive harvest management approach for the Green River.* "

The phrase "and/or the use of appropriate supplementation techniques" should be added to this sentence. The DCAR should acknowledge that acclimated smolt release programs are being used with success to restore and reintroduce fish stocks elsewhere in the region. This can be an acceptable means to accelerate recovery rates and increase the chances for harvestable fish, particularly in the case of continuing habitat impacts and trade-offs such as those presented by the AWSP.

Page 44: Phased Approach

11

The Tribe is concerned about the impacts to anadromous fish resources posed by Phase I, as well as Phase II. In the face of the growing literature about the importance of natural flow regimes to biotic integrity, none of which are referenced in the DCAR, tribal technical concerns about Phase II impacts are even more serious. Storage and diversion in Phase II will raise the cumulative spring instream flow reduction to approximately 40% of the median natural streamflow as estimated for the USGS Near Palmer Gage. Some researchers suggest that negative effects may occur at a 25% flow reduction - this level of reduction will be exceeded by Phase I. A good compilation of these concepts can be found in Poff, N.L et al. *The natural flow regime: a paradigm for river conservation and restoration*, BioScience, Dec. 1997. The CAR should weigh these concepts against the benefits of the AWSP.

Page 49: Recommendations

Suggested edits for Recommendation #5: The potential storage of up to 5000 acre-feet in non-drought years should be implemented ...decision on how much if any of this water to store in any given year...

Consider adding a recommendation related to reservoir migration delay and other fisheries concerns such as "The Monitoring and Evaluation Plan elements and details of the adaptive management approach should be should be fully identified along with funding commitments."

Most importantly, the CAR should recommend that flexibility for use of careful supplementation should be allowed as it may be an essential tool to mitigate and compensate for project impacts and existing habitat limitations.

Again, we appreciate the opportunity to review the DCAR, and the complexity involved in assessing the AWSP. If you have any questions, please contact Eric Warner, Biologist, at 939-3319 ext. 125.

Sincerely,

· FOR ·

Isabel Tinoco
Fisheries Director

Cc: Dave Fredericks
Tim Thompson
Office of the Tribal Attorney

CORPS RESPONSES TO U.S. FISH AND WILDLIFE RECOMMENDATIONS

RECOMMENDATION	CONCUR	PARTIALLY CONCUR	NONCONCUR
FISHERY RESOURCES			
1. The fish passage facility should be designed to maximize fish survival. Additional refinements should be pursued during PED.	X		
2. Impacts from pool enlargement need to be fully mitigated for. The Service requests participation in developing mitigation during PED.	X		
3. All restoration should be implemented. The Service requests participation in developing restoration during PED.	X		
4. Adopt an adaptive management approach to project operation.	X		
5. Store up to 5,000 ac ft in non-drought years beginning in Phase I. It would include joint responsibility for the storage and use of the water.	X		
6. The "dampened dam" should be included as a project feature.	X		
7. Begin reservoir refill by Feb 15 and target 5,000 ac ft storage for the month. Analyze measures to resolve flood protection issues.		Agree with refill start, analysis as needed to resolve flood protection, and total February storage for Phase II, 5,000 ac. ft. The Corps has agreed to store 3,000 ac. ft. between 15 Feb and 28 Feb during Phase I, and will evaluate whether 5,000 ac. ft. can be stored in February during PED.	
8. Initially, use the proposed maximum refill rates and evaluate benefits.	X		
9. Storage volume of 25,400 ac ft should be evaluated further to see if the entire quantity is necessary for 98% reliability for minimum flows.		In high run-off years 25,400 ac ft may be more storage than is required to meet 110 cfs at 98% reliability. We can evaluate the need for meeting or not meeting current rule curve based on resource agency and MIT agreement to share risk in not meeting low flow augmentation storage targets and based on evaluation of run-off forecasts.	

RECOMMENDATION	CONCUR	PARTIALLY CONCUR	NONCONCUR
10. Continuous staff coverage should be provided, as needed, during refill and early conservation season. More frequent coordination will be necessary.	X		
11. Continue to develop hydrologic database and improve snowpack surveys for predicting run-off.	X		
12. All large trees in new inundation zone should be retained for fish habitat.	X		
13. Measures to protect TPU's water supply (turbidity) should not be at expense of fish conservation storage. Loss of storage to flush turbid water or to delay refill should be counted against M&I water supply unless replacement can be accomplished without adverse affects to fish.		We agree that measures to protect TPU's water supply will not come at the expense of existing conservation storage. The decision to flush turbid water or delay refill to protect water supply, that may also risk adaptive storage of Section 1135 water or Phase II fish conservation storage, would be a cooperative process involving resource agencies, MIT, Tacoma and the Corps.	
14. The trap and haul of sufficient adult steelhead and salmon to meet Upper Watershed natural production objectives should not be constrained by TPU's water quality concerns.	X		
15. The Service, other resource agencies, and MIT, should be included in development of the monitoring and evaluation plan during PED.	X		
TACOMA LAND MANAGEMENT PLAN (TLMP)			
1. The TLMP is major component of mit. plan. Service recommends adoption of plan as part of mit. package, and used to further refine components.		Concur—the Corps has asked Tacoma to adopt the TLMP as part of the mitigation package. Tacoma has indicated its willingness to do this.	
2. The TLMP should be modified to reflect current recommendations for snag densities and coarse woody debris		The Corps concurs—however, depending on forest stands, snag densities may not be achievable in some areas.	

RECOMMENDATION	CONCUR	PARTIALLY CONCUR	NONCONCUR
ELK AND OTHER SPECIES USING PASTURE AND FORAGE			
1. Elk forage should be increased by:			
a. expanding existing meadows	X		
b. creating new meadows	X		
c. increasing forage value in ROW's	X		
d. increasing forage value in existing meadows	X		
The Service has provided suggested seed and fertilizer mixes	X		
2. Plant evergreen trees and shrubs in ROW areas.		Agree with all suggested species, although BPA and Puget Sound Energy will have ultimate approval in their ROW areas.	
3. Select sites from Raedeke's report. Monitor sites for forage production.	X		
4. Devote small areas of each meadow to testing of productivity, including selection of fertilizers.		Test areas will be established, but probably not on every meadow. Areas with similar soils, topography, and aspect will have only one test area.	
5. Place salt or mineral blocks to attract elk to created pastures.	X		
6. Sow cereal rye, winter wheat, and perennial rye on mudflats in fall to provide additional winter forage for elk.	X		
7. Use a wide variety of plant species to re-vegetate drawdown zone.		Agree. However, due to tremendous seasonal fluctuations of the reservoir, most species can only be planted along the edge of the highest reservoir elevation (including willows, cottonwoods, rushes, and most sedges).	
8. Optimal thermal cover is significantly lacking in project area. Plant shade-tolerant shrubs and conifers under forest canopy.	X		

RECOMMENDATION	CONCUR	PARTIALLY CONCUR	NONCONCUR
PILEATED WOODPECKERS OTHER PRIMARY EXCAVATORS, AND RED-BACKED VOLES			
1. Accelerate late-successional characteristics by:			
a. providing at least .5 snag ≥20" dbh per acre	X		
b. providing at least 11 snags 6" to 20" dbh per acre	X		
c. providing raptor perch trees and snags at edge of reservoir	X		
d. thin even-aged stands to stimulate understory development	X		
e. maintain dominant trees in uneven-aged stands and cut subdominant conifer and deciduous trees.	X		
f. leave felled trees on ground.	X		
g. underplant with shade tolerant shrubs and conifers.	X		
2. Develop natural snags to extent possible. Preferred tree species are Douglas fir and Western red cedar.	X		
3. Recommended topping technique is blasting above at least one live lower branch.		Concur, as long as Tacoma can accommodate this request (i.e., blasting may not be an acceptable method in the watershed, or be allowed by OSHA, etc.)	
4. Provide nest boxes or constructed cavities in areas devoid of snags.	X		
5. Artificial snags should be randomly erected in natural and conservation zones to increase pileated woodpecker HU's.		Concur, though this will be limited by the availability of acceptable logs.	
WOOD DUCKS AND OTHER WETLAND DEPENDENT SPECIES			
1. Sub-impoundments should be created along perimeter of upper reservoir to function as shallow open water habitat during draw-downs.	X		

RECOMMENDATION	CONCUR	PARTIALLY CONCUR	NONCONCUR
2. Sub-impoundment behind old railroad grade should be included as a project element. Fish passage would be required.		Fish passage is currently not included in the design for the 1135 study, as the sub-impoundment is not intended to be over-topped by the reservoir. For the AWS, fish passage will need to be discussed.	
3. Improve habitat within upper reservoir sub-impoundments by installing wood duck boxes, LWD, and planting of emergent vegetation and willows.	X		
MONITORING AND EVALUATION			
1. Recommend development of a management plan for project mitigation lands. Plan would be approved by agency representatives and include an annual SOP and annual reports in years 1-5. In years 6-20, reports would be done every 5 years; years 21-50, reports would be prepared every 10 years.		MIT would also be included in development and approval of management plan. We feel evaluation would not be necessary every year the first five years. Rather, in the first year, and then again in year five. Assume reports would be prepared by the mitigation land manager.	
Tacoma's forest land management plan should be used as the basis for the management plan.	X		
2. Detailed monitoring plan should be developed. Annual reports should be prepared years 1-5; every 5 years (years 6-20); every 10 years (years 20-50)		The Corps plans to have an evaluation of the mitigation sites every 5 years through year 15. Reports would be prepared at the close of each evaluation year. Annual evaluations should not be necessary; the program should be well in hand by year 15.	
3. A contingency plan and process are needed to guide management changes to correct for undesirable results. An adaptive management approach should be used.		Agree; however, by its nature, adaptive management will be developed as we proceed with management (i.e., it cannot be fully developed prior to implementing the mitigation plan).	

SECTION 2. COMMENTS AND RESPONSES

2.0 COMMENTS AND RESPONSES

This section documents the public and agency review of the Howard Hanson Dam Additional Water Storage (AWS) Draft Feasibility Study/ Draft EIS (DFR/DEIS) and how the Seattle District used the review to formulate the Final Feasibility Report/Final EIS (FR/EIS). The section includes a summary of the review process, a discussion of the nature of the comments, a list of commenters, reproductions of comment letters, and responses to the comments. Changes in the FR/EIS text in response to comments are noted in the responses.

2.1 DRAFT EIS REVIEW PROCESS

The Draft EIS was officially filed with the U.S. Environmental Protection Agency and released for public and agency review on May 1, 1998. Approximately 400 copies of the Draft EIS were distributed to elected officials, government agencies, tribal organizations, associations, businesses, individuals, and public libraries. The review period for the Draft EIS lasted 45 days; it ended on June 15, 1998.

One public meeting was held at the Tacoma Public Utilities Building on May 28, 1998, to enable review of the DFR/DEIS. Approximately 17 people attended the meeting.

The meeting consisted of four parts. The first part was an open house where individuals could review posters and displays showing the major features of the AWS Project and issues raised by resource agency and tribal technical staff during the course of the Feasibility Study. The second part was an overhead presentation addressing the purposes, alternatives, issues involved, and anticipated effects of the AWS Project. The third part of the meeting was a question and answer session and in which the audience asked questions of a technical panel. The panel included key staff from the Corps, the City of Tacoma, and staff from R2 Resource Consultants. The fourth part of the meeting was a formal public hearing open to all speakers who wished to provide testimony. A court reporter recorded all hearing testimony (including the panel discussions). Transcripts of the hearing are available for purchase from the Starkovich Reporting Services, PO Box 22884, Seattle, WA 98122; be sure to include the date of the meeting (May 28, 1998).

The Corps encouraged recipients of the DRF/DEIS to submit written comments on the document. Over 80 letters were received. The Corps reviewed these letters as part of the Final EIS.

2.2 Draft EIS Comments

The Corps received written or verbal comments from nearly 90 people during the review process. This included 84 letters, and two comments written on comment cards issued at the public meeting. The comment letters ranged from a one paragraph note, to 65 copies of a form letter signed by 65 individuals, and large packages with lengthy reviews. All comments received full consideration, regardless of their style or volume.

The Corps reviewed all comment letters, comment cards, and hearing records and identified all substantive comments with a number. Comments were numbered sequentially to provide a unique identifier for each comment. This process resulted in the identification of 275 separately numbered comments from all the comment sources.

Table I-1 summarizes the types of commenters and comments received during the comment period on the DFR/DEIS. Seventy-six percent of the letters and written statements were from a single form letter sent in a package by the Washington Recreational River Runners. Comment letters were received from two state agencies and two federal agencies[1]. The Muckleshoot Tribe sent in one response package that was treated as four separate letters (cover letter, general remarks, DFR/EIS, and Wildlife Appendix) that generated 172 separate comments.

In addition to these official comment letters, the Draft Feasibility Report and EIS was reviewed by 1) the U.S. Fish and Wildlife Service (USFWS) pursuent to their responsibility under the Fish and Wildlife Coordination Act. The Service's Coordination Act report provides their official comments and recommendations on the AWS Project (Appendix I Part-1); and 2) pursuant to the Endangered Species Act, USFWS and National Marine Fisheries Service reviewed two Biological Assessments (BA) that discussed project impacts relevant to terrestrial and aquatic species proposed or listed under the Act.

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[1] Additionally, the U.S. Department of Interior sent in comments on June 19, 1998, four days following the official closure date of the comment period. The U.S. Environmental Protection Agency sent comments dated July 7, 1998, twenty-two days after the close of the comment period. To be fair to all respondents, we are listing their comment letter but we did not prepare an official reply to the comments and have not included the letters in this appendix.

TABLE I-1. SUMMARY OF DRAFT EIS REVIEW INPUT.

Category	Number of Letters	Number of Comments
Letters		
Tribal (T)	5	172
Federal Government (F)	2	2
State Government (S)	2	27
Local Government (L) (incl. 1 hearing comment card)	5	32
Association/Organization/Business (O) (incl. 1 hearing comment card)	7	41
Individual (I)		
Non-Form Letters	0	0
Form Letters	65	1
Total Letters	86	275
Testimony at Hearing		0
Total	86	275

Table 1-2 is a complete list of all commenters. This table, which follows the introduction to this section, functions as a table of contents for the comments reproduced here. Attachments to the comment letters that do not contain substantive comments directly addressing the EIS are omitted. No formal verbal comments were received during the public hearing, most of the hearing testimony is in the form of question and answer. Copies of the hearing transcript are available on request. The complete printed record of all comments received on the Draft EIS is maintained by the Corps and is available for public review at the U.S. Army Corps of Engineers, Seattle District Office, 4735 E. Marginal Way S., Seattle, WA 98124-2255.

2.3 RESPONSE TO COMMENTS

The Corps prepared a response to each of the 275 comments received on the Draft EIS. Certain issues were mentioned repeatedly in the comments. These broad, recurring themes frequently involved the factors contributing to the current status of ESA – listed salmon stocks or to issues generated by the specific focus of the DFR/DEIS.

Other recurring themes involved specific criticisms of the DFR/DEIS an/or particular resource concerns. Comments relating to these recurring themes have been grouped into 9 common issues. These issues are discussed below, followed by a synopsis of each issues and the Corps response.

TABLE I-2. COMMENTERS ON THE DRAFT EIS.

Letter	Organization	Name
	Tribal Letters	
T01	Muckleshoot Indian Tribe	John Daniels, Jr.
T02	Muckleshoot Indian Tribe	John Daniels, Jr.
T03	Muckleshoot Indian Tribe	John Daniels, Jr.
T04	Muckleshoot Indian Tribe	John Daniels, Jr.
T05	Muckleshoot Indian Tribe	John Daniels, Jr.
	Federal Letters	
F01	US Dept of Commerce, NOAA	Susan B. Fruchter
F02	Department of Health & Human Services,	Kenneth W. Holt,
	State Letters	
S01	WA Dept of Ecology	Barbara J. Ritchie
S02	WA Dept of Fish and Wildlife	R. Gary Engman
	Local Letters	
L01	Tacoma Public Utilities - Water Division	John Kirner
L02	King County Dept of Natural Resources	Pam Bissonnette
L03	Pierce County Public Works & Utilities	Tim Ramsaur
L04	City of Seattle - Seattle Public Utilities	Diana Gale
L05	Covington Water District	Judith L Nelson
	Organizational Letters	
O01	Burlington Northern and Santa Fe Railway	J. M. (Mike) Cowles
O02	Sierra Club - Cascade Chapter - Water and	Harrison Grathwohl,
O03	Friends of the Green River	Patricia Sumption
O04	Washington Kayak Club - Conservation Chair	Dara Mueller
O05	Center for Environmental Law & Policy	Rachael Paschal
O06	Washington Recreational River Runners	Mark Burns
O07	Washington Kayak Club - Conservation Chair	Dara Kessler Mueller
	Individual Letters	
I01	Ned Sickels	
I02	Jill Langhorst	
I03	Larry Riscl	
I04	Brett Kerin	
I05	Ryan Kerin	
I06	Nick Music	
I07	P. Cimusbo	
I08	Nancy McLeod	
I09	Sara J. Smith	
I10	Teresa Platt	
I11	Martha Gigier	
I12	Jim Sheflojr	
I13	Eric Naumann	
I14	Jeff Weiss	
I15	Shane Turnbull	
I16	S. Down(difficult to read)	
I17	Pat B.(unable to read)	

	Table I-2. Commenters on the DEIS -CONT	
I18	Celia J. Parker	
I19	Martha Parker	
I20	Kelly C.(unable to read)	
I21	Sarah George	
I22	Robin Strong	
I23	C. Darots	
I24	Larry Burke	
I25	Mark Tennant	
I26	Dan Mencocci	
I27	Sara Williams	
I28	Kimberly Schaive	
I29	Todd Turnbull	
I30	Paul Seter	
I31	Lee Price	
I32	Steven Tore	
I33	Veronica Shy Ro	
I34	Samuel N. Smith	
I35	Jim Sutton	
I36	Al Stevens	
I37	Scott Marshall	
I38	Ehren Wiener	
I39	Gerald Elles	
I40	John Miesaloski	
I41	Richard Landino	
I42	Mark Burns	
I43	B. Scott	
I44	Jessica Scott	
I45	Ron Jenkins	
I46	John Hawes	
I47	Jeffery Lynn	
I48	Clay Wood	
I49	Roger Bowles	
I50	Melinda Burns	
I51	Peter Gott	
I52	Jan Cowen	
I53	Donald Hulse	
I54	Sara Kaye	
I55	David Boder	
I56	Shelly Becker	
I57	Amy Thurner	
I58	Charles W Den Tex	
I59	Rick Klug	
I60	Brad McCarrell	
I61	Scott Gollerlieve	
I62	Matt ?(unable to read)	
I63	Gabby Leol	

	Table I-2. Commenters on the DEIS -CONT	
164	Haven Heidlik	
165	Julie Albright	

2.4 COMMON ISSUES AND RESPONSES

Several common issues were identified in the comments received. A brief discussion of those issues, is presented below. The issues are presented in no particular order and additional information on individual issues can be found later in this report in response to specific comments:

1. Recreational Interests
2. Endangered Species Act and the HHD AWS Project
3. Restoring Self-sustaining Runs of Chinook Salmon in the Upper Watershed
4. Dual Project Purpose: Municipal Water Supply and Ecosystem Restoration
5. Basin-wide Restoration
6. Schedule for Reviewing Draft EIS and the Technical Appendices
7. Tribal Interests
8. Priority of Springtime Water Storage and Release
9. Phase II Implementation

2.4.1 Common Issue No. 1: Recreational Interests

Issue:

Proposed project negatively impacts recreational activities on the Green River.

Response:

As described throughout the DFR/DEIS, the AWS Project will be managed to mimic the natural flow conditions in the Green River Basin. To do this, the Corps and Tacoma Public Utilities will be developing a reservoir refill and release schedule that will mimic the natural highs (freshets) and lows (baseflows) in river flows during late winter and spring. The proposed operating strategy is described in Section 4.2 Recommended Plan: Hydrologic Considerations. Under Phase 1 of the proposed project, refill timing and release rates will be based on target instream flows that will be adjusted yearly in response to weather conditions, snowpack, the amount of forecasted precipitation and biological input from fisheries resource managers. Proposed refill rules are designed to meet project objectives for protecting instream resources, meeting existing conservation storage requirements, and providing reliability for storing additional water for M&I and low flow augmentation. Non-fishery resource needs are not a designated downstream delivery objective; however, where those non-fishery resource needs do not conflict with fishery objectives, every attempt will be made to satisfy multiple uses.

2.4.2 Common Issue No. 2: Endangered Species Act and the HHD AWS Project.

Issue:

How does the proposed listing of the Puget Sound Chinook impact the HHD AWS Project?

Response:

The National Marine Fisheries Service (NMFS) and the United States Fish & Wildlife Service (USFWS) recently proposed to list several salmonid species in the Puget Sound region as threatened or endangered under the Endangered Species Act (ESA). The NMFS proposed to list the Puget Sound Chinook salmon evolutionarily significant unit (ESU), which includes the Green River stock, as threatened; and the USFWS also proposed to list bull trout in the Puget Sound distinct population segment (DPS) as threatened. The two federal agencies are also considering other anadromous species for listing under the ESA. The listing of a Green River stock of fish under the ESA adds a complexity to the permitting process of the AWSP, but by itself does not support or reject project need or project benefits.

In the 9 March 1998 Proposed Rule for chinook salmon (50 CFR parts 222, 226, and 227), the NMFS note a variety of habitat problems contributing to escapement problems for Puget Sound chinook. Reduction of slough and side-channel habitat, changes in flow regime, high water temperatures, loss of large woody debris, loss of sediment transport and blockage of fish passage associated with flood control projects were cited as major habitat impacts in the ESU. The AWSP involves a variety of mitigation and restoration measures that as a whole, significantly improve habitat conditions for chinook salmon in the Green River. Reconnection of side channel habitat, modified springtime storage and release operations, provision of a two-level water outlet for water temperature control, and transport of large woody debris and gravel-sized sediments into the Middle Green River represent major habitat improvements. The HHD-AWS also provides important structural and operational features that provide the opportunity to extend the range of anadromous fish to historic habitats. The reconnection of the Upper watershed, through combined upstream fish passage by Tacoma and downstream passage by the Corps, may be the single greatest measure available for restoring significant anadromous fish habitat to the Green River basin. Since the upper watershed contains more than 40% of the historic anadromous stream reaches, restoring anadromous fish access to the upper watershed significantly increases the availability of anadromous fish habitat in the Green River basin.

Biological assessments were prepared for bull trout and Puget Sound chinook (January 15, 1998 and May 22, 1998, respectively) and sent the USFWS and NMFS, respectively for their concurrence. Bull trout was a candidate species at the time and USFWS did not comment on our finding of not likely to adversely affect. NMFS has not yet responded to our BA on Puget Sound chinook. The AWS Project was developed to provide limited restoration of selected ecosystem processes in the Green River Basin, to restore selected aquatic habitats in the Lower watershed, and to provide the opportunity to restore self-sustaining runs of anadromous salmonids in the Upper watershed. The Corps believes that Phase 1 of the HHD-AWS Project provides significant benefits to the Green River ecosystem in general, and may benefit chinook salmon and bull trout. As both species are currently proposed for listing, the Corps will be seeking NMFS and USFWS concurrence during pre-construction engineering and design (PED).

2.4.3 Common Issue No. 3: Restoring Self-sustaining Runs of Chinook Salmon in the Upper Watershed.

Issue:

Many commenters noted that with all the many measures that need to be implemented in concert, and with the perturbations that have been occurring to natural processes in the upper watershed (e.g., clear-cutting that removes a source for large woody debris, and leads to sedimentation of spawning gravels) that goal of restoring sele-sustaining salmon and steelhead runs, especially Chinook, may be unrealistic.

Response:

The AWS Project was initiated in 1989 to address how the existing Howard A. Hanson Dam Project could meet the water supply needs of Puget Sound residents. In response to a change in federal policy in 1994, the study objective was expanded to include environmental (ecosystem) restoration. The goal of restoration is to return the environmental study area to as near a natural condition as is justified and technically feasible. The original HHD project reduces the function of natural processes within the Green River by blocking the downstream movement of gravel-sized and larger sediments and large woody debris and presents an impediment to the migration of anadromous salmonids. The AWSP was designed to provide limited restoration of ecosystem functions of sediment and large woody debris transport and includes the opportunity to re-establish self-sustaining anadromous fish runs in the upper watershed.

Spawning anadromous fish have been recognized as a critical link in the aquatic food webs of the Pacific Northwest. Rearing in the ocean, adult anadromous salmon return to streams with ocean nutrients, enriching the food web from primary producers to top carnivores. At the top of the food web, at least 22 species of wildlife, including black bear, mink, river otter, and bald eagle, feed on salmon carcasses. At the base of the food web, salmon carcasses provide a significant amount of nitrogen to streamside vegetation as well as large amounts of carbon and nitrogen to aquatic insects, and other macroinvertebrates. Re-establishing naturally reproducing, self-sustaining runs of anadromous fish in the upper watershed was considered a reasonable and effective project objective since it provided the greatest opportunity to restore ecosystem functions.

The City of Tacoma is responsible for providing adult upstream fish passage at their Headworks as part of a Settlement Agreement between the City and the Muckleshoot Indian Tribe. Their proposed ladder and trap-and-haul facility will provide passage from their Headworks to above HHD. Anadromous fish can be introduced to the upper watershed by transporting above HHD unmarked adults returning to the Tacoma Headworks, or if found to be beneficial, juvenile salmonids from the Muckleshoot Indian Tribe's Fish Restoration Facility (FRF) could be used to accelerate restoration of upper watershed fish runs. Unlike recent hatchery practices in the Green River, the FRF could provide a short-term rearing program to provide additional production of salmon and steelhead to "jump-start" the recovery and restoration of salmon and steelhead to the Upper Green River. Unlike traditional hatchery production, where natural production is replaced, supplementation is meant to assist in the recovery or maintenance of salmon populations. Integrated planning, management, and operation would be used to minimize impacts to existing natural production and to maximize recovery of populations. Operation of the FRF would utilize features constructed to "naturalize" the rearing of juvenile hatchery fish. The opportunity for supplementation of the Upper watershed is provided by the City of Tacoma's commitment to fund a Fish Restoration Facility for the for the Muckleshoot Indian Tribe. This could be a short-term measure meant to complement (not replace) the natural rebuilding of the runs. The decision to supplement upper watershed recruitment will not be made by the Corps or Tacoma, but will be made by fisheries resource agencies responsible for management of the Green River fishery resource.

The City of Tacoma is responsible for transporting adult fish to the upper watershed, but the HHD-AWS provides for successful downstream fish passage to secure the opportunity to establish self-sustaining runs. Juvenile coho salmon and steelhead migrate downstream at a large size and should pass downstream through the reservoir and dam at a high rate of survival. Given the suite of mitigation and restoration measures proposed in Phase 1 of the HHD-AWS, restoring self-sustaining runs of steelhead and coho to the upper watershed appears promising.

Restoring self-sustaining runs of coho and steelhead appears promising, but there is greater uncertainty for chinook relative to the other species. Chinook are also proposed for listing as a threatened species under the ESA and will receive added attention from NMFS and other fisheries resource agencies during PED. In addition to loss of estuary rearing habitat and low ocean survival, one of the problems facing chinook in the upper Green River is their potential susceptibility to predation and/or delay during downstream passage through the reservoir. In order to maximize the opportunity to restore self-sustaining chinook runs, a fish passage facility was designed to pass the median daily flow during the outmigration season and maximize outmigrant survival. Although the selected fish passage facility is more costly than simpler and smaller designs, the potential to restore runs of chinook, coho and steelhead to the upper watershed justifies the selected fish passage alternative.

In the case of chinook, which are less likely than steelhead to develop self-sustaining runs, supplementation of adult recruitment from the FRF may be especially beneficial in addressing temporary or long-term shortfalls in the restoration goal of self-sustaining runs and harvest. Supplementation on a temporary basis may reduce the period of time required to reach adult escapement goals. If limiting aspects of the chinook life-cycle do not provide sufficient adult escapement on a sustainable basis, long-term supplementation may be considered as a fall-back measure. Again, the decision to supplement upper watershed recruitment on a short-term basis, or on a long-term basis if found to be beneficial, will not be made by the Corps or Tacoma, but will be made by fisheries resource agencies responsible for management of the fishery resource. The Corps of Engineers does not have the authority to decide fisheries management, but the responsibility to ensure that the HHD-AWS is complementary to Green River fisheries management decisions.

2.4.4 Common Issue No. 4: Dual Purpose Project: Municipal and Industrial Water Supply and Ecosystem Restoration.

Issue:

Commenters felt that municipal and industrial (M&I) water supply should not be a project purpose, particularly since it seems to be in conflict with ecosystem restoration.

Response:

This is a dual purpose project water supply and ecosystem restoration. Tacoma is the local sponsor for both purposes and the project must meet both objectives. The project began a single purpose water supply project at a time when the Corps authority did not include ecosystem restoration. In 1994 federal law changed and ecosystem restoration was added as a Corps authority. The Corps, however, cannot bring forth a project on its own and is required, by law, to have a non-federal sponsor to share the costs. Tacoma recognized that ecosystem restoration was a worth while goal and agreed to sponsor, and cost-share that part of the project along with the water supply. While Tacoma is willing to sponsor a single purpose water supply project and a dual purpose water supply/ecosystem restoration project there is no local sponsor who has expressed willingness to sponsor a single purpose ecosystem restoration project. Therefore, both objectives of this project need to be met.

The Howard Hanson Dam (HHD) Additional Water Storage (AWS) Project provides a regional water supply for three areas: 1) metropolitan Seattle; 2) South King County; and 3) Pierce County. Phase I of the AWS Project provides a means to more efficiently use 20,000 acre-feet of water from Tacoma's second diversion water right. It will be stored behind Howard Hanson Dam during the spring for use during the summer as municipal and industrial (M&I) water. Under Phase II it is proposed that an additional 2,400 acre-feet of water be stored behind Howard Hanson Dam for M&I water use. Phase II is contingent upon achieving Phase I objectives and consensus from all resource agencies and the Muckleshoot Indian Tribe (MIT). Even if the AWS Project were not to occur, TPU has indicated they would find another means to store and use this water to meet projected future demands. Mitigation planning for the AWS Project was designed to occur on site to the greatest extent possible.

Restoration efforts were intentionally restricted to areas near Howard Hanson Dam, to restore habitats that may have been initially affected by construction of the dam. By definition all ecosystem restoration features go beyond what is required to mitigate for impacts from storing additional water. As described in the DFR/DEIS we address several key limiting factors that affect salmon and steelhead in the Green River basin. The factors we address include 1) reconnecting the Upper Watershed to the Lower Watershed with a downstream fish passage facility (in combination with the Tacoma Public Utilities adult truck and haul); 2) improvement of water quality (temperature) with use of the selective withdrawal system and flow augmentation; 3) improvement of instream flows by mimicking natural flow fluctuations in refill and release and with summer low flow with flow augmentation; 4) improvement of spawning habitat with gravel nourishment; 5) increased off-channel habitat with restoration of Signani Slough; and 6) addition of large woody debris with truck and haul of wood collected in the reservoir.

The storage of water for flow augmentation (an environmental or ecosystem restoration features) and water supply does create negative impacts to areas below and above the dam. We avoid or minimize the downstream impacts with the phased-implementation of the project: Phase II impacts will be reduced or conditioned by resource agency consultation. Under Phase II storage of 9,600 acre-feet of water for low flow augmentation is proposed. If we store additional water for either ecosystem restoration or water supply we cannot avoid impacts from inundating terrestrial and wetland habitats: the areal loss of habitat around the reservoir will be fully mitigated.

The ecosystem restoration goal was developed over a year-long process of collective work by staff from all of the resource agencies, the MIT, Tacoma Public Utilities, and the Corps. This collaborative process resulted in the defined ecosystem restoration goal and focus for the AWS project and the opportunity for self-sustainability is provided for chinook, coho, and steelhead through construction and operation of the Tacoma Public Utilities (TPU) upstream fish passage and the AWS Project downstream fish passage facilities.

2.4.5 Common Issue No. 5: Basin-wide Restoration.

<u>Issue</u>:

The comments range from statement of support for ecosystem restoration; concern that restoration has a lower priority than water storage; too little restoration is proposed; restoration is needed both upstream and downstream; restoration needs to mimic historical conditions, especially instream flows; restoration should include the entire watershed; restoring the river's natural floodplain and estuary; protection of riparian habitat; reducing impacts of development; acquiring as much land in federal ownership as possible; restoration should increase quality and quantity of habitat (not maintain status quo); restoration is held hostage by the water storage project; overlap between AWS restoration and Green-Duwamish Restoration study; restoration should not include water storage; restoration goals are in conflict with MIT goals; the distinction between restoration and mitigation measures is unclear.

Response:

This is a dual purpose water supply and ecosystem restoration project. Tacoma is the local sponsor for both purposes and the project must meet both objectives. The project began as a single purpose water supply project at a time when the Corps' authorities did not include ecosystem restoration. In 1994 federal law changed and ecosystem restoration was added as a Corps authority. The Corps, however, cannot bring forth a project on its own and is required, by law, to have a non-federal sponsor to share the costs. Tacoma recognized that ecosystem restoration was a worth while goal and agreed to sponsor, and cost-share that part of the project along with the water supply. While Tacoma is willing to sponsor a single purpose water supply project and a dual purpose water supply/ecosystem restoration project there is no local sponsor who has expressed willingness to sponsor a single purpose ecosystem restoration project with a new downstream fish passage. Therefore, both objectives of this project need to be met.

By definition all ecosystem restoration features go beyond what is required to mitigate for impacts from storing additional water. As described in the DFR/DEIS we address several key limiting factors that affect salmon and steelhead in the Green River basin. The factors we address include 1) reconnecting the Upper Watershed to the Lower Watershed with a downstream fish passage facility (in combination with the Tacoma Public Utilities adult truck and haul); 2) improvement of water quality (temperature) with use of the selective withdrawal system and flow augmentation; 3) improvement of instream flows by mimicking natural flow fluctuations in refill and release and with summer low flow augmentation; 4) improvement of spawning habitat with gravel nourishment; 5) increased off-channel habitat with restoration of Signani Slough; and 6) addition of large woody debris with truck and haul of wood collected in the reservoir.

We recognize the concern regarding potential negative effects of additional water storage on fishery resources. This concern resulted in the Phased Project Implementation of the project. It also resulted in our accepting the recommendation of the Fish Passage Technical Committee (FPTC) for the MIS/Fish Lock fish passage facility over other design alternatives. The design of the surface collector provided for the capacity to pass a large volume of water to maximize fish collection efficiency at the dam and to speed fish passage through the enlarged reservoir. We recognize that no fish passage modification at the dam can totally compensate for the pool environment created by existing or additional water storage; however, there is no compelling evidence that the size of HHD reservoir is a fatal flaw to the goal of restoring salmon runs in the Upper Watershed.

The mitigation requirements for impacts to inundated forest and stream habitats under Phase I and II were developed based on standard mitigation assessment protocol. As described in Sections 3 and 4 of the DFR/DEIS and Sections 3 and 8 of the Appendix F1, we have identified impacts based on the areal extent of inundation and mitigated for those impacts by providing an equivalent areal extent of stream improvement. Beginning in 1999 and continuing into 2001, the MIT and other resource agencies will be involved in final design development of these mitigation measures during the plans and specifications phase (PED).

Restoration goals of the Corps of Engineers for the Howard Hanson Dam Additional Storage Project are necessarily restricted to those areas originally affected by Howard Hanson Dam construction and operation. The Corps is committed to restoring habitats in the watershed

The proposed new fish passage goes far beyond that which would be required to mitigate for the pool raise for municipal and industrial water supply. This new fish passage allows for the possibility of achieving self-sustaining runs of fish above HHD which would not be possible without a 'restoration level' downstream fish passage.

This project recognizes the need for additional Lower Watershed restoration measures of which Signani Slough, Gravel Nourishment, Large Woody Debris Transport and Water Temperature Improvements are examples of measures being proposed in this project. The Additional Water Storage (AWS) Project is proposed to provide for the expected growth of the region. However, since all M & I water available under Phase I of the project is part of Tacoma's second supply water right, which they expect to exercise even if the AWS project is not built, most of the growth in the region would take place with or without the AWS project. Population growth results in cumulative impacts and resource problems in all environmental arenas (not just to salmonids). However, since these effects are future effects, and cannot be accurately quantified, a detailed analysis is not possible. Qualitatively, we can predict that more roads will be built, as will houses and support services, such as strip malls, golf courses, play fields, churches, and schools. Terrestrial habitat will be lost, and aquatic habitats may be lost, and will certainly suffer impacts due to increased runoff and pollution from sedimentation, metals, toxic organics, and nutrients from human uses. At the same time, the AWS Project offers an opportunity to provide benefits to salmon through restoration of habitats and fish passage through and around Howard Hanson Dam.

This spring and summer we have begun to modify dam releases to improve downstream habitat by instituting a version of a natural flow regime and by augmenting flows for steelhead redd protection. We have also begun additional studies (side-channel habitat use) to determine what additional modifications to dam releases will optimize the Lower Watershed habitat.

The geographic scope of the AWS Project DFR/DEIS, while focusing on the Howard Hanson Dam and reservoir area, as well as functional aspects of the Green River below the dam, addresses the Green River Watershed above the reservoir in the cumulative impact section, and in various other sections where reference is made to other landowners and agencies that are conducting studies or completing work in the watershed. The Corps is committed to restoring habitats in the watershed, but is limited in what it can do by Congressional authority, agency missions, and sponsor objectives. In addition, the Corps owns very little land in the watershed, and is unable to participate in a land exchange with other entities. Our land holdings are directly related to the dam and areas immediately surrounding the dam. Congress had not authorized purchase of lands by the Corps, except as required to complete construction projects. Thus, the Corps is unable to purchase lands for restoration. This is a major restriction when it comes to protecting wetland, riparian, and other floodplain resources. However, we can and do provide engineering, geotechnical, fish and wildlife biology, and other forms of expertise in the watershed restoration study.

The Corps is also the major action agency in the parallel Green-Duwamish River Basin Restoration study, with sponsorship from King County. These two studies are separate, and authorized by separate Federal statutes, with funding targeting specific actions. The Corps has worked to minimize any overlap.

2.4.6 Common Issue No. 6: Schedule for Reviewing DFR/DEIS and Technical Appendices.

Issue:

The 45 day comment period was felt to be too short, especially considering the length of the document and appendices, and the complexity of the project.

Response:

We recognize that this is a complex project and over the past eight years of the study we have worked hard to include the resource agencies and the Muckleshoot Indian Tribe in each step of the process and hope to continue this cooperative effort during the PED phase of the project. See response to comment O04-2 on page 2-135 of this document for further clarification.

2.4.7 Common Issue No. 7: Tribal Interests

Issue:

Comments generally reflect the lack of the DFR/DEIS to accurately depict tribal treaty rights; effects of the project on cultural resources, and fish and wildlife; effects of MIT harvest on fish and game; tribal positions and/or acceptance on/of certain issues; that tribal positions are not given equal weight to agency positions; and failed to confirm with the tribe certain statements regarding tribal positions.

Response:

The Muckleshoot Indian Tribe is a federally recognized tribe located on the Muckleshoot Indian reservation in King and Pierce Counties. MIT has rights under and is successor to certain bands and tribes who were parties to the Treaty of Point Elliot (12 Stat. 927) and the Treaty of Medicine Creek (10 Stat. 1132). MIT holds federally guaranteed rights under the Treaty of Point Elliot, including fishing and hunting rights, in the Green/Duwamish River system. These rights were retained in exchange for lands ceded by the Tribe in the treaties and are considered property rights. MIT has rights and responsibilities for the management of the fish and wildlife resources and other natural resources of the Green/Duwamish basin, including the protection of those resources from environmental degradation. While salmon and steelhead fishing remains the center of tribal culture, subsistence, and economy, fishing opportunity has been severely restricted in recent years due to low abundance. We recognize the treaty rights of the Muckleshoot Tribe to hunt in the watershed, as well as the agreement between MIT and TPU for ceremonial hunts. We also recognize that E.O. 13007, "Indian Sacred Sites", allows tribal access to Corps project lands (and other Federal lands) for ceremonial purposes.

The identified prehistoric archeological sites in the vicinity of the Howard Hanson reservoir are in the process of being evaluated for National Register eligibility. If they are determined eligible for listing, an Historic Properties Management Plan (HPMP) will be prepared that will address the impact of season inundation for both the current and proposed projects, and a memorandum of agreement will be prepared to stipulate conditions for their management within Howard Hanson reservoir. The historic sites in the pool raise area for Phase II lack site integrity and are, to a large extent, dismantled or destroyed. These identified historic sites appear not to meet the criteria of eligibility for the National Register. These issues will be specifically addressed in the HPMP. This course of action will satisfy requirements of Section 106 NHPA

We recognize that this is a complex project and over the past eight years of the study we have worked hard to include the Muckleshoot Indian Tribe in each step of the process and hope to continue this cooperative effort during the pre-construction engineering and design (PED) and construction phases of the project. Where the MIT have expressed concerns regarding potential project impacts, good faith efforts have been made to address those concerns. Additional studies have been commissioned to evaluate potential issues and in response to identified impacts, measures have been designed to avoid, minimize, or mitigate those impacts. In response to significant concerns raised in the planning process, and as a result of the Agency Resolution Process, a two-phased project approach was implemented. The phased approach incorporated an adaptive management process that conditioned Phase II of the project on the demonstration that impacts could be sufficiently minimized and mitigated and agreement of the MIT and resource agencies. These efforts are meant to provide assurances of project acceptability.

The environmental quality criteria, see Section 3.3.3.3 of the DFR/DEIS, were intended to address, among other things, tribal economic and spiritual sustenance needs for fishing, hunting, gathering of native plant material, and access to the river, wetlands, and forests of the basin. In some cases, tribal interests were not explicitly identified but were addressed by underlying assumptions. For instance, a level of tribal harvest of the Green River fishery was assumed to be an inviolate component of the process of meeting the goal of self-sustaining fish runs

We applied no harvest restrictions in our analysis. We applied a realized long-term average harvest rate which incorporated periods of high harvest, 1980's, and low to no harvest, 1990's. Natural trends in wild and hatchery salmon and steelhead productivity are characterized by periods of high and low productivity. Harvest rates for wild and hatchery fish tend to follow these trends as evidenced by the high degree of variation in Puget Sound salmon and steelhead harvest. We used an average in our analysis for selecting the recommended fish passage facility. Other fish managers may apply harvest restrictions as per their required policy and legal mandates. It is stated within the state Wild Salmonid Policy that higher natural escapements may be necessary to recover wild stocks but that the goal of the policy is greater harvest opportunities for all parties. National Marine Fisheries Service described the ESU for Puget Sound Chinook Salmon as having high harvest rates during the 1980's. The Corps and Tacoma Public Utilities (TPU) are not fish managers and we cannot mandate or require changes in harvest policy. We hope the combined Corps/TPU fish restoration measures will provide a real opportunity for restoration of Upper Watershed salmon and steelhead runs along with protection and substantial recovery of Lower Watershed runs. Full restoration throughout the basin will require cooperative efforts between all resource agencies, MIT, the Corps and Tacoma

The Corps acknowledges that the Muckleshoot Indian Tribe has not indicated approval for or opposition to the Project.

2.4.8 Common Issue No. 8: Priority of Springtime Water Storage and Release.

Issue:

This issue is very similar to issue No. 4; however, comments addressed under No. 4 relate more to the policy decisions of water supply versus fish management. Comments addressed under No. 8 relate more closely to actual use of the water stored behind Howard Hanson Dam.

Response:

The current springtime operating strategy of Howard Hanson Dam reflects the authorized project purposes of flood control and water storage for low flow augmentation. The Corps has also attempted to respond to flow management requests from natural resource agencies, recreational groups and local communities where they do not interfere with authorized project purposes. In some instances, complying with requests from various groups has had unanticipated effects on downstream fisheries resources. Under the proposed AWS, a revised operating strategy will be implemented that gives environmental resource agencies and tribes much greater opportunity, and responsibility, for managing flows in the Green River.

The proposed AWS operating strategy is described in Section 4.2 Recommended Plan: Hydrologic Considerations. Under Phase 1 of the proposed project, refill timing and release rates will be based on target instream flows that will be adjusted yearly in response to weather conditions, snowpack, the amount of forecasted precipitation and biological input from fisheries resource managers. Proposed refill rules are designed to meet project objectives for protecting instream resources, meeting existing conservation storage requirements, and providing reliability for storing additional water for low flow augmentation and municipal water supply. Rules to provide for recreational, community and other non-fishery resource needs were not included in the description of the proposed storage and release strategy. Non-fishery resource needs are not a designated downstream delivery objective; however, where those non-fishery resource needs do not conflict with fishery objectives, every attempt will be made to satisfy multiple uses.

The proposed operating strategy involves the use of dedicated and non-dedicated blocks of storage. The quantity of water available to Tacoma under the second supply water right (also known as SSWR or P5 water right) will be held on a daily basis as dedicated storage. Water stored behind HHD for Tacoma's use will be accumulated at the rate of 100 cfs a day (64 mgd) and conditioned on meeting minimum flow levels established in the TPU/MIT Agreement. The decision to dedicate water to the municipal storage block will be conducted on a real-time basis to maximize the flexibility available with non-dedicated storage while ensuring the reliability of municipal storage is not exacerbated beyond the constraints of the TPU/MIT Agreement.

The non-dedicated storage (Dampen Dam) can be directed for release to meet immediate fishery resource needs or stored for later low flow augmentation to benefit fishery resources. Springtime operation of HHD, where it does not conflict with flood control responsibilities, will be responsive to fishery resource agency and tribal direction. Providing fishery resource agencies and tribes greater input to water storage and release patterns will help minimize the effects of water storage on downstream fisheries resources. The rate of water storage can be designed to increase the rate of water storage during periods of least environmental impact and reduce the rate of water storage during periods of high environmental impact. For instance, under baseline conditions assumed for the AWS, water for low flow augmentation is stored at the rate of 400 cfs per day from 15 April through 31 May (see DFR/DEIS, Appendix F1, Section 9). Based on observations of outmigrating juvenile chinook in the Green and other Puget Sound rivers, the peak outmigration of chinook smolts occurs during May and early June. Storing water during the peak of the chinook smolt outmigration period exacerbates the impact of water storage on the survival of outmigrating chinook. Shifting the majority of water storage from May to March may reduce the impact of water storage and increase chinook survival. Assumptions regarding the effect of different water withdrawal patterns must be confirmed through monitoring, but the proposed adaptive management process provides the opportunity to alter operations to minimize impacts.

In addition to identifying the period of greatest risk to smolt outmigrants, and allowing for subsequent modifications to the storage rules, the proposed monitoring and adaptive management process will help assess flow enhancement scenarios to optimize flow releases. Under the proposed AWS, non-dedicated storage can be released as a freshet to speed downstream movement of outmigrating chinook and increase survival. Monitoring the effects of freshets will help fishery resource agencies and tribes decide whether to release water as a freshet, release water to augment baseflows, or to reduce the rate of water storage. Each of these flow management alternatives may help or hinder production of the various fisheries resources in the Green River. The proposed AWS monitoring and adaptive management package provides increased opportunity to manage water storage and release to meet fishery resource needs, and is a dramatic improvement over 1996 baseline operating conditions. Provided the authorized project purposes of flood control and storage of 22,400 acre-feet of water for low flow augmentation are not compromised, storage or release of non-dedicated water will be responsive to input to fishery resource managers. Where non-fishery resource needs do not conflict with fish protection objectives, every attempt will be made to satisfy multiple uses.

2.4.9 Common Issue No. 9: Phase II Implementation

Issue:

Commenters felt that the DFR/DEIS was vague about the future implementation of Phase II, and, though they understood that Phase II would not be implemented without agreement of resource agencies and the MIT, the statements made in the DFR/DEIS seemed to imply otherwise. They also wondered if additional NEPA documentation would be required.

Response:

The Corps agrees that Phase II would be implemented only following evaluation of monitoring results showing that Phase I objectives have been achieved and with consensus of resource agencies and the MIT. Additional NEPA documentation would be required for Phase II.

2.5 INDIVIDUAL COMMENTS AND RESPONSES

MUCKLESHOOT INDIAN TRIBE

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June 15, 1998

RECEIVED 17 JUN 1998 USACE REGULATORY BRANCH

Colonel Rigsby
U.S. Army Corps of Engineers
Seattle District
4735 E. Marginal Way S.
Seattle, WA 98124-2255

RE: ADDITIONAL WATER STORAGE PROJECT, DRAFT FEASIBILITY REPORT AND EIS: HOWARD HANSON DAM, GREEN RIVER, WASHINGTON.

Dear Colonel Rigsby:

T01-1 The Muckleshoot Indian Tribe has received the referenced draft documents regarding the proposed Howard Hanson Additional Water Storage Project (AWSP) and offers the following comments. Because of the extremely large volume of technical material provided for our review and the refusal of our first requested deadline extension, these comments should not be viewed as a complete response to all issues presented in the draft report and its nine appendices. Therefore, we reserve the option to comment further on this proposal as future opportunities arise. By way of this letter we formally request that the Tribe be given an extension to complete its review of the DEIS and its technical appendices and submit additional comments.

The Muckleshoot Indian Tribe is a federally recognized tribe whose reservation is located in King and Pierce Counties. The Muckleshoot Indian Tribe has rights under and is the successor to certain bands and tribes who were parties to the Treaty of Point Elliott (12 Stat. 927) and the Treaty of Medicine Creek (10 Stat. 1132). The Muckleshoot Indian Tribe holds federally guaranteed rights under the Treaty of Point Elliott, including fishing and hunting rights, in the Green/Duwamish River system. These rights were retained in

T01-1 We recognize that this is a complex project and over the past eight years of the study we have worked hard to include the Muckleshoot Indian Tribe in each step of the process and hope to continue this cooperative effort during the PED phase of the project. However, we must hold to the close of the public review period as scheduled.

T01-1 cont. exchange for lands ceded by the Tribe in the treaties and are considered property rights. The Muckleshoot Indian Tribe has rights and responsibilities for the management of fish, wildlife, other natural resources, and cultural resources of the Green/Duwamish system, including the protection of those resources from environmental degradation. These comments have been generated in the interest of protecting the Tribe's treaty resources.

T01-2 Due to the complex nature of the DEIS and its appendices and the need to place its project impacts in context of the other federal actions above the Dam, Tribal staff have not had sufficient time to thoroughly evaluate the proposed mitigation measures, the magnitude of the impacts of the project upon salmon and their habitat, and the potential benefits of the project. The Tribe is concerned that the proposed fisheries mitigation measures will be insufficient and that the purported benefits will not be realized. The project is fraught with uncertainty, with even the Corps admitting that it is unable to provide a determination on project effects for chinook below the Dam.

T01-3 Numerous simultaneous federal actions are occurring above Howard Hanson Dam that, individually and cumulatively with the Additional Water Storage project, will impair Treaty rights and could limit the potential benefits for this project. For example, the DEIS failed to consider the effects of two Habitat Conservation Plans, a major federal land exchange, and other federal actions. The DEIS is also filled with inaccuracies, inconsistencies, assumptions, and misrepresentations. The FEIS should analyze the effects of multiple federal actions occurring in and around the project area and correct errors as noted in our page specific comments.

T01-4 The DFR/DEIS and its recommendations imply that Phase II implementation will inevitably follow Phase I. The approval and implementation of Phase II requires a consensus of the agencies and the Muckleshoot Indian Tribe, as agreed in the October 28, 1997 Howard Hanson Dam Additional Water Supply Proposal document put forth by TPU and the Corps of Engineers. The agency resolution process seeking federal funding support for the AWSP was explicitly limited to Phase I due to the higher level of ecosystem risk in Phase II. The entire phased implementation approach was predicated on postponing Phase II, perhaps indefinitely, subject to the outcome of adaptive management learning, the details of which remain only vaguely defined. We request that this commitment be reinforced within the FEIS. We also request that a new environmental impact analysis be completed for Phase II of this project.

T01-5 The Tribe's view of the project's potential restoration encompasses a wide range of possible alternatives that include supplementation, and an evaluation plan with specific actions tied to results of the evaluation. Instead, the DEIS appears to approach salmon restoration from the narrow perspective of self-sustaining, naturally reproducing salmon colonizing the upper basin in numbers. While the Tribe holds the same ideal outcome to heart, a number of tribal and agency biologists do not believe that self-sustainability is a probable outcome for chinook and/or coho. However, analyses regarding hatchery

T01-2 The Corps recognizes the uncertainty regarding this project. This concern resulted in the Phased Project Implementation. It also resulted in our accepting the recommendation of the Fish Passage Technical Committee (FPTC) for the MIS/Fish Lock fish passage facility over other design alternatives. It also resulted in an adaptive management approach and proposed long term monitoring plan which will help to optimize the project benefits.

T01-3 Agree that the DEIS does not address the habitat conservation plans (of Plum Creek Timber Co., Tacoma, Department of Natural Resources (DNR), and King County). The omission of the Plum Creek HCP was an inadvertent oversight; neither Tacoma nor King County had begun development of their HCP's at the time of preparation of the DEIS, so the effects of those plans could not be considered. DNR's HCP is state-wide in scope and, while it has been completed, the Corps has not seen a copy of this plan. The Corps did not have information from any of these HCP's prior to preparation of the DEIS, and thus analysis could not reflect any of these actions. The land exchange between the USFS and Plum Creek Timber Co. was briefly addressed in the cumulative impact section of the DEIS (Section 6.11). We agree that all of these actions result in cumulative effects in the watershed and that overall treatment and analysis of this aspect in the DEIS could have been better. For instance, the Corps recognizes that increased acreage devoted to clearcutting sometimes results in increased runoff, erosion, and sediment loads in streams, particularly in areas without adequate stream and wetland buffers. These effects are unquantified and difficult to address with regard to specific impacts to salmonids. However, Plum Creek's HCP establishes 200' buffers for the 130 miles of DNR Types 1-3 streams on its lands, and 100' buffers on 75% of the Type 4 streams (152 miles) on its lands. This is an improvement over existing conditions, and, as Plum Creek puts it, results in, "....in most instances, up to 100 percent of the large woody debris inputs that occurred under natural conditions." With regard to snowmelt, the Corps and Tacoma have been concerned with the effects of clearcutting in the watershed on increased flows resulting from snowmelt in late winter and spring. We will be looking at implementing state of the art snowpack monitoring in the PED phase of this project to better predict runoff and lead to better operations of Howard Hanson Dam flows.

Management by USFS was briefly addressed in Section 1.6.6. The result of land exchanges, adaptive management areas, and other actions by USFS suggest improvements to habitats on Forest Service lands over the next several years. Many lands recently acquired by USFS through the land exchanges were recently cut, and will, through succession of forests, result in less runoff and stream degradation over time.

T01-3 Cont. The USFS has implemented 300' buffers on 179 miles (100%) of Types 1-3 streams on its lands, and no less than 150' buffers on Type 4 streams. Some roads will be obliterated, which will further improve overall habitat quality on Federal lands in the watershed. Thus, on balance, it appears to the Corps that salmon restoration efforts in the upper watershed proposed in the HHD AWS DFR/DEIS will in general coincide with improved habitat management by other watershed landowners over the next several years.

Concerning "inaccuracies", the Corps utilized the best information available, using the knowledge of local experts from the USFWS, Washington Department of Fish and Wildlife, recognized experts from private consulting firms, as well as MIT, to develop the assessment of environmental impacts. Although we acknowledge the presence of errors in the document, "inaccuracies, inconsistencies, assumptions, and misrepresentations" may simply be differences of professional opinion between MIT and the Corps. The Corps intends to continue working closely with MIT and the resource agencies to resolve differences and develop mitigation and restoration plans that will satisfy all stakeholders.

T01-4 Agree—Phase II will not be implemented unless and until the agencies and MIT agree that Phase I management and restoration is successful. A new environmental document will be prepared prior to implementation of Phase II.

T01-5 The ecosystem restoration goal was developed over a year-long process of collective work by staff from all of the resource agencies, including technical staff from MIT. This collaborative process resulted in the defined ecosystem restoration goal and focus for the AWS project. This goal and focus also was required to conform to the Ecosystem Restoration guidance. The opportunity for self-sustainability is provided for chinook, coho, and steelhead through construction and operation of the Tacoma Public Utilities (TPU) upstream fish passage and the AWS Project downstream fish passage facilities. The Corps and TPU do not set fish management policy, and our ecosystem restoration goal and project features do not attempt to set fish management policy. It is up to the NMFS, WDFW, and MIT to define what the fish management policies of the Upper Watershed will be, including whether the goal is natural reproducing, self-sustaining salmon and steelhead or some other species-specific combination of hatchery and wild fish production.

See also Common Issue and Response No. 5.

Comments

T01-5 cont. supplementation and potential adult survival relied too heavily on optimistic assumptions on natural production, and should be re-evaluated jointly with tribal staff.

T01-6 The narrow viewpoint of self-sustainability of salmon runs in concert with implied harvest management restrictions may not be realistic. Neither past fisheries management nor current discussions between the co-managers support this viewpoint. The DEIS suggests that changes in harvest management are needed to achieve the goal of self-staining runs above the dam. Given the projected 40% mortality for chinook through the reservoir and dam, it would be necessary to curtail all fishing in Canada and substantial reductions in Puget Sound to offset this mortality rate. Full restoration should not rely on decreases in harvest to compensate for production losses due to regional water supply needs.

T01-7 We are also concerned that the Corps has not given the restoration goals and objectives of the Tribe the same weight as state and federal agencies and King County. The DEIS discusses the goals of establishing runs of chinook and coho salmon and steelhead trout above Howard Hanson Dam and maintaining existing anadromous salmonid populations by ensuring no net loss of lower watershed habitat. However, the DEIS lacks any recognition of the Tribe's goal to substantially **increase** the quality and quantity of habitat downstream of the TPU Diversion Dam so as to increase salmon production. It is unclear why the Tribe's goals have not been included into the project objectives given the Corps fiduciary responsibility to protect the Tribe's treaty resources. The Corps has the power to significantly improve habitat downstream of the dam independent of this project by simple modification of procedures at the dam and should conduct such activities in the interest of the Tribe's goals for the Green River.

We have also some major specific concerns regarding the impacts and alleged benefits of the project as follows:

- T01-8 The DEIS does not accurately reflect the positions taken by Muckleshoot Indian Tribe through its Fisheries Department staff, and does not accurately present the Tribe's involvement in discussions or activities part of or tangential to the project.
- T01-9 The DEIS narrowly defines the extent of the project area to minimize the magnitude of the project's impacts upon cultural resources and avoids a discussion of the existing project impacts upon cultural resources.
- T01-10 The rigor of the underlying review of the HHD AWS is suspect when primary citations are not used or citations are lacking. For example, the DEIS contains numerous, unsubstantiated statements claiming that the habitat quality above the HHD is good or prime, despite the presence of other documents produced by the Corps and the US Forest Service containing statements to the contrary.

3

Replies

T01-6 See Comment-Reply T01-5 regarding self-sustainability. We applied no harvest restrictions in our analysis. We applied a realized long-term average harvest rate which incorporated periods of high harvest, 1980's, and low to no harvest, 1990's: See also Comment-Replies S02-13, T03-8, T03-48, T03-53, T03-87, and T03-103. Natural trends in wild and hatchery salmon and steelhead productivity are characterized by periods of high and low productivity. Harvest rates for wild and hatchery fish tend to follow these trends as evidenced by the high degree of variation in Puget Sound salmon and steelhead harvest. We used an average in our analysis for selecting the recommended fish passage facility. Other fish managers may apply harvest restrictions as per their required policy and legal mandates. It is stated within the state Wild Salmonid Policy that higher natural escapements may be necessary to recover wild stocks but that the goal of the policy is greater harvest opportunities for all parties. National Marine Fisheries Service described the ESU for Puget Sound Chinook Salmon as having high harvest rates during the 1980's. The Corps and Tacoma Public Utilities (TPU) are not fish managers and we cannot mandate or require changes in harvest policy. We believe the combined Corps/TPU fish conservation measures will provide a real opportunity for restoration of Upper Watershed salmon and steelhead runs along with protection and substantial recovery of Lower Watershed runs. Full restoration throughout the basin will require cooperative efforts among all resource agencies, MIT, the Corps and Tacoma.

T01-7 Based on MIT technical and policy staff comments we (Corps and TPU) received throughout the Feasibility Study and in particular during the Agency Resolution Process, we believe we have given equal or in some cases greater than equal, weight to MIT goals and concerns. Examples include: 1) MIT staff collaborated in the year long development of the ecosystem restoration goal defined before and during the Agency Resolution Process; 2) staff were strong proponents of mimicking natural flow regimes which we have incorporated in our reservoir and release plans; and 3) staff emphasized the need for additional Lower Watershed restoration measures of which Signani Slough, Gravel Nourishment, Large Woody Debris Transport and Water Temperature Improvements were selected. This spring and summer, as your staff advised us to pursue, we have already begun to implement your goal of modifying dam releases to improve downstream habitat by instituting a version of a natural flow regime and by augmenting flows for steelhead redd protection. We have also begun additional studies (side-channel habitat use) to determine what additional modifications to dam releases will optimize the Lower Watershed habitat. Outside of the AWSP, the parallel Corps/King County Green-Duwamish Feasibility Study will provide additional opportunities to substantially increase the quality and quantity of habitat below both

T01-7 Cont. dams.

Conversely, as you stated clearly in your letter (T01) when you question the ability to achieve our project benefits and state that failure is a real possibility, we believe the same uncertainty and caution must be applied to major Lower Watershed restoration. Since most of the Lower Watershed stream, floodplain, and estuarine habitat is permanently hydro-modified by a flood protection dam, extensive levees, and by urbanization, the quantity and quality of substantial habitat restoration is reduced or of a high degree of uncertainty. In addition, because the Lower Watershed natural river processes are so highly modified, it is likely that any successfully completed restoration will be highly dependent on ongoing human maintenance activities. Considered in this light, the achievement of habitat restoration and salmon and steelhead recovery throughout the Basin will also depend on the collective efforts of your organization with all resource agencies, local governments, the Corps and Tacoma. We hope the AWS Project offers the right vehicle to realize a significant portion of this potential. See also Comment-Reply T03-84, T03-45, and T03-108.

T01-8 It is unclear what is meant by this statement. Muckleshoot technical staff have been involved in project planning and during baseline studies for 8 years. The Corps believes the DFR/DEIS accurately reflects the major issues identified by MIT and resource agency technical and policy staff. As discussed in Section 3 of the DFR/DEIS the Agency Resolution Process provided an intensive forum for your technical and policy staff to identify the major issues that were unresolved. This process formalized the ecosystem restoration features of the project and resulted in minimizing the impacts of the water supply features through the phased implementation. On many issues we agree, on some issues we have based our position on our interpretation of the best science available and respectfully disagree with MIT staff positions. See also Comment-Reply T03-45 and T03-108.

T01-9 Comment acknowledged. The identified prehistoric archeological sites are in the process of being evaluated for National Register eligibility. If they are determined eligible for listing, an Historic Properties Management Plan (HPMP) will be prepared that will address the impact of season inundation for both the current and proposed projects. Adverse effects of erosion and inundation will be addressed in the HPMP if the sites are determined eligible for the National Register. The historic sites in the pool raise area for Phase II lack site integrity are to a large extent dismantled or destroyed. These identified historic sites appear not to meet the criteria of eligibility for the National Register. These issues will be specifically addressed in the HPMP.

T01-10 We agree that many sections of the DFR/DEIS contain technical statements without primary references. The DFR is the summary of the feasibility study incorporating the main results of the various technical appendices. The technical reports in the appendices are fully supported with citations. Comment letter T03 points out specific statements or sections that are lacking reference: refer to Comment-Replies for Letter T03-1 to find citations for these primary references. Regarding habitat quality above HHD please refer to Comment-Reply T02-3, T03-70, T03-96 and refer to Fuerstenberg et al. (1997). Also note that unlike the Lower Watershed, stream and floodplain habitat above HHD and Reservoir has not been extensively hydro-modified by water control structures (dams), extensive levees, or by urbanization.

T01-11 • Many of the proposed mitigation or restoration measures should not be credited to this project as they are required or are policies implemented under other programs. Also, many proposed restoration actions, often specified as contingent on the project, are actions that should be taken by TPU and the Corps to mitigate the downstream impacts caused by the existing presence and operation of the dams, regardless of this project.

T01-12 This project, as described, is a water use project, albeit with some salmon enhancement features added, that has the potential to significantly degrade salmon habitat and lower salmon production. The water generated from this project will promote continued urban growth and development within areas where chinook and other salmonids are produced. It is unlikely that the restoration and mitigation components of this project will offset these impacts.

Further page specific comments concerning, fisheries, wildlife, and cultural resources are attached to this letter. These comments are in addition to this cover letter and constitute the tribal comments on this proposal to date. Your immediate attention to all of our comments and concerns is appreciated. Isabel Tinoco, the Fisheries Department Director, will be the lead contact for the Tribe for this project. She and the other staff of the Muckleshoot Indian Tribe represent the interests of the Tribe. Please direct your questions regarding this letter and the attached comments to her.

Sincerely,

John Daniels Jr

Tribal Chair
John Daniels, Jr.

Attachments

cc: NMFS- William Stelle
USFWS - Michael Spears
WDFW- Bern Shanks
EPA - Chuck Clarke

4

T01-11 Should not claim credit for mitigation and restoration measures

Federal agencies need Congressional authorization and funding to complete projects. These projects must be cost-effective and serve the public interest. Documenting benefits is required to get Congressional authorization and funding. In some cases activities taken by others is complementary to the proposed action. We described those activities to show broad support for the proposed action but did not include them as a benefit of the project authorization.

Actions Should be Taken

We agree that the proposed restoration work should be implemented: the restoration authority for this project allows the restoration work and the funding for that work—without that authority, regardless of need, the Corps would not be able to accomplish the work. This is the Federal process that allows the restoration work to be completed; there is no other way the work could be done or credited.

T01-12 The project as described is a dual-purpose project for ecosystem restoration and water supply, not simply a water supply project with some salmon enhancement features. Salmon enhancement is not part of the project purpose. Restoration of ecosystem functions or habitats affected by modified functions that are necessary for restoration of anadromous salmon and steelhead runs is the project purpose. We consider reconnecting the Lower Watershed to the Upper Watershed, which has 45% of the basin and over 100 miles of salmon and steelhead habitat, a significant restoration component of this project.

The restoration goals and objectives for the AWS Project are not keyed to offset impacts from increased urban growth and development. Therefore the restoration features of the project are not meant to offset urbanization impacts. The restoration features were specifically identified and developed to address ecosystem factors that were affected by construction and operation of the dam. Since the AWS Project cannot impact the existing authorized project purpose of flood protection, what factors and watershed areas we could address were limited. As such, we developed the recommended restoration features in concert with resource agency and MIT staff. Mitigation was specific to project impacts from either inundating Upper Watershed habitat, dewatering Lower Watershed habitat, or potential effects to salmon and steelhead survival. Mitigation is not keyed to offset impacts from increased urban growth and development.

Tacoma Public Utilities Second Supply Project provides a regional water supply for three areas: 1) metropolitan Seattle; 2) South King County; and 3) Pierce County. Phase

T01-12 Cont. I of the AWS Project provides a means to more efficiently use TPU's water right under the SSP: Phase II is contingent upon achieving Phase I objectives and consensus from all resource agencies and the MIT. Even if the AWS Project were not to occur, TPU has indicated they would find another means to store and use this water to meet projected future demands. All entities that use the SSP water, either through a completed AWS Project or other means, will be subjected to the scrutiny of the Growth Management Act, the state Wild Salmonid Policy, and the expected dramatic regulatory effects of Endangered Species Act listings. As described above, the AWS Project does not provide restoration (or mitigation) for areas affected by continued urban development; however, it does provide substantial restoration opportunities outside of current and future urbanizing areas of the basin.

T02-1

GENERAL REMARKS

The Tribe continues to have serious concerns about the environmental impacts of the Howard Hanson Dam Additional Water Storage Project. Increased storage presents a significant perturbation to the Green River that may contradict ecosystem restoration objectives. Success of the keystone AWSP restoration element - the proposed fish passage structure - is highly uncertain when combined with a greater reservoir storage burden. While the proposed passage structure is superior to existing dam outlets, even the best outlet design can restore only an imperfect connection between the lower and upper watershed due to the intervening reservoir. The enlarged reservoir would require a refill volume as much as 245% greater than the existing reservoir. Considering present Green River habitat limitations and those likely to be introduced by the AWSP, the DFR/DEIS is unconvincing that the restoration goal of self-sustaining salmon and steelhead runs is achievable, especially for chinook.

T02-2

The AWSP impact analysis relies upon a daily flow spreadsheet model and a set of biological assumptions. To its credit, the DFR/DEIS acknowledges that these impacts, particularly on downstream juvenile migration, are difficult to predict with confidence given an imperfect set of life history assumptions. The minimum baseflows proposed as a mitigation strategy offer some added protection relative to instream flow requirements, yet are frequently lower than spring flows now present in the river. The proposed maximum reservoir refill rates again will provide some protection, yet refill will be prolonged over a longer duration. The use of artificial freshets to promote outmigration survival, particularly at levels modeled, may inadvertently strand as many fish as it transports. In response to these and other concerns, much reliance is made on adaptive management to address project risks and uncertainties. As stated in Appendix F, the first essential element of adaptive management is that "the possibility of failure must be acknowledged and included in policy decisions" (Fluarty and Lee, 1988). We see little in the DFR/DEIS that provides for or acknowledges the possibility of failure.

T02-3

The position held in the DFR/DEIS that 95% salmon survival through the HHD will restore salmon runs is fallacious. Restoration of salmon above HHD is not based upon percent survival at any one part of their life history above the HHD, but upon the total number and condition of outmigrating juvenile salmon that pass beyond the HHD and reach the estuary. However, the habitat, that determines the number of salmon that can be produced, above HHD dam, contrary to statements in the EIS, are not good. Indeed, DFR/DEIS statements concerning the quality of the habitat and estimated salmon production are contradicted by statements contained in the Green/Duwamish River Basin General Investigation Ecosystem Restoration Study Reconnaissance Phase. The Corps is basing it prediction of the number of salmon produced above the dam upon comparison to other systems in much better shape and upon data collected in those systems often decades before. The futility of using such data to support estimates of production is illustrated that production values based upon those estimates failed to prevent the NMFS from being prepared to recommend that chinook salmon be listed as a threatened species.

T02-1 We share your concern about the potential negative effects of additional water storage on fishery resources and the need to complement other ongoing ecosystem restoration projects. This concern resulted in the Phased Project Implementation. It also resulted in our accepting the recommendation of the Fish Passage Technical Committee (FPTC) for the MIS/Fish Lock fish passage facility over other design alternatives. The design of the surface collector provided for the capacity to pass a large volume of water to maximize fish collection efficiency at the dam and to speed fish passage through the enlarged reservoir. We recognize that no fish passage modification at the dam can totally compensate for the pool environment created by existing or additional water storage; however, there is no compelling evidence that the size of HHD reservoir is a fatal flaw to the goal of restoring salmon runs in the Upper Watershed.

We maintain that achieving self-sustaining runs of steelhead and coho appears promising with the proposed mitigation and restoration measures, and agree that there is greater uncertainty for chinook relative to the other species. The proposed listing of chinook salmon in Puget Sound by NMFS underscores the potential benefits of extending the range of anadromous species to historic habitats.

T02-2 The Corps agrees that an essential element of adaptive management is the possibility of failure; along with the need for flexibility to adjust project conditions to avoid further failure. An extensive monitoring program is proposed for the AWS project to provide feedback on the efficacy of project operations. The proposed downstream passage facility expands the window of opportunity for springtime reservoir refill and agency and tribal decisions on the use of a non-dedicated block of storage provide the opportunity to modify reservoir refill and release. These measures significantly enhance project flexibility which is needed to address the "failure" of specific operational measures.

In addition to enhanced project flexibility to address the efficacy of proposed measures, the phased project implementation is the ultimate acknowledgement of the possibility of failure. Rather than proceed with the full project, the Corps and Tacoma agreed to a phased approach where Phase II of the project is conditioned on the demonstration that environmental impacts can be sufficiently minimized and mitigated. This phased approach presents significant risk to municipal and industrial water supply project benefits, a risk that is conditioned on a demonstration of project "success".

T02-3 <u>95% Survival is fallacious</u>
We agree that providing successful passage through HHD is only one component of an

T02-3 Cont. anadromous salmonid restoration program. Our analysis of restoring salmon and steelhead to the Upper Watershed included a deterministic life cycle model that examined adult returns in light of assumptions regarding each phase in the life history of salmon and steelhead. (see Appendix F1, Section 8E: Incremental Analysis of Restoration and Mitigation Projects). Assuming the preferred fish passage facility is implemented, project survival rates (reservoir and dam passage) were 89% for coho, 87% for steelhead and 60% for chinook.

Upper Watershed Habitat Quality

We agree that habitat above HHD is degraded. An analysis of pool frequency of major western Washington rivers by the U. S. Geological Survey (Black and Silkey, 1998) suggests that pool frequency in the upper Green River basin is well below historical levels, but higher than pool frequency such as the Skykomish, Snoqualmie and Cedar Rivers. The majority of land in the upper watershed has been degraded by past timber harvest practices, but ongoing timber harvest is controlled by state and federal restrictions. Under the protection of Habitat Conservation Plans and FEMAT guidelines, stream habitat quality in the upper watershed is expected to improve as should restoration opportunities for all anadromous stocks.

Black, R.W., and M. Silkey. 1998. Water-quality assessment of the Puget Sound Basin, Washington, summary of stream biological data through 1995. Prepared by the U.S. Geological Survey. Water-Resources Investigations Report 97-4164. 78 p.

Production Potential Estimates

We recognized from the outset the limitations of habitat-based production estimates and would welcome current agency and tribal production estimates specific to the Upper Green River. As described in Section 2.A of Appendix F1, we used several different methods and data sources to derive our Green River production estimates, including production estimates for the upper Green River prepared by WDF, US Fish and Wildlife Service, and Bureau of Indian Affairs (D.Chapman, under contract) biologists. Since these estimates were not developed for assessment of self-sustainability of the Upper Green River Watershed, we noted the range of estimates and developed independent assessments. For instance, R. Gerke, a WDF biologist estimated the total adult return (pre-harvest) for the Upper Watershed was 48,700 salmon and steelhead, compared to our estimate of 24,900 adults. The primary difference between the two estimates was the number of coho adults produced in the Upper Watershed.

Letter T02

Comments

T02-4 Improving passage through the Dam will be meaningless unless, the natural spawning habitat can produced significantly greater numbers of fish than are planted above the Dam currently. The passage facility might be swapping one mortality factor for another without a net gain in production. The Corps in the Green/Duwamish River Ecosystem Study writes in regard to the estimate of producing approximately 15,000 coho, 2,500 steelhead and 5,600 chinook above the HHD that:

> *This estimate assumes that the habitat currently above the reservoir is in excellent shape and could support juvenile densities comparable to other relatively pristine systems. ....However, it is likely that any estimates of salmonid production in the upper watershed are optimistic and that actual production might be much lower. The rearing habitat for species such as coho appears to be particularly limited.*

There is insufficient information is presented in the EIS to determine if riparian and stream habitat will be fully mitigated. Indeed, the EIS admits the applicants are unsure of many of the impacts. Additionally, the DFR/DEIS appears to attempt to hold the possibility of "ecosystem restoration" under the auspices of the Green-Duwamish River Basin General Investigation Ecosystem Restoration Study Reconnaissance Phase hostage to the successful implementation of the HHD AWS. This statement is reinforced by statements regarding actions that will not occur unless the HHD AWS is implemented, such as gravel nourishment, actions that are being considered under the Ecosystem Restoration Study.

T02-5 Reading part of the DFR/DEIS is difficult because of the liberal use of the term "ecosystem restoration" and "project". Thus, it is difficult to separate "ecosystem restoration ' allegedly attributable to the HHD AWS project with the "ecosystem restoration" proposed by the US Army Corps, Green-Duwamish Ecosystem Restoration Project. Furthermore, the Green-Duwamish Ecosystem Restoration is also known as a "project". Therefore, when ecosystem restoration is being discussed in terms of the project, it is difficult to sort out what action might be associated with what project.

Replies

T02-3 Cont. Gerke, B. 1987. Counteroffer regarding mitigation for fishery losses due to the Green River Diversion Plan. Washington Department of Fisheries, Draft Letter to City of Tacoma.

T02-4 <u>HHD fish passage is meaningless without Upper Watershed improvements</u>
As described in Section 2.A of Appendix F1, and in response to T02-3, we used several different methods and data sources to derive our Green River production estimates. We believe our estimates are reasonable, but would welcome current agency and tribal production estimates specific to the Upper Green River.

<u>Insufficient information to assess riparian/stream habitat mitigation needs.</u>
The mitigation requirements for impacts to inundated forest and stream habitats under Phase I and II were developed based on standard mitigation assessment protocol. As described in Sections 3 and 4 of the DFR/DEIS and Sections 3 and 8 of the Appendix F1, we have identified impacts based on the areal extent of inundation and mitigated for those impacts by providing an equivalent areal extent of stream improvement. Beginning in 1999 and continuing into 2001, the MIT and other resource agencies will be involved in final design development of these mitigation measures during the plans and specifications phase (PED).

<u>Will be holding GD "hostage" to successful implementation of HHD AWS.</u>
If the HHD AWS does not proceed, various restoration opportunities identified as AWS mitigation and restoration measures will be available for implementation under the Green/Duwamish General Investigation Study (GI). Local sponsors are required to pay 50% of the planning cost, 35% of design and construction costs and 100% of post-construction operation and maintenance of restoration measures. The local sponsor's share of only construction of the proposed downstream fish passage facility is $11,900,000.00. Several of the AWS mitigation and restoration measures would probably be instituted under the Green/Duwamish GI study; however, we are unaware of a willing, local sponsor for the proposed downstream fish passage facility.

T02-5 Section 4 of the DFR/EIS describes the recommended project plan including the specific ecosystem restoration features attributed to the HHD AWS Project. The ecosystem features of the AWS Project were limited in their location and scope by being linked to original construction impacts or processes influenced by construction and operation of HHD. The Green-Duwamish Basin Restoration Feasibility Study is being conducted under the General Investigation Authority of Puget Sound and Adjacent Waters whereas the HHD AWS is conducted under Section 216, modification of an

T02-5 Cont. existing Corps project. The Green-Duwamish Study, under the General Investigation authority, places higher restoration priority in watersheds where there has been Corps influence and is not as limited in location and scope as the AWS Project. The term "project" is used for each and every Corps study or construction project. In this case, project is used in the DFR/DEIS to describe the HHD AWS "project".

SPECIFIC COMMENTS : DFR/DEIS:

Many of the citations used in the DFR/DEIS narrative are secondary citations, rather than primary citations. Additionally, many statements presented as fact or well founded conclusions lack supporting citations. Though, Appendix F include some of the missing citations, each statement in the DFR/DEIS narrative should be properly cited. What is speculation, rather than fact supported by the literature should be clearly specified. Furthermore, given the uncertainty regarding the benefits of the project, each debatable or open to interpretation statement should be supported by citation. For example the following statements are presented as fact, but actual are speculation:

T03-1

Page 139	While this habitat is degraded from pre-management conditions, it is still considered highest quality habitat or has much greater recovery potential than much of the Lower Green River stream habitat.
Page 16	In 1929, the State Department of Game ...
Page 17	No escapement goals have been established for the Upper Green.
Page 17	Of the seven original anadromous stocks ...
Page 249	... very few areas in the upper Green exceed 14° C, which is near the optimum range for growth of most life stages of salmon
Page 249	... upper basin stream habitat is generally in good condition with percent pools ranging from 28-73%.
Page 31	Initial releases of wild salmon ...
Page 50	.... they (MIT) were the one party not granting conditional acceptance to the project...
Page 61, 138	Of the remaining side channel habitat, the HHD AWS Project could seasonally dewater an additional 8.4 acres.
Page 81	The habitat above the dam is not pristine; it has also been degraded from timber harvest, but remains high quality in comparison to most of the Lower River.
Page 84	The Muckleshoot Tribe has not accepted the HHD AWS Project but is implicitly committed to the recommended facility through the FPTC acceptance.
Page 89	A brief evaluation of the hydraulic characteristics of the Upper Green River site [RM 60 to 57] showed that gravel placement there would be transitory and largely ineffective without incorporating retention structures.
Page 89, 250	This measure is estimated to maintain 400,000 ft^2 of spawning habitat in the Middle Green River over a 50-year period

T03-1 As noted, some of the excerpts from the Appendix F technical appendices were copied without the accompanying citations. We have included citations for the specific following comments where appropriate, or have noted where comments represent hypotheses rather than fact.

Page 139 - The statement regarding "habitat recovery potential" is debatable from a semantics viewpoint. While the lower watershed has a high theoretical recovery potential, we assumed that due to extensive flow management, urbanization and industrialization of the lower river, it would be difficult to effect significant restoration. The statement that the upper and middle Green River reaches have a higher recovery potential compared to downstream areas reflects this assumption.

Page 16 - The reference did not have the proper citation. The primary citation was a 1929, Anonymous letter report on the fisheries resources of the Green River from the Washington Department of Game. In describing the availability of steelhead habitat in the Green River basin the letter states "At least 90% of the spawning area and tributaries of the Green River system are above the City of Tacoma's Dam."

Page 17 - We provided salmon and steelhead spawner escapement and juvenile production estimates to MIT and WDFW for review in 1995 (see Section 2A of Appendix F1) and asked for review of our proposed estimates or alternate estimates. Other than a preliminary steelhead escapement estimate from Tom Cropp (WDFW, pers. comm. 1996) WDFW and MIT did not reply to our request. The production estimates and spawner escapements we developed were subsequently used in 1997 as part of a deterministic life cycle model in the incremental evaluation of the fish passage alternatives: Section 8 Appendix F1.

Page 17 - (Washington Department of Fisheries, Washington Department of Wildlife, and Western Washington Treaty Tribes. 1993. 1992 Washington State salmon and steelhead stock inventory, Olympia.)

Page 249 - At the time the DFR/DEIS was written, we had stream temperature data for many of the tributaries in the Upper Watershed from several organizations including 1) U.S. Forest Service; 2) Tacoma Public Utilities; 3) U.S. Fish and Wildlife; 4) Plum Creek Timber; and 5) U.S. Army Corps of Engineers. Except for the Sunday Creek Basin, and for drought conditions, stream temperatures were usually below 14C. As reported by Reiser and Bjornn (1979) the temperature range for chinook salmon spawning is 5.6-13.9 C, the range for incubation is 5.0-14.4 C, and the preferred range

T03-1 Cont. for juvenile rearing is 7.3-14.6 C (with 12.2 C an optimum). The preferred range for juvenile coho salmon rearing is 11.8-14.4 C.

Reiser, D.W., and Bjornn, T.C. 1979. Habitat requirements of anadromous salmonids, in Meehan, W.R., ed., Influence of forest and Rangeland Management on Anadromous Fish Habitat in the Western United States and Canada: Portland, Oregon, U.S. Forest Service General Technical Report PNW-96, unpaginated.

Page 249 - (Wunderlich, R. C. and C.M. Toal. 1992. Potential effects of inundating salmonid tributary habitat due to increased impoundment at Howard Hanson Dam. Western Washington Fishery Resource Office, Olympia, WA. *as cited in* : Appendix F, Section 3: Headwaters tributary stream habitat)

Page 31 - The assumed schedule for release of salmon into the upper watershed was based on completion of the upstream fish passage facility planned as mitigation for the Second Supply Project (Tacoma City Water. 1994. Final Supplemental Environmental Impact Statement for the Second Supply Project (Pipeline No. 5) City of Tacoma, Tacoma, Washington).

Page 50 - The statement contained a reference to a description of the Agency Resolution Process (Paragraph 3.1.2.3b). Shortly after the Agency Resolution Process, the City of Tacoma and the Corps received written, conditional letters of support from state and federal resource agencies involved in the process; a similar conditional letter of support was not received from the MIT.

Page 61, 138 - The citation in the statement on pg. 138 was cited as Appendix F, Section 6 in the DFR/DEIS; the correct citation is: Appendix F, Section 7: Side Channel Habitats in the Green River, Washington.

Page 81 - (Fuerstenberg, R.R., K. Nelson and R. Blomquist. 1997. Ecological conditions and limitations to salmonid diversity in the Green River, Washington, USA [Draft]. Surface Water Management Division, King County Department of Natural Resources, Seattle, Washington 32 p.)

Page 84 - Staff from the MIT have been involved in meetings of the FPTC to review the downstream fish passage facility and have not provided any written documentation indicating their rejection of the FPTC recommendation.

T03-1 Cont. Page 89 - (Appendix F, Section 4.B: Gravel Nourishment in the Middle and Upper Green River)

Page 89, 250 - Appendix F, Part 1, Section 8D: Habitat Restoration and Mitigation Project Descriptions, Part 3.1Gravel Bar Nourishment of the Middle Green River, pg. F1-524.)

Page 81 - The statement in the DFR/DEIS should have read:
"The reconnection of the upper river, through combined upstream fish passage by Tacoma and downstream passage by the Corps, is the greatest single measure available for restoring significant anadromous fish habitat to the Green River basin." Since the upper watershed contains more than 40% of the historic anadromous stream reaches, the value of the single measure of restoring access to this habitat is self-evident.

Page 205 - This statement is the Corps determination based on observation of habitat conditions within the reach and reports by WDFW regarding spawning densities and King County regarding gravel availability. Prior to 1997, spawner surveys had not been conducted for chinook or coho salmon in the gorge so information was not available on habitat use. The 1929 letter report from the Department of Game (see Comment-Reply T03 -1 - 3) noted that the gorge has "limited spawning area because of the extensive deep pools." Steelhead spawner surveys for 1994 to 1996 showed the gorge had the fewest number of redds per mile of any reach surveyed above Auburn (WDFW unpublished data). King County has documented a loss of suitable sized spawning gravels with resultant bed armoring from below HHD to the below Flaming Geyser State Park (Perkins 1993). This armoring layer is estimated to be advancing at 700 to 900 ft per year. Given that spawner surveys have not been conducted on an annual basis, the statement in the DFR/DEIS is considered a general observation. It may not be accurate for a specific species, but is an accurate general reflection of habitat availability.

T03-1 cont.

Page 81. The reconnection of the Upper River ... is the greatest single measures available for restoring significant fish runs to the Green River basins.

Page 205 WDFW spawning surveys show that chinook, coho and steelhead use parts of this sub-basin for spawning; however, this section contains more rearing habitat than spawning habitat.

T03-2 Pages 8, 29. The DFR/DEIS should acknowledge the potential conflict between anadromous fish protection and recreational releases.

T03-3 Page 8 and 28 - There are conflicting statements in the DFR/DEIS regarding flow requirements for salmon and steelhead. A statement on page 8 claims that it is unknown what flows are necessary for salmonids, then on page 28, the DFR/DEIS claims that an unreferenced study by MIT and DOE found that flows are inadequate to meet salmonid needs. See also last paragraph on Page 74.

T03-4 Page 9. Also 4.1.1, Page 116. The DFR/DEIS notes that instead of storing 5,000 ac-ft during drought estimated to occur one in five years on average *"recent negotiations have resulted in the change to yearly storage if the Additional water storage proceeds"*. These negotiations have not resulted in tribal concurrence on annual storage, except to agree that annual storage of 5,000 ac-ft could be an option pending improved understanding of trade-offs between steelhead incubation needs and other species and life stages, and actual runoff conditions in any given year.

T03-5 Page 9. The temperature analysis notes that at times the additional storage of water will be responsible for increasing water temperatures. Since there are already temperature violations above the dam (Smay and Gale Creeks on the 303(d) lists, which means that the state and PEA recognize that these temperature violations are due to human activity)' and at the inflow, the FEIS should state if the incremental water quality standard allow for additional temperature increases, regardless of the temperature downstream. Additionally, throughout the discussion of temperatures, average daily temperatures are typically used rather than maximum, thus underestimating the level and temporal duration of exceedances of state water quality standards.

T03-6 Pages 13, 182. Discussions under headings of Treaty Tribes Rights, Corps Trust Responsibility and Native American Relationships should provide adequate background and recognize federal obligations to protect treaty fish resources and the ability of the Tribe to exercise its fisheries. The FEIS should at a minimum include the following language:

> The Muckleshoot Indian Tribe is a federally recognized tribe located on the Muckleshoot Indian Reservation in King and Pierce Counties. MIT has rights under and is the successor to certain bands and tribes who were parties to the Treaty of Point Elliott (12 Stat. 927) and the Treaty of Medicine Creek (10 Stat. 1132). MIT holds federally guaranteed rights under the Treaty of Point Elliott, including fishing and hunting rights, in the Green/Duwamish River system. These rights were retained in exchange for lands ceded by the Tribe in the treaties and are considered

T03-2 We agree that in the past there have been conflicts between flow releases for recreation and instream flow needs for fishery resources. Under the HHD-AWSP, operating conditions have been proposed to limit potential conflicts. The proposed operating strategy is described in Section 4.2 Recommended Plan: Hydrologic Considerations. Under Phase I of the proposed project, refill timing and release rates will be based on target instream flows that will be adjusted yearly in response to weather conditions, snowpack, the amount of forecasted precipitation and biological input from fisheries resource managers. Proposed refill rules are designed to meet project objectives for protecting instream resources, meeting existing conservation storage requirements, and providing reliability for storing additional water for M&I and low flow augmentation. Rules to provide for recreational, community and other non-fishery resource needs are not included in the description of the proposed storage and release strategy. The proposed operating strategy involves the use of a non-dedicated block of storage. The non-dedicated storage can be directed for release or dedicated storage provided reservoir refill rule curves are satisfied for the original 22,400 ac-ft of low flow augmentation and storage of water available to Tacoma under the P5 water right. Decisions on the use of the non-dedicated block of stored water will consider consultations with fish and wildlife resource agencies. Non-fishery resource needs are not a designated downstream delivery objective; however, where those non-fishery resource needs do not conflict with fishery objectives, every attempt will be made to satisfy multiple uses.

T03-3 We find no apparent conflict that studies funded by Ecology (Caldwell and Hirshey 1989) and the MIT (Caldwell 1992) identify that existing Green River flows are inadequate to meet salmonid needs; yet, there is a "lack of available information on the flow requirements of all fish species" in the Green River. Flow management involves changes in the quantity, timing, duration and frequency of instream flows. Several years of pre-construction monitoring and up to 15 years of post-construction monitoring have been proposed to further identify instream flow needs and minimize project impacts.

Caldwell, B. and S. Hirschey. 1989. Green River fish habitat analysis using the Instream Flow Incremental Methodology. IFIM Technical Bulletin 89-35. Water Resources Program, Washington State Department of Ecology. Olympia, WA. 149 p.

Caldwell J. E. 1992. Green River IFIM study: further analysis. Jean E. Caldwell and Associates, Submitted to Muckleshoot Indian Tribe, Auburn, WA. 70 p.

T03-4 Comment noted.

T03-5 There is no description of water temperature analyses on pg. 9 as referenced in the MIT comment. The water temperature analysis described on pg. 123 and pg. 189 acknowledge that dam release temperatures may exceed inflow temperatures during droughts of extreme duration. While state water quality standards may be occasionally exceeded under proposed project operations, the frequency of temperature excursions will be much less than under existing conditions. As described in Appendix D and Section 4A of Appendix F1 (32 years of modeled temperature releases), the fish passage facility provides a surface discharge capacity. The availability of both surface and deep outlets allows warm and cool water to be blended to meet state temperature standards in most years. Blending of the available volume of cool water extends the period of time that the water temperature of dam releases can be less than inflow temperature.

The water quality analysis showed that the reservoir does tend to warm the river, though generally not above the state water quality standard of 16 °C. The analysis showed that this standard will occasionally be exceeded due to short-term, local hydrometeorological conditions. Due to the long residence time of water in the reservoir during the summer, occasional high inflow temperatures would be attenuated and the river downstream of the dam would be cooler than the inflow. Comparison of AWS Project outflow releases vs. existing project releases, there was an improvement in total degree days for 27 of 34 years. The range of daily water temperature improvement is 0.7-1.2 °C. However, as noted by Caldwell and Associates (1994), the water temperature of dam releases reach equilibrium with air temperatures within several miles of the dam. Water temperatures of the lower Green River are independent of the temperature of dam releases.

Daily average temperatures were used in the temperature analysis, because the proposed project would affect outflow rather than inflow temperatures. With the proposed selective withdrawal system, outflow temperatures in the spring and early summer would reflect the daily variation of inflow temperature as influenced by weather. Once the water in the reservoir is thermally stratified (usually by mid-summer), outflow temperature barely changes from hour to hour. Because outflow water temperature does not undergo diel fluctuation as the inflow temperature does, so hourly analysis is less useful. With no diel fluctuation, there are no higher maximum temperatures. Outflow temperatures are not underestimated, so exceedance of the state water quality standard are not underestimated. In 1995, MIT staff reviewed and accepted the temperature analysis, including the limitation of using average daily temperatures.

Comments	Replies
T03-6 cont. property rights. MIT has rights and responsibilities for the management of the fish and wildlife resources and other natural resources of the Green/Duwamish basin, including the protection of those resources from environmental degradation. While salmon and steelhead fishing remains the center of tribal culture, subsistence, and economy, fishing opportunity has been severely restricted in recent years due to low abundance.	T03-6 By reference to this document, the following text provided by the MIT is included in the FEIS. " The Muckleshoot Indian Tribe is a federally recognized tribe located on the Muckleshoot Indian reservation in King and Pierce Counties. MIT has rights under and is successor to certain bands and tribes who were parties to the Treaty of Point Elliot (12 Stat. 927) and the Treaty of Medicine Creek (10 Stat. 1132). MIT holds federally guaranteed rights under the Treaty of Point Elliot, including fishing and hunting rights, in the Green/Duwamish River system. These rights were retained in exchange for lands ceded by the Tribe in the treaties and are considered property rights. MIT has rights and responsibilities for the management of the fish and wildlife resources and other natural resources of the Green/Duwamish basin, including the protection of those resources from environmental degradation. While salmon and steelhead fishing remains the center of tribal culture, subsistence, and economy, fishing opportunity has been severely restricted in recent years due to low abundance."
T03-7 Page 14. Beginning in 1992, priority for refill timing and operations was shifted to protect lower river fish instead of passage of juvenile fish stocked above HHD. The FR/EIS should clarify that the Tribe considers overall existing project conditions, including the reservoir itself and refill operations, as an impediment to permanent recovery along with habitat loss basin-wide.	T03-7 Comment noted. The proposed operating strategy has been designed to minimize project impacts. The adaptive management process included in the proposal allows adjustment of the refill and storage regime as we refine our knowledge of fishery resource needs in response to project operations.
T03-8 Page 14. The statement "*tribal and state fish managers have the most direct impact on the number of adult fish that spawn in the river and ultimately could spawn above the dam*" suggests that treaty and sport fisheries should bear the mitigation burden for upriver restoration associated with the AWSP. Flood control, storage and diversion impacts have an equally direct impact on the number of returning fish. The DFR/DEIS implication to further restrict tribal fisheries as a way to provide salmon for the areas above the HHD upriver escapements is inappropriate and contrary to the trust responsibility of the federal government to the Tribe. The Tribe historically has restricted its fisheries for conservation purposes, including halting all fishing of Green River chinook for four consecutive years. The Tribe is not eager to give up its meager remaining fisheries to accommodate the impacts of still another least-cost water supply development within its fishing area. Furthermore, the FR/EIS should recognize that salmon originating in the Green River are caught outside of Elliot Bay by international and other U.S. sport and tribal fisheries. By one estimate, 28% of Green River chinook are harvested by Canadian fisheries alone. The Tribe has made major investments to reduce interceptions of Green River fish, including a successful decade-long intertribal allocation case in the federal court system.	T03-8 Flood control and water storage and diversion indirectly affect adult returns in the Green River by impacting salmon and steelhead reproduction and rearing. Harvest management directly affects adult returns. There was no intent to imply the level of responsibility for recovery efforts, but to acknowledge which party's actions most directly affect which portion of the salmon life cycle. In the DFR/DEIS, the Corps and Tacoma acknowledged the need to preserve tribal harvest opportunities and assumed an adult harvest level of 70% for coho, 35% for steelhead and 55% for fall chinook to be an inviolate component of the salmonid life cycle in the Green River.
T03-9 The narrative portion of the EIS typically overlooks the current and future impacts of the HHD upon the downstream transport of large woody debris. Sentences such as the following examples should be modified to include LWD impacts: Page 16. *Specific factors that limit anadromous fish abundance in the Green River related to HHD are:* Page 30. *Almost 50% of the watershed is above HHD and the dam traps a large amount of sediment.* Page 159 *Other significant impacts to the river as a result of Howard Hanson Dam include 1)* Page 207 *Dam and reservoir operations that effect flow releases and sediment transport ...*	T03-9 Comments noted.
T03-10 Page 17. ... *comanaged by the WDFW and the Muckleshoot and Suquamish Indian Tribes.* Amend to read: ... comanaged by the WDFW, the Muckleshoot Indian Tribe and the Suquamish Indian Tribe.	T03-10 Comment noted.

Comments

T03-11 Page 18. In discussions of fisheries management, use of Green River chinook stock data older than twenty years is not recommended. Stock data collected further back in time, while it presents an interesting history, is not relevant because catch of Green River fish were not specifically accounted for and escapement was not assessed with a consistent methodology as in more recent years. Implementation of treaty fishing rights in the 1970's marks the beginning of a period characterized by greater accuracy and consistency in estimation of catch and escapement. With few exceptions, sport catch is still not accounted for specific to the Green River, even when it occurs in the terminal area. The terminal treaty net fishery is the only fishery reliably able to collect data for evaluation. This fishery has collected 1500 tags, and a large number of scales and otoliths for evaluation purposes. Current Green River chinook management is based on passing 5,800 chinook to the spawning grounds. The run is comprised of both hatchery and naturally spawning chinook. The numbers of chinook expected to return to the hatchery and to the spawning grounds are determined by respective pre-season estimates. The number of chinook available for harvest is calculated by applying the harvest rate appropriate to the natural component to the combined hatchery plus natural run size. Typically, several thousand hatchery fish in excess of the hatchery escapement goal of 3,500 fish return to the hatchery. While attempts have been made to estimate the natural component of the run independently during conduct of an annual test fishery, no effective or statistically valid method has resulted. Straying of hatchery fish into the natural escapement is known to occur and clearly accounts for some of the difficulty encountered in forecasting hatchery and natural run sizes. The extent of straying is unknown and is a critical element in making future determinations about the status of Green River chinook. The FEIS should be updated appropriately.

T03-12 Page 18. "*These harvest rates provide one more mortality factor influencing the number of adults returning to spawn that are required to maintain existing runs or that could be necessary for recovery and restoration of natural runs...*" The Corps' poor choice of words will tend to reinforce the unfounded, but wide spread belief that harvest and particularly the Muckleshoot terminal fishery, which is the bulk of the in-river fishery, takes most of the salmon produced in the Green River.

T03-13 Page 18. It is unclear if the statement means that 90% of the coho that entered the Green River were harvested, or that 90% of the 90% of the coho originating from the Green River were harvested.

T03-14 Page 18. It is unclear if the statement stating harvest rates in the Green/Duwamish River peaked in the 1980's refers to harvest rates for populations derived from the Green/Duwamish River peaked in the 1980's or that harvest rates in the river itself peaked in the 1980s.

T03-15 Page 18, 48. WDFW has adopted the Wild Salmonid Policy through its Fish and Wildlife Commission. The tribes have not adopted what is intended to be a joint policy. The last sentence should be updated accordingly.

T03-16 Page 19. : The Washington Forest Practices Act was adopted in 1972. The cumulative effects rule, which requires watershed analysis, or WAC 222-22, was adopted in 1992 and is part of the larger Act. Watershed analysis is a regulatory requirement. Watershed

Replies

T03-11 Thank you for the additional information. Harvest rates used in the life cycle analysis described in the DFR/DEIS were based on harvest data from the 1970's to present.

T03-12 See response to T03-8

T03-13 It was meant that 90% of the coho salmon originating from the Green River were harvested; harvest location was not specified.

T03-14 The statement refers to harvest rates for populations derived from the Green/Duwamish River peaked: harvest location was not specified.

T03-15 Comment noted.

T03-16 Comment noted.

T03-16 cont. Analysis produces prescriptions tailored to specific Watershed Administrative Units (WAUs), of which 5 are located in the project area. Watershed Analysis has been completed for only 1 WAU (Lester). Two more WAUs are still under review by the DNR. Two more WAUs are undergoing analyses at this time, however for these, the private landowners and TPU have failed to submit to the DNR proposed prescriptions to protect public resources.

T03-17 Page 19 *This Act prompted watershed owners to form a watershed analysis team that established specific forest practices rules for the Green River watershed.* This statement is incorrect. See previous comments concerning Watershed Analysis.

T03-18 Page 19 *The rules .... as well as provide guidance on riparian areas and identified sensitive areas, which are to be avoided by new road construction and during timber harvest.* There is no requirement under the current Forest Practices Act or Watershed Analysis to avoid road construction or timber harvest on unstable slopes or in riparian areas. The prescriptions allow road construction on unstable slopes following submission of an alternate plan. Furthermore, no WSA to date has produced riparian prescriptions that even approach that considered necessary to comply with the ESA. The Corps, though a landowner in areas covered by the ongoing Watershed Analyses, is not a regular participant at meetings that are preparing to propose prescriptions to protect existing salmon habitat and allow for the restoration of additional salmon habitat.

T03-19 Page 19. The 3rd paragraph should be corrected to reflect the following : In 1994, the NW Forest Plan was adopted by various federal agencies and created the concept of the Snoqualmie Pass Adaptive Management Area. This plan and its Record of Decision modified the Mt. Baker-Snoqualmie (MBS) Forest Plan. The Snoqualmie Pass Adaptive Management area has its own plan and was likely adopted as a modification to the revised MBS Forest Plan.

T03-20 Also, the DFR/DEIS is not current regarding the nature of the land exchanges. The land exchange with Weyerhaeuser is complete., occurring 5 months before the publication of the DFR/DEIS. Furthermore, the USFS is considering transferring much of the remaining Forest Service Land to the Plum Creek Timber Company. The impact of the Weyerhaeuser and PCTC land exchanges is that the bulk of the old-growth, mature and late seral timber left above HHD will be transferred to private entities that will harvest the timber and construct roads with considerable less environmental protections than those currently in effect on Forest Service lands. Federal lands enjoy a much greater levels of protection than private and state lands, yet even the standards of protection are federal land are not guaranteed to prevent a salmon run from being extirpated, let alone ensure harvestable numbers of salmon. Yet, now no-cut buffer widths that can exceed 200 feet could be reduced to as little as 30 feet. The old growth and late seral timber that will be harvest within a tree-height of the streams will reduce the rate of habitat recovery in the system and over the long term reduce the habitat quantity and hence salmon production. The extent to which the land exchanges will degrade the overall quality of salmon habitat above the dam and hence influence the salmon production estimates has not been quantified.

T03-17 A watershed landowner indicated that landowners had worked together to achieve certain prescriptions. This was inadvertently reflected as a "team" effort in the DFR/DEIS.

T03-18 This is simply a statement reflecting the intent of the State Forest Practices Regulations, as well as King County's Sensitive Areas Ordinance.

T03-19 Comment noted.

T03-20 The Weyerhaeuser land exchange is referenced in Section 1.6.6—your comment that this exchange is completed is appreciated. The Plum Creek Timber land exchange is discussed in Section 6.11. The Corps shares your concern that large timber will be cut as a result of these land exchanges and will no longer be available as habitat or LWD recruitment. Plum Creek's HCP, and other HCP's now in preparation, will implement wider buffers near streams and wetlands. Even without the possibility of improved habitat management under these HCP's, the effects on salmon habitat resulting from too narrow buffer widths would be impossible to quantify under our study authority. We recognize that such practices often result in negative effects on streams, particularly through sedimentation, reduction in LWD, loss of shading, higher water temperatures, reduction of stream productivity, loss of spawning gravels, loss of rearing habitat, and other effects. The restoration measures the Corps and Tacoma have jointly proposed will only be effective within the framework of improved habitat management regime implemented by all landowners in the watershed. We are aware that stronger habitat protection measures will be implemented in the near future and are counting on these measures to aid in salmonid recovery efforts.
See Comment-Reply T01-3.

T03-21 Page 34. The DFR/DEIS states that additional storage capacity is needed to augment flows in the summer and early fall for salmon and steelhead rearing, and that the Tribe has been a strong proponent of additional summer flows. However, the Tribe has voiced concerns about going beyond provisions to enhance summer/fall flows already made in the 1995 MIT-TPU Settlement Agreement in light of evidence that high spring flows are functionally important to salmon production.

T03-22 Page 37. Table 2-1 is missing several other applicable federal laws such as:

Secretarial Order 3206, American Indian Tribal Rights, Federal-Tribal Trust Responsibilities and the Endangered Species Act.

Executive Order 12898 *Environmental Justice*

Executive Order 13007 Indian Sacred Sites

Executive Order 11593 Protection and Enhancement of Cultural Environment

T03-23 Page 46. Despite refill strategies presented in the DFR/DEIS, we are concerned that adequate commitments have not been made to insure that the Phase I Preferred Alternative can meet the criteria "*water supply measures must avoid any overriding environmental problems*". Notwithstanding more cooperation and adaptive learning in recent years, reservoir operations involve conflicting objectives and often harm downstream fish resources. This problem is aggravated by a limited ability to forecast widely variable inflows and precipitation, and the fact that competing interests generally receive a higher priority than anadromous fish protection. The FR/EIS should specify what financial commitments will be made by each sponsor for improved staffing and forecasting and for reservoir operations, coordination, and streamflow management, and what commitments will be made to afford improved protection for anadromous fish including during times of water shortage.

T03-24 PAGe 48, 117 *Habitat restoration measures upstream of HHD are dependent on providing adequate fish passage through the dam.* This statement does not follow from an analysis of the project goals and definition of success, which is based upon a 95% survival rate through the HHD, rather than absolute numbers of juveniles that reach the Duwamish Estuary. As mortality through the dam is density independent, then the number of fish that pass through the dam will increase with the number of fish hatched or planted above the dam, even in the absence of a new juvenile outlet through the dam. The Corps has failed to provide compelling evidence that natural production above the Dam, when all mortalities are factored in, will result in more juvenile fish reaching the estuary than current management practices.

T03-25 Page 50. *Green-Duwamish River Ecosystem Restoration Team. A multi-agency panel participated in the formulation of habitat restoration measures with representatives from the USFW, USFS, MIT.* This sentence implies that the Tribe had greater involvement with the Restoration Team than occurred. The acknowledgment section in that report does not even list the Tribe as a major participant. The Muckleshoot Indian Tribe Fisheries Department (MITFD) was not granted the opportunity to review a draft copy of the Ecosystem Restoration Study and the MITFD's comments upon the incorporated King County document were not addressed by the Corps. Furthermore, the Tribe

T03-21 Comment noted.

T03-22 Items that pertain to the Corps of Engineers will be added to the table for environmental compliance in revised section 8. Secretarial Order 3206 only applies to the Interior Department agencies.

T03-23 Water Supply Impacts

As noted in the DFR/DEIS, Section 1.8 Without-Project Condition, Section 1.8.4: Municipal and Industrial Water Supply, the without-project condition assumes that Tacoma will construct Pipeline No. 5 and withdraw up to 100 cfs from the Green River at their Headworks facility on a run-of-river basis under their existing water right. The impacts of reducing flow in the Green River below Tacoma's Headworks by 100 cfs during the spring and early summer must be addressed through Tacoma's water right. The proposed project provides the opportunity to optimize springtime flow management to satisfy fisheries resource needs and municipal and industrial water supply and mediate much of the detrimental effects of the P5 water right on downstream fishery resources.

Competing Interests

See response to T03 - 2

Staffing Commitments

Provisions for continuous project operation during the spring refill and summer storage management period have been included in the proposed operations plan. As stated in Section 4.12 Recommended Plan, Operation and Maintenance:

> "For 3½ months from 15 February to 1 June, the high activity rate at the fish passage facility will require up to 11 additional personnel to operate the gates, stoplogs, and fish discharge equipment. Coordinating the main gates and the fish passage gate is sufficiently time consuming to require additional staffing. The additional staff will work three shifts per day, generally three persons per shift. The rate of pool fill during this period and the rate of outmigration requires operation through the night. The design team will examine controlling the pool fill so as to eliminate the third shift by preventing the need for nighttime stop log installations. The pool raise staffing equates to 5 FTE.

During the summer and fall months, stoplog changes will not be so frequent, and pool elevation can be managed to allow stoplog operation during the day shift. Personnel will be needed to remove the stoplogs, but will not be needed full time. Assuming that the outflow does not exceed 1,250 cfs, the fish passage gate will control the flow and the

T03-23 Cont. main gates will not be needed. Therefore flow control will not require staffing above current levels. However, three man crews will be required for the occasional stop log removal. Upland habitat maintenance will be scheduled for this time. The total staffing for these months equates to 3 FTE."

T03-24 We disagree. Under existing conditions, an estimated 5 to 25%of juvenile salmonids survive passage through the HHD project. Under Phase I, survival through the reservoir and dam is expected to increase to 60 to 89% depending on the species. The anticipated increase in project passage survival, improved downstream flow management and proposed restoration and mitigation efforts provide compelling evidence that more juvenile salmonids will reach the estuary than current management practices.

T03-25 The referenced Reconnaissance Report was the result of extensive consultations with the MIT, local governmental organizations and resource agency representatives. King County, the Green-Duwamish Restoration Project's local sponsor, and the USFWS, as the federal coordinating agency, were the only parties provided with the opportunity to review the Recon report. A Feasibility Study Report, which represents the next phase of the ecosystem restoration process, will be submitted for review and comment in the Fall of 1999. During that process, written and oral comments from the MIT will be addressed and given careful consideration in further plan development. We will be coordinating very closely with the MIT during the Feasibility Process.

Comments

T03-26 believes that the HHD is greatly responsible for the lack of large woody debris in the mainstem of the Green River below HHD, an issue not explicitly addressed in the Green-Duwamish River Basin Ecosystem Restoration Study. Aerial overflights of the river show considerably more large woody debris above the Dam than below. Given the constrained nature of the Green River gorge and the extensive levee systems below Newaukum Creek, the area above HHD represents over 50% of the potential large woody debris contribution to the downstream reaches.

T03-27 Page 55. Aquifer storage recovery of 20,000 ac-ft of Green River water in the Federal Way aquifers (*i.e.* the Oasis Project) has been proposed as a viable alternative to the AWSP. Engineering review has shown that this project has a high likelihood of success. This alternative should be discussed in the FEIS along with any technical analysis that indicates this alternative will not meet the water supply needs of the applicants.

T03-28 Page 57. The DFR/DEIS narrative lacks a citation for the estimated 1 million salmon and steelhead smolts that could produced from the upper Green. Though, some citations are in Appendix F, the FEIS should also include the citations as previously suggested.

T03-29 Page 58. Alternative 9B, Downstream Fish Passage at the Dam Without Water Supply, would result in the most successful ecosystem restoration short of dam removal,. because it would limit the downstream effects of storage upon salmon and maximize in-reservoir migration if accompanied by careful refill operations and a new outlet facility. In tandem with the potential Oasis alternative , it could meet screening criteria for both water supply and restoration.

T03-30 page 60... *not consistent with ecosystem restoration guidance or the Basin Restoration Project.* The section in the Basin Restoration Project supporting this statement should be clearly cited. Furthermore, there has been no official announcement that the Basin Restoration Plan is a document with which plans or proposals must be consistent.

T03-31 Page 60. Discussions that refer to permanent and temporary supplementation programs should recognize that temporary and possibly permanent supplementation is a concurrent mitigation component for TPU water development impacts under the 1995 MIT-TPU Settlement Agreement and such supplementation may be required to address shortfalls in the restoration goal of self-sustainability and harvestability. Because of the AWSP impacts of reduced lower river flows during spring and the estimated 36% mortality rate on juvenile chinook passing the existing reservoir, restoring fish runs above HHD on a self-sustaining basis is questionable. Harvestable, self-sustaining runs of chinook below the HHD may not be feasible given habitat limitations, including the 97% of estuarine habitat.

T03-32 Pages 61-62. It is unclear as to which Basin Analysis the DFR/DEIS is referring to in paragraph 2. The FEIS should quantify the amount of mitigation associated with the proposed habitat improvements, so that there is clear documentation that the improvements equal the extent of habitat impacts.

T03-33 Page 63. As written, it is unclear as to whether or not if fish will be stranded as part of the sub-impoundments in Alternative 11C1. It should be stated in the EIS narrative that

Replies

T03-26 We concur that much of the large woody debris input to the Green River has been blocked by construction and operation of HHD. As described in Appendix F, Section 8.D, Habitat Restoration and Mitigation Project Descriptions, Measure 4: MS-09 Truck and Haul of Large Woody Debris, the Corps is proposing to transport select pieces of large woody debris collected during annual reservoir debris removal operations for placement into the Green River below Tacoma's Headworks.

T03-27 In Section 2.6.6e of Appendix B, is a discussion of the proposed aquifer project in Federal Way (OASIS aquifer project). The unit cost of this alternative is similar to the cost of the "generic" alternative used to help quantify project benefits - so in effect, the OASIS project is included in the water supply benefit analysis of this project. Under the OASIS project water is more expensive than that proposed in the AWS project. In addition, the OASIS project does not provide for environmental restoration activities. No local sponsor has come forward for the single purpose restoration project, which incorporates a downstream fish passage facility.

T03-28 Comment noted.

T03-29 Construction of a new downstream fish passage facility at Howard Hanson Dam would not be available under Section 1135, the Water Resource Development Act of 1986 or Section 206, the Water Resource Development Act of 1996. Under those Acts, a non-federal sponsor is required to provide 25-35% of planning, design and construction costs, and 100% of all operation and maintenance costs. Not more than $5 million may be spent at a single locality.

Investigation of a new Section 216 Project would also require a local sponsor. The local sponsor would be required to pay 35% of the planning and design costs, 35% of construction costs and 100% of post-construction operation and maintenance. The local sponsor's share of only construction of the proposed fish passage facility is $11,900,000.00. A local sponsor for a single purpose restoration project providing the downstream fish passage facility proposed under the HHD AWS has not been identified.

T03-30 While it is true that there is no requirement for the project to be consistent with the Basin Restoration Plan, it does need to meet the project objective of restoring fish runs above HHD, *and* it is not consistent with ecosystem restoration guidance." See DFR/DEIS Section 3.2.4.12.

T03-31 We acknowledge that the Fish Restoration Facility, provided by the local

T03-31 Cont. sponsor as part of the 1995 City of Tacoma and Muckleshoot Indian Tribe Settlement Agreement, will have the capacity to supplement natural salmon and steelhead recruitment in the upper watershed. While we believe that supplementing recruitment is not an absolute requirement for restoring anadromous fish production in the upper watershed, supplementation may be beneficial in addressing temporary or long-term shortfalls in the restoration goal of self-sustaining runs and harvest. Deciding on the need, and the level and duration, of supplementation are not the responsibility or authority of the HHD AWS Project.

T03-32 The referenced "Basin Analysis" is the Green-Duwamish River Basin, General Investigation Ecosystem Restoration Study, Reconnaissance Phase.

T03-33 As presently envisioned, sub-impoundments will be designed to flood during high reservoir pool elevations and maintain surface water during reservoir drawdown. Juvenile salmonids that do not exit a sub-impoundment pool during reservoir drawdown may exit the sub-impoundment when the pool overflows during precipitation events. Additional detail on the design of sub-impoundments will be developed during the PED project phase. The potential for juvenile salmonid trapping during drawdown will be one design consideration.

T03-33 cont. the elevation of the culverts in relation to the impoundments will be placed and/or replaced to prevent juvenile fish stranding in these impoundments.

T03-34 Page 66. The DFR/DEIS is overly optimistic regarding the potential for the proposed ecosystem restoration to achieve healthy, naturally reproducing self-sustaining chinook and coho runs in the upper watershed. While the outlook for steelhead is considered promising due to their large size at outmigration and other factors, it is essentially bleak for chinook. The DFR/DEIS reports that studies in the existing reservoir have estimated a 35-40% reservoir and dam passage mortality rate for chinook. This mortality will be incurred by chinook prior to additional mortality incurred during the migration from above the HHD to the sites below the HHD from which chinook are currently released. The DFR/DEIS should discuss these limitations more specifically and emphasize that while self- sustainability may be a goal, the ability to achieve healthy, harvestable naturally spawning salmon runs without continual supplementation is highly uncertain.

T03-35 Page 68. It is not clear how the Preferred Alternative meets the criteria stated as *"Mitigation needs must be addressed prior to development of restoration projects, and meet the full mitigation requirement"*. We are not convinced that the daily flow model has identified and quantified all impacts and mitigation needs associated with the AWSP, nor that the Preferred Alternative can be implemented in a manner that avoids and/or minimizes impacts to downstream migrants and early rearing habitat in the upper or the lower river.

T03-36 Page 68. It is unclear why impacts to downstream migrant fish are incorporated in side channel mitigation proposal. The proposed side channel mitigation projects, which in the DFR/DEIS are limited to two large side channels at O'Grady and Metzler Parks, address mitigation for side channel disconnection. The FEIS should specify how the mitigation for side channel habitat disconnection will address impacts to the downstream migration of juvenile salmonids. The analyses of the proposed habitat mitigation measures is insufficient to determine if the probable and significant impacts of this proposal can and will be mitigated. Leaving till the permit review stage under the guise of adaptive management and future data collection, the determination of whether or not, the impacts of this project can be mitigated is unacceptable.

T03-37 Page 68. While the goal of self-sufficiency for steelhead justifies the selected fish passage alternative, self-sufficiency for chinook and coho is uncertain considering habitat limitations.

T03-38 Page 69. Refined planning criteria (b)(14) -This criteria fails to provide any assurances as to how higher project survival rates will be met.

T03-39 page 70. *"The Muckleshoot Indian Tribe was the on study partner who did not grant conditional acceptance. They remain neutral at this stage in the coordination project."*. This statement overlooks the that fact that the Tribe expressed grave concerns about the project.

T03-34 The influence of reservoir and dam passage and instream migration below HHD have been described in Appendix F, Section 8.E Incremental Analysis of Restoration and Mitigation Projects. Reasonable assumptions regarding various phases of the salmon and steelhead life-cycle have been incorporated into a deterministic model to evaluate project benefits. The potential benefits of supplementing salmonid recruitment in the upper watershed through the Fish Restoration Facility was identified in the DFR/DEIS in Section 3.1.3 Preliminary Alternatives Considered.

T03-35 We believe that the analyses of instream migration, steelhead spawning and incubation and side channel connectivity, as described in Appendix F, Part 1: Fish Mitigation and Restoration, have appropriately identified and quantified impacts and mitigation needs. Sufficiency of mitigation is addressed in Section 8: Mitigation and Restoration Plan Summary.

T03-36 As described in Appendix F, Section 5, Green River Salmon and Steelhead Migration, the analysis of Phase I conditions indicates that instream migration survival of chinook, coho, steelhead and sea-run cutthroat below HHD would improve by 2-3 % using the 32 year period of modeled daily flows (1964-1995). Instream migration survival of chum salmon would decrease less than 1% under the same flow record. Mitigation for the 0.35% decrease in chum survival is addressed by the opportunity to conduct releases of hatchery fry under a proposed freshet regime.

Between 1992 and 1996, an average of 732,000 chum fry were released into the Green River from hatcheries. During this period, hatchery-reared chum fry have been released into the Green River at an average flow of 1,473 cfs, measured at Auburn. Instream migration survival of chum fry released at 1,473 cfs is 63 percent according to the AWSP flow : survival function. Instream survival would increase to 88 percent if chum fry were released at flows of 2,500 cfs. The 24 percent increase in survival of 732,059 fry yields an increase in survival of 178,000 chum fry each year.

Assuming 4 million wild chum fry are produced in the Green River each year, the 0.35 percent decrease in instream migration survival under Phase I conditions would cause an estimated loss of 14,000 wild chum fry. The increase in survival of 178,000 hatchery-reared chum fry associated with hatchery releases at 2,500 cfs and the reduced duration of interaction with wild fry would offset the loss of wild chum fry under Phase I conditions.

Under Phase II conditions, instream migration survival of juvenile chinook, coho,

T03-36 Cont. steelhead and cutthroat would increase up to 1.8 %. Instream migration survival of chum salmon would decrease an estimated 4.76 percent under Phase II and corresponds to an estimated loss of wild chum production by 190,400 fry. The increase in survival of 178,000 hatchery-reared chum fry associated with hatchery releases at 2,500 cfs will partially offset wild chum fry losses, but additional mitigation would be required. Since chum salmon in the Green River heavily use side channel habitats, improvements in the quality of side channel habitats associated with side channel improvements are considered a buffer to the loss of wild chum fry. Sufficient mitigation is proposed under Phase II to fully offset anticipated impacts.

T03-37 We maintain that achieving self-sustaining runs of steelhead and coho appears promising with the proposed mitigation and restoration measures, and agree that there is greater uncertainty for chinook relative to the other species. The potential to restore anadromous fish production to the upper watershed justifies the selected fish passage alternative. Providing a potentially less successful downstream fish passage facility would severely constrain restoration opportunities. The proposed listing of chinook salmon in Puget Sound by NMFS underscores the potential benefits of extending the range of anadromous species to historic habitats.

T03-38 The quality of lower Green River and estuary habitats is reflected in survival estimates from Green River hatchery releases (see Appendix F Section 8.E Incremental Analysis of Restoration and Mitigation Projects). The marine survival estimates represent one stage in the life cycle model used to derive project benefits. Low survival estimates from Green River hatchery releases must be offset by higher project passage survival if self-sufficiency is to be attained.

T03-39 Comment noted.

T03-40 Page 73. Demand management measures listed in Alternative 4A failed to consider to include water rate reform as a tool to reinforce conservation behavior and efficiency investments. Meaningful rate reform would include increased consumption prices, lower fixed monthly charges and higher summer seasonal rates. Because of this omission, the water savings estimated for Alternative 4A are very minor, amounting to less than 2% of the present TPU peak season system demand.

T03-41 Page 74. It should be clarified that Alternative 7B, Mimic Natural Hydrology During Refill and Provide Low Flow Augmentation, is intended to address refill operations for M&I purposes as well as for low flow augmentation. Although the minimum baseflow targets of 575 to 900 cfs. offer improved instream protection compared to existing instream flow requirements, these targets are not guaranteed nor are they adequate to fully protect instream resources. For example, Green River Hatchery chinook smolt releases were found to have had higher survival to the Duwamish with increasing flow: only 40% survived at approximately 650 cfs. at Auburn, while survival rates of between 70 and 100% were observed at flows higher than 2,000 cfs. (Wetherall, J. A. *Estimation of survival rates for chinook salmon during their downstream migration in the Green River, WA.* PhD thesis, Univ. of Washington, 1971).

T03-42 Pages 73-74. Alternative 4 A- This section describes varies actions that TPU could take to lessen demand and conserve water; however, the DFR/DEIS fails to disclose whether or not TPU intends to pursue any or all of these actions.

T03-43 Page 74. Evaluation of water supply alternatives-The proposed economical analysis outlined in this section is incomplete. A better analysis would look also at the mitigation costs associated with HHD additional storage compared to the costs for the other viable water supply measures.

T03-44 Page 79. The discussion regarding scientific understanding of fish passage needs provides examples of failed fish passage facility "experiments" over the last 40 years. While outlet design has been improved, it is difficult to predict how the proposed fish passage facility will perform in combination with added storage. It is reasonable therefore to assume that restoration associated with the Preferred Alternative is equally experimental.

T03-45 page 85. *The restoration objective is consistent with state and federal requirements for ...and fits within the King County sponsored Green/Duwamish Ecosystem Restoration Study.* The project is not consistent with MIT requirements to restore salmon the quantity and quality of habitat in the Green River below the dams so as to increase salmon production. In order to achieve continuity with the federal final selection authority regarding criteria regarding acceptability of ecosystem restoration plans, the FR/EIS should specify what assurances will be made to insure that the ecosystem restoration plan is acceptable to the MIT tribal government as required in the criteria.

T03-46 page 93. *..to have no net loss of lower watershed habitat while maintaining existing anadromous salmonid populations.* This conflicts with Tribal goal to increase habitat below the HHD. It is unclear why the project will not attempt to significantly restore

T03-40 The quality of lower Green River and estuary habitats is reflected in survival estimates from Green River hatchery releases (see Appendix F Section 8.E Incremental Analysis of Restoration and Mitigation Projects). The marine survival estimates represent one stage in the life cycle model used to derive project benefits. Low survival estimates from Green River hatchery releases must be offset by higher project passage survival if self-sufficiency is to be attained.

T03-41 The opening sentence in Section 3.2.3.1 of the DFR/DEIS clearly identifies that refill for M&I purposes is a project objective. No change to the text is needed.

> "Alternative 7B was developed to meet or be consistent with three preliminary project objectives: 1) provide a regional M&I water supply..."

We agree that baseflow targets offer improved fishery resource protection compared to existing instream requirements. As described in Appendix F, Section 5: Green River Juvenile Salmon and Steelhead Migration, instream migration survival was evaluated using a daily flow model of the period 1964-1995 and a flow: survival relationship based on the Wetherall data. Under Phase I, changes to existing refill and storage operations provide clear improvement in instream migration survival for chinook, coho and steelhead.

T03-42 In Section 2.6.2e of Appendix B is a discussion of the conservation (demand management) measures that Tacoma has already undertaken and implemented. In Section 2.6.6b is a discussion of the conservation measures that Tacoma has evaluated and are available to be implemented as an alternative to the proposed project. Twelve of the most cost effective measures were included as part of the alternatives analysis to Howard Hanson Dam water supply and are included in the benefit evaluation. See table B2-10 of Appendix B for the unit cost of implementing these measures.

T03-43 The economic analysis of water supply for this project compares the avoided cost of not needing to implement the most cost-effective alternatives to HHD AWS (if these alternatives require mitigation, these costs are included) to the total separable water supply costs (i.e. costs identified as only occurring directly as a result of that project purpose). Separable water supply costs of HHD include all mitigation costs associated with water supply; so the economic analysis already does what you recommend in your comment.

T03-44 In recognition of past dam passage failures at other projects in the Pacific

T03-44 Cont. Northwest, the preferred alternative was selected after more than seven years of study by federal researchers and oversight by the Green River Fish Passage Technical Committee (FPTC). The objective of the FPTC was to develop a downstream fish passage plan that the committee was confident would provide successful passage of juvenile salmonids past HHD. The proposed alternative reflects the advice of the committee and satisfies 23 different design criteria developed by the committee.

T03-45 The Corps and Tacoma have been coordinating with the MIT and other resource agencies since project inception. Where the MIT have expressed concerns regarding potential project impacts, good faith efforts have been made to address those concerns. Additional studies have been commissioned to evaluate potential issues and in response to identified impacts, measures have been designed to avoid, minimize or mitigate those impacts. In response to significant concerns raised earlier in the planning process, and as a result of the Agency Resolution Process, a two-phased project approach was implemented. The phased approach incorporated an adaptive management process that conditioned Phase II of the project on the demonstration that impacts could be sufficiently minimized and mitigated. These efforts provide assurances of project acceptability.

T03-46 Downstream Habitat

In addition to the planning objective referenced by the MIT, other objectives listed in the same sentence identify restoration opportunities downstream of the project :

> "...to provide limited habitat restoration for selected ecosystem functions, processes, or structures in the Green River Basin; to have no net loss of lower watershed habitat while maintaining existing anadromous salmonid populations; to restore natural, self-sustaining runs of anadromous salmonids in the headwaters watershed; and to restore selected aquatic habitat limiting factors of the Lower watershed,..."

Growth

The Additional Water Storage (AWS) Project is proposed to provide for the expected growth of the region. However, since all M & I water available under Phase I of the project is part of Tacoma's second supply water right, which they expect to exercise even if the AWS project is not built, most of the growth in the region would take place with or without the AWS project. Population growth results in cumulative impacts and resource problems in all environmental arenas (not just to salmonids). However, since these effects are future effects, and cannot be accurately quantified, a detailed analysis is

T03-46 cont. habitat downstream of the dam or will not attempt to restore downstream anadromous populations. Indeed, the DFR/DEIS (page 81) states *the reduced habitat capacity and habitat quality in the Lower river adds to the uncertainty of restoring fish runs in the Upper River.* Additionally, the DFR/DEIS (page 274 and 275) refers to *additional growth due to water supply resulting in habitat loss and fragmentation.* The potential impacts of this additional development upon salmon production below the dam, and the nature and uncertainty of such growth upon the potential of restoring salmon runs above the dams needs to be evaluated in the FEIS and factored into total habitat and production gains.

T03-47 Page 89. Alternative 11B2 Gravel - On this page it is unclear if the 3,900 cu. yd. of gravel placement is a one-time or an annual activity that will occur over the 50 year project life. Furthermore, without an aggressive program to replace and grow LWD to assist gravel retention, it is unlikely that the full benefits of this mitigation measure will be achieved.

T03-48 page 93 *Planning objectives... to establishing healthy, naturally reproducing, self-sustaining runs of chinook and coho salmon and steelhead trout;...* . There is considerable reference in the document to "self-sustaining runs". However, this term, "self-sustaining runs" does not appear to be defined, except by allusion to total adult production. Unless, the definition includes the provision of sufficient number of salmon for the treaty guaranteed harvest, the planning objectives fail to meet the treaty obligations of the federal government and additional mitigation would be required.

T03-49 Page 96. Table 3-4. A note should be made for Section 1135 LFA to the effect that annual storage of 5,000 ac-ft is an option depending on adaptive management results, and that Phase II implementation is subject to consensus approval by the agencies and MIT.

T03-50 page 101, 117 *The mitigation amount was dependent on defining the riparian area, the definition was provided from the Tacoma Forest Land Management Plan.* The definition should be provided in the EIS and the definition of riparian should be based upon definitions used the WDFW and the NMFS. Furthermore, the riparian areas should be specified in terms of a typical width of land paralleling a stream. It is essential to mention widths in the narrative portion of the EIS, as well as the Appendix, because the TPU definition of riparian zone if used in context with the descriptions for the Natural, Conservation and Commercial zones. Otherwise, the definition in the EIS could imply that any land landward of a road or powerline right away could be presumed not to be riparian habitat, even if that land could contribute large woody debris to the stream. Additionally, buffer widths for riparian mitigation projects should be stated, both, in absolute widths and the increase in width , if any, over the existing TPU Forest Land Management Plan. For example, a proposed mitigation or restoration buffer of 150 feet is not mitigation or restoration if the current management plan already calls for a buffer of 150 feet. Much of the riparian mitigation proposed for this project, appears to seek salmon habitat mitigation credit for actions that the current TPU Forest Plan states are

T03-51 needed to maintain water quality and quantity Furthermore, an unquantified amount of land owned by Tacoma is committed by contract for timber harvest. The FEIS should

T03-46 cont. not possible. Qualitatively, we can predict that more roads will be built, as will houses and support services, such as strip malls, golf courses, play fields, churches, and schools. Terrestrial habitat will be lost, and aquatic habitats may be lost, and will certainly suffer impacts due to increased runoff and pollution from sedimentation, metals, toxic organics, and nutrients from human uses. At the same time, the AWS Project offers an opportunity to provide benefits to salmon through restoration of habitats and fish passage through and around Howard Hanson Dam.

T03-47 As described on pg. 89, gravel placement was assumed to be an annual commitment.

T03-48 The analysis of the potential to restore self-sustaining anadromous fish runs above the project is described in Appendix F, Section 8:Restoration and Mitigation Plan Summary, Part E: Incremental Analysis of Restoration and Mitigation Project. The final incremental analysis describes potential project benefits under various assumptions of reservoir and dam passage, instream and ocean survival and adult harvest. A 70% adult harvest level for coho, 35% for steelhead and 55% for fall chinook was assumed to be an inviolate component of the salmonid life cycle in the Green River.

T03-49 Comment noted.

T03-50 Tacoma's buffer widths for riparian areas were selected because Tacoma owns all of the land surrounding the reservoir and streams along which mitigation and restoration measures will be implemented. Thus, the state guidelines apply (i.e., Forest Practices Act), not Federal regulations, which apply only to Federally-owned lands: under ESA, National Marine Fisheries Service 300 ft buffer widths do not apply for lands above HHD as critical habitat for chinook salmon has been designated only below the dam. Tacoma's lands adjacent to the reservoir and Green River are all in the Natural Zone. Even though some streams pass through the Conservation and Commercial zones, Tacoma's Forest Land Management Plan (FLMP) calls for the same riparian buffer widths regardless of the zone (75 horizontal feet on each side of the stream (total 150') for Type 3 streams). In general, the mitigation and restoration sites protect more than what is provided in Tacoma's FLMP; for example, Site MS-08 includes stream buffers of 200 feet. With regard to claiming credit for utilizing Tacoma's FLMP, there is no guarantee that Tacoma would follow through with that plan. By committing Tacoma to this mitigation plan, it also commits Tacoma to use the FLMP. The difference between commitment and non-commitment allows crediting of Tacoma's FLMP riparian areas toward mitigation.

T03-51 Cont. clearly state which, if any, restoration or mitigation proposals, involve TPU obligated for timber harvest.

T03-52 page 101. *It is expected that the proposed fish passage rate will allow a 95% survival rate of juveniles migrating through it. This is the survival rate considered necessary to accomplish the goal of a self-sustaining run.* The EIS should stipulate what is the required survival rate from spawning to passage through the HHD to ensure self-sustaining harvestable numbers of fish. Healey in Pacific Salmon Life Histories (eds C. Groot and L. Margolis) suggests that under natural conditions, 30% or less of the chinook eggs deposited result in emergent fry, or fry and fingerling migrants in the systems studied. Indeed, the literature values reported for chinook salmon spawning success, yield mortality rates of 40 to 96% for egg to emergence and 80- 89% for egg to fry/smolt. The literature also notes hat fry mortality rates during early rearing and outmigration can reach 70-90%. The literature values reported for coho survival from eggs to emergence are 1-27% for average conditions, and 65-85% for very favourable conditions. Using mortality rates provided in the literature and the DFR/DEIS, for egg to fry emergence, early rearing survival, current and postulated dam and reservoir mortality rates there is a considerable range of overlap between the no-action alternative and the preferred alternative regarding the total number of juvenile salmonids that reach the TPU Diversion Dam, due the much greater number of fry produced by a given number of eggs in supplementation programs compared to natural settings.

T03-53 page 106. *Mitigation and restoration projects were developed and selected based on ecosystem or biological needs first.* The supporting narrative to this statement assumes that the restoration goals of the Corps, other federal agencies and that consistency with King County are more important than the restoration goals of the Tribe.

page 106. *Restoration measures must address overriding environmental problems, in particular, identified and accept aquatic habitat limiting factors. ......Mitigation and restoration projects must be ecosystem function or process driven.* The supporting narrative to this statement assumes that the restoration goals of the Corps, other federal agencies and that consistency with King County are more important than the restoration goals of the Tribe, some of which are expressed in these comments.

T03-54 page 117 *Mitigation Features: These projects include maintenance of stream-corridor habitat within the inundation pool (13.3 acres) and management of riparian forest to accelerate succession on major streams above the project (10.3 acres) for a total of 121.6 acres.* The practice of thinning trees as a tool of riparian enhancement reduces the short to mid-term large woody debris recruitment into streams. This is an impact for which mitigation is required. The proposed width of stream corridors should also be specified. No mitigation credit should be granted for buffer widths less than those stipulated in the TPU Forest Land Management Plan or the WDFW Wild Salmonid Policy, whichever is greater for a respective stream type.

T03-55 page 117 *reserving riparian forests at a ratio* of 5 acres reserved to 1 acre impacts. See previous comments concerning riparian issues.

T03-56 page 135, 271 *Predator Monitoring and Evaluation - If there is an increase in the overall abundance in response to outmigrating presence a selective predator removal program*

T03-51 According to Dick Ryan, Tacoma forester, none of the mitigation and restoration lands are located on lands scheduled by Tacoma for timber harvest.

T03-52 The analysis of the potential to restore self-sustaining anadromous fish runs above the project is described in Appendix F, Section 8:Restoration and Mitigation Plan Summary, Part E: Incremental Analysis of Restoration and Mitigation Project. The incremental analysis includes assumptions regarding percent survival values for various stages of the salmon life cycle. Percent survival from spawning to smolt stages are inherent in the juvenile salmonid potential estimates described in Appendix F, Section 2A: Production Potential of the Headwaters of the Green River Watershed.

T03-53 The EQ criteria were intended to address tribal economic and spiritual sustenance needs for fishing, hunting, gathering of native plant material, and access to the river, wetlands, and forests of the basin. In some cases, tribal interests were not explicitly identified but were addressed by underlying assumptions. For instance, a level of tribal harvest of the Green River fishery was assumed to be an inviolate component of the process of meeting the goal of self-sustaining fish runs.

T03-54 Disagree—the type of thinning to be done in the riparian areas will only remove small trees to reduce stem density and create openings to encourage stronger shrub growth; in addition, the trees that are removed will be placed in piles in forested and wetland areas. We believe the riparian habitat will be improved through these measures and do not require mitigation.

T03-55 Replacement at a 5:1 ratio implies that the Corps partially agrees that mitigation with lands already protected does not allow 1:1 replacement. Thus, the implementation of prescriptions is intended to provide some mitigation. We feel that 5:1 (5 acres replaced for each acre impacted) is a reasonable ratio.

T03-56 The specific design of a predator monitoring program, and process for selective removal if deemed appropriate, will be developed in the PED phase of the project.

T03-56 cont. *can be initiated. The predator removal program must be coordinated through the City of Tacoma, and cooperating resource agencies.* The proposed mitigation measure is speculative and TPU appears to have the power to veto such removal. Furthermore, predation can be increased without an increase in the overall abundance of predators. The monitoring plan must be able to determine if there has been an absolute increase predation without an increase in predator number.

T03-57 Page 139. The section regarding riparian and stream improvements quantifies the acreage amount of stream and riparian habitat lost due to additional storage. However, it fails to quantify the type of habitat loss by examining existing stand conditions. If the inundated sites have mature forest conditions with large conifer trees and the proposal is to place wood of a smaller diameter and length, then there are additional impacts that should be mitigated.

T03-58 page 139 *Site MS-02 Green River- Partial mitigation for riparian areas would be accomplished by 1) retention of existing trees along the riparian zones* ....This land is most likely within the Natural zone according to the definitions in the TPU Forest Land Management Plan and hence is not typically subject to harvest except major or minor to timber practices to improve water quality, water quantity or wildlife habitat. See other comments concerning buffers.

T03-59 page 139. *While this habitat [tributary stream above HHD] is degraded from pre-management conditions, it is still considered highest quality habitat or has much greater recovery potential than much of the Lower Green River stream habitat.* See other comments addressing this issue.

T03-60 page 140 *Site MS-08 The mitigation area on the mainstem Green includes stream buffers of 200 feet and protects a total riparian areas of 400 acres.* See other comments regarding buffers.

T03-61 page 140. *Site MS-02* 140 *Site TR-01: Lower Bear Creek- This project will improve the stream channel by adding boulder or logs and includes limited excavation to recreate meanders or backwater habitat.* The number of logs to be added over the 3,000 feet of the project should be specified in the narrative portion of the EIS, as well as Appendix F. Additionally, the MITFD does not believe that adding boulders is mitigation for project impacts. Appendix F appears to suggest that more boulders will be added to the tributary streams, than LWD. The history of timber harvest has substantially increased the relative quantity of large boulders, while diminishing habitat formed by wood. Additionally, the value of boulders to providing high flow refuge habitat declines with increasing flow, while that provided by LWD increased to a threshold flow.

T03-62 page 140. *Stream Habitat - Above Reservoir.* See other comments concerning mitigation.

T03-63 page 141 *Site TR-09 .. 2) placement of one cluster of keystone logs in the North Fork channel* and page 141. *MS-08... addition of large keystone trees (60 feet or greater, 4-foot-diameter rootwad) attached) at one 2-3 tree cluster/half mile of mainstem* Both projects involve placement of wood quantities well below Watershed Analysis standards for key pieces of LWD.

T03-57 Mature evergreen trees represent a small proportion of loss of riparian forest, we maintain that the proposed riparian and stream improvements fully mitigate the impacts of increased inundation. Existing stands will not be "lost", though they will be inundated and die. They will not be cut, and will remain as snags and stems in the water to provide habitat for smolts. Immediately upslope from the inundation zone will remain a forested zone consisting of trees equally large as those that will be inundated; further, mitigation and restoration targets enhancement of riparian areas as well as upland forests, that focuses on producing larger trees. Thus, existing stands will not be replaced with smaller wood.

T03-58 Agree—this land is in Tacoma's Natural Zone, and not typically subject to cutting. However, as noted in our response to comment T03-50, there is no guarantee that Tacoma would follow through with its management scenario. Thus, some mitigation credit is claimed for this measure.

T03-59 See response to T03-1-1

T03-60 See response to T03-50.

T03-61 As described in Appendix H, Section 8E, Table 8: Project Scope for Riparian and Stream Habitat Projects..., measure TR-01 involves placement of 60 boulders and 150 logs. Siting of the boulder and log placement, and the proportion of logs to boulders actually placed in the stream, will be developed during the PED phase.

T03-62 See response to T03-61.

T03-63 The proposed addition of logs to serve as instream structure is intended to supplement existing levels of instream large woody debris.

T03-64 page 142. *TR-10 Headwater Culvert Replacement.* The provision of fish passage is a requirement of state law, hence no mitigation credit should be granted for complying with a law which mandates that passage be provided whether the HHD AWS Project is built or not.

T03-65 page 146 *Environmental Restoration Features The objective of this measure is to address impacts from the original construction and operation of HHD.* The DFR/DEIS narrative however, does not consider all impacts caused by the construction and operation of the dam. The DFR/DEIS (page 47) relies upon the Green/Duwamish River Basin Ecosystem Restoration Study and states *"Basin analysis and interagency scoping has identified six aquatic habit-limiting factors or restoration issues that the HHD AWS can address".* However, the DFR/DEIS (page 62) recognizes that the HHD traps LWD that would otherwise provide a variety of downstream biological and hydrologic functions. The NMFS also takes this position in regard to dams.

T03-66 Page 147, 250. *Gravel Placement Gravel nourishment was identified as a necessary feature to maintain mainstem spawning habitat in the Lower Green River. ... The gravel will maintain an increment of existing spawning habitat in the Middle Green River and could help maintain and proposed side channel habitat mitigation projects. ... Because of the reduction in peak flows (with decreased sediment transport ability), gravel nourishment in the Flaming Geyser area is limited and will not equal the annual transport rate for the river (estimated range 3,900 - 11,700 cu yd3/year). The replacement value for this project is approximately 50% of the median estimated loss of sediment.* The term increment should be defined. It is unclear how one of the project goals to maintain downstream habitat will be realized if the inflow of gravel is half the loss. Indeed the quantity of gravel selected was not based upon ecological or salmon habitat considerations, but instead (page 89, 250) *the least cost level, 3,900 yd3, was selected as a final restoration measures.* Furthermore, the DFR/DEIS statements conflict with Tribe's goal to see a significant increase the quantity and quality of spawning habitat below the dams. Additionally, the FEIS should stipulated that it is important to spread the gravel out in the system to account for the 30 years of gravel deprivation.

T03-67 Page 159. - The risk assessment referred to in the 3rd paragraph can be found within Washington's Dept. of Fish and Wildlife's DFR/DEIS for the Wild Salmonid Policy. This is not a National Marine Fisheries Service document as suggested here.

T03-68 Page 171 *Table 5-1* There is no reference to the signing of the Treaties with Muckleshoot Tribe.

T03-69 Page 189 *inflows to the Project above 60°F degrees occur in most years* and on page 191 that *water temperatures above 60° F are limiting for cool water adapted fish such as salmon and steelhead.* This is an admission that the summer and early fall rearing value of the mainstem is compromised by temperatures. Furthermore, the DFR/DEIS EIS (page 249) contends that *"very few areas in the Upper Green exceed 14°C".* However, MITFD monitoring of streams has noted that following streams have been observed to exceed 16°C (60°F): Green, Sunday, Intake, Charlie, Tacoma, Friday, Cougar and Sylvester. Furthermore, two upper watershed streams are on the Washington 303(d) list

T03-64 This is a federal action, as such, the Corps development of mitigation alternatives is not bound by state requirements for culvert replacement. Even if state law applied, there is nothing that would prevent counting credit for the AWS project mitigation along with credit for whatever landowner was required to provide culvert replacement on the improved stream. This is especially true considering that we are replacing existing culverts for the purpose of providing improved fish passage through the culverts (i.e., restoration of degraded habitat). Finally, since the Corps is funding, designing, and performing the work (and not the landowners in most cases), credit should accrue to the Corps.

T03-65 We concur that much of the large woody debris input to the Green River has been blocked by construction and operation of HHD. As described in Appendix F, Section 8.D, Habitat Restoration and Mitigation Project Descriptions, Measure 4: MS-09 Truck and Haul of Large Woody Debris, the Corps is proposing to transport select pieces of large woody debris collected during annual reservoir debris removal operations for placement into the Green River below Tacoma's Headworks.

Categorization of this process could be considered to fit under the stream habitat factor of the six factors/issues we identified under restoration issues that the AWS Project could address. The Green Duwamish Basin Study classified LWD reduced loading as falling under the limiting factor of -- loss of channel complexity and instream structure. Be assured that recruitment of LWD is included under the stream habitat issue of paragraph c.(1) on page 47.

T03-66 As noted, the proposed level of gravel nourishment is intended to maintain "an increment" of existing spawning habitat in the Middle Green River. The objective of gravel nourishment is to slow or stop the downstream extension of streambed armoring and replenish certain areas presently deficient of spawning-sized sediments. The extent to which gravel nourishment successfully stops continued streambed armoring will be Identified through monitoring and evaluation. A major concern of adding gravel-sized sediments to the Middle Green River is the potential effect on flood control measures in the lower river. As described in Appendix F, Section 4B Gravel Nourishment in the Middle and Upper Green River, a monitoring plan is proposed to track the travel distance, redistribution and deposition of the added gravel to minimize the risk of major downstream ramifications. Annual gravel placement would be reduced or halted if monitoring identifies problematic aggradation.

As a restoration measure, the maximum rate of gravel nourishment is capped by

T03-66 Cont. financial constraints. If problematic gravel aggradation in the lower river is identified, the rate may be reduced. If monitoring identifies the value of an increased rate of gravel nourishment, funds for additional gravel must come from other sources. The Green/Duwamish River Basin Ecosystem Restoration Study sponsored by the Corps and King County is one possible source for additional funding.

T03-67 Comment noted.

T03-68 Comment acknowledged. Table 5-1 is revised in this document to acknowledge Muckleshoot treaties with the United States. See updated table on next page.

T03-69 We concur with your comment that the mainstem river (as valuable salmon and steelhead spawning and rearing habitat) in the Middle and Lower Green River may be compromised because of high water temperatures. In fact, mainstem river temperatures in the Middle Green River (RM 35) exceed the state water quality standard (18 C) in virtually every year: in 75% of the years of record (1964-84, 1992) temperatures exceeded the range of avoidance for salmon and steelhead (21 C) for one or more days (Section 4A Appendix F).

As noted in the DFR/DEIS, reservoir inflow (Upper Watershed) temperatures are generally lower than 60°F (16 C), however short-term periods of higher temperatures occur in most years. Even though the Upper Watershed has areas (within selected years) that exceed the AA water quality stream temperature requirement (16 C), stream temperatures are mostly within the preferred range for salmon spawning and rearing habitat. Also, the Upper Watershed has a greater potential for recovery of the riparian systems that provide necessary stream shading unlike much of the Lower Watershed. See comment T03 - 5 for further discussion of stream temperatures and salmon and steelhead habitat in the Upper Watershed.

TABLE 5-1. CHRONOLOGY OF EVENTS IN THE GREEN-DUWAMISH RIVER BASIN BETWEEN 1850-1997

DATE	EVENT	RESULT
1850	Oregon Donation Land Act	Land granted to settlers after 5 years homesteading
1851	First Euro-American settlers arrive in the Duwamish area	Land clearing begins - three claims filed
1852	Livestock introduced into Green River valley	Grazing begins on land
1853	Extension of Land Act through 1855	Seventeen claims filed along the river
1854	First road built in King County	Road built through the river valley
1854-55	Medicine Creek Treaty/Point Elliott Treaty	Created Muckleshoot Indian Reservation and former tribal lands ceded to U.S.
1855-58	Removal of debris from river for navigational purposes.	Elimination of LWD habitat
1855-56	Indian Wars	Settlers move to Seattle for protection - settlement slows
1856	Land clearing resumes	Duwamish area gardens planted, orchards established, timber cutting begins
1858	Drainage Laws	County passes laws permitting ditches for drainage, swamp land drainage begins
1862	Homestead Act	Settlement of territory encouraged
1866	Population of valley starts to grow in earnest	Displacement of Native Americans
1867	First railroad bridge built across Black River	Local railroad construction begins in DGB
1870	277 settlers living in valley	Displacement of Native Americans
1870s	Major railroads build lines	Pace of logging increases in Green/Duwamish River watershed
1875	Channel Improvement Act	County road funds used for improvement of rivers
1880-1910	Extensive logging occurs in the watershed	Extensive road and railroad construction
1883	RR bridge built across White River	Northern Pacific Railroad constructs east/west line through Green River valley
1893	Great Northern Railroad develops lines in north/south direction in valley	Increases population of basin
1895	Drainage District Act	County Drainage Districts formed
1895	Duwamish East Waterway construction begins	East Duwamish Waterway dredged and used for Harbor Island fill
1902	Green River Hatchery	State operated Green River Hatchery opens on Soos Creek
1901-04	Hydraulic sluicing of Beacon Hill	Fill placed in the intertidal area of the Duwamish River to raise land and decrease flooding potential

DATE	EVENT	RESULT
1906	Major flooding in rivers during fall and winter	Log jam on lower White River forces flood water into the Puyallup River
1902-27	Interurban Electric railway	Interurban rail eclipses riverboat travel
1910	Tacoma Water Diversion authorized	City of Tacoma Green River Diversion Dam construction is begun for municipal water
1911	White River Diversion	White River completely diverted to Puyallup River to reduce flooding problems
1913	Tacoma Water Diversion completed	Water diverted from Green River, complete blockage to upstream migration of fish
1916	Black and Cedar Rivers diverted from Green/Duwamish River	Ship Canal cut to Lake Union draining Lake Washington to Puget Sound. Reduced flooding in Green/Duwamish Basin
1917	East/West Duwamish Waterways finished	Dredging of channel completed, 2.2 square miles of Duwamish intertidal area filled, flooding reduced
1919	Private and county levees built to protect lowlands from flooding	Encouraged more productive agricultural use
1931	Installation of first stream gauge at Palmer	Begin to acquire river flow data
1959	One of the largest floods on record (28,000 cfs at Auburn)	Significant property damage
1960s	Extensive levee building by local and federal government	Channelization of the river
1963	Howard Hanson Dam completed	Reduces maximum flow of Green River to 12,000 cfs at Auburn to reduce flooding
1977	Tacoma completed their North Fork Valley well fields	Allows Tacoma to provide water during periods of high turbidity or low flows in the river
1980	Washington State Department of Ecology establishes instream flows at Palmer and Auburn	All but eliminates any future river diversions during periods of low flows
1995	Tacoma and Muckleshoot Agreement for future off-stream or diversions and instream flows	Further protection of fisheries resources during low flow periods
1996	Corps completes a Section 1135 Environmental Assessment for additional water supply at HHD for low flow augmentation	Further protection of fisheries resources during low flow periods
1997	Corps completes the Reconnaissance Report for the Green-Duwmaish Ecosystem Restoration Study and begins Feasibility Phase	Proposed project has restoration features that complement the HHD AWS Project

T03-69 Cont. for temperature impairment. The extent to which this has been factored into the Corps' estimate of salmon production is unknown.

T03-70 Page 193 *Timber harvest has resulted in the predominance of second-growth .... The oldest stands are 60 to 80 years olds.* The young age of the trees along most of the riparian corridors above the HHD has a direct influence upon the rate of large woody debris input in the stream and the size of the LWD recruited, hence pool formation and gravel storage. Given that large scale recruitment of suitably sized large woody debris will not occur for many decades in the bulk of the harvested areas and that LWD is declining due to flushing and decay, the habitat quality will continue to decline for many years. The extent to which the proposed mitigation and restoration measures will compensate for the overall decline in habitat over the next few decades is unknown. Hence, any statements regarding salmon production over the next few decades are speculative. To achieve the DFR/DEIS salmon production goals, habitat above HHD will require a much greater degree of habitat protection than currently in place.

T03-71 Page 201 *Substrates in the project are generally unstable in relation to biological value. Substrate stability is affected by changes in pool elevation and bedload shifts during periods of high flows.* These impacts will now occur in the new inundation area and adjacent areas.. The extent to which this has been considered in the estimate of salmon production is suspect.

T03-72 Page 203 *Federal, state, and tribal agencies manage Green River fisheries and fish habitat with cooperation from the Corps.* Though, the Corps is involved with the management of habitat, the Corps in not involved with fisheries management, which is the management of harvest.

T03-73 Page 203. Competitive and predatory interactions between resident and anadromous fish in the upper watershed, including in the 3-mile reach between the TPU diversion and the HHD, may significantly influence the success of restoration efforts. The FEIS should include a discussion of the potential impacts of the large and established resident salmonid population upon juvenile anadromous survival.

T03-74 Page 204. Summer and winter steelhead are actually reared at Palmer on the Green River. Steelhead fry planted in the upper watershed are native Green River stock. Except for chum and steelhead, all hatchery stocks were native Green River origin. Steelhead and chinook have been managed for natural escapement for the last two decades, while coho continue to be managed for hatchery fish.

T03-75 Page 204. This section does not clearly acknowledge the Keta Creek Hatchery, operated by the MIT, nor the adjacent rearing ponds that the tribe maintains and operates for the state.

T03-76 Page 204 There is no evidence that hatchery practices in the Green River have reduced the fitness of the chinook or coho.

T03-77 Page 205 *WDFW spawning surveys (1987-1993) shows this sub-basin supports the highest density of natural spawning activity by anadromous salmonids (as indicated by*

T03-70 We agree that improved habitat protection in the watershed will be increasingly important to the fate of salmonids. We believe that through the eventual completion of HCP's, as well as USFS management plans, that stream buffers and forest land management will in fact be more responsive to fish and wildlife habitat needs (see response to comment T01-3). We share your concern that the young age of the stands is not conducive to recruiting larger sized woody debris necessary to create the larger, deeper pools found along streams and rivers within more mature riparian forests. This perspective led to the development of the three aspects for fish mitigation projects along the larger tributaries above HHD including 1) forests along these larger tributaries would be permanently set-aside as riparian reserves using the buffer widths in the Tacoma Forest Land Management Plan; 2) riparian areas would be selectively thinned to accelerate the succession of these younger, smaller, even aged stands; and 3) along the mainstem Green River, large, keystone trees (minimum 4 ft diameter, 40 ft length or greater) in groups of three or greater could be placed in the river at intervals to act as anchor points to collect these younger age trees.

T03-71 Substrate instability in the inundation area were considered in developing smolt production potential estimates. Production potential estimates for the upper watershed, including the new inundation area, are described in Appendix F, Section 2A: Production Potential of the Headwaters of the Green River Watershed. Production potential estimates for coho include limited production from inundated lengths of stream and a smolt density per hectare of surface area from Beechie et al. (1994). Steelhead and chinook production potential estimates assumed 25% production from stream lengths partially inundated during the summer (Elev. 1141 to 1177 ft) and 10% production from stream reaches inundated for most of the summer (Elev. 1035 to 1141 ft).

T03-72 Comment noted.

T03-73 The design of a predator monitoring program, and process for selective removal if deemed appropriate, will be developed in the PED phase of the project. Although not specifically identified in the DFR/DEIS test, the 3-mile reach between Tacoma's Headworks and HHD would be included in the predator monitoring program since it represents the return location for the downstream fish passage bypass.

T03-74 Thank you for the additional information. We understand that NMFS, as part of their ESA review process, and in cooperation with the MIT, are reviewing the origin and status of anadromous fish stocks in the Green River.

T03-75 Comment noted. The Keta Creek Hatchery, operated by the Muckleshoot Indian Tribe, and the adjacent rearing ponds that the tribe maintains and operates for the state are referenced on pg. 205.

T03-76 Comment noted.

T03-77 Prior to 1997, the reach between RM 33.8 to 46.5 has supported the highest number of spawning salmon. Shorter segments of the river have had higher densities during specific years. We have not had the opportunity to compare MIT 1997 surveys vs. earlier years.

T03-77 Cont. *redd counts).* It is unclear if the term density means overall numbers, or number of redds per mile of stream channel.

T03-78 Page 205 *WDFW spawning surveys show that chinook, coho and steelhead use parts of this sub-basin for spawning; however, this section [RM 46.5 to 61.0] contains more rearing habitat than spawning habitat.* MITFD helicopter surveys from RM 45 to 61 and float surveys from RM 61 to 56 for spawning chinook found high densities of chinook spawning. Recent, helicopter surveys show a considerable quantity of spawning occurs in the Green River Gorge (MITFD, unpub. data).

T03-79 Page 206 ... *serves as a corridor...*The area also provide rearing habitat for juvenile salmonids.

T03-80 Page 206. 1st paragraph- Very few chinook spawn in this river reach (RM 11-20) due to poor spawning substrate. Indeed, this reach is no longer consistently surveyed by the State or the Tribe due to the lack of spawning. This section of the EIS will need to be changed to actually reflect where chinook spawn based upon actual redd counts, not upon literature review.

T03-81 Page 207. paragraph 3, 1st sentence, WDFW and the Treaty tribes evaluated stock status in the Green River. Amend to read, WDFW, the Suquamish Indian Tribe and the Muckleshoot Indian Tribe.

T03-82 Page 207. Though chinook salmon were collected for GSI work in 1997 as part of a cooperative effort between the WDFW and the MIT, the FEIS should include the results of the GSI analysis, if the analysis has been completed. If the analysis has not been completed, the FEIS should so state.

T03-83 Page 209. Table 6.1- The DFR/DEIS suggest that 9000 fish above Howard Hanson dam will be released. It is unclear how this number was derived and where these fish will come from. This table also suggests that large woody debris will be transported through the dam which is inconsistent with some of the other statements about large woody debris transport. It is unclear as to how the project will *subside* initial sliding events that affect long term turbidity levels. Also in Table 6.1- The DFR/DEIS fails to consider that potential impact to aquatic resources and water quality that may occur from chemical "fertilization impacts to localized areas".

T03-84 Page 211. Chinook are assigned a "moderate chance" of becoming self-sustaining in Phase I. It is difficult to see how this conclusion is justified or conceivable given the low migration survival rate through the reservoir and dam.

T03-85 Page 211, 215 state that chum and sockeye salmon did not historically exists in the project area. However, the US Army Corps of Engineers Green/Duwamish River Basin Ecosystem Restoration Study, pages 26 and 27, states that chum and sockeye salmon historically were found in the project area

T03-86 Page 212. It is unclear in the DFR/DEIS at to how the 1 acre of side channel mitigation will offset the impacts of flooding 5.9 acres of stream habitat and 11.6 acres of riparian habitat.

T03-78 Comment noted.

T03-79 Comment noted.

T03-80 We believe describing the distribution of spawning chinook salmon based on literature review is appropriate for the objective of this section of the document: a general description of Green River fisheries resources by reach.

T03-81 By reference to this document, the following text provided by the MIT is included in the FEIS.
"The WDFW, the Suquamish Indian Tribe and the Muckleshoot Indian Tribe completed a stock status report in 1993, and at that time, concluded the Green River stock of chinook salmon were healthy; determination under the Endangered Species Act may be different."

T03-82 As of July 1998, the GSI analysis has not been completed.

T03-83 Adult Escapement
The 9000 adult salmon to be released is based on the production potential of the upper watershed; this figure was submitted for review and comment to agencies and tribes in 1995 and 1996.

Large Woody Debris Transport
see response to T03-26

Mass Wasting Events
We are not suggesting that the project would "subside" the sliding events, but that, over time, as the reservoir levels reach equilibrium with the slopes and soils, the sliding events would become less frequent and less severe than the initial events that are expected to occur immediately after the pool raise. Minor bank sloughing has occurred in the past with no significant impacts to water quality.

Fertilization Effects on Water Quality
Tacoma has indicated concern with the potential effects on water quality that may result from the application of fertilizers on the elk grazing pastures; this was noted in the table, but inadvertently omitted from the main text. In fact, the Corps does not believe that fertilizing of the pastures would result in measurable degradation of water quality. The Corps will continue monitoring of water quality through the life of the project.

T03-83 Cont. Should any negative effects from fertilizer be detected, fertilizing will be halted and corrective measures taken to restore water quality.

T03-84 As described in Appendix F1, Section 2: Juvenile Salmon and Steelhead Passage through the Howard Hanson Dam Project and Section 8.E Incremental Analysis of Restoration and Mitigation Projects, we maintain that restoration of a self-sustaining population of chinook salmon to the upper Green River watershed has a moderate chance of success. Chinook salmon smolts are expected to have a high rate of passage success through the dam and an estimated 70% survival through the reservoir. The assumed 70% survival for chinook smolts passing through the reservoir was based on comparing the physical and proposed operational features of the Howard Hanson Reservoir to other reservoir systems in the Pacific Northwest supporting chinook salmon passage. The reservoir passage assumption was recognized as having greater uncertainty than dam passage. In order to gain additional insight into chinook reservoir passage, a Delphi panel of salmon migration experts was convened (see Appendix F1, Section 2.C: Assessment of Reservoir Passage Success Using the Delphi Process). We know of no chinook reservoir survival data specific to the Green River reservoir.

T03-85 The Corps Green/Duwamish River Basin Ecosystem Restoration Study incorrectly cited a 1996 USFS document as providing evidence that chum and sockeye salmon historically were found in the upper Green River basin. Native runs of chum and sockeye may have occurred in the lower watershed, but we are not aware of any documentation confirming the presence of chum and sockeye salmon above Eagle Gorge prior to construction of Tacoma's Headworks at RM 61 in 1911.

T03-86 The impacts of reservoir inundation are not mitigated by side channel improvements. The 1.0 acre of side channel improvement considers areas located below Tacoma Headworks and is achieved through changes in storage and release operations. Impacts of reservoir inundation are addressed by riparian mitigation measures as described in Appendix F1, Section 8: Fish Mitigation and Restoration Plan Summary.

Comments

T03-87 Page 214- The DFR/DEIS fails to consider the potential for probable and significant adverse impacts to salmonids and other treaty resources and the potential impairment of the Muckleshoot Indian Tribe's treaty rights and the Tribe's treaty harvest of salmon, and the potential for this project to modify the escapement goal with resultant impacts to the Tribe's treaty harvest.

T03-88 Pages 217-218. The DFR/DEIS fails to consider the potential for new growth and development arising from this project to adversely affect the water supply of the WDFW Green River and MIT Keta Creek hatcheries. Both of these facilities experience problems with water quantity and quality as a result of upstream development.

T03-89 Page 225. If the process of passing only fine bedload material to downstream areas continues with this project as expected, then it is unclear how the proposed placement of 3900 cu. yd. of gravel will reduce or minimize the process of downcutting and bed armouring.

T03-90 pages 277-229 In general, the site locations of historic and traditional importance to the Tribe should not be specifically referenced in public documents such as this DFR/DEIS so as to protect their location and identity. One such site of contemporary importance to the Muckleshoot people is locatable on a map from the published description referenced on p. 181.

T03-91 Prehistoric sites of importance to the Muckleshoot Indian Tribe have been identified at and just below the existing water level at "elevation 1147 feet" as early as 1985 by Benson and Moura, who recommended at that time they be tested, evaluated, and data recovery made. ("An Archaeological Reconnaissance of Howard A. Hanson Dam Project" pp 36-38). This work, although required by Section 106 of the National Historic Preservation Act, was not undertaken at the time.

Again a decade later in 1996 pursuant to work for the present Additional Storage project, Larsen Anthropological and Archeological Services referred to the Benson-Moura work, the age of the sites, and compared them in age and potential importance to the comparable Chester Morse Lake sites. ("Cultural Resources Survey of the Additional Water Storage Project Area, Howard A Hanson Dam, King County Washington" at pp. 8-11.) LAAS has recommended that the Howard Hanson sites also be tested and evaluated, before elevation of water levels made data recovery tasks more difficult. The Muckleshoot Tribe made a formal request of the Army Corps of Engineers in 1996 that Section 106 procedures at 36 CFR 800.4-9 should be followed regarding these sites, in consultation with the Tribe.

The DFR/DEIS states, in regard to both the "no action" and "preferred alternative", that because the sites at issue lie below the 1147 foot elevation they would not be affected. Such is not the case, and this verbal construction cannot avoid the Corps responsibility under Section 106. The sites become increasingly difficult for archaeologists to examine, and would suffer further degradation from the increased water level. They remain within the area of affect for this federally licensed undertaking.

The Corps must finally fulfill its Section 106 responsibilities regarding evaluation and data recovery, in consultation with the Muckleshoot Tribe, for these important sites

Replies

T03-87 In the DFR/DEIS, the Corps and Tacoma acknowledged the need to preserve tribal harvest opportunities and assumed an adult harvest level of 70% for coho, 35% for steelhead and 55% for fall chinook to be an inviolate component of the salmonid life cycle in the Green River.

T03-88 The "without project" alternative assumes Tacoma's Second Diversion water right would be developed providing the opportunity for regional growth. See comment-reply T01-12 and T03-46.

T03-89 See Appendix F1, Section 4B: Gravel Nourishment in the Middle and Upper Green River.

T03-90 Comment acknowledged. Future reference to cultural resource sites or Native American traditional cultural properties will only be described generically and not located on maps for public distribution.

T03-91 The archeological sites in the existing pool are now being evaluated for their National Register Eligibility. If they are eligible, the effects of erosion and inundation will be addressed in a Historic Properties Management Plan, and a memorandum of agreement will be prepared to stipulate conditions for their management within Howard Hanson reservoir. Planning and coordination with the Muckleshoot tribe will be an important part of these efforts. This course of action will satisfy requirements of Section 106 NHPA.

T03-91 Cont. of historic and cultural interest located at or below the current water level at Howard Hanson Dam. Such requirements are independent of agreements negotiated between MIT and Tacoma, and are among required mitigations of adverse effects for this project prior to implementation of Phase II referenced on p 229 of the DFR/DEIS.

T03-92 Page 229. "*This is the alternative [Preferred Alternative: Phased Development With Environmental Restoration] the Tribe is expecting, though they have not formally accepted the project. ... It is expected that implementation of the preferred alternative would be acceptable to the tribe, with understanding that implementation of Phase II would be postponed until it could be shown that restoration and mitigation measures could offset the adverse impacts*". The writers of the EIS are presuming to have a knowledge of the policy positions of the Muckleshoot Tribe. Furthermore, it is the Tribe's understanding that Phase II would only be implemented with the unanimous consent of all the resource agencies, the Corps and the Tribe. Thus the DFR/DEIS statements misrepresents the position agreed to by the Tribe.

T03-93 Page 229. *The No Action alternative may adversely affects Tacoma's ability to meet the terms of this agreement[MIT TPU], and would strain the relationship between the MIT and Tacoma, as well as between MIT and the Corps of Engineers.* The DFR/DEIS writers presume to predict the how the Tribe would respond if the HHD AWS plan is not implemented.

T03-94 Page 243. The discussion of wetlands fails to disclose that wetlands to be inundated may provide substantial overwintering habitat that may or may not be compensated for by side channel creation at Kanaskat.

T03-95 Page 247 *Preferred Alternative: Water quantity and water quality in the lower river can limit anadromous salmonid production in most years* Tribe believes that a lack of habitat is a major factor limiting production in the system, not just water quality and water quantity. The impacts of reduced water quantity or magnified by the lack of large woody debris to create pools in which salmon rear and hold.

T03-96 Page 249. *upper basin stream habitat is generally in good condition with percent pools ranging from 28-73%.* However, an analysis of MITFD data collected while surveying more than 15 miles of stream reaches in numerous streams above the HHD, data used as part of past and ongoing Washington State Watershed Analysis, found only 24% of the stream habitat is classified as pools with a standard deviation of 15%. Additionally, many of the pools and streams lack large woody debris. Juvenile salmon rearing habitat above HHD is extremely limited. Indeed, the lack of rearing habitat above HHD is known to the Corps which stated in its Green/Duwamish River Basin Ecosystem Restoration Study that *much of the upper watershed has been subjected to heavy timber harvesting and spawning gravels and pools have been damage.* This study also citing US Forest Service Watershed Analysis for the Green River above the HHD reports:

T03-92 It appears that semantics have led to misunderstanding of the DEIS in this case. The Corps agrees that Phase II would be implemented only following evaluation of monitoring results showing that Phase I objectives have been achieved and with consensus of all agencies and the MIT. Section 6.7.4 attempted to point out that Phase II of the Preferred Alternative would not occur without tribal concurrence.

T03-93 This seemed to be a valid assumption that did not require verification, as the tribe and Tacoma have worked diligently to reach agreement, and the no action alternative would certainly effect the full and final implementation of that agreement. The Corps apologizes for not first contacting the tribe before writing this statement.

T03-94 The restoration of the side channel at Kanaskat is not intended to mitigate for the loss of overwintering elk habitat in the reservoir inundation zone. However, the Corps acknowledges the possibility that overwintering elk may use the newly restored side-channel at Kanaskat. The mitigation targeted for overwintering elk is calculated to fully compensate for the loss of foraging habitat without benefit of the side-channel mitigation at Kanaskat.

T03-95 Comment noted. In recognition of the potential benefits of large woody debris to salmonid production, a restoration measure providing for transport of large woody debris past the HHD project has been proposed. See Appendix F1, Section 8.D, Habitat Restoration and Mitigation Project Descriptions, Measure 4: MS-09 Truck and Haul of Large Woody Debris.

T03-96 We agree that in the past, habitat above HHD has degraded by timber harvest practices. An analysis of pool frequency of major western Washington rivers by the U. S. Geological Survey (Black 1998) suggests that pool frequency in the upper Green River basin is well below historical levels, but higher than pool frequency such as the Skykomish, Snoqualmie and Cedar Rivers. The majority of land in the upper watershed has been degraded by past timber harvest practices, but ongoing timber harvest is controlled by state and federal restrictions. Under the protection of Habitat Conservation Plans and FEMAT guidelines, stream habitat quality in the upper watershed is expected to improve as should restoration opportunities for all anadromous stocks.

Comments

T03-96 Cont. *Of all the tributary habitats surveyed by the USFS (1996) in the upper basin, only Twin Camps Creek and Sawmill Creek were considered to have usable fish habitat. The other tributaries were ranked poor due to lack of pools, LWD, and or spawning gravels. The pools are spawning gravels are not maintained in the system largely because of the lack of LWD. Additionally, spawning gravels in some pools have been buried by fine sediments inputs from mass wasting or road erosion.*

T03-97 Page 250 *The second project is the collection, transport and hauling of large woody debris from the reservoir to the river below Tacoma's Diversion Dam for placement. The volume, timing, and placement of large woody would be adaptively managed based on the annual accumulation of large woody debris ... the final implementation of the truck and haul and placement of large woody debris would be dependent on developing a boater safety plan in conjunction with King County.* The DFR/DEIS narrative term placement of large woody debris implies that wood will be physically placed into a specific location, while Appendix F indicates much of the wood would be placed into the high flow of the channel and left to move. The FEIS narrative should clarify the proposed actions as though, some benefit will accrue from placing wood into portions of the river, over the long term, habitat quality and quantity will be improved if wood is placed into the river at the TPU Diversion Dam and then letting the river place the wood naturally. This will enable habitat restoration more consistent with the oft cited Green/Duwamish River Basin Ecosystem Restoration Study. Additionally, the DFR/DEIS proposed measures appears to be contingent upon the agreement of recreational boaters. Recreational boaters in King County have voice opposition to the placement of large woody debris into the Green River. If the Corps fails to implement the placement and release of LWD, then efforts to protect and restore salmon runs in the Green River will be compromised by the optional, recreational activities of a few people. Additionally, the statement on page 250 conflicts with that on page ...*to have no net loss of lower watershed habitat while maintaining existing anadromous salmonid populations* as well as the Tribal goal to increase the quality and quantity of salmon habitat below the Dams. It is also unclear why the Corps would in the interest of the recreational interests of a few allow the habitat quality downstream of the dams to degrade when the Corps (page 81) acknowledges the reduced habitat capacity and habitat quality in the Lower river adds to the uncertainty of restoring fish runs in the Upper River. Furthermore, a considerable quantity of large woody debris is needed in the lower reaches of the river to mitigate for the impacts that will arise from additional growth due to water supply resulting in habitat loss and fragmentation.

T03-98 Page 250. 2nd paragraph, There may be an error in this paragraph. The last sentence should read 400,000, instead of 400,00.

T03-99 Page 250. The discussion should indicate how only 3.2 acres of off channel mitigation. can adequately mitigate for 8 miles of stream and side channel impacts.

Replies

T03-97 As described in the Appendix F1, Section 8. Habitat Restoration and Mitigation Project Descriptions, Measure 4: MS-09 Truck and Haul of Large Woody Debris, the wood would be deposited in the active channel. Large woody debris could be placed below Tacoma's Headworks in late fall following initial reservoir drawdown for flood control to minimize the effects of LWD on recreational boaters. Details of the large woody debris transport plan will be worked out during the PED phase of the project.

A public involvement program has been requested by King County, and as local sponsor of the original Howard Hanson Dam Project, the Corps will consider King County's request. Coordination with King County and recreational groups is needed to help design the plan to minimize impacts to recreational boating where it doesn't negate benefits to fisheries resources. Public coordination is also needed to prevent boaters, anglers and other recreationists from cutting the wood after it becomes stranded in the Green River channel.

T03-98 Comment noted.

T03-99 The 3.2 acres of off-channel habitat improvement are provided under the environmental restoration portion of the HHD-AWS. The HHD-AWS restoration goal is to take advantage of opportunities to restore ecosystem functioning where it will improve the quality of the environment, is in the public interest and is cost-effective. The two habitat restoration projects proposed for the lower watershed are not meant as full restoration for the original dam impacts.

Comments

T03-100 Page 252-253. The DFR/DEIS implies that all salmonid species are likely to be equally affected by the project without any supporting information. Elsewhere in the DFR/DEIS, there are statements about some salmonid species (i.e. steelhead trout) being more affected than others. Such conflicting statements need to be resolved in the FEIS.

T03-101 Page 258. The DFR/DEIS contends that that the enlarged reservoir constitutes mitigation and not an impact. However, information presented in the DFR/DEIS clearly indicates that lack of certainty in the purported benefits of the project.

T03-102 Page 260 ... *it is uncertain whether chum salmon spawn as far as Kanaskat.* MITFD surveys during the chum spawning season found chum as far upstream as the surveys went the Icy Creek Rearing ponds. Given the lack of dedicated surveys for chum above Flaming Geyser Park and the statements in the US Army Corps of Engineers Green/Duwamish River Basin Ecosystem Restoration Study, chum use should be considered a high probability.

T03-103 Page 265. It is possible that that the NMFS would not allow wild chinook above Howard, as allowing wild chinook allowed above the HHD would experience a higher mortality rate than exists below the dam and thus impede recovery. The DFR/DEIS should discuss the implications of this to project benefits.

T03-104 Page 270. *The fish passage facility is considered a restoration and mitigation feature of the project.* The narrative justifying the distinction between restoration and mitigation is unclear and requires further elucidation.

T03-105 page 271. *Evaluation of the adult returns of the CWT juveniles would be considered the responsibility of the WDFW and or the Muckleshoot Indian Tribe.* The applicants are attempting to get others to undertake the determination oft he mitigation and alleged restoration. The undertaking should be the responsibility of the applicants to fund and collect the data. Furthermore, project success is the successful exercise of treaty harvest.

T05-106 Page 273. The discussion of cumulative impacts should include the effects of the TPU dam and first diversion water right, existing impacts of the Howard Hanson reservoir operations, and the effect of riprapping along the Green River in the upper watershed to protect the railway and roadways lying within the channel migration zone. The discussion of existing and potential future habitat degradation due to timber harvest activities in the upper watershed, appears to conflict with judgments elsewhere in the draft that the upper watershed habitat is of high quality.

T03-107 Page 275. The DFR/DEIS fails to consider that the Endangered Species Act requirements for improved fish passage at the dams without additional storage should be discussed.

T03-108 Page 278. The conclusions of the EIS could be interpreted to assume that the MIT has accepted the proposal. The Tribe has not accepted the project nor the alleged benefits of the project.

Replies

T03-100 The referenced text on pg. 252-253 describes the effects of the "No Action" Alternative. Continued downstream extension of bed armoring will reduce the quality and availability of salmon and steelhead spawning habitat; continued bed armoring will increase disconnection of side channel habitats and will reduce salmon and steelhead rearing habitat in the Lower Green River watershed. The continued loss of habitat in the lower watershed under the "No Action" Alternative will affect all salmonid species.

T03-101 The referenced text clearly acknowledges that inundation of tributary stream habitat reduces the productivity of the affected areas for salmonid spawning and juvenile rearing and requires mitigation. The coho production potential of the areas to be inundated is estimated at 6,500 smolts. The effects of inundation are assumed to reduce coho production in the inundated stream reaches, but reduced coho production is partially offset by increased reservoir surface area and shoreline. The net effect of inundated stream reaches is a 75 percent loss of juvenile production potential. Mitigation requirements are met by a combination of riparian and stream habitat improvement measures and the 25% of the coho production potential represented by the enlarged reservoir surface area.

T03-102 We believe the statement that "it is uncertain whether chum salmon spawn as far upstream as Kanaskat" accurately reflects the state of existing knowledge. The Corps Green/Duwamish River Basin Ecosystem Restoration Study incorrectly cited a 1996 USFS document as providing evidence that chum and sockeye salmon historically were found in the upper Green River basin.

T03-103 Passage of adult and/or juvenile chinook salmon to the upper watershed is not a Corp activity, but is the responsibility of the local sponsor, the City of Tacoma. The proposed AWS project does not provide for upstream movement of fish, but increases the survival of juvenile salmonids migrating downstream from the upper watershed.

It is possible that juvenile chinook originating from the upper watershed will experience a lower rate of survival to the estuary than fish originating from below HHD, since lower watershed fish will not be exposed to the effects of reservoir and dam passage. The AWS project provides the opportunity to extend the range of chinook salmon to historic habitats and to allow increased expression of life history traits. At this time, NMFS have not given any indication that the potential for increased chinook diversity provided by the AWS would not be allowed under the ESA.

T03-104 From a cost allocation standpoint, that portion of the fish passage facility that

T03-104 Cont. is needed because of the additional water supply pool (i.e. from without project pool elevation 1147 to foot elevation 1167) is considered to be a mitigation cost associated with water supply. Moreover, that portion of the fish passage facility needed because of additional storage for low-flow augmentation(from pool elevation 1167 to 1177) is considered a mitigation cost associated with restoration.

T03-105 Monitoring of Adult Returns. Under request from Corps Headquarters Policy Review staff, the Seattle District Corps is no longer proposing to mark outmigrating smolts with coded wire tags, or to provide funding for evaluation of adult returns. Should the MIT, WDFW and NMFS believe it beneficial to supplement recruitment of anadromous salmonid in the upper watershed, the Corps assumes that marking and monitoring those outplants will be performed, and funded, as part of the supplementation program.

Tribal Harvest is the Demonstration of Success. We agree that project success must include the opportunity for tribal harvest. In the analysis of the potential to establish self-sustaining runs above HD, an adult harvest level of 70% for coho, 35% for steelhead and 55% for fall chinook was assumed to be an inviolate component of the salmonid life cycle in the Green River.

T01-106 A detailed analysis of the cumulative impacts of the issues listed by the MIT is beyond the scope of the DFR/DEIS.

T03-107 In their statement of proposed ESA listing, the NMFS did not consider the Green River above Howard Hanson Dam to be critical fish habitat for the Puget Sound chinook ESU. The proposed ESA listing of chinook salmon in Puget Sound by NMFS underscores the potential benefits of extending the range of anadromous species to historic habitats above Howard Hanson Dam; however, the opportunity for potential benefits does not suggest a requirement.

T03-108 The Recommendations Section does not say these agencies have accepted the project. At this time, the Corps acknowledges that the Muckleshoot Indian Tribe has not indicated approval for or opposition to the Project. As described in the Executive Summary, page iii, second to last paragraph, the only fish and wildlife resource agencies listed as accepting the project are NMFS, USFWS and WDFW: the MIT is not listed as accepting. Lastly, see the Reply to Comment T03 - 1 - 8.

T03-109 Page 278. Information in the DFR/DEIS does not support the conclusion that 9,600 acre feet of Phase II additional storage for summer/fall low flow augmentation will benefit anadromous fish given the trade-offs and uncertainties surrounding reduced spring flows.

T03-109 In response to significant concerns regarding potential project impacts, and as a result of the Agency Resolution Process, a two-phased project approach was implemented. The phased approach incorporated an adaptive management and monitoring process that conditioned Phase II of the project on demonstrating that impacts could be sufficiently minimized and mitigated. One objective of proposed monitoring will be to identify whether salmonids respond to changes in spring flows as anticipated.

APPENDIX F1

T04-1 F1- Page 5. The discussion and identification of the "two main competing hypotheses" regarding life history limiting factors is vastly oversimplified and fails to address the need to develop explicit hypotheses about how the system functions. This Appendix should be revised to reflect the more complex concepts of sequential habitat availability and limiting factors expressed, for example, in the 1996 Independent Scientific Group report *Return to the River* and included in the narrative portion of the FEIS. It should also address the concepts raised by Poff et al. in *The natural flow regime: a paradigm for river conservation and restoration* (BioScience, December 1997.

T04-2 F1-Page 15. The adult return rate study failed to distinguish between fish emigrating in spring versus those emigrating in fall. Conclusions about the future condition under AWSP cannot therefore be made. Studies in Duwamish estuary show that more fish from above HHD are caught the year after release than the year of release for all species.

T04-3 F1- Page 17. The results statements imply that the smolts were closely associated with wood, when only the presence of radiotags themselves were confirmed to be located near wood in proximity to loon and otter inhabitants. Most of those tags that were associated with wood remained stationary, suggesting that the tagged fish had been consumed by avian and mammal predators. The report should discuss the alternative analysis and conclusions presented in the paper *Travel time and residualism of juvenile coho salmon, chinook salmon and steelhead trout migrating through Howard Hanson Reservoir, King County, WA: An analysis of Mobile tracking and fixed receiver data*, E. Warner, MIT Fisheries Department July 19, 1997.

T04-4 F1- Page 78-79. The comparison to smolt production estimates in lakes is inappropriate because unlike in most lakes, the Howard Hanson reservoir is drawn down dramatically every year to elevation 1070 ft. Furthermore, any smolts surviving year round are likely to be significant predators on other fish.

T04-5 F1-Page 84. The water particle travel time estimates provided are misleading and oversimplified as they assume equal inflow and outflow and a uniform reservoir width. These assumptions are not consistent with spring refill or the shape of Howard Hanson reservoir. A large back eddy is created during refill that is compounded by the reservoir narrows at Eagle Gorge (see Warner, 1997).

T04-6 F1-Page 94. The discussion of reservoir size fails to recognize the greater influence of refill rate and inflow/outflow on fish passage.

T04-7 F1- Page 131. Conclusions drawn from comparison of Howard Hanson Reservoir to Lake Washington are especially weak as the discussion failed to consider differences in refill rate and water residence time. Additionally, residualization of coho and chinook has been observed in Lake Washington as well.

T04-8 F1-Page 169. It should be noted that the outmigration timing data presented is for hatchery plants. Natural or wild fish, especially wild chinook, could be expected to have

T04-1 Comment noted. The understanding of "normative river" flow regimes and how fish respond to these flow regimes is a rapidly evolving cognitive process. A similar, rapid evolution in system understanding is also occurring in the two sister watersheds, Lake Washington and the Green River. Section 1.0 of Appendix F1 provides an introduction to the concept of adaptive management including the extent of discussion the Corps has had with resources agencies and MIT staff regarding how HHD does or does not affect aquatic habitat. In writing the DFR/DEIS we were not prepared to go beyond the general professional agreement reached describing an adaptive management plan, including more explicit hypotheses on system function. An adaptive management plan, incorporating a long-term monitoring plan with explicit hypotheses to be evaluated, will be developed in the PED phase of the project. See comment-reply T04-3.

T04-2 We disagree that future conclusions cannot be made. The design of the adult return rate study was set up and agreed to by resource agency and MIT staff: survival rates for returning adult coho salmon planted as smolts above and below HHD provided a baseline condition against which future returns (AWS Project) could be analyzed. It was understood from the beginning that there would be uncertainty as to the smolt emigration timing (spring vs. fall) and how each contributes to adult returns. Because of this the Corps and Tacoma agreed to fund additional studies including a WDFW follow-on report that includes an analysis of adult-return in relation to identification of spring vs. fall emigration timing. Even if study results show that WDFW cannot identify the timing of emigration, the adult returns provide a valuable baseline to measure future smolt-to-adult returns.

T04-3 We agree that some of the tags at one location, the floating debris pile near the dam, could have been excrement from loons or other predators that had eaten radio-tagged fish. However, radio-tagged juveniles were found associated with wood throughout the reservoir, including debris jams in the upper reservoir at low pool, at the tributary confluences of the North Fork and Charlie Creek, and at the debris pile near the dam. Other than some of the tags at the dam debris pile, we did not find tags near wood in stationary positions during our mobile tracking studies indicating that these were still actively moving tagged-fish. Given any uncertainty in determining the final disposition of radio-tagged fish, it still does not remove the reasoning that additional large woody debris in the reservoir will improve habitat conditions for rearing and migratory juvenile anadromous salmonids.

The alternative analysis and conclusions in Warner (1997) will be considered in the

T04-3 Cont. Adaptive Management Plan and Monitoring Program report that will be completed in the Plans and Specifications phase, PED. This report will present an integrated monitoring and evaluation approach for all instream areas affected by dam and reservoir operations. Resource agency and MIT staff who were previously involved in the Feasibility Study will have the opportunity to provide input to development of the monitoring program and refinement in dam and reservoir operations.

T04-4 We did not use a smolt production estimate for chinook salmon or steelhead. However, we consider it self-evident that some number of smolts will be produced from an artificial lake, such as HH Reservoir, even one that varies in size from 100-763 (existing) or 100-1254 (AWSP) surface acres. As discussed in pages 78-79 and Section D of Appendix F1, HH Reservoir provides fair to good rearing conditions for juvenile salmonids. In fact, in 1991 and 1992, over 30,000 smolt-sized coho salmon pre-smolts emigrated from the reservoir. It is a simple conclusion to expect that some percentage of these fish will survive the winter to become smolt-ready fish. We also consider it self-evident to expect that additional production from reservoir-reared juveniles will occur during the AWS Project given the habitat improvements projects we are recommending for 1) areas above the reservoir (restoration), 2) within the reservoir, and 3) below the reservoir. These projects will benefit juveniles rearing in the river prior to reservoir entry, during residence in the reservoir, and after emigration below the reservoir and dam. As discussed on page F1-79, we do not expect that additional reservoir production will off-set losses from inundated stream habitat. In our mitigation planning we are recommending projects that compensate for the full area of inundated habitat irrespective of reservoir production compensation.

In the AWS Project analysis we did estimate a small production potential for coho salmon smolts, paralleling earlier work done by the US Fish and Wildlife Service (USWS). The USFWS provided an estimate of coho smolt production in HH Reservoir using an average reservoir elevation for existing and the AWS Project pool (Wunderlich and Toal 1992). In their estimate they calculated coho smolt production using a value of 1.25 smolts/yard of shoreline as reported in Zillges (1977). As discussed on Pages F1-78 and 79 we elected not to use the value from Zillges as this value appears to overestimate production when compared to estimates using smolts per surface area of lake (Baranski 1989). We did use the value for smolts per unit surface area in estimating existing and future production potential for coho smolts in the reservoir. As shown in Table 4, page F1-43, we estimated 2935 smolts for existing reservoir area (using the same average pool elevation 1105 ft as Wunderlich and Toal 1992), and 1823 additional smolts for the AWS Project pool (elevation 1123 ft as reported in Wunderlich

T04-4 Cont. and Toal 1992).

We are unsure of what is meant by "smolts surviving year round". If you mean yearling pre-smolts (1+) or smolts that were entrapped in the reservoir from the lack of a surface-outlet at the dam, we are unaware of any study that has documented that these hold-over fish are significant predators on other fish. In general, coho pre-smolts (under natural or artificial rearing conditions) can prey on other fish, but there is little or no evidence showing "smolt-sized" juveniles or entrapped pre-smolts and smolts are any greater predator than coho pre-smolts from other river systems: although it is reasonable to expect some level of predation for larger salmon and steelhead juveniles. Monitoring and evaluation of predator populations will occur before and after construction of the AWS Project.

T04-5 In consultation with US Fish and Wildlife Service and biologists from U.S. Geological Service we added modeled water particle travel times (WPTT) to provide a more complete list of physical variables that could be analyzed against juvenile travel times. The modeled WPTTs are simplified from natural conditions, requiring a steady-state condition, but they were considered adequate for the small sample-size of radio-tagged fish they were analyzed against. Our model did not assume or use a uniform reservoir width but used actual reservoir cross-sections (n=16) with measured widths and depths included in the model parameters.

Back-eddies can form at various points throughout the reservoir, including tributary confluences, the dam and at the inlet to Eagle Gorge. There is insufficient information to identify 1) under which conditions these eddies form; 2) where they form; 3) what is their duration and magnitude; and 4) what these eddies ultimately mean to the survival of migratory juvenile salmonids (for example, during the mobile surveys of radio tracking study we did not find more than one fish consistently at the constriction/inlet of Eagle Gorge). Under the next study phase, Plans and Specifications, we will be constructing three physical models (built to scale) of the lower reservoir and dam to analyze flow patterns. These physical models will identify actual and potential cross-flow fields and will be a valuable tool in evaluating fish passage facility modifications necessary to overcome or reduce these cross-flow areas. We are also recommending an adaptively-managed, 15 year cost-shared restoration monitoring program for fish passage through the reservoir: see Section 10 of Appendix F1.

We have been aware of micro or meso-habitat changes that can occur in the reservoir (specifically Eagle Gorge and the gorge inlet) since discussion of the radio-tracking

T04-5 Cont. results with Fish Passage Technical Committee member Milo Bell in 1995. Milo stated that during periods of high refill, in this case we were specifically discussing a refill rate of 500 cfs or 1000 ac ft/day vs. inflow of 1100 cfs (45% ratio of outflow/inflow), reverse flow conditions could result in Eagle Gorge and at the inlet to Eagle Gorge. The results of the FWS regression analysis and discussions with Milo Bell and other fish scientists has resulted in the AWS Project continuing and primary emphasis on minimizing refill rates (Phase I maximum of 400 cfs/day March, 300 cfs/day April, and 200 cfs/day May) and mimicry of natural flow hydrology.

T04-6 Throughout the course of the AWSP Feasibility Study, MIT staff communicated they were concerned about reservoir size and reservoir operational effects on juvenile salmonid survival. One objective of Section 2B-2 in Appendix F1 was "to compare the physical characteristics (morphometry) of various reservoirs in Washington with Howard Hanson Reservoir, Baseline to the AWS Project." It did not include discussion of reservoir operational considerations, which are reviewed in Section 2B-3 to 2B-5. The discussion on page F1-94 follows this objective for Section 2B-2. The conclusion to the review of physical characteristics is that HH Reservoir, existing and the enlarged AWS Project, is small to medium-sized. In combination with the results of the travel time study (Aitkin et al. 1996 and Sections 2B-3 and 2B-4) we believe the AWS Project reservoir size will have a minimum effect on overall survival. However, we are still taking a conservative approach in project planning, by emphasizing a variety of habitat improvement projects and flow management tools to ensure maximum smolt survival through the reservoir.

In Sections 2B-3, we describe that reservoir refill is but one possible answer explaining travel time differences: based on the UFWS analysis of smolt travel-time, which identified a variety of reservoir parameters that could influence travel time, including reservoir inflow, reservoir refill, fish condition, and turbidity. Even though these study results suggest that reservoir travel time is affected by a variety of factors, we have carried forward minimizing the AWSP reservoir refill rate as a major operational factor that could improve migratory conditions for juveniles transiting the reservoir.

T04-7 The comparison with Lake Washington is especially appropriate given that 1) hatchery coho salmon is from the same basin stock, Green River; 2) Lake Washington is the nearest neighbor watershed to the Green River; 3) MIT technical staff have provided information to the Lake Washington Ship Canal Fisheries Interagency Workgroup comparing Lake Washington coho and chinook salmon smolt-to-adult survival rates to other nearby river systems, including the Green River; 4) like the Green River, habitat

T04-7 Cont. conditions in Lake Washington have been extensively modified by urbanization and include virtually no estuarine habitat; 5) both watersheds are influenced by refill operations of the Seattle District Corps; and 6) the storage volume and timing of reservoir refill are virtually the same for Lake Washington and Phase I of the AWS Project; Phase II is greater. Lake Washington active storage volume (lake elevation between 20 to 22 ft) varies from 112, 966 ac ft at low pool to 159,390 ac ft at full pool, or a spring refill volume of 46,424 ac ft: HHD Phase I storage volume is 50,400 ac ft. The timing of Lake Washington reservoir refill is February 15 to the end of the first week in May, or about 88 days, with an average daily refill rate of 528 ac ft: Phase I refill follows the same general refill period beginning on February 15 and reaching full pool May 17 (32-year average), or about 97 days, with an average daily refill rate of 520 ac ft. Water residence time would be considerably longer in Lake Washington given that the total storage volume affected by the locks is 159,000 ac ft (15 ft to 22 ft elevation) and that a greater storage volume of the Lake lies below 15 ft elevation.

Residualism is a potential life-history pattern for coho, chinook and steelhead under natural and artificial rearing conditions and can be accelerated in frequency by a variety of natural and human-influenced factors including non-reservoir and reservoir related. Residualism has been observed in Lakes Washington and Sammamish. To our knowledge, primary factors explaining this residualism have not been provided. For example, Lake Sammamish has freshwater resident chinook salmon reaching sizes greater than 20 inches. In this instance, is residualism a function of the Issaquah Creek hatchery stock, excessive temperatures in the lake and Sammamish Slough, abundant food resources, or some other unidentified source?. We can also speculate that residualism for some stocks may have occurred in Lake Washington because of low inflow and operations at the Locks. In recent decades there have been recurring years with long periods of time when no spill occurred during the normal smolt emigration window leaving only the locks, the fish ladder, or the saltwater drain as egress routes. It has been clearly communicated to the Corps that these routes are not "fish-friendly" and that the lack of spill may have delayed or entrapped emigrating smolts.

T04-8 Table 1 on page F1-169 (Appendix F1) illustrates the outmigration timing from naturally-reared salmon and steelhead fingerlings planted in the Upper Watershed. As stated on Page F1-168, Table 1 is shown for comparison to Figure 1, page F1-168. Figure 1 values were used in the predictive travel time model as *Variable 1: Juvenile Outmigration*. The proportional outmigration timing shown in Figure 1 was developed from a wide variety of Green River references (Lower and Upper Watershed), including

T04-8 Cont. a much more extended migration period. This will significantly influence the stated benefits of the project and needs to be analyzed in the FEIS.

F1-Page 359. With regard to chinook and self-sustainability, the implications for management from the extent of straying are a serious matter. If straying is minimal, *e.g.* 10-20% on a consistent basis, then there is probably evidence that natural production is healthy. If so, there may be opposition to introduction of more strays from upper basin supplementation because evidence of straying from upper river releases of hatchery chinook have been found. For example, Icy Creek tags have been found throughout the basin and HHD chinook tags have been recovered in Newaukum Creek.

T04-9 If straying is mid-range, e.g. 20-40%, then there will be less chance of a healthy natural stock and more pressure to reduce straying and it is probable there will be resistance to upper basin supplementation for reasons stated above.

If straying is high, e.g. 40-80% then natural production is most likely entirely made up of second or third generation hatchery fish. Under this scenario, however, self sustainability is not a realistic goal.

Determining the degree of straying is of critical importance to the future of Green River Chinook management, with or without the project. While many attempts have been made, none are considered best science. Within the foreseeable future, however, all hatchery chinook production will be marked with an adipose clip for the purpose of selection during sport fisheries. An incidental benefit of this mark will be certainty in determining hatchery/natural composition in the terminal fishery and the rate of straying to the spawning grounds. Assuming several full cycles of supplementation in the upper basin it will be possible to determine with certainty how many chinook returning to the trap are of supplementation origin and how many are progeny of natural production. In the Tribes view this quality of information will be necessary to determine the feasibility of self sustaining stocks. Assuming it to be the case now is short sighted and irresponsible. Five cycles of chinook takes fifty years to complete.

T04-8 cont. data from Table 1. These references are discussed in Section-5.A of Appendix F1. These multiple references include emigration timing for wild and natural-reared hatchery plants and were used in the analysis of AWS Project impacts and benefits for both Section 2B-5 and Section 5 of Appendix F1. We believe that we were thorough in our review of known information on Green River juvenile salmonid emigration timing and that our impact analysis and benefits assessment is as accurate and complete as the available information.

T04-9 We agree that identifying the rate of straying of returning adult chinook is important to the management of Green River chinook salmon, and that the knowledge of chinook straying must be improved. We believe that providing the opportunity to establish a self-sustaining run of chinook salmon in the upper watershed is a reasonable and responsible goal. Whether the goal of establishing a self-sustaining run can be achieved won't be known till the project has been operating and monitored for several years. The analysis of the potential for self-sustainability used a deterministic life-cycle model that assumed values for each step in the salmon life cycle. Significant deviations from any of the steps will significantly affect the realization of self-sustainability.

For instance, we assumed that only 67 percent of juvenile chinook would survive migrating through the HHD reservoir. If observed survival is 75 percent, and assuming the other life cycle assumptions are accurate, there would be 266 more adult chinook returning to the upper Green River watershed[1]. An increased return of 266 adult chinook represents more than 10% of the escapement goal for the upper watershed. If all other life cycle assumptions are accurate, increasing reservoir survival increases the likelihood that self-sustainability can be achieved. If observations indicate that reservoir survival is less than expected, operations must be changed to increase survival, or other measures must be instituted to ensure higher survival. If NMFS finds it to be in the best interests of Green River chinook stocks, the Corps would not be against supplementing adult returns to enhance chinook recruitment. The goal of self-sustainability was not adopted to limit fish resource management alternatives, but to ensure the highest level of fisheries restoration benefits within the constraints of cost-effectiveness and public interest.

Specific Hunting/Wildlife Comments on USACE AWSP DFR DEIS

General comments:

T05-1 A detailed contour map showing the current pool level and proposed levels in Phase I and II is needed to address wildlife issues. An additional map of existing habitat showing current pool level and an outline of each Phase is also needed.

T05-2 Muckleshoot Indian Tribe wildlife biologists anticipate being be included in planning for, commenting on, and monitoring the elk forage habitat mitigation sites.

Specific comments

T05-3 pg. 9 *The proposed project modifications are consistent with the project purpose of low-flow augmentation, and provide a positive benefit to fish and wildlife resources.* Such a broad statement as a "positive benefit to wildlife" is too general. Not all wildlife will be benefited from the proposed project. The HEP analyses focused on a few general species of wildlife. While this may represent a mix of affected species, none of the proposed alternatives have no impact on some wildlife species. MIT recommends presenting a detailed species list for the inundation area showing those positively affected and those negatively affected.

T05-4 pg. 62 *Large woody debris would also be placed in terrestrial habitats to provide additional food and denning places for terrestrial mammals and birds.* This statement is rather vague. It does not identify which species may be enhanced or where LWD would be placed. Most importantly this statement assumes that there is currently not enough large woody debris for mammals and birds and that these populations might be enhanced with this material. General statements like these without specifics should be deleted from the EIS.

T05-5 pg. 63 *Plant types could include: ... bald cypress...* ONLY native plant species should be considered. There have been enough problems with non-native plants introduced into new areas.

T05-6 pg. 142 *Wildlife Habitat Mitigation* The elk forage pastures proposed for mitigation of the loss of MacDonald field have the ***potential*** to the produce suitable elk and deer pastures. There should be close coordination between MIT, TPU, Corps, and WDFW on forage species, disking, seeding, and fertilization schedule. The ongoing MIT adult cow elk study will yield data on elk distribution, movements, migrations, home range, and habitat use. These pre-AWS data should prove valuable in assessing the effectiveness of the mitigation plan, however, there should also be other mitigation alternatives available, and applied adaptively, should the proposed plan fail.

T05-7 pg. 142 *Such changes would not affect the attainment of full mitigation; rather they would affect the manner in which full mitigation is achieved.* The MIT Hunting Wildlife program acknowledges that wildlife habitat mitigation will be dynamic and that an exact plan description may be modified as work on specific sites begins. The key phrase in this

T05-1 A detailed contour map was not included as the Corps felt that few readers would benefit from such a map. However, the Corps can make one available to MIT in the near future if you desire one. A map showing the various reservoir elevations was included in Appendix F1 (Figure 2 of Section 2B-1 and Figure 1 of Section 3A). We agree that such maps would be helpful, but we did not overlay the reservoir levels onto the contour map, or on the habitat map, as the detail of such combined maps would make them unreadable. We feel that impact assessment is still easily accomplished without these aids. During PED, however, large scale contour maps of the individual wildlife mitigation sites will be produced to aid us in fine-tuning the locations of pastures and other mitigation features.

T05-2 The Corps agrees completely. We will again form an interagency team (including MIT) during our PED phase to solicit input for design of mitigation measures. The team will remain throughout the phase and into and through construction, and monitoring. We did not develop the initial plans without agency and tribal input, and we will not complete the project without agency and tribal input.

T05-3 The statement that the proposed project would result in a positive benefit to wildlife was not meant to mask that adverse impacts would occur (there would be impacts to some species), but rather to indicate our belief that the Section 1135 project would result in positive effects to wildlife overall. There are few—if any—projects that do not result in adverse impacts to some species. Enhancement of power line rights-of-way for elk grazing may seem to be positive benefit to all species that already utilize those areas. However, the rights-of-way include many shrubs and small trees, as well as herbaceous plants, that could be removed to create pastures. Thus, species that utilize shrubs, trees, and herbaceous plants would suffer an impact as a result of this effort. There are literally hundreds of plant and animal species found in the vicinity of Howard Hanson Dam. A table showing the effects of the Section 1135 project on each species is not within the scope of this document. However, we can offer, in our best professional judgment, that elk, mallard, green-winged teal, osprey, common loon, Canada goose, wood duck, and hooded merganser would all benefit from the project. All species that live in forested habitats such as Hutton's vireo, black-throated gray warbler, black-tailed deer, and many others are likely to be impacted by the project. We determined, through agency coordination, that the primary target species for the project include elk, common loon, cougar, red-backed vole, pileated woodpecker, and wood duck (and several others). We believe that the 1135 project would benefit wildlife on the basis that the habitats to be improved are scarce in the project area, while the habitats to be adversely impacted are abundant in the project area. Thus, while the forested species are affected,

T05-3 Cont. the loss they suffer is relatively small compared to the gain made by species that utilize pastures, islands, and wetlands.

T05-4 This statement is made in an introductory section of the DEIS; thus, details were not provided in that section. Page 148 of the DEIS, and p. 62 of Appendix F2 provide details of placing LWD in terrestrial habitats.

T05-5 Ultimately, approval to use a non-native plant will come through the WDFW permit process for introduction of native plants. Agencies, MIT, and the public will have the opportunity to comment through this process. Also see Comment O06-11.

T05-6 Agree. An interagency team (including MIT) will participate in the refinement of pasture design, including forage species, disking, seeding, and fertilization schedules, which we hope would utilize the data from the on-going cow and calf elk studies. Other alternatives will also be developed by the team.

T05-7 Mitigation measures proposed by the Corps in the recommended plan are intended to provide full mitigation for project impacts. Monitoring is designed to test whether the sites are performing per Corps expectations. If they are not, changes will be made to bring them up to expectations.

T05-7 Cont. sentence is that *full mitigation will be achieved.* Less than full wildlife habitat mitigation is unacceptable and does not comply with the Tribe's goals for wildlife.

T05-8 pg. 142 *Elk Forage Habitat pastures* For reference and clarity there should be a restatement of exactly how much of each habitat type is inundated for each Phase. . For example, it is unclear how large MacDonald Field is.

T05-9 pg. 142 *Elk Forage Habitat* Burning should also be considered as an additional pasture management tool.

T05-10 pg. 142 *Phase I Mitigation* Sites 1 and 2 may not be used by elk displaced from MacDonald field.

T05-11 pg. 142 *Phase I Mitigation* Elk currently use the powerline area which has been proposed for elk forage habitat mitigation (Sites 1,2,7,8). Thus, the loss of open pasture is not being actually replaced with open pasture but simply with potentially better forage (As stated in F2-18). A detailed forage analysis needs to be conducted on all sites proposed for forage habitat enhancement to verify that the proposed management activities will result in better and more forage than currently exists on those sites at all times of potential use. The amount of new forage (e.g., in DDM units) on the proposed mitigation sites ***must*** be equal to what presently exists on those sites ***plus*** an added amount to compensate for the loss of forage through inundation.

T05-12 pg. 142 *Phase I Mitigation* An additional consideration for ecosystem restoration that should be tied to this proposed project is elimination or reduction of scotch broom throughout the entire watershed, especially in potentially important elk foraging areas under powerline right-of-ways.

T05-13 pg. 145 *Phase II Mitigation* The Phase I elk pasture mitigation results must first be assessed on their effectiveness before Phase II is implemented. Phase II should be proposed under a separate EIS after the results of Phase I have been analyzed.

T05-14 pg. 157 *Staffing* Is all of the proposed wildlife mitigation practical? What added staff are needed to fully develop the wildlife mitigation sites and what is the certainty they will be hired to implement and monitor the mitigation proposals?

T05-15 pg. 196 *Cougar (Felis concolor) are also numerous.* Black bear (*Ursus americanus*) are also quite numerous.

T05-16 pg. 197 *WDFW estimates 590-650 elk within the watershed each year.* This comment needs to be cited or supported by information from studies conducted within the watershed. A more recent 1997 report available from WDFW indicates an elk population of only 200-300 animals.

T05-17 pg. 197 *A tribal subsistence hunt...* The elk hunt in the watershed was canceled in 1997 and again in 1998 and will be closed until the elk herd rebounds and productivity increases.

T05-18 pg. 197 *Black-tailed deer ... their numbers are estimated to be similar to black tailed deer populations in surrounding areas.* Numbers depend on size of area. What is probably meant here is *density* not numbers. The habitat potential may be similar to

T05-8 The total acreages of each habitat type, under existing conditions, and through each phase of the project, are listed in Table 3 of Annex 1 to Appendix F2. Acreages of specific areas, such as MacDonald field, were not given. The Corps estimates that approximately 18 acres of MacDonald field would be inundated.

T05-9 Concur; burning can be a useful tool in habitat management. This will be considered in PED.

T05-10 Maybe not; however, sites 1 and 2 are currently used by elk. The Corps anticipates that improving the forage at sites 1 and 2 should aid the population of elk that utilizes these areas (which will lose forage along the shoreline of the North Fork Green River in Phase I).

T05-11 Agree. Test pastures will be planted prior to implementation of Phase I to analyze the forage quality, and soil suitability for various pasture plants. The HEP analysis assumes that we will succeed with improved forage quality (i.e., greater than that existing today), and thus shows a net benefit to elk as a result of the mitigation.

T05-12 Control of Scot's broom in other areas of the watershed may be outside the scope of this project. Where it occurs on mitigation lands, every effort will be made to control this invasive plant. It is possible we may be able to enter into a cooperative agreement with BPA or Puget Sound Energy. However, the species is extremely difficult to control. Burning (twice) is accepted as the most viable method, and it is extremely doubtful that power companies would allow burning under their lines.

T05-13 Agree. The Corps intends on preparing a separate environmental document for Phase II, since few of the impacts of Phase II are truly quantifiable at this time, and need to be addressed in greater detail prior to implementation. Mitigation for Phase II would be re-evaluated at that time.

T03-14 During PED the Corps and TPU will be working with the MIT and the resource agencies to assure that the wildlife mitigation sites included in the final design are the most appropriate. The mitigation sites will be developed during construction and once developed will be maintained under Operations and Maintenance (O&M). Before construction, The Corps and TPU will enter into a cost sharing agreement and part of that agreement will address the requirement for TPU to be responsible for O&M on the AWS Project. This would include all mitigation sites.

T05-15 Comment noted.

T05-16 Agree. The Corps was not aware of the magnitude of the decline until after the DEIS was printed.

T05-17 Agree. The Corps was aware of this but failed to reflect it in the DEIS.

T05-18 Density is the correct term. The fact that the density may actually be less due to predation by cougars, coyotes, and black bears is new information. Comment noted.

T05-18 Cont. surrounding areas, but due to protection of bear, cougar, and coyotes, predation has likely resulted in lower density of deer than surrounding areas.

T05-19 pg. 198 *Cougar* The WDFW *was* involved in a cougar study which has ended. The stated estimated number of cougars is well beyond current estimates and what the available prey base can support.

T05-20 pg. 198 *...the large stable elk herd...* The elk herd has declined from 600+ to 200+ in 3 years, which can be hardly called stable. The Corps biologist recently attended a meeting on the status of the Green River elk herd. Cross-check comment with that on pg. 244.

T05-21 pg. 243 *Inundation of roughly 12 acres of grass meadows and up to 90 acres of emergent wetlands would result in loss of these forage areas. This loss represents approximately 56% of the foraging habitat for elk near the reservoir.* With a loss of 56% of the habitat in the area, will the mitigation meadows replace this habitat completely? Also, any evidence that elk will use these areas that are scheduled to be replanted and re-tilled each year should be presented.

T05-22 pg. 244 *Migration corridors often follow shorelines.* If this from a study that was conducted, it should be cited. We can not determine from the EIS that the created shorelines will be effective corridors for the elk. Again, the MIT elk study will shed light on migration patterns.

T05-23 pg. F2-6 *Existing Wildlife Resources.* It would help if these species were listed in a table and *a + or - or =* used to identify how each species might be affected by various alternatives with and without wildlife habitat mitigation.

T05-24 pg. F2-9 *Phase I 281 acres and Phase II 161 acres* The current MIT-TPU agreement provides for tribal ceremonial hunts. Watershed inspectors have interpreted this to mean ceremonial hunts shall occur on City of Tacoma lands and other open and unclaimed land. The loss of 442 acres of terrestrial land base during inundation only reduces the amount of area possible for conducting ceremonial hunts. TPU shall facilitate landowner agreements to provide access to other lands while conducting tribal ceremonial hunts.

T05-25 pg. F2-18 *...assumed elk meadows can be established which are more than twice as productive than existing right-of-way...* It would help if there were data to back up this statement. Will *twice as productive* be enough to offset losses from inundation? Although created pastures may be twice as productive as natural openings, how do they compare in forage quality? Data may be collected to assess elk nutrition and habitat use in the ongoing MIT elk study.

T05-26 pg. F2-18 *Several different mixes will be tested prior to the pool raise to determine which species are most preferred by elk.* True forage *preference* studies are hard to design and interpret. MIT wildlife biologists expect to be included in discussions of forage species considered and studies to assess which are "preferred".

T05-27 pg. F2-18 How might the elk pasture productivity and resultant availability to elk for winter forage be affected by increased rodent or insect populations associated with the pastures?

T05-19 Comment noted. An early estimate of cougars in the watershed was 25-35. This number was used in the DEIS without confirmation from the WDFW. We understand the number is much less than that, though population estimates have not been made.

T05-20 Concur. This information was available at the time of preparation of the DEIS, as reflected in the discussion of elk on p. 244. Unfortunately, not all of the discussion in the DEIS regarding elk populations was updated. We understand that the elk herd has been in serious decline for at least three years, likely due to a variety of causes.

T05-21 Phase I will inundate 12 acres of grassland, which will be replaced by 79 acres of managed pastures. Though none of the pastures will be adjacent to the reservoir, the HEP analysis indicates these will fully replace the loss of MacDonald field. Several studies from previous mitigation projects at Merwin Project (Lewis River) (Merker and Hale, 1982), BPA powerline study (West, 1987*), and Taber (1977, unpublished*), indicate that the productivity of the forage can be improved between 126% and 232% through the application of fertilizer. In two of these studies (West and Taber), elk use was found to increase. In Taber's study, however, the increase in elk use may have been so high that it caused lower productivity during the winter months. Thus, we are optimistic that creating productive forage will result in increase elk use.

Up to 90 acres of wetlands could be lost as a result of Phase I; these will not be fully replaced, but the replanted sedge meadows are expected to be at least as palatable and nutritious as those lost to the pool raise. The hope is that elk will find them more palatable than what is currently there, based upon evidence at other projects (see response to comment T05-28).

*West, S.D. 1988. Nitrogen fertilization and the suppression of tree establishment on Western Washington rights-of-way. In: Byrnes, W.R. and H.A. Holt. 1988. Proceedings, Fourth Symposium on Environmental Concerns in Rights-of-Way Management. October 25-28, 1987, Indianapolis, Indiana. Purdue University, West Lafayette. pp. 128-132.

*Taber, R.D. 1977. Power line rights-of-way and wildlife in forested mountains. Unpublished report, University of Washington, College of Forestry, 33 pp.

T05-22 No study was done; the comment was made based on personal observation, albeit, brief and over very short distances. Also, anecdotal evidence (i.e., discovery of

T05-22 Cont. hoof prints and grazing activity along shorelines) suggested to the author that elk very likely follow at least some of the Howard Hanson shoreline. We appreciate the fact that the MIT study will shed light on elk movements in the vicinity of the project and look forward to seeing this report.

T05-23 Concur. A Species list follows this letter. However, at this late date, the specifics of project alternative impacts on each species, with and without mitigation, are not possible to provide in the short time remaining prior to publication of the final report.

T05-24 We recognize the treaty rights of the Muckleshoot Tribe to hunt in the watershed, as well as the agreement between MIT and TPU for ceremonial hunts. The AWS project does not alter these treaties or agreements in any way. However, the loss of approximately 440 acres due to implementation of both phases of the project is an irretrievable loss of habitat for elk. The project proposes to mitigate for this loss by planting sedges in the areas of low topographic relief, and through various other measures to replace wetland, forested, and grassland habitats. The Corps' HEP analysis indicates the mitigation would replace lost habitat fully by increasing the yield and nutritional value of other grazing areas, and creating new grazing areas. Although the eventual success of the plan is not guaranteed, we look forward to working with MIT to refine the sites and development of the sites, and using the results of your elk cow and calf studies to further aid in refinement of the mitigation plan; we trust this cooperative effort will provide better assurance for the success of the mitigation plan. With regard to access, the loss of acres is seasonal: during the fall and winter, the reservoir will be drawn down to existing fall and winter levels, thereby resulting in no change of access (though vegetation cover will change) for the sanctioned hunting season (though we recognize the hunt was suspended in 1997 and 1998). We assume ceremonial hunts may occur at any season, and for these, the pool raise would result in a smaller effective hunting area. We also recognize that E.O. 13007, "Indian Sacred Sites", allows tribal access to Corps project lands (and other Federal lands) for ceremonial purposes.

T05-25 See response to comment #T05-21 above. Forage quality will be assessed during the test pasture study (see response to comment #T05-11).

T05-26 Thank you! Our plan is to involve resource agencies and MIT in development of detailed mitigation plans. This includes the testing of managed pastures and forage species of plants. Several studies could be conducted, including performance (growth) of various forage species on different soil types; performance with different fertilizers;

T05-26 Cont. palatability to elk; nutritional content; etc. The Corps is committed to making this mitigation plan a success; your assistance will be instrumental in reaching that goal.

T05-27 This is a good question for which we have no answers at this time. It is one more item that could be examined during the testing of pastures. Even if testing does not disclose problems, rodent or insect outbreaks could occur later, following implementation of the approved mitigation plan. Such outbreaks would be immediately obvious to watershed inspectors (who will visit most sites at least weekly) or to O&M personnel. Solutions will be quickly sought and implemented.

T05-28 pg. F2-20 *At each site, shallow marsh vegetation would be developed...* The proposed sedge plantings as mitigation for loss of elk forage habitat (sites 16, 22,23,24,25) without reference to forage value and palatability to elk is misleading. Is there documented use of these sedge species by elk? These plantings, however, may provide some benefits to other wildlife.

T05-29 pg. F2-23 *Phase 2 would .. inundate the 4 acres of sedge planted for Phase 1 emergent wetland mitigation.* It would be cost-effective to delete these 4 acres from being planted initially due to imminent inundation with Phase 2.

T05-30 pg. F2-35 *Tame Pastures receive tilling and seeding over 25% of pasture each year, and fertilizer each year.* This is not accounted for in the cost analysis within the Appendix. The costs accrued for tilling, seeding, and fertilizing each of these parcels for the next fifty years needs to be listed within the cost analysis. Is there an indication of the effects on elk that may be resident or transient within the fields that are being cultivated? What time of the year will this be occurring - cultivation of the fields may coincide with calving and, thus, disrupt the calving process. The MIT elk study will yield data on timing of migration and calving.

T05-31 pg. F2-43 *Pasture sites were selected on the following criteria...* Relative distance to roads, especially main roads within the watershed, is not mentioned. Was this considered as a disturbance factor?

T05-32 pg. F2-43 *site 1 will merely be screened from a road by trees on one side* The road being referenced needs to be stated. Also, will there be mitigation factors included for potential deaths due to a foraging site being placed next to a road?

T05-33 pg. F2-44 *Several mixes of pasture grasses will be tested on several plots of existing pasture two years prior to the pool raise. The best performing mix will be selected for mass seeding on the newly created pastures.* Are the mixes preferred going to be altered for each site depending on the surroundings and soil. It would seem logical to evaluate the site and then chose from a variety of preferred mixes. Also, will the preferred mix be chosen depending on the availability of nutrients in that area, and whether it is a summer or winter range? Preferably the winter range sites would be planted with species that are higher in available nutrients.

T05-34 pg. F2-44 *Existing roads adjacent to the created pastures will be screened with shrubs and low growing trees to provide elk with some privacy while grazing.* This sentence is repetitive, and vague as to explaining which species of trees and shrubs will be planted. Are the species to be planted considered as forage for elk?

T05-35 pg. F2-44 *some of the older mixed and coniferous forests will be managed to 'accelerate' the maturity of the forests to mimic conditions found in very mature forests.* How is this process conducted, i.e. tools, materials, length of time. What are the techniques used to promote this acceleration, and is this accounted for in the cost analysis section?

T05-36 pg. F2-45 *forage availability is considered to be a limiting factor within the vicinity of the reservoir* Cite reference to this statement.

T05-28 The only evidence of which we are aware that supports elk use of sedges is from two sources: Chester Morse Lake in the Cedar River Watershed, and Wynoochee Dam project on the Wynoochee River. Watershed managers in the Cedar River have noted elk use of inflated and beaked sedges (personal communication, Paige, 1996). At the Wynoochee Dam project, the Corps planted slough sedge in the upper part of the reservoir, only to find elk severely damaged plugs soon after planting the sedges. This is actually a concern at Howard Hanson Dam, that this large investment in plants may be an attractant to elk, and we will have difficulty establishing plants. The value of sedges to other wildlife (including waterfowl and loons), as well as fish and amphibians, is unquestioned, and is at least as compelling a reason to plant them as are the potential benefits to elk.

Paige, D. 1996, Personal communication, Cedar River Watershed, Seattle Water Department, Seattle, WA

Raedeke Associates, Inc.; Herrera Environmental Consultants, Inc.; Gaynor Landscape Architect Designers, Inc. 1995 "1993 Progress Report: Wetland Plant Community Monitoring Studies, Chester Morse Lake, King County, Washington" Seattle Water Department, Seattle, WA

T05-29 The sedge selected for the lowest elevations is Columbia sedge (*Carex aperta*), a native sedge that can tolerate inundation of up to 50 feet depths (Skeesick and Sheehan, 1993). The 4 acres that would be inundated by Phase II are not expected to die as a result of inundation, as the designed planting depth accounts for Phase II. Additionally, we do not consider implementation of Phase II "imminent". Rather, as you point out in earlier comments, implementation of Phase II is entirely dependent on approval of resource agencies and MIT.

T05-30 All but one of the pastures (#17) are passive pastures, which means they will not receive annual tilling and seeding. Only site 17 (in Phase II) will receive this treatment. This would be considered an O & M cost of the project. Concur that, should calving be occurring during the scheduled maintenance of sites, maintenance work could affect calf production. We hope your elk study will reveal timing and behavioral clues to calving that will assist us in timing of pasture maintenance so as to result in minimal impact to elk.

T05-31 Yes, distance to roads was one factor considered in choosing pasture locations. We appreciate the impact of roads to elk productivity, and attempted to locate most

T05-31 Cont. pastures away from roads. A few, especially #1, #3, and #4, are relatively close to well used logging roads. For these sites, screen trees will be planted to reduce the visual impact to elk to encourage them to use the sites. On the other hand, we recognize there will be an increased risk to vehicular collisions if these sites are heavily used; however, for this reason, as well as slopes, soils, and topographic relief, sites 3 and 4 were not selected for Phase I mitigation. Site 3 would be implemented in Phase II.

T05-32 This site is currently frequently used by elk (King, personal communication, 1996*). Since the site is nearly adjacent to the North Fork Green River, it was felt that the proximity to the road may not be as negative a factor as it could have been, since elk could access the site across the river, and not necessarily across the road (as is currently done); thus, mitigation for lost animals is not considered to be necessary. We would be happy to discuss this further with you, as it is also one of our concerns. It was also felt the site would receive more use if trees were planted to screen the busy road from the site. As stated in earlier comments, the detailed design of mitigation sites will involve the resource agencies and MIT—changes can and will be made based on your input.

*King, B. 1996. Personal communication. Green River Watershed manager, Tacoma Water Division, Tacoma, Washington.

T05-33 Yes, performance of plant growth relative to soils was one factor we planned to assess on the test plots. A variety of seed mixes will also be tested; however, we want to be careful not to make the testing so complex that key data is confused or obscured. Availability of nutrients is certainly a key factor in determining the forage mix. The choice of winter vs. summer forage is a key element that has not yet been determined. Summer use is less (fewer animals) and may not be as critical for the population as high quality winter forage; yet, cows and calves will require high quality summer forage to fatten up before the winter season. This is an excellent issue for further discussion.

T05-34 Do not agree that sentence is repetitive. The sentence simply states that pastures adjacent to roads will receive screen trees and shrubs. The suggested species are listed on page F2-19, and could include lodgepole pine, Western white pine, California bay laurel (non-native), and Pacific yew. Of these Pacific yew is known to be heavily browsed by elk, and Western white pine is also browsed. They are not planted as forage species, but as screen species. We selected evergreen (to provide screening during winter as well as summer) trees and shrubs that do not grow tall (to reduce maintenance underneath powerlines). Other suggestions are welcome.

T05-35 The process is described in Section 3.2.3 of Appendix F2 (pages F2-23—F2-27). The cost analysis reflects this activity. Briefly, the process involves removing small trees to decrease stem density and create openings in the canopy, thereby increasing light penetration and accelerating growth of grasses and shrubs. Snags would be created and woody debris would be placed to mimic characteristics of mature forests.

T05-36 This statement was made by Ken Raedeke, Raedeke Associates, Inc., Seattle, WA. His analysis of the landscape condition of elk habitat in the Green River watershed is found in "Mitigation Concepts for Terrestrial Wildlife, Howard Hanson Dam Additional Water Storage Project, King County, Washington", dated April 19, 1996, prepared for the Corps of Engineers and City of Tacoma.

T05-37 pg. F2-45 *The HSI's are relatively generic in the sense that they do not look closely at the species of grasses and other herbaceous plants available for forage, nor at the percent cover of these plants. Rather, the HSI's are based on factors such as whether the site is fertilized, seeded, and otherwise treated at frequent intervals.* An explanation of whether or not a HSI determination may be made with so few factors needs to be included. Also, cite other studies that have been conducted that used a small sample of HSI's. Pasture treatment is not a viable factor if the species of grass being treated is not known as plant species respond differently to treatments. The percent of cover may also determine the viability of species within the area.

T05-37 If plants aren't utilized, pasture management is not viable. Percent cover may contribute to viability of species. HEP is a dynamic tool. Modification of HSI models is a common technique to more appropriately match the model to the local conditions. In the case of Howard Hanson Project, the interagency team agreed that the elk model needed to focus on forage quality (unfortunately, MIT did not have a wildlife biologist on staff at the time). Though not representative of the whole range of forage characteristics that determine viable elk forage, the HSI's were intentionally simplified to capture what the team felt best represented the important forage factors for elk. We recognize the contribution of percent cover to forage viability, as well as the fact that if a habitat isn't used, the HSI score is meaningless. The basic tenet of HEP is that animals are present and habitats are assumed to be used.

Plant Species of Howard Hanson Reservoir by Habitat Type

Upland Habitat Types

1. Deciduous Forest

Trees:	*Acer macrophyllum*	Big-leaf Maple
	A. circinatum	Vine Maple
	Alnus rubra	Red Alder
	Populus trichocarpa	Black Cottonwood
	Pseudotsuga menziesii	Douglas Fir
	Thuja plicata	Western Red-Cedar
	Tsuga heterophylla	Western Hemlock
Shrubs:	*Rubus spectabilis*	Salmonberry
	R. ursinus	Trailing Blackberry
	R. parviflorus	Thimbleberry
	Oemleria cerasiformis	Indian Plum
	Vaccinium parvifolium	Red Huckleberry
	Oplopanax horridum	Devil's Club
	Sambucus racemosa	Red Elderberry
	Cornus stolonifera	Red-osier Dogwood
Forbs:	*Polystichum munitum*	Sword Fern
	Pterdium aquilinum	Bracken Fern
	Urtica dioica	Stinging Nettle
	Heracleum lanatum	Cow Parsnip
	Oenanthe sarmentosa	Pacific Water-parsley
	Prunella vulgaris	Self-heal
	Tolmiea menziesii	Pig-a-back
	Galium spp.	Bedstraw
	Rumex spp.	Docks
	Juncus spp.	Rushes
	Ranunculus repens	Creeping Buttercup
	Dicentra formosa	Bleeding Heart
	Poaceae	Grasses

1. Deciduous Forest - Alder

Trees:	*Alnus rubra*	Red Alder
	Thuja plicata	Western Red-Cedar
	Tsuga heterophylla	Western Hemlock
Shrubs:	*Rubus spectabilis*	Salmonberry
	R. discolor	Himalayan Blackberry
	R. parviflorus	Thimbleberry
	Ribes sanguineum	Red Flowering Current
Forbs:	*Polystichum munitum*	Sword Fern
	Athyrium filix-femina	Lady Fern
	Maianthemum dilatatum	False Lily-of-the-Valley
	Tiarella trifoliata	Foam Flower
	Poaceae	Grasses

3. Deciduous Forest - Cottonwood

Trees:	*Populus trichocarpa*	Black Cottonwood
	Alnus rubra	Red Alder
	Acer circinatum	Vine Maple
Shrubs:	*Rubus spectabilis*	Salmonberry
	R. parviflorus	Thimbleberry
	Oemleria cerasiformis	Indian Plum
	Sambucus racemosa	Red Elderberry
Forbs:	*Polystichum munitum*	Sword Fern
	Tolmiea menziesii	Pig-a-back
	Ranunculus repens	Creeping Buttercup

4. Deciduous Forest - Seedling/Sapling

Trees:	*Alnus rubra*	Red Alder
	Acer circinatum	Vine Maple
Shrubs:	*Rubus discolor*	Himalayan Blackberry
	R. ursinus	Trailing Blackberry
	R. spectabilis	Salmonberry
Forbs:	*Epilobium angustifolium*	Fireweed
	Poaceae	Grasses
	Polystichum munitum	Sword Fern
	Pteridium aquilinum	Bracken Fern
	Agrostis alba	Redtop Bentgrass

5. Coniferous Forest

Trees:	*Pseudotsuga menziesii*	Douglas Fir
	Thuja plicata	Western Red-Cedar
	Tsuga heterophylla	Western Hemlock
	Acer circinatum	Vine Maple
	Alnus rubra	Red Alder
Shrubs:	*Berberis aquifolium*	Tall Oregon Grape
	Rubus parviflorus	Thimbleberry
	R. ursinus	Trailing Blackberry
	R. spectabilis	Salmonberry
	Gaultheria shallon	Salal
	Sambucus racemosa	Red Elderberry
	Oplopanax horridum	Devil's Club
Forbs:	*Achlys triphylla*	Vanilla Leaf
	Galium aparine	Cleavers
	Poaceae	Grasses
	Maianthemum dilatatum	False Lily-of-the-Valley
	Montia sibirica	Western Spring Beauty
	Polystichum munitum	Sword Fern
	Pteridium aquilinum	Bracken Fern
	Smilacina racemosa	False Solomon's Seal
	Tolmiea menziesii	Pig-a-back
	Linnaea borealis	Twinflower

6. Coniferous Forest

Trees:	None	
Shrubs:	*Pseudotsuga menziesii*	Douglas Fir (sapling)
	Alnus rubra	Red Alder (sapling)
	Rubus ursinus	Trailing Blackberry
	R. spectabilis	Salmonberry
	R. discolor	Himalayan Blackberry
	R. parviflorus	Thimbleberry
Forbs:	*Epilobium angustifolium*	Fireweed
	Polystichum munitum	Sword Fern
	Agrostis alba	Redtop Bentgrass
	Pterdium aquilinum	Bracken Fern
	Poaceae	Grasses

7. Mixed Coniferous Forest

Trees:	*Acer macrophyllum*	Big-leaf Maple
	Alnus rubra	Red Alder
	Pseudotsuga menziesii	Douglas Fir
	Thuja plicata	Western Red-Cedar
	Tsuga heterophylla	Western Hemlock
Shrubs:	*Berberis aquifolium*	Tall Oregon Grape
	Rubus parviflorus	Thimbleberry
	R. ursinus	Trailing Blackberry
	R. spectabilis	Salmonberry
	Sambucus racemosa	Red Elderberry
Forbs:	*Galium aparine*	Cleavers
	Maianthemum dilatatum	False Lily-of-the-Valley
	Montia sibirica	Western Spring Beauty
	Polystichum munitum	Sword Fern
	Pteridium aquilinum	Bracken Fern
	Smilacina racemosa	False Solomon's Seal
	Tolmiea menziesii	Pig-a-back
	Achlys triphylla	Vanilla Leaf
	Blechnum spicant	Deer Fern
	Poaceae	Grasses

8. Shrubland

Trees:	*Acer circinatum*	Vine Maple
	Alnus rubra	Red Alder
	Pseudotsuga menziesii	Douglas Fir
	Tsuga heterophylla	Western Hemlock
Shrubs:	*Holodiscus discolor*	Creambush Oceanspray
	Rubus ursinus	Trailing Blackberry
	R. spectabilis	Salmonberry
	R. discolor	Himalayan Blackberry
	Sambucus racemosa	Red Elderberry
	Cytisus scoparius	Scot's Broom
Forbs:	*Anaphalis margaritacea*	Pearly Everlasting
	Epilobium angustifolium	Fireweed
	Polystichum munitum	Sword Fern
	Pteridium aquilinum	Bracken Fern
	Verbascum thapsus	Common Mullein
	Cirsium arvense	Canadian Thistle
	Tolmiea menziesii	Pig-a-back
	Equisetum arvense	Horsetail
	Ranunculus repens	Creeping Buttercup
	Rumex spp.	Docks
	Poaceae	Grasses

9. Grassland

Trees:	None	
Shrubs:	*Rubus ursinus*	Trailing Blackberry
	Agrostis alba	Redtop Bentgrass
	Cirsium arvense	Canadian Thistle
	Elymus glaucus	Western Rye Grass
	Holcus lanatus	Common Velvetgrass
	Phleum sp.	Timothy
	Poa pratensis	Kentucky Bluegrass
	Senecio spp.	Ragworts
	Trifolium spp.	Clovers
	Rumex spp.	Docks
	Taraxacum spp.	Dandelions

10. Talus Slope/Rock

Trees:	None	
Shrubs:	*Alnus rubra*	Red Alder (sapling
	Pseudotsuga menziesii	Douglas Fir (sapling)
	Tsuga heterophylla	Western Hemlock (sapling)
Forbs:	*Agrosta alba*	Redtop Bentgrass
	Anaphalis margaritacea	Pearly-everlasting
	Crucifer	unknown Mustard
	Poaceae	Grasses
	Hypericum perfoliatum	St. Johnswort
	Trifolium spp.	Clovers
	Verbascum thapsus	Common Mullein
	Epilobium angustifolium	Fireweed

11. Roadway/Railroad

Trees:	None	
Shrubs:	*Rubus discolor*	Himalayan Blackberry
	R. spectabilus	Salmonberry
Forbs:	*Cirsium arvense*	Canadian Thistle
	Achillea millefolium	Yarrow
	Epilobium angustifolium	Fireweed
	Anaphalis margaritacea	Pearly-everlasting
	Senecio spp.	Ragworts
	Verbascum thapsus	Common Mullein
	Poaceae	Grasses

Wetland Habitat Types

1. Forested Swamp

Trees:	*Alnus rubra*	Red Alder
	Fraxinus latifolia	Oregon Ash
	Populus balsamifera	Black Cottonwood
	Thuja plicata	Western Red-Cedar
	Tsuga heterophylla	Western Hemlock
	Picea sitchensis	Sitka Spruce
Shrubs:	*Rubus spectabilis*	Salmonberry
	Salix spp.	Willows
	Acer circinatum	Vine Maple
Forbs:	*Lysichitum americanum*	Skunk Cabbage
	Oenanthe sarmentosa	Pacific Water-parsley
	Scirpus spp.	Bulrush
	Epilobium watsonii	Watson's Willow-herb
	Juncus effusus	Soft Rush
	Petasites Frigiduc	Colts Foot
	Glyceria sp.	Mannagrass
	Heracleum Lanatum	Cow Parsnip

2. Shrub Swamp

Trees:	None	
Shrubs:	*Salix hookeriana*	Hooker's Willow
	Salix spp.	Willow
Forbs:	*Scirpus cyperinus*	Woolgrass
	Agrostis sp.	Bentgrass

3. Emergent Marsh

Trees:	None	
Shrubs:	None	
Forbs:	*Agrostis alba*	Redtop Bentgrass
	Carex spp.	Sedge
	Holcus lanatus	Common Velvetgrass
	Juncus effusus	Soft Rush
	Poa spp.	Bluegrass
	Ranunculus flammula	Creeping Buttercup
	Scirpus cyperinus	Woolgrass
	Eleocharis spp.	Spike-Rush
	Typhus latifolia	Common Cattail
	Equisetum spp.	Horsetail

4. Moss

Trees:	None	
Shrubs:	None	
Forbs:	*Agrostis alba*	Redtop Bentgrass
	Bryophyta	Mosses
	Chara sp.	Stonewort
	Ranunculus flammula	Creeping Buttercup
	Spirogyra sp.	Green Algae
	Zygnema sp.	Green Algae

5. Mudflat

Trees:	None	
Shrubs:	None	
Forbs:	*Bryophyta*	Mosses
	Chara sp.	Stonewort
	Spirogyra sp.	Green Algae
	Zygnema sp.	Green Algae

6. Riverbed

Trees:	None	
Shrubs:	None	
Forbs:	*Spirogyra sp.*	Green Algae
	Zygnema sp.	Green Algae

7. Open Water

Trees:	None	
Shrubs:	None	
Forbs:		phytoplankton
		floating algae

Bird Species of Howard Hanson Reservoir

Gavia immer	Common Loon
Aechmophorus occidentalis	Western Grebe
Ardea herodias	Great Blue Heron
Butorides virescens	Green Heron
Cathartes aura	Turkey Vulture
Branta canadensis	Canada Goose
Aix sponsa	Wood Duck
Anas crecca	Green-winged Teal
A. platyrhynchos	Mallard
A. strepera	Gadwall
A. americana	American Wigeon
Aythya collaris	Ring-necked Duck
Aythya affinis	Lesser Scaup
Histrionicus histrionicus	Harlequin Duck
Bucephala islandica	Barrow's Goldeneye
B. albeola	Bufflehead
Lophodytes cucullatus	Hooded Merganser
Mergus merganser	Common Merganser
Pandion haliaetus	Osprey
Haliaeetus leucocephalus	Bald Eagle
Circus cyaneus	Northern Harrier
Accipiter striatus	Sharp-shinned Hawk
A. cooperii	Cooper's Hawk
A. gentilis	Northern Goshawk
Buteo jamaicensis	Red-tailed Hawk
Falco sparverius	American Kestrel
F. columbarius	Merlin
Dendragapus obscurus	Blue Grouse
Bonasa umbellus	Ruffed Grouse
Charadrius vociferus	Killdeer
Tringa melanoleuca	Greater Yellowlegs
T. solitaria	Solitary Sandpiper
Actitis macularia	Spotted Sandpiper
Calidris mauri	Western Sandpiper
Gallinago gallinago	Common Snipe
Larus californicus	California Gull
Columba fasciata	Band-tailed Pigeon
Zenaida macroura	Mourning Dove
Bubo virginianus	Great Horned Owl
Glaucidium gnoma	Northern Pygmy-Owl
Strix occidentalis	Spotted Owl
S. varia	Barred Owl
Chordeiles minor	Common Nighthawk
Cypseloides niger	Black Swift
Chaetura vauxi	Vaux's Swift
Selasphorus rufus	Rufous Hummingbird
Ceryle alcyon	Belted Kingfisher
Sphyrapicus ruber	Red-breasted Sapsucker

Picoides pubescens	Downy Woodpecker
P. villosus	Hairy Woodpecker
Colaptes auratus	Northern Flicker
Dryocopus pileatus	Pileated Woodpecker
Contopus cooperi	Olive-sided Flycatcher
C. sordidulus	Western Wood-Pewee
Empidonax traillii	Willow Flycatcher
E. hammondii	Hammond's Flycatcher
E. difficilis	Pacific-slope Flycatcher
Lanius excubitor	Northern Shrike
Vireo cassinii	Cassin's Vireo
V. huttoni	Hutton's Vireo
V. gilvus	Warbling Vireo
V. olivaceus	Red-eyed Vireo
Perisoreus canadensis	Gray Jay
Cyanocitta stelleri	Steller's Jay
Corvus brachyrhynchos	American Crow
C. corax	Common Raven
Progne subis	Purple Martin
Tachycineta bicolor	Tree Swallow
T. thalassina	Violet-green Swallow
Stelgidopteryx serripennis	Northern Rough-winged Swallow
Riparia riparia	Bank Swallow
Hirundo pyrrhonota	Cliff Swallow
H. rustica	Barn Swallow
Poecile atricapillus	Black-capped Chickadee
P. rufescens	Chestnut-backed Chickadee
Psaltriparus minimus	Bushtit
Sitta canadensis	Red-breasted Nuthatch
Certhia americana	Brown Creeper
Thryomanes bewickii	Bewick's Wren
Troglodytes troglodytes	Winter Wren
Cistothorus palustris	Marsh Wren
Cinclus mexicanus	American Dipper
Regulus satrapa	Golden-crowned Kinglet
R. calendula	Ruby-crowned Kinglet
Myadestes townsendi	Townsend's Solitaire
Catharus ustulatus	Swainson's Thrush
C. guttatus	Hermit Thrush
Turdus migratorius	American Robin
Ixoreus naevius	Varied Thrush
Sturnus vulgaris	European Starling
Anthus rubescens	American Pipit
Bombycilla cedrorum	Cedar Waxwing
Vermivora celata	Orange-crowned Warbler
V. ruficapilla	Nashville Warbler
Dendroica petechia	Yellow Warbler
D. coronata	Yellow-rumped Warbler
D. nigrescens	Black-throated Gray Warbler

D. townsendi	Townsend's Warbler
D. occidentalis	Hermit Warbler
Oporornis tolmiei	MacGillivray's Warbler
Geothlypis trichas	Common Yellowthroat
Wilsonia pusilla	Wilson's Warbler
Piranga ludoviciana	Western Tanager
Pipilo maculatus	Spotted Towhee
Passerculus sandwichensis	Savannah Sparrow
Passerella iliaca	Fox Sparrow
Melospiza melodia	Song Sparrow
Zonotrichia leucophrys	White-crowned Sparrow
Z. atricapilla	Golden-crowned Sparrow
Junco hyemalis	Dark-eyed Junco
Pheucticus melanocephalus	Black-headed Grosbeak
Agelaius phoeniceus	Red-winged Blackbird
Sturnella neglecta	Western Meadowlark
Euphagus cyanocephalus	Brewer's Blackbird
Molothrus ater	Brown-headed Cowbird
Carpodacus purpureus	Purple Finch
C. mexicanus	House Finch
Loxia curvirostra	Red Crossbill
Carduelis pinus	Pine Siskin
C. tristis	American Goldfinch
Coccothraustes vespertinus	Evening Grosbeak
Passer domesticus	House Sparrow

Mammal Species of Howard Hanson Reservoir

Didelphidae:	*Didelphis virginiana*	Virginia Oppossum
Soricidae:	*Sorex vagrans*	Vagrant Shrew
	S. obscurus	Dusky Shrew
	S. palustris	Northern Water Shrew
	S. bendirii	Marsh Shrew
Talpidae:	*Neurotrichus gibbsi*	Shrew-mole
	Scapanus townsendii	Townsend Mole
	S. orarius	Coast Mole
Vespertilionidae:	*Myotis lucifugus*	Little Brown Bat
	M. yumanensis	Yuma Myotis
	M. keeni	Keen Myotis
	M. evotis	Long-eared Myotis
	M. volans	Long-legged Myotis
	M. californicus	California Myotis
	Lasionycteris noctivagans	Silver-haired Myotis
	Eptesicus fuscus	Big Brown Bat
	Lasiurus cinereus	Hoary Bat
	Plecotus townsendii	Townsend's Big-eared Bat
Leporidae:	*Ochotona princeps*	Pika
	Lepus americanus	Snowshoe Hare
Aplodontidae:	*Aplodontia rufa*	Mountain Beaver
Sciuridae:	*Eutamias townsendii*	Townsend's Chipmunk
	Tamiasciurus douglasii	Douglas Squirrel
	Glaucomys sabrinus	Northern Flying Squirrel
Castoridae:	*Castor canadensis*	Beaver
Cricetidae:	*Peromyscus maniculatus*	Deer Mouse
	Neotoma cinerea	Bushy-tailed Woodrat
	Phenacomys intermedius	Heather Vole
	Clethrionomys gapperi	Boreal Red-backed Vole
	Microtus townsendii	Townsend's Vole
	M. longicaudus	Longtail Vole
	M. oregoni	Oregon Vole
	Ondatra zibethica	Muskrat
Zapodidae:	*Zapus trinotatus*	Pacific Jumping Mouse
Erethizontidae:	*Erethizon dorsatum*	Porcupine
Ursidae:	*Ursus americanus*	Black Bear
Procyonidae:	*Procyon lotor*	Racoon

Mustelidae:	*Martes americana*	Marten
	Mustela erminea	Short-tailed Weasel
	M. frenata	Long-tailed Weasel
	M. vison	Mink
	Lutra canadensis	River Otter
	Spilogale putorius	Spotted Skunk
	Mephitis mephitis	Striped Skunk
Canidae:	*Canis latrans*	Coyote
	Vulpes fulva	Common Red Fox
Felidae:	*Felis concolor*	Mountain Lion
	Lynx rufus	Bobcat
Cervidae:	*Cervus canadensis*	Rocky Mountain Elk
	Odocoileus hemionus	Black-tailed Deer

Reptile Species of Howard Hanson Reservoir

Anguidae:	*Gerrhonotus coeruleus*	Northern Alligator Lizard
Colubridae:	*Thamnophis sirtalis*	Common Garter Snake
	T. elegans	Western Garter Snake
	T. ordinoides	Northwestern Garter Snake

Amphibian Species of Howard Hanson Reservoir

Ambystomidae:	*Ambystoma gracile*	Northwestern Salamander
	A. macrodactylum	Long-toed Salamander
Plethodonidae:	*Plethodon vehiculum*	W. Red-backed Salamander
	P. larselli	Larch Mountain Salamander
	Ensatina eschscholtzi	Escholtz's Salamander
Salmandridae:	*Taricha granulosa*	Rough-skinned newt
Leiopelmatidae:	*Ascaphus truei*	Tailed Frog
Bufonidae	*Bufo boreas*	Western Toad
Hylinidae:	*Hyla regilla*	Pacific Treefrog
Ranidae	*Rana aurora*	Red-legged Frog
	R. cascadae	Cascades Frog

UNITED STATES DEPARTMENT OF COMMERCE
Office of the Under Secretary for
Oceans and Atmosphere
Washington, D.C. 20230

May 6, 1998

Kris Loll
Civil Projects & Planning Branch
US Army Corps of Engineers, Seattle District
PO Box 3755
Seattle, WA 98124-3755

Dear Mr. Loll:

Enclosed are comments on the Draft Environmental Impact Statement for Additional Water Storage Project, Howard Handson Dam, Green River, Washington. We hope our comments will assist you. Thank you for giving us an opportunity to review this document.

Sincerely,

Susan B. Fruchter

Susan B. Fruchter
Acting NEPA Coordinator

Enclosure

Printed on Recycled Paper

MEMORANDUM FOR: Susan B. Fruchter
Acting NEPA Coordinator

FROM: Charles W. Challstrom
Acting Director, National Geodetic Survey

SUBJECT: DEIS-9804-14-Additional Water Storage Project, Howard Hanson Dam, Green River, Washington

The subject statement has been reviewed within the areas of the National Geodetic Survey's (NGS) responsibility and expertise and in terms of the impact of the proposed actions on NGS activities and projects.

All available geodetic control information about horizontal and vertical geodetic control monuments in the subject area is contained on the NGS home page at the following Internet World Wide Web address: http://www.ngs.noaa.gov. After entering the NGS home page, please access the topic "Products and Services" and then access the menu item "Data Sheet." This menu item will allow you to directly access geodetic control monument information from the NGS data base for the subject area project. This information should be reviewed for identifying the location and designation of any geodetic control monuments that may be affected by the proposed project.

F01-1 If there are any planned activities which will disturb or destroy these monuments, NGS requires not less than 90 days' notification in advance of such activities in order to plan for their relocation. NGS recommends that funding for this project includes the cost of any relocation(s) required.

For further information about these monuments, please contact Rick Yorczyk; SSMC3, NOAA, N/NGS; 1315 East West Highway; Silver Spring, Maryland 20910; telephone: 301-713-3230 x142; fax: 301-713-4175.

F01-1 Comment noted.

DEPARTMENT OF HEALTH & HUMAN SERVICES Public Health Service

Centers for Disease Control
and Prevention (CDC)
Atlanta GA 30341-3724

June 15, 1998

U.S. Army Corps of Engineers, Seattle District
Planning Branch (CENWS-PM-CP)
Attn: Ms. Kris Loll
P.O. Box 3755
Seattle, WA 98124-2255

Dear Ms. Loll:

We have completed our review of the Draft Environmental Impact Statement (DEIS) for the Additional Water Storage Project, Howard Hanson Dam, Green River, Washington. We are responding on behalf of the U.S. Public Health Service, Department of Health and Human Services.

F02-1 We believe this DEIS is well written, the need for this project has been well established, and we believe our potential concerns have generally been addressed. We noted that the proposed combined water supply and restoration project was subjected to an agency resolution process involving Washington State Departments of Ecology, Fish and Wildlife, US Fish and Wildlife Service, the Muckleshoot Indian Tribe, the City of Tacoma and the Corps of Engineers. We also noted that the preferred alternative, the phased adaptive management plan which provided early outputs of water supply and restoration benefits, would result in the least amount of habitat loss of the three build alternatives, and the least amount of cumulative impact.

Thank you for the opportunity to review and comment on this DEIS. Please send us a copy of the Final EIS, and any future environmental impact statements which may indicate potential public health impact and are developed under the National Environmental Policy Act (NEPA).

Sincerely,

Kenneth W. Holt

Kenneth W. Holt, MSEH
Special Programs Group (F16)
National Center for Environmental Health

F02-1 Will incorporate requirement for relocation of destroyed or disturbed NGS monuments, within the project area, in the plans and specifications for the project as required.

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

P.O. Box 47600 • Olympia, Washington 98504-7600
(360) 407-6000 • TDD Only (Hearing Impaired) (360) 407-6006

June 11, 1998

Kris Loll
US Army Corps of Engineers
PO Box 3755
Seattle WA 98124-3755

Dear Ms. Loll:

Thank you for the opportunity to comment on the environmental impact statement for the Howard Hanson Dam Additional Water Storage Project.

S01-1 Consistent with the Department of Ecology's responsibilities as Washington State's coordinator for the National Environmental Policy Act, we are forwarding the comments received from the State of Washington, Department of Fish and Wildlife. If you have any questions on the comments made by Washington Department of Fish and Wildlife, please call Mr. Gary Engman at (425) 775-1311.

Sincerely,

Barbara J. Ritchie
Environmental Coordination Section

BJR:ri
EIS #982404

Attachment

S01-1 Comment noted.

STATE OF WASHINGTON
DEPARTMENT OF FISH AND WILDLIFE
16018 Mill Creek Boulevard • Mill Creek, Washington 98012 • (206) 775-1311 FAX (206) 338-1066

June 9, 1998

Ms. Kris Loll, Project Manager
U. S. Army Corps of Engineers, Seattle District
Post Office Box 3755
Seattle. Washington 98124-3755

RE: U. S. Army Corps of Engineers Howard Hanson Dam Additional Water Storage Project, Green River, Draft Feasibility Report and EIS, April 1998.

Dear Ms. Loll:

We received the above referenced documents concerning the proposed Howard Hanson Dam Additional Water Storage Project (AWSP) and have the following comments.

S02-1 At the outset, we need to make it clear these comments refer to the main report only. Detailed review of the accompanying nine appendices, totaling over 1000 pages of material involving complex issues, was simply not possible within the constraints of the preset response deadline; our good faith request for an extension of the response deadline was denied. Our comments therefore reflect only those questions or issues we were able to discover; no conclusions should be reached as to issues not discussed herein.

General Comments

Washington Department of Fish and Wildlife (WDFW) Director Bern Shanks' November 17, 1997 letter to Mark Crisson, Director Tacoma Public Utilities, and Colonel James M. Rigsby, U. S. Army Corps of Engineers, stated that "....realization of the resource benefit potential of the AWSP is absolutely dependant on commitment to and effective implementation of the following principles:

S02-2
1) clear commitment that Howard Hanson Dam refill and storage management will be dedicated to and directed to fishery resource conservation and enhancement;

2) provide for continuous project operation during refill and storage management periods;

3) state-of-the-art enhancement of snow pack monitoring and runoff forecasting;

S02-1 The draft DFR/EIS is the result of a collaborative process involving federal, state and local resource agencies (see agency resolution letters in Appendix I), the Muckleshoot Indian Tribe, non-governmental organizations, and the public. The technical appendices describe a variety of studies conducted since 1989 and include evaluations of fish and wildlife resources of the Green River Basin. Some of these studies were previously provided to WDFW in draft form for review and comment. Some of the WDFW comments on the draft DFR/EIS were addressed in the appendices. Additional fish and wildlife studies will be conducted during the three year Preliminary Evaluation and Design (PED) phase of the project; during this period WDFW will have additional opportunity to comment on Green River fish and wildlife studies.

S02-2 Below are responses to each of the stated principles:

1 - In Section 1.5 Existing Howard A. Hanson Dam Project, the current operating strategy is accurately described as reflecting a variety of natural resource needs, recreational opportunities and local community requests. The proposed operating strategy is described in Section 4.2 Recommended Plan: Hydrologic Considerations. Under Phase I of the proposed project, refill timing and release rates will be based on target instream flows that will be adjusted yearly in response to weather conditions, snowpack, the amount of forecasted precipitation and biological input from fisheries resource managers. Proposed refill rules are designed to meet project objectives for protecting instream resources, meeting existing conservation storage requirements, and providing reliability for storing additional water for M&I and low flow augmentation. Rules to provide for recreational, community and other non-fishery resource needs were not included in the description of the proposed storage and release strategy.

The proposed operating strategy involves the use of a non-dedicated block of storage. The non-dedicated storage can be directed for release or dedicated storage provided reservoir refill rule curves are satisfied for the original 22,400 ac-ft of low flow augmentation and storage of water available to Tacoma under the P5 water right. Decisions on the use of the non-dedicated block of stored water will consider consultations with fish and wildlife resource agencies. Non-fishery resource needs are not a designated downstream delivery objective; however, where those non-fishery resource needs do not conflict with fishery objectives, every attempt will be made to satisfy multiple uses.

2 - Provisions for continuous project operation during the spring refill and summer storage management period have been included in the proposed operations plan. As

S02-2 Cont stated in Section 4.12 Recommended Plan, Operation and Maintenance:

"For 3½ months from 15 February to 1 June, the high activity rate at the fish passage facility will require up to 11 additional personnel to operate the gates, stoplogs, and fish discharge equipment. Coordinating the main gates and the fish passage gate is sufficiently time consuming to require additional staffing. The additional staff will work three shifts per day, generally three persons per shift. The rate of pool fill during this period and the rate of outmigration requires operation through the night. The design team will examine controlling the pool fill so as to eliminate the third shift by preventing the need for nighttime stop log installations. The pool raise staffing equates to 5 FTE.

During the summer and fall months, stoplog changes will not be so frequent, and pool elevation can be managed to allow stoplog operation during the day shift. Personnel will be needed to remove the stoplogs, but will not be needed full time. Assuming that the outflow does not exceed 1250 cfs, the fish passage gate will control the flow and the main gates will not be needed. Therefore flow control will not require staffing above current levels. However, three man crews will be required for the occasional stop log removal. Upland habitat maintenance will be scheduled for this time. The total staffing for these months equates to 3 FTE."

Opportunities for automating project operations to improve responsiveness, while reducing the level of project staffing described in the DFR/DEIS, will be explored during the PED phase of the project.

3 - During PED we will investigate whether additional snowpack monitoring and improved runoff forecasting will benefit the reliability and flexibility of spring water storage and release. If it determined to be beneficial, the Corps and Tacoma are committed to enhancing monitoring/forecasting and will develop details of an expanded monitoring/forecasting plan during the PED project phase.

4 - Effective procedures for risk-sharing between municipal water supply and fishery resource needs have been implemented throughout the HHD AWS project. In response to agency and tribal concerns regarding potential risks to fishery resources, an Agency Resolution Process (DFR/DEIS, Paragraph 3.1.2.3b) was convened. As a result of this process, the Corps and Tacoma agreed to phased implementation of the HHD AWS Project. This phased approach incorporates an adaptive management process that conditions Phase II of the project on the demonstration that environmental impacts can be sufficiently minimized and mitigated. This phased approach presents significant risk

S02-2 Cont. to municipal and industrial water supply project benefits, a risk that is conditioned on satisfying fishery resource concerns.

Shared risk between municipal water supply and fishery resources is also demonstrated under Phase I of the HHD AWS Project. Under Phase I, only the quantity of water available for municipal and industrial use (M&I) under Tacoma's existing water right will be held as dedicated storage behind HHD. Under Tacoma's existing water right, water is only available when instream flows exceed a minimum flow regime developed in an agreement between Tacoma and the MIT. The Tacoma/MIT flow agreement specifies a minimum flow regime that exceeds Washington State instream flow requirements. During drought years, the quantity of water available for municipal and industrial use will be reduced whenever instream flows drop below the Tacoma/MIT minimum flow regime. During drought conditions, the actual quantity of dedicated municipal water held behind HHD at the end of the spring storage period reflects the shared risk between municipal water supply and fishery resource needs.

Under the HHD AWSP, operating procedures have been proposed to limit potential conflicts between municipal water supply and fishery resource needs. Under Phase I of the proposed project, proposed refill rules are designed to meet project objectives for protecting instream resources and providing reliability for storing additional water for M&I and fishery resource needs. Refill timing, storage and release rates will be adjusted on a real-time basis in response to input from fisheries resource managers.

The proposed operating strategy involves the use of dedicated and non-dedicated blocks of storage. The quantity of water available to Tacoma under the P5 water right will be held on a daily basis as dedicated storage. The non-dedicated storage (Dampen dam) can be directed for release to meet immediate fishery resource needs or stored for later low flow augmentation to benefit fishery resources. Springtime operations, where they do not conflict with flood control responsibilities, will be responsive to fishery resource agency and tribal direction. This operating strategy was designed to minimize conflicts between municipal water supply and fishery resource needs by giving fishery resource managers much greater opportunity, and responsibility, for managing flows in the Green River.

5 - A monitoring and evaluation program is proposed for the first 15 years following project construction as described in Appendix F, Section 10: Proposed Adaptive Management Monitoring and Evaluation Program. The results of these surveys will assess the efficacy of proposed mitigation and enhancement measures and identify

Ms. Kris Loll
June 9, 1998
Page 2

S02-2 Cont.

4) effective procedures for risk sharing between municipal supply and fishery resource needs, including use of municipal storage to meet fish needs when storage flexibilities are not adequate;

5) fund and implement monitoring and use results to effectively modify project procedures and design; and

6) restore fish habitats where appropriate and where significant benefits can be demonstrated."

Our endorsement of the project also hinges on the effective implementation of these very important principles. In our reading of the draft Feasibility Report and Environmental Impact Statement (DFR/DEIS), commitment to these points was unclear. We request an explicit and detailed discussion as to how each of these principles will be addressed through AWSP design, construction and operation. These are essential to fulfillment of our stated goals in regard to fishery resource protection, restoration and enhancement.

S02-3

In the DFR/DEIS, the proposed fish passage facilities and reestablishment of anadromy to the upper watershed are characterized as keystones of the restoration project. We agree with the importance of these elements. However, also very important to the overall restoration of Green River fisheries resources is greater protection of downstream resources. In broad terms, the existing project, as defined and limited by its Congressional mandate has both harmed and benefitted Green River fisheries resources. At present, the existing project benefits fall salmon spawning at the expense of spring outmigration and steelhead incubation survival. These are the consequences of spring refill, constraints on the use of conservation storage, and project operations to serve purposes other than resource protection and restoration. Effectively doubling the amount of storage that is intended to be captured every spring, while correcting rather than exacerbating existing problems, will require greatly expanded attention and dedication to meeting fishery resource needs.

S02-4

Additionally, our endorsement of the AWSP, as outlined in our November 17, 1998 letter, was only for the Phase I portion of the proposed project. At various points in the DFR/DEIS it is implied that Phase II would proceed automatically. We wish to make it clear that our approval of Phase I was with the understanding that Phase II would not proceed without specific further approval by the resource agencies and Muckleshoot Tribe.

Specific Comments

S02-5

1.5.6., page 8. With regard to Howard Hanson Dam (HHD) discharge adjustments to accommodate purposes other than fishery resource needs, the inherent incompatibility of such potential actions must be clearly recognized. One event can nullify months or years of effort to protect and restore fisheries resources.

S02-2 Cont. whether the level of project impacts are as anticipated.

The adaptive management process provides for changes in operational strategies to minimize project impacts following construction. Changes in operating guidelines for refill and storage are assumed to address many of the potential project effects. Maintenance and necessary modifications will be made to the non-fish passage related mitigation and restoration measures. Detailed study plans on the field methods and data analysis procedures to be employed will be developed during the PED phase prior to project construction.

6 - A detailed description of proposed measures to restore fish habitats in the Green River Basin is included in Appendix F, Part 1: Fish Mitigation and Restoration and summarized in Section 8: Restoration and Mitigation Plan Summary.

S02-3 Comment noted. See Comment-Reply S02-2.

S02-4 We concur. As stated in Section 4.1.2 Recommended Plan Description: Phase II, "Implementation of Phase II would be contingent upon acceptance by the regulatory agencies and the MIT".

S02-5 See response to SO2-2-1

Ms. Kris Loll
June 9, 1998
Page 3

S02-6 Ibid. We disagree that water management conflicts result from a lack of knowledge of what flows the resources require. Far more often, conflicts have arisen from non-resource needs taking precedence, incompatible project mandates and uncertainties in runoff forecasting.

S02-7 Ibid. Steelhead incubation may require substantially more than 50 days, depending on water temperatures and when spawning occurs.

S02-8 1.5.7., page 9. The option to annually store the additional 5,000 ac-ft is necessary to reduce the annual, and in some years, substantial loss of steelhead eggs through spawning sites (redds) being left high and dry by insufficient stream flows. To some extent this occurs every year but greatest losses usually occur in years with above average spring runoff. We recognize the incremental effect that storage of this water may have on juvenile outmigration survival and this will be a consideration in storage decisions every spring. But failure to store this water will, in most years, guarantee significant wild steelhead losses.

S02-9 1.6.5., page 16. We strongly agree that the capacity of the watershed to produce salmon and steelhead has been greatly reduced. Flow management practices of the existing project should also be listed among the "specific factors" especially in regard to steelhead.

S02-10 Ibid. Regarding Tacoma Headworks trap catches of adult salmon and steelhead, these catches are a mixture of upper and lower watershed origin fish and are not necessarily directly proportional to upper watershed releases or production.

S02-11 Ibid. WDFW has developed a preliminary wild steelhead escapement goal of 650 for the upper watershed.

Ibid, page 18. WDFW has adopted a wild salmonid policy.

S02-12 Ibid. Puget Sound steelhead are no longer under consideration for listing under Endangered Species Act.

S02-13 3.2.1.2.b.(11), page 69. We would appreciate some definition as to how self-sustainability will be defined. What assumptions are made regarding harvest? Stocks that are self-sustaining only with very restricted harvest will not achieve restoration goals and will curtail harvest opportunities on other healthier stocks.

S02-14 3.2.4.10., page 78. Regarding the fall-back fish collector, Alternative 9B2, how and when would this option be implemented?

S02-15 3.3.2.4.a.(3)., page 102. Here, and in subsequent sections, reference is made to supporting steelhead incubation flows through the end of June. While steelhead emergence begins in June,

S02-6 As noted in the document, water management conflicts arise from a combination of differing fishery resource needs, project mandates, uncertainties in runoff forecasting and non-fishery resource needs. The proposed adaptive management strategy is predicated on the opportunity to modify storage and release practices to benefit fishery resources as we gain knowledge and experience.

S02-7 The rationale and limitations of the assumption that steelhead incubation extends over a 50-day period are described in Appendix F, Section 6, Green River Steelhead Spawning and Incubation. As noted in that document:
The assumption that embryonic development, from fertilization to emergence, lasts 50-days is a simplification. The time required for egg incubation and alevin development to the emergent fry stage is dependent upon the accumulation of Fahrenheit Temperature Units (FTUs), which in turn is a function of water temperature. Burton and Little (1997) found that winter steelhead fry emerge from the gravel in the Cedar River after accumulating between 1045 and 1284 mean Fahrenheit Temperature Units (FTUs), with mean emergence at about 1165 FTUs. Green River water temperatures during the incubation period range from about 45 degrees Fahrenheit in early March to about 62 degrees Fahrenheit in mid August. In the Green River, the number of days required to accumulate 1165 FTUs from March through June varies between 40 to 45 days for eggs fertilized near the end of June to 75 to 80 days for eggs fertilized in early March. For this analysis, 50 days was selected as the time between fertilization to emergence for modeling purposes. Based on the 50-day assumption, the steelhead spawning and incubation model developed for this analysis projected that fry would emerge from the gravel between April 20 (early March spawn) and August 19 (late June spawn) (Table 2). In reality, fifty days underestimates development time for eggs fertilized in March through the first two weeks in May, and overestimates development time for eggs fertilized during the last two weeks in June. Fifty days is a good estimate for eggs fertilized during the last two weeks in May through the first two weeks in June.

S02-8 For planning purposes, release of the 5,000 ac-ft stored under the Section 1135 process was assumed to maintain an instream flow in the Green River of 250 cfs at the USGS gage near Auburn during drought conditions. The Section 1135 Project incorporates an adaptive management process that allows changes to the frequency of storage, reservoir refill strategy and storage release schedule. Use of the Section 1135 storage volume to benefit steelhead incubation is one of several potential opportunities to augment flows to benefit fisheries resources.

S02-9 Comment noted.

S02-10 Comment noted. Adult salmon captured at the Tacoma Headworks are not currently released above Howard Hanson Dam.

S02-11 Comments noted. Based on production potential estimates of the upper watershed, an escapement of 1,300 adult steelhead was used in the analysis of project impacts and potential benefits. The production potential estimate was derived from data on potential accessibility of tributary streams based on surveys of the upper watershed conducted by USFWS, USFS, Plum Creek Timber Company, US Army Corps of Engineers, and City of Tacoma personnel.

S02-12 Comment noted.

S02-13 The analysis of the potential to restore self-sustaining anadromous fish runs above the project is described in Appendix F, Section 8:Restoration and Mitigation Plan Summary, Part E: Incremental Analysis of Restoration and Mitigation Project. A range of harvest rates were initially used for each salmonid species adult run size under different parameters of dam passage, instream and ocean survival. Harvest rates used in the final incremental analysis reflect the long-term average harvest rates of lower watershed salmon and steelhead from the late 1970's to the 1990's.

Harvest rates for salmon populations in the Green/Duwamish River system peaked in the 1980's: chinook salmon harvest for all Puget Sound rivers ranged from 69-83% (NMFS press release February 27, 1998); coho salmon harvest in the Green River was assumed to average 90% from 1986-1991 (WDFW draft Wild Salmonid Policy, 1995). In the 1990's with five years of El Nino ocean conditions (1992-1995, 1997), adult harvest has been drastically reduced with total closures in several years. For the final incremental analysis, the fish passage model preferred alternative (See Appendix B, Cost-Benefit, Tables 1-8), long-term harvest rates were assumed to be lower than the peak 1980 years, but higher than the 1990's: 70% for coho, 35% for steelhead, 55% for fall chinook.

Adult harvest rates are one of several mortality factors influencing the number of adults returning to spawn that are required to maintain existing runs or that could be necessary for recovery and restoration of runs to the upper watershed. The actual level of adult harvest is determined on an annual basis in a cooperative effort between WDFW and the tribes. The recent proposed listing of Puget Sound chinook as a threatened species under the Endangered Species Act (ESA) adds an additional complexity to salmon harvest management. Restoration of self-sustaining, naturally reproducing runs of adult salmon and steelhead is a major project objective; however, the Corps and the City of

S02-13 Cont. Tacoma do not govern harvest levels in the Green River. The final incremental analysis describes potential project benefits under various assumptions of reservoir and dam passage, instream and ocean survival and adult harvest. A 70% adult harvest level for coho, 35% for steelhead and 55% for fall chinook was assumed to be an inviolate component of the salmonid life cycle in the Green River.

S02-14 An upstream fish collector (Alternative 9B1 or 9B2) is considered a fall-back option should a fatal design or operational flaw be identified during the PED phase. If Alternative 9A8 is found to be unacceptable during the PED phase, the combination of 9A4 and 9B1 will be given consideration as the next best alternative. Once Alternative 9A8 is constructed, consideration of an upstream collector (Alternative 9B1) would require new Section 216 authorization.

Two versions of an upstream fish collector were initially evaluated, Alternative 9B1 which includes trucking as a downstream transport mechanism and 9B2 which includes an open channel flume for downstream transport. The upstream collector options were considered both as single facility alternatives and combined with downstream fish passage facilities located at the dam (9A1-7). In the initial incremental analysis, Alternative 9B1 when combined with Alternative 9A4 ("gulper" on existing tower) was incrementally justified as the least-cost alternative that met escapement goals under most scenarios. Following review of the initial incremental analysis, the Corps and Tacoma entered into an Agency Resolution Process. It was during this process that Alternative 9A8 was identified and developed (new intake tower, horn and fish lock and MIS screen of 1,250 cfs capacity). A final incremental analysis and evaluation were completed following development of Alternative 9A8. This analysis incorporated the comments of the FPTC and included Alternative 9A8. The final list of alternatives that were selected by the model included 9A4, 9A8, and the combination of 9A4/9B1, 9A8/9B1 and 9A8/9B2 (see Table B2-19, Appendix B).

The analysis showed that while Alternative 9A4 provided a relatively low dollar cost per unit output ($94), as a single facility it would not provide the passage success required to produce sufficient numbers of returning adult salmon to support self-sustaining runs. It was also rejected by the FPTC for not meeting design criteria. Fish passage measure Alternative 9A8 is the least-cost facility that supports the goal of self-sustaining runs. The analysis showed an obvious difference in incremental cost per incremental output between 9A8 and the combination of 9A4 and the upstream collector 9B1. The incremental cost per incremental output of Alternative 9A8 is $188 while the cost of the combined 9A4/9B1 is $538. The incremental cost per incremental output of Alternative

S02-14 Cont. 9A8 and the upstream collector 9B1 is even higher at $1,019.

Based on the incremental analysis, combined Alternative 9A4/9B1 has a high likelihood of supporting self-sustaining runs of salmon and steelhead, but was rejected by the FPTC and was much more expensive than Alternative 9A8. Based on technical feasibility and incremental evaluation, Alternative 9A8 was recommended as the facility being in the federal interest. The use of the upstream collector 9B1 in combination with Alternative 9A4 will be considered a fall-back option during the PED phase, but following construction of Alternative 9A8, an upstream collector would only be considered under a new Section 216 authorization.

S02-15 Depending on the amount of precipitation and reservoir refill operating rules, storage of water would occur between 15 February and 30 June. During this period, priorities for use of inflow are for reservoir refill and to satisfy downstream water demands including baseflows to protect steelhead incubation and other instream resources. Priorities for use of water that flows into Howard Hanson Reservoir during this time are described in Appendix F, Section 9 Modeling parameters for Baseline, Phase I and Phase II reservoir operations. Water can be stored after 30 June on an opportunistic basis under the adaptive management process, but for modeling purposes, it was assumed that following 30 June, the reservoir would switch from a refill condition to release of stored water for downstream flow augmentation. Flow augmentation during July and August will provide instream resource protection, including protection of steelhead egg incubation.

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S02-15 Cont. emergence is not complete until late July to early August. Protection only through June perpetuates the existing problem for steelhead.

S02-16 4.1.2., page 118. "Implementation of Phase II would be contingent upon acceptance by the regulatory agencies and the MIT." Provided "regulatory agencies" is also intended to mean resource agencies (e.g., WDFW), this reflects our understanding.

S02-17 4.2.7., page 123. A listing of "primary refill rules" includes "....a stage decline of no more than 1 foot from 1 May to 30 June to protect incubating steelhead eggs...." The erroneous implication is that achievement of this objective will protect steelhead. Steelhead spawning begins in April and extends into June. Emergence is not complete until late July to early August. The option to annually store the supplemental 5,000 ac-ft is needed to help provide incubation flows through emergence.

S02-18 Table 6-1, page 211. Chinook in the upper watershed are given a "....moderate chance...." of achieving self-sustaining returns. While we would welcome this prospect, based on apparent survival rates of lower Green River chinook, expected passage efficiency makes this unlikely. What additional or compensatory measures will be implemented if chinook are not sustainable?

S02-19 6.2.5.d., page 221-222. Reference is made to improved recreational opportunities in the upper watershed because of the "....large increase in the number of naturally spawning adult salmon and steelhead released in the Upper Watershed." All things considered, it is unlikely the upper watershed will be open for the taking of any anadromous fish.

S02-20 6.9.2., page 246. The stated goals of the AWSP include "....while maintaining **existing** anadromous salmonid populations...." (Emphasis added). Given the stressed condition of Green River fisheries resources, this would be a short-sighted goal. We believe that significant restoration and enhancement is possible.

S02-21 6.9.2.1.d., page 248. How will gravel nourishment at a rate that is only 50% of the estimated rate of loss (4.8.3., page 148) be able to "....maintain spawning habitat for salmon and steelhead."? If monitoring so indicates, will augmentation rate be increased?

S02-22 6.9.2.2.d., page 258. How will it be determined that the proposed riparian habitat mitigation, in combination with the enlarged reservoir surface area, will off-set production losses from habitat inundation losses for coho, chinook, and steelhead? If not, what additional measures will be employed to more fully achieve restoration goals?

S02-23 Ibid, page 261. Future prospects for lower watershed chinook are indeed unclear. Their future depends to a great degree on how well adaptive strategies for annual refill work out in actual practice. This underscores the need for flow management to be focused on fishery resource

S02-16 We concur. Regulatory agencies was intended to mean resource agencies.

S02-17 The reservoir refill rule guiding maximum stage declines was developed in cooperation with WDFW personnel and designed to protect incubating steelhead eggs. As noted in the response to SO2-15, after 30 June reservoir operations change from a refill mode of operation to release of stored water for downstream flow augmentation. Extending the refill rules past 30 June would provide little benefit since the reservoir will releasing water rather than storing water. The need for sustained baseflows to protect steelhead eggs remains through the July and early August period. Management measures to protect steelhead eggs during July and early August should focus on release of stored water rather than guidelines for reservoir refill.

S02-18 Should anticipated levels of reservoir and dam passage success not be achieved, or if other factors, such as ocean survival be identified as controlling influences, other reasonable and prudent alternatives may be considered under the adaptive management process. Under the adaptive management process, WDFW and the Muckleshoot Indian Tribe will determine management direction for the Green River salmon and steelhead stocks within the constraints of the NMFS listings under the ESA. Should self-sustaining runs be deemed infeasible, long-term supplementation of some stocks may be considered as one option to seed the upper watershed.

S02-19 We concur.

S02-20 We agree that fisheries resources in the lower watershed can be improved, and as stated on pg. 246, one of the goals of the AWSP is to restore selected aquatic habitat features of the lower watershed.

S02-21 As noted on Pg. 147, the proposed level of gravel nourishment is intended to maintain "an increment" of
existing spawning habitat in the Middle Green River. The objective of gravel nourishment is to slow or stop the downstream extension of streambed armoring and replenish certain areas presently deficient of spawning-sized sediments. The extent to which gravel nourishment successfully stops continued streambed armoring will be identified through monitoring and evaluation. A major concern of adding gravel-sized sediments to the Middle Green River is the potential effect on flood control measures in the lower river. As described in Appendix F, Section 4B Gravel Nourishment in the Middle and Upper Green River, a monitoring plan is proposed to track the travel distance, redistribution and deposition of the added gravel to minimize the risk of major

S02-21 Cont. downstream ramifications. Annual gravel placement would be reduced or halted if monitoring identifies problematic aggradation.

As a restoration measure, the maximum rate of gravel nourishment is capped by financial constraints.. If problematic gravel aggradation in the lower river is identified, the rate may be reduced. If monitoring identifies the value of an increased rate of gravel nourishment, funds for additional gravel must come from other sources.

S02-22 As described in Appendix F, Section 10: Proposed Adaptive Management Monitoring and Evaluation Program, Table 10-3, a monitoring and evaluation program is proposed for the first 15 years following project construction. The stability and biological effectiveness of instream habitat enhancement measures will be evaluated through physical and biological surveys. Juvenile salmonid distribution and growth in the reservoir will be monitored as will predator abundance in the reservoir and tributary confluences. The results of these surveys will help identify impacts of inundation on juvenile salmonid production and the efficacy of proposed mitigation measures. Maintenance and necessary modifications will be made to the non-fish passage related mitigation and restoration measures based on the results of the monitoring evaluations. Detailed study plans on the field methods and data analysis procedures to be employed will be developed during the PED phase prior to project construction.

S02-23 Comment noted.

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S02-23 Cont. needs.

For steelhead, future status depends to a great degree on how well incubation losses can be controlled and reduced. Under present conditions, we believe these losses are the paramount limiting factor on lower river wild steelhead production.

S02-24 6.9.2.3.d., page 265. Regarding lower watershed chinook salmon, we agree that a determination cannot be made as to project effects. However, this conclusion appears to conflict with anticipations described at page 261.

S02-25 6.10.2.d., pages 271 and 272. Regarding flow adjustments and reservoir operations, controlling flow stage declines only during the period from May to June 30 will not protect wild winter steelhead eggs and alevins. See earlier discussions on this point.

S02-26 Ibid, page 273. It is stated that mitigation of existing project effects on steelhead was "....aimed to protect **existing** level of natural production in the Lower Watershed." (Emphasis added) and that this was the WDFW objective. The existing level of production is presently impaired by project operations, both accidental and intentional. It is our desire that these impairments be reduced to the fullest extent possible to restore these runs to their full potential which will be significantly greater than the **existing** level.

Thank you for the opportunity to provide comments.

Sincerely,

R. Gary Engman
Mitigation/Water Rights Division

cc: Muckleshoot Tribe
U. S. Fish and Wildlife Service
National Marine Fisheries Service
Department of Ecology

S02-24 We agree that biological project effects are uncertain, however, that does not obviate the need to describe anticipated effects under NEPA. Many of the operational strategies incorporate an adaptive management process to allow changes to be implemented as additional information is gathered through the monitoring and evaluation process. The adaptive management process was incorporated in response to the inherent inability to predict biological outcomes with certainty.

S02-25 See earlier response to SO2-15.

S02-26 Comment noted.

Tacoma Public Utilities

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17 JUN 1998
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REGULATORY BRANCH

Mark Crisson
Director

3628 South 35th Street
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Divisions
Light
Water
Belt Line

June 15, 1998

Colonel James M. Rigsby
District Engineer
U.S. Army Corps of Engineers, Seattle District
P.O. Box 3755
Seattle, WA 98124-3755

Attn: Kris Loll, Civil Projects & Planning Branch

Re: Review of Howard Hanson Additional Water Storage Project (HHD AWSP) Draft Feasibility Report/Draft Environmental Impact Statement (DFR/DEIS)

Dear Colonel Rigsby,

L01-1 As the local sponsor for the Howard Hanson Additional Water Storage Project, Tacoma Water has worked closely with the U.S. Army Corps of Engineers for several years. During this time, we have consistently tried to address the concerns expressed about the project by federal, state, and local resource agencies and the Muckleshoot Indian Tribe. We believe that the outcome of this multi-year dialogue and cooperative work effort has been the design of a municipal water storage project that works in concert with the needs of fish and wildlife resources. Now that the Feasibility phase of the project is coming to a close, we encourage the Corps of Engineers to move quickly into the Preliminary Engineering and Design phase so that the Howard Hanson Additional Water Storage Project can be implemented on schedule.

Our staff has reviewed the Howard Hanson Additional Water Storage Project Draft Feasibility Report/Draft Environmental Impact Statement, and would like to provide you with the following comments.

Draft Feasibility Report & EIS

L01-2 Project water availability seems to be based on the COE Scenario #7 analysis. This scenario has been superseded by the modeling done by CH2M and the subsequent negotiations with federal and state natural resource agencies and the Muckleshoot Tribe which focused on an adaptive management approach to instream flows. Less water is now available to Tacoma than there was under Scenario #7.

A reduction in water available to Tacoma and its partners from this project resulted from increasing Auburn instream flows in the spring from 400 to 575 cubic feet per second in the modeling effort. This change is of serious concern because it reduces the water

L01-1 The Corps is committed to completing the NEPA process in a timely fashion, in order to submit the document to Congress for authorization in the next Water Resources Development Act bill.

L01-2 The proposed operating strategy allows for storage of Tacoma's full second supply water right (SSWR) available between 15 February and 30 June as modified by the TPU/MIT agreement. On days when instream flow levels do no meet minimum flows established by the TPU/MIT agreement no water would be stored. The decision to dedicate stored water for M&I use would be made on a real-time basis, TPU can accumulate water in a dedicated block of storage at a rate established by the TPU/MIT agreement. See Common Issue Response - Priority of Springtime Water Storage and Release.

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L01-2 Cont. available for municipal storage by about 4500 acre feet in 1992. Review of the hydrograph for that year reveals some opportunities to recover that lost storage. Tacoma will want to discuss this with resource agencies during the development of operating guidelines for the project.

L01-3 Water quality is always of paramount concern to Tacoma due to our water supply responsibilities. Therefore, we will expect that a water quality management plan will be developed to cover the construction of the additional storage project. This plan should be included as part of the Preliminary Engineering and Design (PED) phase.

The natural rate of reduction of pool turbidity in the spring following refill is of critical concern to Tacoma since we operate as an unfiltered surface water supply. Preliminary study by the COE has indicated that if the reservoir pool is highly turbid following refill, it will return to acceptable turbidity levels by May. Tacoma believes that this preliminary work must be confirmed during PED to assure that Tacoma's operations will remain in compliance with the Safe Drinking Water Act.

L01-4 The currently identified local sponsor share for this project is $38.6 million. This cost has increased significantly over the course of the study. It will be a goal of Tacoma to implement all cost reduction measures possible consistent with project objectives. This will be a central focus of our PED effort.

L01-5 *Page 62. 3.1.3.11 b (4) Alternative 11B4 Large Woody Debris Management for Fish and Wildlife Habitat.* The discussion in this section implies that the large woody debris (LWD) collected in Howard Hanson Reservoir is owned by the Corps of Engineers. As you know, the LWD and any merchantable timber that accumulates in the reservoir during flood events is owned by Tacoma Water. Tacoma Water uses this material in part, for habitat mitigation, enhancement, and restoration purposes. We consider the HHAWS Project to be a priority use of this material.

L01-6 *Page 63. 3.1.3.11 c (3) Alternative 11C3 Leave Inundated Trees in the Enlarged Storage Pool.* We fear potential water quality problems due to falling trees causing bank soil loosening as trees topple after their death due to submersion. In addition, many of these trees represent a source of revenue for Tacoma Water, to financially support the subject project. However, we acknowledge the resource agency viewpoint that these trees will provide valuable habitat if left standing. We will work with these agencies during PED to assure that their concerns for shoreline habitat are properly addressed.

L01-3 <u>Water Supply</u>
See Comment-Reply L04-5.

<u>Water Quality Management Plan</u>
We share the concern for water quality of the Green River during construction of the additional storage project. Development of a water quality management plan to cover the construction will be included as part of the Preliminary Engineering and Design (PED) phase.

<u>Water Quality Study</u>
We understand the concern expressed by Tacoma Public Utilities for pool turbidity following refill. Historically, the project has not had a problem with long-term high turbidity values. The turbidity analysis included in the FEIS was based on historic turbidity events and on conservative assumptions concerning the reduction of pool turbidity. As such, the analysis demonstrates that even under a worst-case scenario, the additional water storage project poses no threat to the quality of Tacoma's water supply. We plan to continue water quality monitoring efforts and to further expand our understanding of the causes and fate of turbidity in the reservoir.

L01-4 The COE is committed to meeting project objectives in a cost effective manner and will work with Tacoma in that regard.

L01-5 We concur that the HHD AWS project has priority in the use of large woody debris collected in the HHD reservoir.

L01-6 We agree that this issue can only be fully explored in PED. However, we disagree that trees falling into the water, and causing minor bank sloughing, will cause a significant water quality problem: bank sloughing will occur (and has occurred) with or without leaving trees around the reservoir. These events (individual trees falling into reservoir) will be localized and occur over a long period of time, with no significant impacts to water quality. We recognize the potential loss of revenue to you if trees are left standing, and also the loss of habitat if trees are removed.

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June 15, 1998
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L01-7 *Page 199. 5.9.1c. Ecosystem Description and Function, Terrestrial Resources, Wildlife - Grizzly Bear.* Tacoma's Watershed Inspectors have each spent the past 20 years in and around the upper Green River watershed and none of them has ever seen a grizzly bear. They have seen hundreds of black bears of many colors and sizes. Tacoma is exploring obtaining Endangered Species Act coverage for grizzly bears under its Green River Municipal Water Supply Habitat Conservation Plan.

Staffing Issues

L01-8 *Page 142. 4.7.3 c Wildlife Habitat Mitigation.* Tacoma Water is concerned about the efficiency of using full-time employees to maintain managed elk pastures. We believe the as-yet-undefined work would be more efficiently undertaken by contract employees using their own equipment, and inspected by Tacoma Water and Corps staff..

L01-9 *Page 157. 4.12.1 Operation and Maintenance, Considerations and Concerns.* Tacoma Water is concerned about the plan to adjust floating habitat with pool elevation changes. A less labor-intensive, yet equally effective method of adjusting the floating habitat should be available. Tacoma Water staff want to be involved in the design, operation and maintenance of the floating habitat.

L01-10 *Page 157. 4.12.2 Required Increase in Staffing.* Tacoma Water believes the stated number of additional staff is excessive and can be reduced if fish passage is handled in a practical, efficient manner, utilizing existing staff, part-time employees, contract employees, or possibly a contractor to operate the fish passage facility. The recommendation to have continuous full time coverage (24 hours per day / 7 days per week) during refill should be cafefully evaluated to assure that the benefit outweighs the cost of providing it. The capacity of the current onsite staff should be fully evaluated to help assess the need for the proposed high level of staffing.

If overnight adjustments to flow are justified, there still may not be sufficient justification for continuous full time coverage. This need might be easily met with the current staff being on call, by staggering work shifts or by other creative means.

Tacoma Water feels strongly that an investigation into automating all or part of the stop log function should be investigated to eliminate the need for manual stop-log placement and removal. Finding a practical solution to this problem will greatly reduce the number of FTE's required for ongoing fish passage operations.

L01-7 Comment noted. The USFWS included grizzly bear on its list of threatened and endangered species that potentially could occur in the project area. The biological assessment indicated that no grizzly bears had been observed in the project vicinity, but that tracks of a grizzly bear adult, cub, and unknown-aged bear had been identified roughly 25 miles from the project in 1993.

L01-8 Comment noted. Certainly any work contracted to others will need to have periodic inspections. Presumably the cost of contracting the work plus inspections will be less than doing the work in-house. This cost comparison will be conducted during PED.

L01-9 Comment noted. The design of the floating islands is preliminary. The Corps shares your concern regarding the operation and maintenance of the floating islands and will work with TPU to further refine the design to minimize these concerns.

L01-10 The FTE requirement is based on a Feasibility level design and will likely change as the level of design progresses. We will continue to refine the requirements and costs of Operation and Maintenance in PED.

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L01-11 *Page 158. 4.12.3 Cost of Operation and Maintenance.* The hourly cost of $25.02 appears to us to be a low estimate. Nine FTE's appears excessive, and perhaps includes an inordinately large safety factor.

We thank you for this opportunity to comment on the Howard Hanson Additional Water Storage Project. If you have questions about our comments, please telephone me at (253) 502-8208.

Sincerely,

John Kirner

John Kirner
Deputy Superintendent
Tacoma Water

JK: sf

L01-11 We concur that the hourly rate may be low.

King County
Department of Natural Resources
Yesler Building
400 Yesler Way, Room 700
Seattle, WA 98104-2637
(206) 296-6500

June 15, 1998

Kris Loll
Civil Projects & Planning Branch
US Army Corps of Engineers, Seattle District
P.O. Box 3755
Seattle, WA 98124-3755

Dear Ms. Loll:

Thank you for the opportunity to comment on the Additional Water Storage Project, Draft Feasibility Report and Environmental Impact Statement for the Howard Hanson Dam on the Green River.

L02-1 King County supports the Additional Water Storage Project and Tacoma's associated Second Supply Project. We recognize the potential importance of this project as a new source of water supply for King County, and are impressed by the degree to which Tacoma and the Corps have included not only mitigation for impacts, but also aquatic restoration into the project purpose.

L02-2 The proposed listing of Chinook salmon as threatened by the National Marine Fisheries Service will have significant ramifications on all water resource agencies and projects in the Puget Sound. Endangered Species Act (ESA) response strategies adopted by Tacoma, the U.S. Army Corps of Engineers and others may need to consider the Additional Water Storage project, all associated diversions, and instream flow agreements for the Green River comprehensively to fully assess mitigation needs for fisheries habitat.

Under such an evaluation, there are several important areas of the proposal that may differ from emerging views of river, salmonid, and ecosystem restoration. In addition, the ESA may require a broader regional approach to determining where and how to mitigate for impacts of projects such as this one. Specific areas that may require further evaluation include:

- With the ESA listing on the horizon, we need to preserve options for water management for salmon in the Green while moving ahead to address critical water supply needs. We support the Additional Water Storage Project, but need to better understand how it fits into the ESA response strategy that we have been developing with Tacoma and other regional partners.

L02-1 Comment noted.

L02-2 Tacoma Public Utilities Habitat Conservation Plan includes the AWSP and provides a public forum for King County and other interested parties to comment on and better understand how the project could fit into an overall response strategy. In addition, we expect to have continuing communication with King County about development of the AWSP during the next three years of pre-construction engineering and design (PED phase).

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Ms Loll
June 15, 1998

L02-3
- We support the concept of adaptive management of instream flows and would prefer to see a flow strategy designed to replicate natural flow patterns. The adaptive management approach recommended in the EIS involving the Green River Fisheries Management Coordination Committee in decision-making on flows might be difficult to implement. Given the competing priorities of the many stakeholders in the Green River—hatchery managers, other fisheries agencies, the tribes, recreational user groups, and floodplain managers—consistent decision-making is uncertain. For such an approach to function, we recommend clearly defining the governance structure, including the membership, decision-making protocols, etc. A hierarchy of objectives to be used when competing interests are not mutually compatible would be helpful.

L02-4
- To prepare an ESA response, we should investigate further modifications in flow and storage management to mimic natural hydrologic conditions and would like work with Tacoma and the Corps on this investigation. The Additional Water Storage Project need not wait, but would like to work with you on flow and storage management based recommendations in the context of Tacoma's Habitat Conservation Plan for the Green River. The Habitat Conservation Plan must resolve the issues and house the ultimate agreements on adaptive management strategy and impacts on fish.

King County Department of Natural Resources staff is dedicated to working with you and the City of Tacoma in our efforts to mutually develop a response to the proposed ESA listing. We offer to immediately begin work with you to analyze alternative flow patterns on the Green River in an attempt to create a naturalistic and ecologically complex flow regime.

Attached is a list of additional technical comments on the Additional Water Storage EIS that we offer for your consideration. Please feel free to call Nancy Davidson, Regional Water Resources Manager at 296-3775 if you have any questions.

Sincerely,

Kurt Triplett
for Pam Bissonnette
Director

cc: Nancy Davidson, Regional Water Resources Manager
Nancy Hansen, Manager, Water and Lands Resources Division
John Kirner, Tacoma Public Utilities

L02-3 We agree that the competing priorities of river resource users make consistent decision making a continuing challenge. We will investigate development of a decision making structure for adaptively managing the refill and release of existing and additional storage during the PED phase of the AWSP. This phase begins in fall 1998 and will continue through 2001. Such a decision structure would include a hierarchy of objectives.

L02-4 The City of Tacoma's HCP will not address potential changes to the storage and release of water at HHD; but instead, will address their water withdrawal activities. Further modifications in water storage and release management at HHD will be addressed through the proposed AWS adaptive management plan.

Howard Hanson Dam is a federal project and the storage and release of water at Howard Hanson Dam is a federal activity. The Corps will be seeking coverage for water storage and release at HHD in conformance with Section 7 of the Endangered Species Act through an application for an Incidental Take Statement (ITS). Activities to be covered under the ITS will include:

- storage of water behind HHD;
- reservoir inundation;
- construction of mitigation measures associated with reservoir inundation;
- construction and operation of the downstream fish passage facility;
- alteration of reservoir levels;
- alteration of downstream flows;
- effects of water storage on sediment and gravel transport; and
- restoration activities.

The City of Tacoma is seeking coverage for municipal and industrial water withdrawal activities in conformance with Section 10(a)2(A) of the ESA through an application for an Incidental Take Permit (ITP). In support of their application for an ITP, the City is preparing an HCP that will describe how Tacoma proposes to operate its municipal and industrial water supply system in a manner that will minimize impacts to the covered species, and how these operations may affect other fish and wildlife resources in the HCP area. As local sponsor of the AWS, the City is also responsible for maintenance and monitoring of AWS mitigation and restoration measures. The City will be seeking coverage under an ITP for activities including:

- water withdrawal at Tacoma's Headworks (reduced flows and concomitant habitat effects downstream);
- operation of downstream fish bypass facility at Tacoma's Headworks;

L02-4 Cont.

- water withdrawal from their North Fork wellfield;
- monitoring of downstream fish passage through the HHD reservoir and fish passage facility;
- monitoring and maintenance of the AWS fish habitat restoration projects and fish and wildlife mitigation projects; and
- Tacoma Water watershed forest management activities

Additional Water Storage Project EIS
Additional Technical Comments

Flood Protection

L02-5 The draft Feasibility Report and EIS (the EIS) should better state how each alternative meets the stated objective of not affecting the flood control function of Howard Hanson Dam. The recommended project will require reservoir refill to begin five weeks earlier than under the base case. This will necessarily result in a loss of available flood storage in the reservoir which in principle results in diminished downstream flood protection.

Given the acknowledged importance of Howard Hanson Dam in the regional economy as a flood control facility, the EIS should address the impact of project alternatives (especially early refill) on flood risk, including the following:

- A presentation of the expected marginal changes in flood frequencies and other relevant flood characteristics, and
- An assessment of these impacts in the appropriate economic analysis and mitigation portions of the report.

These analyses should test the flood control performance of alternatives through the full range of historical and appropriate synthetic events including events of probability as low as 1 in 500 years, which has been stated as the protection level provided by the facility under the base condition.

Reliability of Stored Water

L02-6 The EIS uses the term "reliability" expressed as a probability associated with different levels of flow that may be diverted under the TPU Second Supply Water Right (SSWR) for different project alternatives. Given the importance of "reliability" in terms of the economic value of water supply, the main body of the report should provide a description of how reliability is defined and by what method it is determined. This would require that information provided in Appendix D be brought forward to the main report and be supplemented for additional clarity. Appendix D describes reliability in terms of the percentage of "seasons" in which "demand" is satisfied during every 2-week period. However, "demand" never seems to be explicitly defined. Figure 4 of the appendix on page D1-Fig-2 is entitled "Target Diversion Flows from the Green River below Howard Hanson Dam". Are these "targets" supposed to represent "demand?" If so, additional explanation is required regarding how a seasonal demand pattern was derived which declines from 100 to 80 cfs during the summer. The report should explain reliability and demand as well as their relationship to the economic benefits of the proposed project.

L02-5 The recommended project includes reservoir refill in February which is earlier than refill under the base case. This is not considered a necessary loss of available flood storage for two reasons, it is not *required*, and the magnitude is small. The amount of refill storage is 5,000 acre-feet which is 5% of the 106,000 acre-feet of storage for flood control. Our discharge-frequency files show that the 500-year 1-day maximum discharge at Auburn for February is approximately 70% of the 500-year for January. Although the relationship for flow and storage is not necessarily linear, this does strongly suggest that the 101,000 acre-feet that is still available for February (95% of the total storage) is ample to cover floods expected in February.

The refill of 5,000 acre-feet of storage by the end of February is not a firm requirement. The EIS and water management procedures for Hanson Reservoir have recognized that the flood control function is a higher priority use over water supply. If the weather outlook was for flood conditions in February, the refill would not be initiated. If the refill was already underway or completed, the 5,000 acre-feet would be evacuated. This water could be evacuated in one day using a discharge of 2,500 cfs plus inflow, which should be well within the channel capacity of 12,000 cfs at Auburn. A presentation of expected changes in flood frequencies and impacts was not included in the EIS because they are expected to be zero.

L02-6 The water supply output of the proposed project as well as all of the structural water supply alternatives are based on 95 percent reliability. Basically, this means that 95 years out of 100, the amount of water claimed as an output can be provided. Since water supply benefits are based on avoided costs of not having to implement the most cost effective alternatives to the proposed project, it is important to evaluate the output/unit cost of those alternatives using the same reliability as that provided by the project. Water demand is compared to the without project supply to determine the project deficits and timing of those deficits. See paragraph 2.5.1, and Section 2.6 of Appendix B.

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L02-6 Cont. In addition, the report describes the reliability of providing flow augmentation as 75%; this appears to be referring to the project's ability to meet State instream flow requirements, but this is not clear in the document. One of the principle stated benefits of this project, however, has been the ability to "adaptively manage" flows, based on additional stored water above and beyond that necessary for supply or to meet the state and the TPU/ Muckleshoot agreement minimum flows. While we welcome the opportunity created by such a surplus, we note that the EIS does not evaluate the reliability of this additional stored water, so it is impossible to determine how often and to what extent it would be available.

Water Rights and Flow Requirements

L02-7 The tables and text in Section 1.6.8 appear to require clarification. The rates, volumes, and priority of Tacoma's SSWR and its relationship to the DOE minimum flows at both Palmer and Auburn should be explained as should the relationship of the TPU/ Muckleshoot instream flow agreement. The text implies that the TPU/ Muckleshoot agreement would be more restrictive on TPU's withdrawal of water than state-mandated minimum instream flows in all cases. However, this appears to be contradicted by the last paragraph on page 23 referring to consultations that would address instream flows in the summer months. The EIS should clarify the applicability of the State minimum flows at Auburn and Palmer, Tacoma's diversions, and stream augmentation by the Additional Water Storage project.

Water Quality (Temperature)

L02-8 The preferred alternative in the EIS attempts to improve temperature conditions in the river by blending water from the existing deep outlet with water from the surface outlet used for fish passage. The proposal focuses on meeting state temperature standards and a target temperature curve based on specific salmonid life histories, rather than on replicating natural river conditions. The report states that, at flows under 400 cfs, the surface outlet must be used with no blending. This could result in warmer temperatures immediately below Howard Hanson Dam in the summertime and early fall than exist under the current management scenario. The EIS should clearly evaluate the effects of this. A comparison of temperatures under "natural" river conditions (assuming no dam or reservoir), current conditions, and the recommended alternative should be made. This comparison should include several representative downstream locations, so that reviewers can evaluate the downstream persistence of any temperature changes. The impacts of these changes to the downstream ecosystem should then be fully evaluated.

L02-9 Gravel and LWD

L02-7 All of the flow versus date tabulations in section 1.6.8 are compiled into one table near the end of the DFR/DEIS in Section 9, Pertinent Data. The inter-relationships of flows are easier to see in the table of Instream Flows for the Green River Below Hanson Dam on page 283 with footnotes on page 284. The relationship of flow versus operating features is simplified on the next page in a separate tabulation.

The statement in the last paragraph on page 23 says that consultations would address the need to drop the instream flow from 250 to 225 cfs. This is not something that would happen every summer. This represents a very rare condition when flows have been low for so long that there is no "additional storage" left and very little existing storage left in Hanson Reservoir.

L02-8 The use of a temperature target curve is the customary procedure for mimicking natural temperature variation for thermal budget modeling of a reservoir. Due to local hydrometeorological variation, it is not possible to operate a fish passage facility to match inflow temperatures that may vary as much as 10°F within a few days, however, we attempted to mimic the natural seasonal increase and decrease in daily average temperatures. In this proposed project, meeting fish passage criteria took precedence over meeting temperature criteria.

The lower limit of 400 cfs through the fish passage structure has been reviewed and revised by the Fish Passage Technical Committee (FPTC). The FPTC recently reviewed the screening velocity criteria for low velocity screens and determined that flows less than 400 cfs could be passed through the fish passage facility. This lower flow volume would allow blending of deep and surface water at lower flows, such that this is no longer a limitation of the project.

In 1992, The Muckleshoot Indian Tribe commissioned Caldwell and Associates to collect and analyze temperature data. The resulting report, as well as the Corps' water quality analysis in the DFR/DEIS, came to the same conclusion that (in 1992) water temperature 4 miles below the dam was independent of the dam outflow temperature. The proposed project would release cooler water in late summer and early fall. Accompanied by greater flow, this cooler water would persist further downstream and could improve salmon and steelhead rearing and spawning conditions in the mainstem just below the dam, however, the improved temperature is not expected to persist much farther downstream. Cooler dam outflows cannot overcome the lack of riparian shading. Page D3-14, Figure 7, of the DFR/DEIS illustrates the before and after project conditions of downstream temperature control. This figure shows that, 4 miles down-

Flow Vs. Operating Features

(See comment-reply L02-7)

Purpose	Min.Flow 110 cfs	Wa.Dept.Ecology Palmer	Wa.Dept.Ecology Auburn	MIT/TPU Agreement	Adaptive Management
Tacoma's 1st Diversion	A	A	A	B	C
Tacoma's 2nd Diversion	A	C	D	C	C
Hanson Existing Storage	C	A	A	E	E
Additional Storage Phase 1	F	C	D	C	G
Additional Storage Phase II	F	C	D	C	G

Explanations of the applicability of various instream flows versus water management purposes

A = Not applicable at all.

B= Applicable after "existing" storage is gone.

C = Directly applicable to regulating the quantity of instream flow after diversion.

D = Not applicable due to location, use the Palmer location.

E = Indirectly applicable due to 4 storage zones. The top of the zones are simplified below:
The top of the Wet Zone (1) is 24,200 ac.ft. on 1 August varying to zero on 8 December.
The top of the Wet-to-Avg. Zone (2) is 22,748 ac.ft. on 3 August varying to zero on 7 December.
The top of the Avg.-to-Dry Zone (3) is 22,748 ac.ft. on 20 July to 19,613 ac.ft. on 31 July then zero on 7 December.
The top of the Dry Zone (4) is 15,490 ac.ft. on 1 August varying to zero on 8 December.

F= Applicable after "additional" storage is gone.

G = Directly applicable as target flows (not minimums) in wet, average, and dry years according to conditions based on 4 reservoir zones (see E). Minimum flows are the MIT/TPU Agreement flows. The success in maintaining the target flows is proportional to the storage available, which is greater in Phase II than Phase 1.

L02-8 Cont. stream of the dam, the water temperature may be as much as 3°F cooler that under existing conditions. Additional comparisons farther downstream were not reported as solar heating becomes the dominant factor for water temperature.

Page D3-11, Table 1, of the DFR/DEIS demonstrates the benefits to outflow temperature of the proposed project over existing project conditions. The poor temperature control of the existing structure would be exacerbated by additional storage without the fish passage/selective withdrawal structure.

L02-9 We share your concerns about potential impacts to flood protection, private property and existing habitat. We do not believe our proposals are overly ambitious, in fact, they may be less than necessary to restore mainstem habitat to a meaningful degree. To avoid impacts to flood protection, the gravel nourishment project was limited to what is considered a minimum sediment transport rate (see Section 4b Appendix F1). We will be conducting additional analysis of sediment transport and channel conditions during the PED Phase. At project inception we will also closely monitor initial and continuing gravel placement. The truck and transport of large woody debris will be limited by the availability of suitable sized pieces of wood. We expect requests for large woody debris (collected from the reservoir) for use in habitat restoration projects will continue to escalate. Just as there are competing interests for instream flows, we are expecting similar competing interests for use for large woody debris.

The two projects, gravel nourishment and large wood transport, are highly controllable requiring the annual placement of material to maintain the benefits of each. If at anytime a problem is identified, the frequency and volume of placement can be reduced or halted. Additional opportunities for public input will occur prior to construction.

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L02-9 Cont. The EIS proposes fairly ambitious programs of reestablishing both gravel and large woody debris in the river below the dam. While we support the concept of reintroducing these attributes into the Green River environment, we believe such work should be done with extreme care. In particular, we're concerned that such projects not be implemented without sufficient analysis of flooding impacts, potential increases in channel migration hazard, and the like. In addition, given the visibility of these initiatives and the likely perception that adverse impacts to private property could occur, it's extremely important that local landowners along the Green River have an opportunity to review these programs in detail. A public involvement program that is limited to formal SEPA/ NEPA review may not be sufficient.

Artificial vs. natural freshets

L02-10 The EIS recommends an adaptively managed flow regime during the spring refill period that includes the potential for release of artificial and/or natural freshets, when there is sufficient available water. Without a detailed analysis of Green River flow conditions before the dams and diversions, we recommend caution in undertaking release of artificial freshets, as it may be difficult to optimize the timing, peak, duration, and rate of change of these flow event within an ecosystem context. Natural freshets—probably created by capturing a consistent target flow or flow percentage, and releasing the remainder—are far preferable.

Relationship to the Green River Ecosystem Restoration Study

L02-11 King County has been cooperating with the Corps, the Muckleshoot Tribe, and various valley cities in the development of a conservation and restoration strategy for the Green River system. The program includes many restoration and rehabilitation projects identified through an evaluation of factors affecting the riverine ecosystem's ability to support salmonids. Many of these projects have now been brought forward in the ADDITIONAL WATER STORAGE PROJECT EIS. The success of these projects are related to flows and a more naturalized interaction among flow, sediment and woody debris in the system.

L02-10 We have conducted a detailed study of late winter and spring flow conditions (post-dam) for 32 years of record, 1964-1995 (see Section 5 Appendix F1). Our priority in flow management is development of a refill and release regime that mimics the natural hydrology of the river. We expect if we can track natural flow patterns that we will rely on natural increase in river flows to achieve the objective of maintaining freshets. Even with mimicry of a natural flow regime, artificial freshets may be a necessary tool to assist in the recovery of depressed Green River salmon stocks. As part of our adaptive management program we have begun development of a database of off-channel habitat (1996) and habitat use (1998), including what influence natural and artificial freshets may have on juvenile salmonids. Beginning in 1999 we expect to build on this aquatic habitat database with additional monitoring of side channel habitat quality and use (for two years) and by monitoring the instream migration of juvenile salmon and steelhead (2 years). At project inception, 2004, we will continue this monitoring of Lower Watershed habitat for 5 more years.

L02-11 We agree that the success of any floodplain or mainstem restoration project developed under either the Green River Ecosystem Restoration or AWSP will be dependent on a more natural flow, sediment and wood transport regime. Ultimately, all floodplain and mainstem habitats (natural or restored) are effected by the permanent flood protection operations of HHD.

Pierce County

Public Works and Utilities

JOHN O. TRENT, Dir

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June 12, 1998
#9806019

Kris Loll
Civil Projects & Planning Branch
US Army Corps of Engineers, Seattle District
P.O. Box 3755
Seattle, WA 98124-3755

RE: Howard Hanson Dam, Additional Water Storage Project, Draft Feasibility Report & EIS

Dear Kris Loll:

Thank you for the opportunity to comment on the document: "Additional Water Storage Project, Draft Feasibility Report & EIS, Howard Hanson Dam, Green Water, Washington, April 1998" prepared by the Seattle District US Army Corps of Engineers. Comments from the Pierce County Public Works and Utilities Department, Environmental Services division are as follows:

GENERAL COMMENTS - Background Information - Chambers Creek Properties

L03-1 In 1992, Pierce County purchased an existing gravel mine from Lone Star Northwest for the purpose of expanding the County's regional wastewater treatment facilities. The site of the gravel mine surrounds the County's existing wastewater treatment plant site, and, together, are referred to as the Chambers Creek Properties. The acquisition of the gravel mine included all rights, permits and licenses, including ground and surface water rights and a water impoundment dam. *Detailed analysis of the water rights shows there is a* combined potential water right of about 15,000 gallons per minute (gpm) or approximately 22 million gallons per day (MGD) of instantaneous (peaking) production and about 15,800 acre-feet (AF) annually or about 14 MGD on an average day basis. This total includes groundwater rights of 12.9 MGD and surface water rights from Chambers Creek for 8.9 MGD. In 1994, Pierce County filed applications with the Washington State Department of Ecology for a change of use of the County's water rights from industrial to municipal. Pierce County is completing some additional studies requested by Ecology prior to approving the change of use applications. Currently, the Pierce County Department of Public Works and Utilities, Water Programs division is studying the activities needed to be accomplished, estimated time-frames, costs, options, strategies and impediments to development of the water resources at the Chambers Creek Properties. Pierce County is considering a variety of methods to distribute the water resources into the regional supply

Administrative Services Sewer Utility Solid Waste Water Programs

L03-1 Due to the uncertainty surrounding the viability and actual availability of this site as an likely alternative to Howard Hanson Dam it was eliminated from further analysis during the plan formulation stage of this study.

network. The City of Tacoma system is only one of the possible methods. At this point in time, Pierce County has not reached any final decisions regarding the use of the Chambers Creek Properties' water rights.

SPECIFIC COMMENTS

Page 53, f. Alternative 3F. Please revise as follows:

L03-2 ~~Lone Star Sand and Gravel.~~ Chambers Creek Properties. This Pierce County owned property contains ~~the rights to develop an additional 9.3 mgd for used during the summer and 4-day peak periods~~ groundwater rights of 12.9 MGD, restricted to 5,778 acre-feet per year. ~~Construction would consist of installing a well, approximately 15,000 feet of transmission pipeline, and retrofitting a pump station to achieve an hydraulic gradient of 576 feet.~~ Developing the groundwater rights associated with the Chambers Creek Properties to be used in the Tacoma Water Division's 576 pressure zone would require approximately 15,000 feet of transmission pipeline to convey the water from the Chambers Creek Properties to the nearest Tacoma Water Division distribution system located at 40th and Bridgeport. A pump station would also be required to lift the groundwater to the hydraulic grade line of the distribution system at elevation 576.

Page 73, b. Alternative 3F. Please revise as follows:

L03-3 ~~Lone Star Sand and Gravel.~~ ~~Construction consists of installing a well and pump plus 15,000 feet of transmission pipeline, as well as retrofitting a pump station to achieve a hydraulic gradient of 576 feet.~~ Chambers Creek Properties. Developing the groundwater rights associated with the Chambers Creek Properties to be used in the Tacoma Water Division's 576 pressure zone would require approximately 15,000 feet of transmission pipeline to convey the water from the Chambers Creek Properties to the nearest Tacoma Water Division distribution system located at 40th and Bridgeport. A pump station would also be required to lift the groundwater to the hydraulic grade line of the distribution system at elevation 576.

Thank you in advance for your consideration of the above comments. Please contact Susan Clark at (253) 798-6169 with any questions you may have.

Sincerely,

Tim Ramsaur

TIM RAMSAUR, P.E.
Water Programs Manager

cc: John O. Trent, P.E., Director, Pierce County Public Works & Utilities Department
Joseph Scorcio, Special Assistant, Pierce County Public Works & Utilities Department
Chambers Creek Properties Management Team
Susan Clark, Associate Planner, Water Programs

L03-2 By reference to this document the following text provided by Pierce County is incorporated in the FR/FEIS.

Page 53, f. Alternative 3F.
"Chamber Creek Properties. This Pierce County owned property contains ground water rights of 12.9 MGD, restricted to 5,778 acre-feet per year. Developing the groundwater rights associated with the Chambers Creek Properties to be used in the Tacoma Water Division's 576 pressure zone would require approximately 15,000 feet of transmission pipeline to convey the water from the Chambers Creek Properties to the nearest Tacoma Water Division distribution system located at 40th and Bridgeport. A pump station would also be required to lift the groundwater to the hydraulic grade line of the distribution system at elevation 576."

L03-3 By reference to this document the following text provided by Pierce County is incorporated in the FR/FEIS.

Page 73, b. Alternative 3F
"Chambers Creek Properties. Developing the groundwater rights associated with the Chambers Creek Properties to be used in the Tacoma Water Division's 576 pressure zone would require approximately 15,000 feet of transmission pipeline to convey the water from the Chambers Creek Properties to the nearest Tacoma Water Division distribution system located at 40th and Bridgeport. A pump station would also be required to lift the groundwater to the hydraulic grade line of the distribution system at elevation 576."

City of Seattle
Paul Schell, Mayor

Seattle Public Utilities
Diana Gale, Director

June 12, 1998

Ms. Kris Loll
U.S. Army Corps of Engineers
Seattle District, Planning Branch (CENWS-PM-CP)
P.O. Box 3755
Seattle, WA 98124-2255

Subject: Howard Hanson Dam Additional Water Storage Project
Draft Feasibility Report and Environmental Impact Statement Comments

Dear Ms. Loll:

We appreciate the opportunity to review the Howard Hanson Dam Additional Water Storage Project Draft Feasibility Report and Environmental Impact Statement, dated April 1998. Our comments are as follows:

L04-1

1. Section 1.7.3, Municipal and Industrial Water Supply on page 28 of the main report, states,

   Seattle Water Department is currently in negotiations with Tacoma Water for Tacoma to provide Seattle with up to 25 million gallons of water per day (mgd) during the summer demand period, via a water supply intertie which is currently planned for construction prior to construction of the proposed HHD AWS Project.

   The Conceptual Agreement between Tacoma and Seattle allocates between Tacoma and Seattle M&I water to be stored under Phase I of the proposed Howard Hanson Dam Additional Water Storage Project as well as run-of-the-river water from Tacoma's Second Supply Water Right. No rate of delivery of water from storage

L04-1 Concur that Tacoma and Seattle are still in negotiation regarding the intertie, that no water delivery rate has been established, and that the intertie would be capable of carrying up to 40 mgd of water.

U.S. Army Corps of Engineers, Seattle District
June 12, 1998
Page 2

L04-1 Cont.

has been negotiated. The intertie would be capable of delivering water at a rate of up to 40 mgd.

L04-2

2. Appendix B, Economic Evaluation, Section 2.3.1, Water Supply, Item (2), page B-7, states,

> *Tacoma intends to supply Seattle up to 25 mgd of water with or without Howard Hanson Dam. [footnote: Supply without Howard Hanson Dam will require developing a currently undefined ground water or out of stream storage site.] As a result, construction of a water supply intertie between Tacoma and Seattle water systems with a peak capacity of 40 mgd would occur under the without-project condition. Based on a water supply contract with Seattle, Tacoma will provide Seattle with 20 mgd of water at 95% reliability during the summer.*

a. ***up to 25 mgd***
The rate of delivery should be "up to 40 mgd;" see our comment to Section 1.7.3.

b. ***Supply without Howard Hanson Dam***
Construction of the Intertie is predicated upon Seattle having access to water from Tacoma during the peak water use season. To date, the mechanism for assuring water to Seattle in the peak season has been the proposed HHD Additional Water Storage Project. Without access to water in the peak water use season it is unlikely that the intertie will be built. Should the Additional Water Storage Project not be approved, then an acceptable substitute method of delivering water to Seattle during the peak water use season would have to be devised. This could be some other yet-to-be-proposed storage project or the identification of a water supply that is available to Seattle during the peak water use season. In either case, the costs, benefits and environmental impacts of these substitutes would have to be evaluated before Seattle could determine whether or not to proceed with the Intertie.

c. ***Based on a water supply contract with Seattle, Tacoma will provide Seattle with 20 mgd of water at 95% reliability during the summer.***
No rate of delivery of water from storage, overall yield, or reliability have been included in the Conceptual Agreement between Tacoma and Seattle. We suggest that this sentence be deleted.

L04-3

3. Appendix B, Economic Evaluation, Section 2.3.1 Water Supply, Item (2) on page B-8 provides information on the cost and benefit to Seattle for the Tacoma-Seattle Intertie and the North Fork Tolt Project. We recommend that this text be deleted from the Appendix because the information is not current. Also, similar information on the cost and benefits of water supply alternatives was not provided for South King County. The cost to Seattle for receiving water from Tacoma is under negotiation, and the firm yield of the supply is now under evaluation. Seattle Public Utilities is in the process of updating its evaluation of water supply

L04-2 It is recognized that the intertie has a capacity of 40 mgd and that water up to that amount can and most likely will be provided at that rate on occasion. The 20 MGD used in the evaluation of this project was based on Tacoma's Water Demand Forecast, dated June, 1995, page 1-6 which states "..Seattle's anticipated demand on the Tacoma system is expected to be 11,700 acre-feet delivered between June1 and October 31. If delivered at a constant rate, this equals 25 mgd for the 153-day period although the system will be operated to allow for varying rates of delivery depending on Tacoma's demands." We took a more conservative approach and reduced the 25 mgd to 20. See section 2.3.1(2) of Appendix B. It is recognized that without Howard Hanson Dam another source of water would need to be developed to supply Seattle with their peak season needs. Given the alternative sources of water available to Tacoma and their respective costs, it is not unreasonable that Tacoma could and would still provide Seattle with part of their summer time water needs via the intertie.

L04-3 While we recognize that the cost and yield of alternative sources of supply change over time and that new sources of supply are being evaluated, the cost and yield of the North Fork Tolt was not used to compute project benefits but only used for comparison purposes.

U.S. Army Corps of Engineers, Seattle District
June 12, 1998
Page 3

L04-3 Cont. alternatives. A Programmatic EIS is being prepared to analyze the potential environmental impacts of a variety of different water supply sources including the project with Tacoma and the North Fork Tolt Project. Information on the potential yield and cost of alternative sources of supply for Seattle will soon be updated.

L04-4 4. Appendix B, Economic Evaluation, Section 2.6.3, Demand Forecast Scenarios, High Forecast, page B-18, and Table B2-3, indicate that the Seattle Water Department has a demand for water from Tacoma of 20 mgd starting in 2003. Seattle needs access to a new supply of water for existing customers (and their projected growth) in the year 2013. Should Seattle take on new wholesale customers, then the need for a new supply would emerge somewhat earlier than 2013, depending on the needs of the wholesale customers added. Alternatively, if the Interim Water Group forms the Cascade Water Alliance and purchases Seattle's interest in the Tacoma project, then they may have a need for the supply earlier as a basis for adding new wholesale customers. However, if the Tacoma-Seattle Intertie is on-line prior to 2013 Seattle may take delivery before then according to the terms of the Conceptual Agreement with Tacoma.

L04-5 5. Our review of the DEIS and supporting documentation indicates that less water supply to Seattle would be available from Phase I than what is reflected in our conceptual agreement with Tacoma Public Utilities. The information provided in the DEIS indicates that the storage for water supply fills to only 13,083 acre-feet in 1992 under the current project constraints as compared to 17,533 acre-feet under previous analyses (see Appendix D, Hydrology & Hydraulics, Part D1, Section 16, Summary of Phase I Operations and the March 4, 1997, CH2M Hill report on the Howard Hanson Additional Water Storage Project Modeling Results for Baseline, Phase I, and Phase II Reservoir Operations). We understand that the difference is attributed to the 575 cfs minimum flow at Auburn for dry springs (March 1 to May 1) agreed to by the Corps, Tacoma Public Utilities and the National Marine Fisheries Service. This difference in stored water available to municipal water supply severely limits the yield and reliability of this project to Seattle and reduces the economic benefits attributed to this project.

L04-6 The City of Seattle is fully supportive of the Howard Hanson Additional Water Storage Project. We believe the project is an example of using water creatively to meet the needs of both fish and people. The project promotes the conjunctive use of water supply in a manner that truly benefits the region. We look forward to being of assistance to the Corps and the city of Tacoma wherever possible.

Again, thank you for the opportunity to comment on the Draft Feasibility Study and DEIS. If you have any questions or would like to discuss our comments, please contact Ben Milgrom at (206) 684-5904 or Ray Hoffman at (206) 233-5008.

Sincerely,

Diana Gale

DIANA GALE
Director

L04-4 The economic evaluation of this project assumes that the intertie between Seattle and Tacoma is in place by project year one (year 2003) and that water is supplied to Seattle beginning in that year. The year water is expected to be supplied to South King County and Seattle is based on Tacoma's latest Integrated Resource Plan.

L04-5 It is unclear how the numbers 13,083 and 17,533 ac.ft were derived. Perhaps these are numbers derived from subtraction using the full pool. Year 1992 was a dry year and a full pool was not obtained under any of the scenarios (Baseline, Phase I, & Phase II). This is not a typical year and should not alone be used to quantify the yield and reliability to Seattle nor the economic benefit attributed to this project. Comparing maximum storage quantities from different scenarios doesn't necessarily relate to what is dynamically happening in the river. In Phase II, there are more demands on the water operation. A maximum achieved storage amount in Phase II may be less than Phase I because of timing and because there is more water actually being delivered from the storage to the intended purpose. A difference in static stored water amounts alone should not be used to determine yield and benefits. One should examine the delivered water for specific time periods. A complete copy of CH2M Hill's report on water operations is available for inspection here in our Reservoir Control Center. It includes a detailed flow and storage accounting of year 1992 that is available for anyone's inspection.

Phase I of the proposed project will provide 20,000 acre feet of M&I storage or 42 MGD of water at 95 % reliability over a 153 day summer/fall period. The benefits of this project associated with water supplied to Seattle are based on 20 MGD being supplied over the 153 day period.

L04-6 Comment noted.

Ms. Judith L. Nelson
MR. MRS. MS. MISS FIRST NAME INITIAL LAST NAME

18631 SE 300th PLACE
ADDRESS PHONE NO. (OPTIONAL)

KENT, WA. 98042
CITY STATE ZIP CODE

Covington Water District
FIRM, ORGANIZATION OR AGENCY REPRESENTED

☒ I WISH TO SPEAK AT THIS MEETING
☐ I HAVE WRITTEN MATERIAL TO SUBMIT
☐ I AM INTERESTED IN OBTAINING A TRANSCRIPT OF THIS MEETING (At Cost of Reproduction)

L05-1 REMARKS: This is a good project with benefits for fish and people. We have been waiting a long time, let's get on with it.

NPD FORM 111 June 1980 (Rev.) NORTH PACIFIC DIVISION, U.S. ARMY CORPS OF ENGINE

L05-1 Comment noted.

BNSF

J. M. (Mike) Cowles
Manager Public Projects
(States of WA., ID, MT, & British Columbia)

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Kris Loll
Corps of Engineers, Seattle District
P.O. Box 3755
Seattle, WA. 98124-3755

May 27, 1998

Dear Ms. Loll:

Concerning the Draft feasibility Report and EIS for the Additional Water Storage Project along the Green River and behind the Howard Hanson Dam.

001-1 The railroad's only comment to the report addresses section 1.6.10, 2nd paragraph on page 25 of the report. In 1985 the Burlington Northern Railroad, predecessor railroad to the Burlington Northern and Santa Fe Railway, sold the operational rights to the Washington Central Railroad from Kennewick to Cle Elum, WA. The branchline from Cle Elum to Auburn, WA. was never, abandoned, but remained inactive from 1983 to 1986.

It is difficult to anticipate when the BNSF will make additional improvements to the existing tunnel to allow for double stack trains. Our best guess for future improvements is in the next 10 years.

Sincerely,

J. M. Cowles

J. M. (Mike) Cowles
Mgr Public Projects

JMC

file: Lester, WA. - General

O01-1 Noted that the branchline from Cle Elum to Auburn was never abandoned but remained inactive from 1983-1986.

Author: GrathwohlH@aol.com at Internet
Date: 6/16/98 1:16 AM
Priority: Normal
TO: Kristin M Loll at NPS-EN
Subject: HHD AWSP DFR/DEIS
------------------------------ Message Contents ------------------------------
US Army Corps of Engineers, Seattle District
P.O. Box 3755
Seattle, Washington 98124-3755

Attn: Kris Loll, Civil Projects & Planning Branch
e-mail: kristin.m.loll@usace.army.mil

Subject: Review of Howard Hanson Dam Additional Water Storage Project (HHD AWSP) Draft Feasibility Report/Draft Environmental Impact Statement (DFR/DEIS)

002-1 The Cascade Chapter of the Sierra Club has a membership of approximately 20,000 who abide in western and central Washington. The Waters and Salmon Committee of the chapter often works with other organizations which are concerned with environmental issues In this particular case we have examined the HHP AWSP DFR/DEIS, and have consulted with the Washington Recreational River Runners regarding the same. We find that we are in complete concord with the WRRR concerning the DFR/DEIS. Rather than writing our own letter, reiterating the same concerns, we herewith express our support of the WRRR letter and the weaknesses of the DFR/DEIS it points out.

002-2 The Sierra Club is very concerned about the survival of the wild salmonids, and the threat of ESA listing which could have a sever effect on the economics and life style of Washington state. The DFR/DEIS does not exhibit adequate awareness of the problems posed by ESA listing. We believe the Corps has a

002-3 conflict of interest in making the proposal and then evaluating it. Several alternative in the scoping document were not given sufficient attention in the DFR/DEIS.

002-4 Water conservation would seem to be the obvious first consideration and lowest cost alternative.

002-5 Trucking fish is a failed policy, and while fish ladders are not good, they are better than trucks if you canÆt get rid of the dams. The river should be run as much as possible like a river, with instream flows maintained at levels necessary for salmonid protection.

002-6 We are opposed to hatchery solutions to depleted salmonid runs. Improved

O02-1 See responses to WRRR letter designated O06 in this document.

O02-2 The Corps and Tacoma Public Utilities share your concern over the survival of wild salmon and steelhead in the Green River Basin. Our extensive investment in fish passage and habitat restoration activities is a reflection of this concern.

As a Federal Agency, the Corps of Engineers is required under the Endangered Species Act to consult or conference with the U.S. Fish and Wildlife (FWS) and/or National Marine Fisheries Service (NMFS) if the effects of a Corps project may impact a proposed or listed species. The form of this communication is a Biological Assessment (BA), a document that describes the proposed action and the Corps' determination as to potential effects on proposed or listed species known to occur within the project area. Upon receipt of the BA, FWS and/or NMFS agrees or disagrees with the Corps' determination in the form of a Biological Opinion. As noted in Section 2 and Section 5 of the DFR/DEIS we had already prepared a BA for Bald Eagle, Bull Trout, and other species under the jurisdiction of FWS, that was reviewed and accepted by the FWS: the BA and BO can be found in Appendix I. The proposal for listing of the Puget Sound Chinook Salmon occurred concurrently to our writing the DFR/DEIS. While there is no absolute requirement to prepare a BA if no listed species appears on the list provided by NMFS, the Corps submitted a BA to NMFS in late May for their review and concurrence. However, their concurrence is not required, and they have indicated their BO will not be completed prior to printing of the FEIS. In addition to the BA's prepared by the Corps, our project sponsor, Tacoma Public Utilities, is completing a Habitat Conservation Plan (with FWS and NMFS) for proposed and listed species (and species of concern) that may be affected by operation of Tacoma's waterworks or in their managed forest lands. Lastly, the FWS and NMFS have been active study participants with the Corps and Tacoma for 7 years and they will continue to be actively involved with the project through design, construction and implementation.

O02-3 The Corps of Engineers can only become involved with a project when approached by a local sponsor for a specific purpose - in this instance Municipal and Industrial water supply and Ecosystem Restoration. Our function is to look at a potential problem, propose possible alternative solutions, and determine which of those solutions are feasible and whether the Federal government has an interest in the project. We believe we have done this to the degree required in a feasibility study. We do not see that we have a conflict of interest in this project.

O02-4 See comment-reply O05-2.

O02-5 Trucking of Fish
Upstream fish passage is the responsibility of the Tacoma Public Utilities, our local sponsor. As described on page 59 of the DFR/DEIS trucking of adult salmon and steelhead is a common method of providing fish passage. The Seattle District Corps has built and operated trap and haul facilities at two Western Washington dams, Wynoochee and Mud Mountain. Mud Mountain dam has provided upstream fish passage for almost 40 years. At no time have either of these facilities been considered "failures" by the Corps or by state of federal fish management agencies. Trapping and trucking fish around large dams is not the preferred means of providing fish passage but is often the only feasible or cost-effective way of moving fish upstream.

River as Natural to Protect Salmon
As described throughout the DFR/DEIS, the AWS Project will be managed to mimic the natural flow conditions in the Green River Basin. To do this, the Corps and Tacoma Public Utilities will be developing a reservoir refill and release schedule that will mimic the natural highs (freshets) and lows (baseflows) in river flows during late winter and spring. This refill and release schedule will be adaptive, being tied to the needs of the fish resources found above and below HHD. We will be identifying the specific fish needs within the Green River Basin through a long-term monitoring and evaluation program.

O02-6 Comment noted.

Letter O02

Comments

002-6 Cont. habitat and access thereto provide superior and lower cost long run solutions to salmonid survival.

002-7 Additional storage at HHD will create more problems for migrating fish by increasing water temperature, slowing steam flow, increasing threats from predators, damaging or destroying wetlands, and causing all the other negative impacts of dams.

002-8 Please re-evaluate the DFR/DEIS in the light of the analysis provided by the WRRR letter.

Sincerely yours,

Harrison Grathwohl, Ph.D.
Waters and Salmon Committee
Cascade Chapter
Sierra Club
5507 258th Ave. N/E.
Redmond, WA 98053

Replies

O02-7 It is unclear from the comment what part of the watershed is referred to. During Phase I in the Lower Watershed, below HHD, conditions will be improved or unchanged including – 1) water temperatures would be reduced from use of the selective withdrawal facility, 2) baseflows are higher and average stream flows would be unchanged from the Baseline condition (Second Supply Project already on-line), 3) predator threats would be unchanged, and 4) mainstem spawning habitat and wetlands would be restored. As part of Phase I, to provide additional water for flow augmentation (yearly storage of 5,000 ac ft, Section 1135) and for water supply the existing reservoir will have to be enlarged. Since the reservoir would be larger water flowing through it would be slowed and wetlands within the new inundation zone would be degraded.

We have developed a variety of flow management techniques (maximum refill rates, freshets) and stream habitat improvements to provide additional protection for juvenile salmon and steelhead that migrate through the reservoir. A range of wetland and stream improvement projects will be built to compensate for the full areal extent of the degraded wetlands. We have not come to a consensus with other resource agencies and the MIT on whether more juvenile salmon migrating through the reservoir will be eaten by predators. As a preventative measure, we will be studying the abundance of predators above and below HHD prior to project construction, and at regular intervals following construction. As required, resource agency or MIT biologists may elect to selectively remove predators to maximize the survival of juvenile salmon and steelhead migrating through the project area.

The changes to habitat (from the enlarged reservoir) during Phase II (additional water stored) will be contingent upon evaluation of Phase I benefits and consensus of all resource agencies and MIT.

O02-8 Responses to the WRRR letter (O06) appear later in this document.

Author: patsump@juno.com at Internet
Date: 6/16/98 7:01 AM
Priority: Normal
TO: Kristin M Loll at NPS-EN
Subject: Review of Howard Hanson Additional Water Storage Project
------------------------------ Message Contents ------------------------------
June 15, 1998

US Army Corps of Engineers, Seattle District
P.O. Box 3755
Seattle, WA 98124-3755

ATTN: Kris Loll, Civil Projects & Planning Branch

RE: Review of Howard Hanson Dam Additional Water Storage Project (HHD AWSP) Draft Feasibility Report/ Draft Environmental Impact Statement (DFR/DEIS)June 15, 1998

Dear Ms. Loll:

Frieds of the Green River appreciates this opportunity for commenting on the DFR/DEIS FOR THE HHD AWSP. Friends of the Green River is a non-profit organization founded in 1988 and dedicated to protecting the Green River and its watershed from environmental and recreational degradation.

003-1 Friends of the Green River continues to have concerns about this project. We are concerned about the role of the Corps of Engineers as both a proponent of the project and the evaluator of the project. We are also concerned about the Corps' relationship with Tacoma.

003-2 The Corps and Tacoma have worked together for a long time. The Corps seems willing to go along too easily with what Tacoma suggests. The Corps seems to have completely given in to Tacoma's wishes regarding exclusion of a Water Conservation and Reuse Alternative. Given the Corps' role in water supply because of the authorized project purpose of HHD for Municipal & Industrial Water Supply, the Corps ought to be trying to learn as much as possible about State and regional water supply options. The Corps should be collecting data regarding water supply from multiple sources and should have required a full study of the potential for water conservation and reuse instead of listening to Tacoma's protestations that they were inconsequential in providing sufficient water. The DFR/DEIS says "Water conservation and non-structural measures have been instituted, to include: required use of low-flush toilets and low-flow

O03-1 The Corps of Engineers can only become involved with a project when approached by a local sponsor for a specific purpose - in this instance Municipal and Industrial water supply and Ecosystem Restoration. Our function is to look at a potential problem, propose possible alternative solutions, and determine which of those solutions are feasible and whether the Federal government has an interest in the project. We function in partnership with our local sponsor.

O03-2 See comment-reply O05-2.

showerheads...; conservation pricing - seasonal water rate increases for residential and wholesale customers." The DFR/DEIS then concludes, referring to Conservation and other non-structural measures, "The above measures will not provide adequate water to supply Tacoma's demands beyond the next 30 years" (page 97). The implications are that there are only a very few things that could be done, that Tacoma is already doing them, that they don't provide much water, and that any benefits provided won't last very long.

O03-2 Cont. On the contrary, there are hundreds, perhaps thousands of things that can be done in the name of water conservation. Tacoma has made positive steps with the measures it has started, but has only begun to scratch the surface of the potential of water conservation. It is also erroneous to assume that conservation and reuse couldn't save much water. Seattle Public Utilities just completed their "Water Conservation Potential Assessment" and estimate that their cost-effective savings from a new package of water conservation measures, given today's technology, would equal 30 million gallons a day by 2020. Tacoma apparently claims that the water saved from a package of water conservation measures would only save between 1.3 and 1.8 mgd (page 74). If Seattle didn't believe it could yield substantial savings from conservation, it would not be pursuing conservation and reuse as equally viable with bringing on a new "structural" source of water. The lack of data in the DFR/DEIS to support the claims of Tacoma that savings from conservation would be *insubstantial makes the claims suspect. Either the data is erroneous or* Tacoma is looking at the wrong packet of conservation measures. It is also not correct to assume that the savings in water would not assist Tacoma in its role as water purveyor for long enough to be worthwhile. Clearly Seattle and others recognize the long term effectiveness of water conservation & reuse.

O03-3 The Corps seems to have given up some of its autonomy to Tacoma in that it is not giving Environmental (Ecosystem) Restoration the primary position as an objective for the DFR/DEIS. Since the federal government has indicated that environmental restoration should have a high priority in what the Corps does, it would seem that the Corps would place that objective above one of meeting water supply needs of Puget Sound residents.
Yet the DFR/DEIS contemplates restoration efforts discussed as if they were merely mitigation for the impacts caused by the real reason for the study: Water Supply. At the same time that the Corps is working on a number of restoration projects in the watershed, some apparently as mitigation for past errors of the Corps and others, the Corps yields to Tacoma by failing to see that the restoration efforts in the DFR/DEIS must be done just as the other non DFR/DEIS restoration projects that are

O03-3 This is a dual purpose project water supply and ecosystem restoration. Tacoma is the local sponsor for both purposes and the project must meet both objectives. The project began a single purpose water supply project at a time when the Corps authority did not include ecosystem restoration. In 1994 federal law changed and ecosystem restoration was added as a Corps authority. The Corps, however, cannot bring forth a project on its own and is required, by law, to have a non-federal sponsor to share the costs. Tacoma recognized that ecosystem restoration was a worthwhile goal and agreed to sponsor, and cost-share that part of the project along with the water supply. While Tacoma is willing to sponsor a single purpose water supply project and a dual purpose water supply/ecosystem restoration project there is no local sponsor who has expressed willingness to sponsor a single purpose ecosystem restoration project. Therefore, both objectives of this project need to be met.

003-3 Cont. being contemplated, regardless of whether or not any project to "meet water supply needs" is undertaken. Since the restoration must be done for the sake of the salmon regardless of anything else, those projects should not be used to make the water supply "need" more palatable. Taking water and storing it for water supply is making the system less natural. Restoration makes the system more natural. Restoration is the primary objective. The water supply objective should not be able to take away from the natural environment and then offer up certain restoration projects to make up for the damage.

003-4 The proponents of this project seem to have cast out the good alternatives without analysis, without logic, and with arbitrariness. As the long list of preliminary alternatives that came up during or before the scoping process was pared down, Alternatives 4a - Water Conservation and Reuse and 4b - Industrial Reuse were eliminated without analysis and without a clearly stated reason. Alternative 3e - Tide Flat wells, Alternative 3f - Lone Star Sand and Gravel wells, and Alternative 3g - South Tacoma Aquifer, which in combination at least could definitely provide a comparable amount of water, were eliminated without analysis and without a well defined reason.

003-5 The Preferred Alternative and Recommended Plan did not well fulfill the Proponents' stated objective of "environmental (ecosystem) restoration" since it created additional negative impacts for fish, wildlife, and native plants. The Preferred Alternative and Recommended Plan does not meet its own Planning Criteria.

003-6 The additional water storage in the Recommended Plan makes the flow regimes of the Green River less natural. Salmonids don't thrive in the less natural environment humans make. The evolved in a free flowing river. The Recommended Plan does not provide fish passage which is the most natural achievable. The dams should be removed; barring that, fish do not survive well when they are trucked from one dam to the other. They do not thrive when trying to migrate through an ever larger reservoir. The Recommended Plan does not provide for ecosystem restoration as it is required to under its own objective. The Plan does not include reforestation and restoration of wetlands throughout the watershed, which would create natural water storage and better instream flows in summer and fall. The Plan destroys habitat for wildlife such as the elk who forage in areas along the banks of the reservoir.

003-7 The Recommended Plan does not analyze impacts to recreational boating in the Green River gorge and below it. It claims that there could be improvements for recreational whitewater boating but produced no studies, no data to support that claim.

O03-4 The evaluation of all identified potential water supply alternatives was presented in the plan formulation and in section 3.1.3.1 of this report. Alternatives must be able to provide water during the same time of year as the proposed project and must be considered viable options to the proposed project. Several alternatives were carried forward for further evaluation and were used in the evaluation of water supply benefits. These alternatives are discussed in section 2.6.6 of appendix B.

O03-5 We disagree with your comment. As described in Comment-Reply O03 -3, the AWS Project is a dual purpose project. By definition all ecosystem restoration features go beyond what is required to mitigate for impacts from storing additional water. As described in the DFR/DEIS we address several key limiting factors that affect salmon and steelhead in the Green River basin. The factors we address include 1) reconnecting the Upper Watershed to the Lower Watershed with a downstream fish passage facility (in combination with the Tacoma Public Utilities adult truck and haul); 2) improvement of water quality (temperature) with use of the selective withdrawal system and flow augmentation; 3) improvement of instream flows by mimicking natural flow fluctuations in refill and release and with summer low flow with flow augmentation; 4) improvement of spawning habitat with gravel nourishment; 5) increased off-channel habitat with restoration of Signani Slough; and 6) addition of large woody debris with truck and haul of wood collected in the reservoir.

The storage of water for flow augmentation (an environmental or ecosystem restoration features) and water supply does create negative impacts to areas below and above the dam. We avoid or minimize the downstream impacts with the phased-implementation of the project: Phase II impacts will be reduced or conditioned by resource agency consultation. If we store additional water for either ecosystem restoration or water supply we cannot avoid impacts from inundating terrestrial and wetland habitats: the areal loss of habitat around the reservoir will be fully mitigated.

O03-6 Flow regimes are less natural.
We agree that the natural productive capacity of the Green River Basin has been greatly reduced by anthropomorphic changes throughout the Basin. Construction and operation of HHD for fall and winter flood protection has permanently modified the natural flow regime of the river. As described in the DFR/DEIS, future reservoir operations and flow releases during spring and summer will mimic the natural flow regimes of the river. An extensive monitoring and evaluation program has been programmed to provide specific information on the habitat needs of salmon and steelhead during spring refill so we may more closely mimic the habitat needs for these fish.

O03-6 Cont. Plan does not provide fish passage which is most natural and remove dams.

Upstream fish passage by trucking adult salmon and steelhead is discussed above in Comment-Reply O02 - 5. Removal of the Tacoma Diversion Dam and Howard Hanson Dam is impractical and infeasible without 1) losing a current and future regional water supply source; and 2) placing much of the urban Green River valley at risk from flooding (including billions of dollars in property value).

Few studies have been conducted on the migration of juvenile salmon and steelhead through small reservoir impoundments (such as HH Reservoir). Of the studies that have been performed, results have indicated that the size of HH Reservoir should not significantly impact the survival of juvenile salmon and steelhead migrating through it. As part of an adaptive management program, we will monitor and evaluate reservoir survival. We expect that we will identify a variety of tools (flow management, habitat improvements, fish management) that can be used to help young salmon survive and possibly thrive during their residence and migration through the reservoir .

Plan does not provide ecosystem restoration as it is required.

See Comment-Reply O03-5. Also, the plan does not include restoration of forests and wetlands throughout the watershed because the plan is specific to Howard Hanson Dam Additional Water Storage Project. Mitigation planning for the AWS Project was designed to occur on site to the greatest extent possible. Restoration efforts were intentionally restricted to areas near Howard Hanson Dam, to restore habitats that may have been initially affected by construction of the dam. Planning criteria in Section 3 of the DFR/DEIS includes a limited ecosystem restoration area. Restoration under the Additional Water Supply Project was also developed in part because of the parallel Green/Duwamish Basin Restoration Study. That study was not limited in project area and will be considering wetland restoration projects throughout the watershed. We recognize that important elk habitat is lost as a result of implementation of the Recommended Plan. An extensive mitigation plan has been developed that is intended to offset the losses of elk habitat.

O03-7 Although recreation is not an authorized project purpose and we have not been approached by any agency expressing interest in becoming a local sponsor in pursuing that authority through Congress, the Corps will take into account the needs and desires of recreational boaters, to the extent possible, in its regulation of water through Howard Hanson Dam. See Comment-Reply O03-6.

003-8 The proponents must make Conservation and Reuse, probably in conjunction with Alternatives 3e, 3f, and 3g, part of the preferred Alternative. The Preferred Alternative must give anadromous fish a fish ladder for real passage. The Preferred Alternative must do real ecological restoration throughout the basin.

Sincerely,

Patricia Sumption, president
Friends of the Green River
10510-11th Ave. NE
Seattle WA 98125

O03-8 <u>The proponents must make Conservation and Reuse, probably in conjunction with Alternatives 3e, 3f, and 3g, part of the Preferred Alternative.</u>
The economic evaluation of water supply (See Appendix B) compares the <u>separable</u> cost of the proposed water supply project (i.e. those costs identified as only associated with water supply) to the cost of implementing water supply alternatives 3e, 3f, and 4a&b (conservation and reuse). Alternative 3g was included as part of the without project supply of M&I water (See paragraph 3.2.2.2 of main report and paragraph 2.6.4 of Appendix B) and therefore, is assumed to be implemented and part of the without supply of water. Since the separable water supply costs of the proposed project are lower than the costs of implementing the water supply alternatives above, the preferred alternative is the proposed project.

<u>The Preferred Alternative must give anadromous fish a fish ladder for real passage.</u>
Upstream fish passage at both dams (Tacoma Diversion Dam and Howard Hanson Dam) is the responsibility of the Tacoma Public Utilities, our local sponsor. And see Comment Reply O02 -5.

<u>The Preferred Alternative must do real ecological restoration throughout the basin.</u>
See Comment Reply O03 - 5. Addition habitat restoration within the Upper and Lower Watershed is also being studied by the Corps and King County under the Green-Duwamish Ecosystem Restoration General Investigation Feasibility Study.

Letter O04 Comments Replies

(B -A ~Washington Kayak Club
c/o Dara Mueller
39612 - 226th Avenue SE
Enumclaw, Washington, 98022-8924
Tel: (360) 802-6275, E-mail: dmueller@ibm.net

June 15, 1998

US Army Corps of Engineers, Seattle District
P.O. Box 3755
Seattle, Washington 98124-3755
Attn: Kris Loll, Civil Projects & Planning Branch
e-mail: kristin.m.loll@usace.army.mil
Subject: Review of Howard Hanson Dam Additional Water Storage Project
(HHD AWSP) Draft Feasibility Report/Draft Environmental Impact Statement (DFR/DEIS)

Dear Project Proponents:
The Washington Kayak Club (WKC) is pleased to offer for filing with the Seattle District Corps of Engineers, our written comments for the Draft Feasibility Report/Draft Environmental Impact Statement (DFR/DEIS) for the above named project

004-1 WKC was founded in 1948. WKC has a membership of over 1,200, with more than half of its members being whitewater boaters. One of WKC's mission is "to encourage, aid, and give direction to conservation of water resources and adjacent lands for recreational purposes." Many of our members boat various stretches of the Green River. The Green River is a classic and premier Washington whitewater run!! WKC members boat the Green River extensively, from primarily Kanaskat-Palmer to Flaming Geyser State Parks (the Green River Gorge). Stretches directly above and below this run, include the "Headworks" and "YoYo", respectively and are excellent beginner runs, both used for teaching purposes. We need a minimum of approximately 1,200 CFS or more to run from Kanaskat-Palmer to the Franklin Bridge (the Upper Gorge) and 800 CFS or more to run from the Franklin Bridge to Fleming Geyser (the Lower Gorge). The unique steep canyon walls, luxuriant with mosses and vegetation, seeping with water, containing excellent pool-drop rapids and remote nature, have made "the Green River Gorge" a favorite whitewater run for decades.
WKC has reviewed the HHD AWSP DFR/DEIS comments of the Washington Recreational River Runners (WRRR) and hereby adopts them as our own.

004-2 While we understand your pending funding deadline; we are deeply concerned that the publics' comments will not be adequately addressed in only one

O04-1 See responses to WRRR letter designated O06 in this document.

O04-2 The DFR/DEIS had an official 45 day review period from May 1 through June 15, 1998, the minimum allowed by the Council on Environmental Quality rules (40CFR 1506.104). Typically, during processing of draft EIS, the Corps receives requests for review extensions and these are routinely granted in most instances. In the case of HHD AWS, however, the District decided to adhere to the rigid schedule for completion and reporting of this seven year plus study. Real benefits associated with meeting the schedule include potential consideration in the current session of Congress and dollar savings in the next fiscal year. Accordingly, all possible time savings were incorporated into our schedule; among them enforcing the 45 day minimum DEIS review period. To mitigate this fairly severe policy, every effort was made to assure timely and direct distribution of the DFR/DEIS. A further consideration was that public awareness and agency and tribal involvement has been internal throughout the conduct of this admittedly complex study; from initial scoping through participation in technical studies and committees to attendance at public meetings and workshops. Most DFR/DEIS recipients were able to respond within the 45 day period. Those comments received late, while not directly responded to in this Appendix, were considered in final formulation and decision-making. There will be further opportunity to comment during the 30 day review of the FFR/FEIS and public involvement will continue into the PED phase.

004-2 Cont. month's time. The public will be short changed and the review process will become nothing but rhetoric.

004-3 There needs to be a regional water supply Environmental Impact Statement produced to determine whether or not the AWSP is the best option to accommodate the Cities that Tacoma would sell water to resulting from the proposed AWSP.

Please provide us with any additional information relevant to this project, throughout the remainder of the schedule for this study.
Sincerely,

Dara Mueller
WKC Conservation Chair/Board of Directors

O04-3 Concur that an integrated planning approach to water supply needs would be ideal. Any comprehensive strategy for effectively dealing with the challenge of providing long term regional or sub-regional water supply would need to consider and include the use of a variety of measures - including conservation/public education, re-use, zoning, new resources and others. These options are, however, not mutually exclusive - to some degree all may be requisite - nor of equal value (but maximizing the efficacy of existing developed water projects would reasonably be among the most important and first implemented). At present the institutional structure does not exist to evaluate, authorize, fund and effect these in a totally organized and integrated manner. The Corps of Engineers has examined alternatives available under this study's authority and has chosen a preferable choice within that constraint. The proposed action is within the Corps' purview; is cost-effective; is "doable"; contributes to resolution of long term water resource problems; enhances the productivity of an existing project; includes an environmental restoration feature and does not preclude or foreclose actions of others to further address the problem.

Author: celp@gonzo.wolfenet.com at Internet
Date: 6/16/98 1:23 AM
Priority: Normal
TO: Kristin M Loll at NPS-EN
Subject: Howard Hanson Dam DEIS
------------------------------ Message Contents ------------------------------
15 June 1998

U.S. Army Corps of Engineers
Seattle District
P.O. Box 3755
Seattle, WA 98124-3755

Attn: Kris Loll, Civil Projects & Planning Branch

Dear Ms. Loll:

Please accept these comments on the Draft Feasibility Report and Draft Environmental Impact Statement issued by your agency for the Howard Hanson Dam Additional Water Storage Project proposal.

005-1 We have attached and incorporate by reference comments we filed with the City of Seattle regarding its Environmental Impact Statement scoping process for the Seattle-Tacoma Pipeline Five Intertie. (These comments have been attached as Word file. Please let me know if there is a problem with transmission.)

As we note in that letter, the Intertie project is inextricably related to the Howard Hanson Dam project. Nonetheless, no single environmental document has evaluated the overall impacts of these projects on regional water resources.

The failure of lead agencies to connect and evaluate on paper the various projects associated with Pipeline Five have impermissibly fragmented the environmental analyses associated with that proposal.

Moreover, the alternatives analysis in the HHD environmental impact statement should consider the fact that, according to its own demand forecasts, Tacoma Public Utilities will not utilize Pipeline Five water in the near to mid-term future. Instead, the purpose of the Pipeline Five project is now to provide water to King County municipalities via the Seattle-Tacoma Intertie.

Given that fact, the EIS should consider the multiple proposals and projects now extant to provide future water supply to the King County

O05-1 Concur that HHD AWS proposed project is related to the Intertie and other proposals and alternatives for regional and sub-regional water supply. As noted in our document the "without project" condition contains the second supply pipeline, therefore, it is considered not dependent on the HHD AWS project. The HHD AWS project is dependent on the second supply pipeline(pipeline 5) for the development of water supply feasibility. Accordingly, environmental documentation supporting each project was written with this relationship as a basis. Any comprehensive strategy for effectively dealing with the challenge of providing long term regional water supply would need to consider and include the use of a variety of measures - including conservation/public education re-use, zoning, new resources, interties and others. These options are, however, not mutually exclusive - to some degree all may be requisite - nor of equal value (but maximizing the efficacy of existing developed water projects would reasonably be among the most important and first implemented). At present the institutional structure does not exist to evaluate, authorize, fund and effect these in a totally organized and integrated manner. The Corps of Engineers has examined alternatives available under this study's authority and has chosen a preferable choice within that constraint. The proposed action is within the Corps' purview; is cost-effective; is "doable"; contributes to resolution of long term water resource problems; enhances the productivity of an existing project; includes an environmental restoration feature and does not preclude or foreclose actions of others to further address the problem.

Comments

005-1 Cont. region as substitute or potentially in conjunction with the Pipeline Five project. For example, the Snoqualmie Aquifer project (East King County Regional Water Association), the former Weyerhaeuser water right from the mouth of the Snohomish River (Snohomish River Regional Water Authority), the Oasis Project (Lakehaven Utility District), and numerous applications for municipal wells in the Green, Cedar and Snoqualmie basins all represent supply alternatives that may impact the demand for Pipeline Five water.

If the objective of the HHD project is to meet water supply needs of Puget Sound residents, it is axiomatic that the EIS must analyze other reasonable alternatives to expansion of the Howard Hanson dam. That the DEIS does not do.

005-2 Further, given (1) the March 1998 proposal by the National Marine Fisheries Service to list Puget Sound chinook as threatened, (2) the critical link between salmonid species health and instream flows in rivers, and (3) the recognition of the physical relationship between ground and surface waters, it is abundantly apparent that water conservation is going to become an increasingly crucial component of future water supply strategies.

For example, the Washington Governor's Office in March released its draft Lower Columbia Steelhead Conservation Initiative, intended to function as a form of recovery plan for the steelhead species listed as threatened in southwestern Washington. In discussing the fact that salmon need adequate water flows, and that this need conflicts with human demand on water resources, the LCSCI stresses water conservation as a habitat strategy. It proposes development of performance oriented goals and standards, noting that these goals and standards should be increased in areas where ESA listings have occurred or likely will occur and lack of or inadequate instream flows are identified as a limiting factor.

There is every reason to believe that a similar goals will be established in the Puget Sound region and the Green River basin. Notwithstanding this probability, the DEIS has elected not to analyze water conservation as a credible alternative to expansion of the Howard Hanson dam.

005-3 As illustrated by the Conservation Potential Assessment, a rigorous economic analysis conducted by Seattle Public Utilities, tens of millions of gallons per day of water may be saved utilizing economically feasible conservation strategies at a cost less than that which will be required to construct the HHD expansion project.

005-4 We propose that it is time for the Corps of Engineers to get its econometric house in order and accord the conservation alternative the attention it deserves. Failure to fully consider such an alternative is a

Replies

O05-2 Water conservation (Demand management and industrial reuse) is considered a crucial component of water strategies and is discussed in the Additional Water Supply Storage Project and DEIS in section 3; Appendix H, Plan Formulation in sections 2.3.4, 3.2.3 and in Appendix B, sections 2.6.1 and 2.6.6. Tacoma has already implemented several conservation measures to include a major plumbing retrofit project to include low flow toilets and showerheads in all new and remodeled residential construction projects (See Section 2.6e) In addition they have implemented conservation pricing of water where the summer water rates are higher for residential and wholesale customers (See Section 2.6e). This component is reflected in their demand forecast for water. In fact, as part of the benefit evaluation of this project, the most cost effective remaining conservation measures were used as a part of the alternatives analysis to Howard Hanson Dam and thereby were included in the computation of water supply benefit. A list of the conservation measures considered is shown in Appendix H, Section 3.2.3 as well as Appendix B, Section 2.6.6b. Also, see table B2-10 and section 2.6.7 of Appendix B.

O05-3 See response to comment 005, #2 above.

O05-4 See response to comment 005, #2 above.

005-4 Cont. serious defect of the DEIS.

Thank you for the opportunity to comment on this proposal. Please feel free to call if you have any questions.

Yours very truly,

Rachael Paschal

CENTER FOR ENVIRONMENTAL LAW & POLICY
1165 Eastlake Ave. East, Suite 400
Seattle, WA 98109
206-223-8454
celp@wolfenet.com

February 24, 1998

Ray Hoffman
Seattle Public Utilities
Dexter Horton Building, 10th Floor
710 Second Avenue
Seattle, WA 98104

RE: Scope of Programmatic Environmental Impact Statement for the Seattle-Tacoma Intertie

Dear Ray,

Thank you for soliciting the Center's comments on the scope of the Programmatic EIS regarding the Seattle-Tacoma Intertie. Following are our concerns regarding the impacts of the proposal that we feel need to be addressed in the EIS. Our concerns include impacts to existing rights in the Cedar and Green River watersheds, as well as instream flows and related habitat, and the need for aggressive conservation and use of reclaimed water to mitigate impacts. We look forward to remaining informed of the progress of the programmatic evaluation as well as the separate project-specific evaluations related to construction of the pipeline.

Impacts to existing water rights, fisheries and instream flows in the Cedar River Basin

005-5 Interties are defined as exchanges of water between systems. The EIS should evaluate whether and to what extent the Seattle-Tacoma Intertie will provide exchanges of water from the Cedar River as well as from the Green River systems. If water will be transferred from the Cedar River System to Tacoma or other users via the proposed intertie, the EIS must evaluate potential impacts of that transfer on existing rights and uses in the Cedar River Basin. The EIS should discuss how the project will provide adequate

O05-5 Comment pertains to the Seattle-Tacoma Intertie Project - not the HHD AWS project.

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005-5 Cont. protection of the remnant natural flow regime in the Cedar River/Lake Washington system.

Impacts to Green River instream flows and instream values

005-6 The Seattle-Tacoma Intertie is inextricably related to the Howard Hanson Dam Additional Water Storage Project. These projects are mutually interdependent and deserve thorough cumulative impact analysis under NEPA-SEPA. To date there has never been a full program review of Pipe 5, the Howard Hanson project and the Seattle-Tacoma Intertie. Part or all of the water supplied to SPU from the Tacoma system will come from the proposed Howard Hanson project. As a result, the impacts of this project on the Green River and anadromous species should be addressed in the Seattle-Tacoma Intertie programmatic EIS. Because Puget Sound Chinook may be listed under the Endangered Species Act, the EIS should specifically address the ESA implications of the project.

Alternatives to Meet Regional Water Supply and Demand

005-7 The Seattle-Tacoma Intertie will facilitate increased use of water resources throughout the Puget Sound region. The project should therefore fully evaluate regional water use from existing sources. This evaluation should comprehensively report past and present rates of use, as well as reliable estimates of future demand for water by all entities and persons that perceive benefit from the Seattle-Tacoma Intertie. Recorded and projected peak-day and average water use statistics should be included for SPU direct customers and SPU purveyors and potential purveyors with their present rates and rate structures.

In assessing regional water demand, the programmatic EIS must discuss how that demand could be met or reduced through development of alternative sources of supply, conservation, system efficiencies, reduction of waste, and use of reclaimed water.

Included in evaluation of regional water demand and supplies, the EIS must address the current level of impairment to instream flows and habitat needs throughout the Cedar River water supply system. The EIS should evaluate each alternative's impacts to regional water supplies, aquatic and water-dependent habitat, existing water rights, and public interests.

We would expect that evaluation of regional supply and demand needs be more comprehensive than the reports we have seen developed to date. For example, conservation should be meaningfully discussed as both an

O05-6 Comment pertains to the Seattle-Tacoma Intertie Project - not the HHD AWS project.

O05-7 Comment pertains to the Seattle-Tacoma Intertie Project - not the HHD AWS project.

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005-7 Cont. alternative and as means to mitigate environmental impacts of the Seattle-Tacoma Pipeline 5 project. This discussion should include the use of regional water rate reform (mandatory metering end rates based on use which increase in summer and penalize excessive use). The EIS should evaluate how rate structures will achieve strong price incentives for reducing residential, commercial, and industrial water use.

The EIS must recognize and discuss the cost-effectiveness of demand reduction alternatives, both in terms of avoided costs of new supply development and costs of environmental despoilation.

Compliance with Existing Law

The Seattle-Tacoma Intertie must comply with existing laws governing transfer and interties.

005-8 The EIS should evaluate Seattle Public Utilities' authority to exchange water from Seattle's system outside the place of use designated in its water right. If water from the Cedar River system would be exchanged via the proposed intertie, what applications for change of water rights need to be filed with the Department of Ecology? Does existing law authorize indefinite length of time for development of a water right claim held by a city? Would the Department of Ecology approve the change of place of use for Seattle's water rights? Will any exchange of water via the intertie impair existing rights, including instream flows and public interests? These questions should be addressed in the EIS.

Thank you for the opportunity to provide these comments. We hope our comments will encourage preparation of a programmatic EIS which comprehensively addresses many complex issues.

Sincerely,

Michele Osborne

O05-8 Comment pertains to the Seattle-Tacoma Intertie Project - not the HHD AWS project.

Letter O06

Comments

US Army Corps of Engineers, Seattle District
P.O. Box 3755
Seattle, Washington 98124-3755

Attn: Kris Loll, Civil Projects & Planning Branch

Subject: Review of Howard Hanson Dam Additional Water Storage Project (HHD AWSP) Draft Feasibility Report/Draft Environmental Impact Statement (DFR/DEIS)

Dear Project Proponents:

Washington Recreational River Runners (WRRR) is a whitewater boaters' club which provides member services which include conservation, protection, and restoration of the rivers of Washington State and beyond. Because they enjoy living in the beautiful Pacific Northwest and recreating in the natural environment, WRRR members seek to protect and restore rivers for environmental and aesthetic reasons as well as to protect them as recreational resources. WRRR works with other boating clubs, recreation organizations, and environmental organizations in their efforts to protect rivers. The members of WRRR are out on the State's rivers whenever possible. A favorite run is the Green River Gorge because of the beauty of the Gorge, the challenge of the whitewater, and, for those who live in the Puget Sound area, the proximity to their homes.

006-1 WRRR members and other boaters are concerned about the instream flows on the Green River and about the effect on flows of the operations of Howard Hanson dam by the Corps of Engineers. WRRR is concerned about the impacts on whitewater boating and on depleted runs of Green River salmonids from the Corps of Engineers' Howard Hanson dam and the Tacoma diversion dam and their operations. Current operations already have negative impacts on salmonids and on recreational boating. The proposed project does not begin to cure these impacts, but adds more and should not go forward as proposed.

See 3 Below The Corps, at Tacoma's request, has been working on this Study (DFR/DEIS) since 1989, with an objective of "meeting water supply needs of Puget Sound residents." While the Corps indicates on page 1 of the DFR/DEIS that it added the objective of "environmental (ecosystem) restoration" in 1994 as a result of changes in federal policy which gave such restoration a high priority, the Corps seems not to have been able to give this second objective the importance it deserves. Restoration was tacked on and used to justify "meeting water supply needs," which remained as the true objective. The Corps has failed to recognize when these two objectives are at odds with each other and has chosen to work toward the water supply objective when such conflicts have arisen.

006-2 Washington Recreational River Runners finds that the Corps has a conflict of interest in being a proponent of this project and also serving as the lead agency doing the evaluation of the proposal.

006-3 In 1998, given the depleted salmonid runs in the Puget Sound region, including the Green River, and the probability of listings of salmonids as threatened or endangered under the

Replies

O06-1 We share your concerns regarding the health of salmon in the Green River and the ability of recreational boaters to have an enjoyable whitewater experience. We believe operational changes during Phase I to benefit salmon and steelhead habitat will also improve flow conditions for whitewater boating.

O06-2 See response to comment O03-3 above.

O06-3 See Comment-Reply O03 -3 and O03-5. All restoration work occurs during Phase I of the project with protection of instream habitat as the primary objective of the spring refill and summer conservation season.

Comments

006-3 Cont. Endangered Species Act, the primary objective of the DFR/DEIS and the proposed project must be Restoration. The water supply objective must not interfere with Restoration.

WATER SUPPLY ALTERNATIVES

The DFR/DEIS indicates that a number of alternatives were considered under preliminary scoping. Seventeen alternatives related to Municipal/Industrial water supply were looked at during the scoping process and mentioned briefly in the DFR/DEIS. For the DFR/DEIS, only three structural M & I water supply alternatives were formulated because Tacoma "considered these (others) non-viable at the time of the reconnaissance report." At Tacoma's request, then, in addition to what Tacoma wanted to be the preferred alternative, Additional Storage at Howard Hanson dam, the only two alternatives studied in depth were building a large dam on Smay Creek in the Green River basin or constructing a new dam on the Skagit River with a water supply pipeline more than 85 miles long from the Skagit River to the Green River basin and then to Tacoma. Apparently, Tacoma chose the two most expensive alternatives from the 17 so that the HHD AWSP would be the least-cost of the three chosen alternatives.

006-4 One of the Alternatives studied should have been the Alternative 4 of the Scoping process, Conservation/Demand Management and Industrial Reuse. From the scant information given on that Alternative on page 54, Tacoma is not thinking beyond basic items such as installation of flow restrictors in showers and sinks, etc. The Corps and Tacoma should have worked with Seattle Public Utilities studying conservation and reuse. Seattle has been studying conservation since 1996 and recently released its "Water Conservation Potential Assessment, Final Project Report, May 1998," a copy of which is attached. Seattle, recognizing the environmental impacts of major structural projects, looked to conservation and reuse as crucial to their future plans.

The Preferred Alternative for the DFR/DEIS must be Alternative 4 of the Scoping process, Conservation/Demand Management and Industrial Reuse. The Corps must not allow Tacoma to create further negative impacts on the Green River without having done all conservation and reuse measures that would be comparable in cost to the Recommended Plan chosen by the Corps and Tacoma. Since additional conservation and reuse measures could be added to the list of items which are cost-effective as technology advances over the years, these measures have great potential over time. Tacoma wants more water during summer/fall when the instream flows are lower than at other times of year. Water use is considerably higher during this season and since much of this additional water use is for watering lawns, Tacoma could start with a campaign to have its customers cut back on such use and plant drought-tolerant plants in place of lawns.

To get to Tacoma's goal for a specific amount of additional water, an appropriate Preferred Alternative might be to do the maximum possible of Conservation and Reuse (Alternative 4) and add to that from the list of Preliminary Alternatives, Alternative 3e - Tide Flat wells, Alternative 3f - Lone Star Sand and Gravel wells, and Alternative 3g -

Replies

O06-4 *It should be noted that water supply benefits are based on the costs avoided by* constructing HHD. The above referenced alternatives were evaluated and in fact are part of the alternatives that were used to compute avoided cost water supply benefits. See Appendix B, Sections 2.6.6 and 2.6.7. The economic analysis presented in Appendix B compares the water supply benefits to the separable costs (i.e. costs incurred directly as a result of adding that project purpose) of water supply to determine economic feasibility. The benefit-cost ratio of water supply is 1.1 to 1. Based on this analysis, it is more cost effective to construct a water supply project at HHD than implement the alternatives referenced in your comment. See Comment-Reply O05-2.

Comments

South Tacoma Aquifer. Such a combination would have far fewer negative environmental impacts and yet costs would be kept low.

006-4 Cont The Corps and Tacoma have got their priorities backwards. On page 74, the DFR/DEIS states about Alternatives 3e, 3f, 3g, and 4, that "with HHD, these measures would not need to be implemented" ... and ... "the cost of these measures would be avoided." The Corps, as an agent which is supposed to effect the federal priority of "environmental (ecosystem) restoration" should be deferring the HHD AWSP so that its costs can be avoided, choosing instead to implement Alternatives 3e, 3f, 3g, and 4 with their much less negative environmental impacts.

Since the DFR/DEIS failed to properly evaluate these Alternatives which were listed under preliminary scoping, and also failed to choose Alternative 4 or a combination of Alternative 4 with Alternatives 3e, 3f, and 3g, the DFR/DEIS is fatally flawed because it permits continuing degradation of the river system to the detriment of natural flows of a free flowing river and to the salmonids of the Green River. None of these Alternatives conflict with the Criteria Common to Water Supply and Restoration Measures, Water Supply Criteria, or Restoration Criteria (pages 46 and 47).

INSTREAM FLOW ALTERNATIVES

006-5 The Recommended Plan in the DFR/DEIS includes additional water storage of 22,400 acre-feet for M & I water supply added to the 26,000 acre-feet already stored for that purpose. In addition, currently an additional 5,000 acre-feet of water for low flow augmentation is authorized. The Recommended Plan adds 9,600 acre-feet of water for low flow augmentation. Altogether, there is a huge impact on the Green River from current storage, let alone the effects of the Proposed Project. The Corps and Tacoma purport to help salmonids (and resident fish) by providing additional water during summer/fall low flow season. In order to do this, they would keep the river from running as high as it normally would in the Spring. The incremental change includes not only the portion stored specifically for low flow augmentation, but also the 22,400 and the 26,000 stored for water supply. These changes, current and proposed, prevent the river from flowing naturally. The anadromous fish runs on the river evolved and thrived in the natural conditions that included high flows in the Spring. Those fish runs are severely depleted currently because of the many impacts to their environment by the manipulations of humans. Causing the river to deviate even further from its natural rhythms is not appropriate. Just because we have caused changes in the past does not mean we should continue to deviate even more. Continued manipulations can only result in further degradation of the fish and the river system. Any projects of the Corps should be toward restoring the ecological system to its original natural state, especially given the potential ESA listings of salmonids.

006-6 Washington Recreational River Runners is concerned in particular about geological aspects of the Recommended Plan's additional storage, including seepage through the North Fork channel and the dam's right abutment pervious material.

Replies

O06-5 Existing storage of 25,400 ac ft (26,000) in HH Reservoir is dedicated to instream flows (low flow augmentation) not M&I water supply as described in your letter. In addition, the project is phased, so that Phase I does not increase water withdrawal from the river over that already stored for instream flows or diverted for Tacoma's water supply needs. Phase II would increase water withdrawals (in reservoir storage) from the river, but, this additional withdrawal will be conditioned by agency and tribal acceptance on our ability to avoid or minimize impacts to aquatic resources.

As described throughout the DFR/DEIS, the AWS Project will be managed to mimic the natural flow conditions in the Green River Basin. To do this, the Corps and Tacoma Public Utilities will be developing a reservoir refill and release schedule that will mimic the natural highs (freshets) and lows (baseflows) in river flows during late winter and spring. This refill and release schedule will be adaptive, being tied to the needs of the fish resources found above and below HHD. We will be identifying the specific fish needs within the Green River Basin through a long-term monitoring and evaluation program. See also Comment Replies L02-10, L02-11, O02-5, O03-5, O03-6.

O06-6 In Section 4.5 of the DFR/DEIS and Section 3.5 of Appendix E we describe possible corrective actions to control seepage. Injection grouting is planned for the right abutment and we will be conducting a test pool raise to determine the amount of seepage prior to construction of the fish passage facility. This issue will be addressed more thoroughly in the PED.

Comments

WATER QUALITY ALTERNATIVES

006-7 Washington Recreational River Runners agrees with the intent of the Corps and Tacoma to improve water quality below HHD. We also advocate such improvements throughout the watershed on main stem and tributaries. Increasing the water storage behind HHD does not improve water quality in the reservoir. Additional storage will change the temperature, making it less like natural temperatures.

FISH PASSAGE ALTERNATIVES

006-8 The Preferred Alternative chosen for the proposed project must be one that provides the most natural anadromous fish passage. The DFR/DEIS Recommended Plan for fish passage is not acceptable, given the depleted salmonid runs. The Recommended Plan, if it does not call for removal of the two dams, should provide for a fish ladder from below the Tacoma diversion dam to a point above Howard Hanson dam. Trucking fish upstream is not biologically supportable. What works best for these fish is what is most like the historical, natural regime for the Green River system. Since Alternative 9F - Remove existing Dam, which would "provide near natural riverine conditions and total restoration of fish passage (both downstream and upstream)" (page 59), was eliminated because it "would violate existing project purposes for flood control and water conservation (meeting minimum instream flows)" (page 59), the fish ladder would be the next best solution.

FISH CULTURE ALTERNATIVES

006-9 Hatchery fish cause problems for wild fish. Existing hatcheries should be phased out. The only way hatcheries of any owner should be used would be as in Alternative 10C - Temporary Supplementation Programs. This type program must be scientifically monitored and terminated if it creates problems for wild fish. It should be ended as soon as possible. Such a program should naturalize the rearing of juvenile hatchery fish in methods such as those in Alternative 10B - Permanent Supplementation Programs.

HABITAT MITIGATION AND RESTORATION ALTERNATIVES

006-10 The objective for the Corps of Engineers must be "environmental (ecosystem) restoration"
for the Green-Duwamish Watershed. The Corps is committed to doing restoration in the watershed, some of which might seem to be outside the scope of this project. However, the above objective, derived from federal policy, could also seem to be outside the scope of this project. It is the position of WRRR that the geographic scope of the Study and the EIS should be the whole Green-Duwamish Watershed. Nothing less will do because the objective of "environmental (ecosystem) restoration" and he federal policy it reflects require looking at the whole watershed. The bottom line is that all agencies whose jurisdictions include/impact the Green- Duwamish Watershed must look at the big

Replies

O06-7 The AWS Project does, in fact, include features that improve water quality throughout the Lower Watershed -- a selective withdrawal structure and increased instream flows. These are considered important benefits to the river from the proposed project. The selective withdrawal structure allows for better management of the thermal budget within the reservoir. Currently at HHD, water exits the reservoir through an outlet at the bottom of the dam. This results in release water that is colder than the natural river would be in the early summer. By mid-summer, the cold water at the bottom of the reservoir is gone, and the release water is much warmer than the natural river would be. As described in the DFR/DEIS, release water temperature would mimic natural conditions all year round.

In addition to improved water temperatures, instream flows during critical salmon and steelhead spawning and rearing periods would be improved. This is a water quality benefit as well because the resulting faster flowing, deeper river would be cooler than the slower, shallower existing river.

O06-8 Upstream fish passage is the responsibility of the Tacoma Public Utilities, our local sponsor. See Comment-Replies O02- 5 and O06 -3. To bypass both dams and the reservoir would require construction of a fish ladder over 7 miles in length.

O06-9 Comment noted.

O06-10 Restoration goals of the Corps of Engineers for the Howard Hanson Dam Additional Storage Project are necessarily restricted to those areas originally affected by Howard Hanson Dam construction and operation. The Corps is also the major action agency in the parallel Green-Duwamish River Basin Restoration study, with sponsorship from King County. These two studies are separate, and authorized by separate Federal statutes, with funding targeting specific actions. Though there is some overlap between the two actions the Corps has tried to minimize the overlap. The geographic scope of the AWS Project DFR/DEIS, while focusing on the Howard Hanson Dam and reservoir area, as well as functional aspects of the Green River below the dam, addresses the Green River Watershed above the reservoir in the cumulative impact section, and in various other sections where reference is made to other landowners and agencies that are conducting studies or completing work in the watershed. The Corps is committed to restoring habitats in the watershed, but is limited in what it can do by Congressional authority, agency missions, and sponsor objectives. In addition, the Corps owns very little land in the watershed, and is unable to participate in a land exchange with other entities. Our land holdings are directly related to the dam and areas immediately

O06-10 Cont. surrounding the dam. Congress had not authorized purchase of lands by the Corps, except as required to complete construction projects. Thus, the Corps is unable to purchase lands for restoration. This is a major restriction when it comes to protecting wetland, riparian, and other floodplain resources. However, we can and do provide engineering, geotechnical, fish and wildlife biology, and other forms of expertise in the watershed restoration study.

The Corps is studying additional restoration work in the Green River watershed, as well as other areas, but we are limited by the authorities bestowed by Congress. Under the Green/Duwamish Basin study, the Corps is investigating projects that meet many of the restoration efforts identified by the WRRR including 1) protecting and restoring wetland habitats throughout the watershed; 2) creating and restoring estuarine habitat; 3) restoring parts of the natural Lower and Middle Green River floodplain; and 4) protecting and restoring riparian habitats. The HHD AWS study mitigation and restoration projects address several of the WRRR restoration objectives (in areas near HHD) including 1) wetland protection and restoration (above the new inundation zone); 2) restoring floodplain habitat; 3) protecting riparian habitats; and 4) improving water quality in the upper and lower watershed. The ability to restrict development is outside the authority of the Corps in either of the above studies. However, the Corps is the federal permitting agency in reviewing development activities that include dredge or fill of wetlands. The Clean Water Act does not restrict development, but merely reviews the impacts of development on water borne habitats, in particular wetlands.

006-10 Cont.

picture. The restoration projects for the whole watershed contemplated be all the government agencies, Muckleshoot Indian Tribe, and others will cost a lot of money, and the players seem dedicated to spend it, provided they can get that money from whatever sources. To benefit wild fish, wildlife, and native plants to the maximum, commitments need to be to the following:

-Protecting and restoring forests in the upper watershed and, to the extent possible in the middle and lower watershed to provide natural water storage and increase instream flows. The Corps and other players should be involved in negotiations re land exchanges in the upper watershed, advocating for retaining as much land as possible in the upper watershed in federal ownership, for reforesting that federal land, and for buying and trading lands within the watershed to increase federal control of old growth trees and roadless areas, and to provide better wildlife corridors.

-Protecting and restoring wetlands throughout the watershed to provide natural water storage and increase instream flows.

-Restoring estuarine habitat to the fullest extent possible.

-Restoring as much as possible of the river's historic, natural flood plains.

-Reducing the impacts of development in the watershed throughout the watershed

-Protection and restoration of riparian habitat for fish and wildlife.

-Improve water quality throughout the watershed through the above measures and through working with other players to eliminate sources of pollution throughout the watershed.

ENVIRONMENTAL/SOCIOECONOMIC CONSEQUENCES

006-11 Most of Washington Recreational River Runners' environmental objections to the HHD AWSP are noted above. In addition, WRRR objects to the negative impacts to the vegetation that will be inundated by enlarging the reservoir, and to the introduction of non-native water-tolerant species to the areas that would be under water part of the year. The wetlands along the banks of the reservoir would be destroyed taking away the positive functions of wetlands including wildlife habit for elk and other species. WRRR is concerned about the impacts to threatened and endangered species in the watershed. Studies of wildlife are inadequate. Studies of fish indicate major problems with additional storage.

IMPACTS TO WHITEWATER BOATING RECREATION

006-12 Washington Recreational River Runners believes the data is insufficient to support the Corps' position that the Preferred Alternative and the Immediate Full Development of Water Supply with Environmental Restoration Alternative "could" bring improvements in frequency and timing of outflows sufficient for additional whitewater boating. The Corps tends to give such recreation short shrift because recreation is not one of the authorized project purposes. Whitewater Boating Recreation is an economic boon to the surrounding community and is likely to be seriously impacted by additional storage. The Corps and Tacoma must do studies of the possible impacts and means of mitigation for them. Speculation is not sufficient. The DFR/DEIS is inadequate for lack of the necessary studies and specificity.

O06-11 Agree that the Recommended Plan would result in negative impacts to fish, wildlife, threatened and endangered species, and their habitats. The extensive mitigation plans for fish and wildlife are intended to offset these impacts. The loss of wetlands is a concern; we propose the introduction of several species of native plants of the genus *Carex* to replace those plants that would be inundated by the reservoir. These replacement species are more tolerant of longer periods and greater depths of inundation than the species currently present in the reservoir. One non-native tree (bald cypress, *Taxodium distichum*) has been proposed to be planted in the reservoir, as it is capable of withstanding great depths and long periods of inundation. Bald cypress has been previously planted in several places in the Pacific Northwest (including several Corps reservoirs), and, to date, has not been known to regenerate itself. Several commenters have expressed concern over planting a non-native plant in the region, with good reason. Additional discussion with resource agencies will occur before any decision is made to plant bald cypress. Should agencies agree with our planting plan, a state Department of Fish and Wildlife permit will be required. The state may decide to not issue the permit. Should the state issue the permit, the growth of this species will be monitored, and the river downstream from the dam will also be monitored to make sure seedlings of this species do not become established outside the reservoir limits.

Biological assessments were prepared addressing the potential effects on threatened and endangered species found in the project vicinity. The USFWS concurred with the Corps' conclusion that the project is not likely to adversely affect bald eagles, marbled murrelets, spotted owls, gray wolves, and grizzly bears. Spotted frogs (candidate species), and bull trout (proposed species) were also addressed, and the Corps also determined a "not likely to adversely affect" conclusion for these species; the USFWS concurred. A biological assessment was prepared for Puget Sound chinook salmon (proposed species), and for Puget Sound coho (candidate species), following the recent announcement in the Federal Register (in March, 1998). The Corps determined the project is not likely to jeopardize the continued existence of the chinook, and is not likely to adversely affect the coho. We expect concurrence from NMFS on our determinations by the end of July, 1998.

O06-12 See response to comment O03-7 above.

In conclusion, Washington Recreational River Runners finds that the DFR/DEIS is inadequate. Additional studies need to be made regarding Whitewater Boating Recreation. The Corps of Engineers should not be in the dual role of project proponent and evaluator of the project. This duality creates a clear conflict of interest. The proponents did not provide the best alternatives and a Preferred Alternative which meet their own Planning Criteria and stated Objective of "environmental (ecosystem) restoration." The Corps and Tacoma have failed to include a Water Conservation and ReUse Alternative. The proponents failed to include a Fish Passage Alternative consisting of a fish ladder for natural upstream and downstream migration of anadromous fish. The Study Area was limited when it should have included the whole watershed which fits with the "environmental (ecosystem) restoration" objective and federal policy. The proposals for fish passage are more tinkering and attempts to build out of the problems created by previous "building" of the two dams on the river. With potential endangered species listings imminent, solutions must be more natural not less so. The DFR/DEIS and the Recommended Plan are not acceptable and must be reworked.

Sincerely, Mark Burns

Mark Burns, President
Washington Recreational River Runners
P.O. Box 25048
Seattle, Washington 98125-1948

Letter O07

Comments

MR. MRS. MS. MISS FIRST NAME Dara INITIAL Kessler LAST NAME Mueller

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CITY Renton, STATE WA ZIP CODE 98059

FIRM, ORGANIZATION OR AGENCY REPRESENTED Washington Kayak Club

☐ I WISH TO SPEAK AT THIS MEETING

☐ I HAVE WRITTEN MATERIAL TO SUBMIT

☐ I AM INTERESTED IN OBTAINING A TRANSCRIPT OF THIS MEETING (At Cost of Reproduction)

007-1 REMARKS: I will submit written comments.

NPD FORM 111 June 1980 (Rev.) NORTH PACIFIC DIVISION, U.S. ARMY CORPS OF ENGINEERS

Replies

O07-1 See comment letter O04.

US Army Corps of Engineers, Seattle District
P.O. Box 3755
Seattle, Washington 98124-3755
ATTN: Kris Loll, Civil Projects & Planning Branch

Dear Project Proponents:

Subject: Review of Howard Hanson Dam Additional Water Storage Project (HHD AWSP) Draft Feasibility Report/Draft Environmental Impact Statement (DFR/DEIS)

I01-1

As a resident of the Puget Sound region who chooses to live here because of the beauty and proximity of the natural world, I expect the government agencies who represent me to protect and restore environmental, recreational, and aesthetic values that make life here special. At this critical time, with several potential listings under the Endangered Species Act (ESA) looming, every government agency should have its primary objective be to restore and protect as fully as possible those threatened and endangered species. Instead, your project makes storage for municipal water supply the primary objective and gives lip service to environmental restoration while continuing to destroy natural conditions.

Your proposed project negatively impacts river recreation on the Green River. The Green River Gorge is a premier whitewater run, renowned throughout Washington State, the nation, and abroad. The river below the Gorge is also much loved and heavily boated, thanks to its beauty and its proximity to a metropolitan area. Additional water storage and changes in the reservoir refill timing will have negative impacts on boating. Refill schedules will make the Green River Gorge unavailable to boating except in winter, but no mitigation for such negative Impacts is provided. Recreation is scarcely mentioned in the DFR/DEIS. No studies were done; no data is provided to indicate what the negative impacts will be. The DFR/DEIS must be specific in relating impacts and mitigation.

The Selected Alternative for this project on the Green River should include:
Making the river's flows more natural --as natural as possible
Reforesting the Green-Duwamish Watershed as much as possible for natural water storage
Restoring and enhancing wetlands to the fullest extent throughout the watershed
Dam removal or keeping the reservoir's water storage as small as possible to enhance salmonid migration; providing a fish ladder from Tacoma's dam to H Hanson dam.
Eliminating dikes and channeling in the lower river to the fullest extent possible
Restoring the estuary wherever possible
Water conservation by Tacoma Public Utilities and all its customers equal to the costs of this and other Water supply projects which make the river less natural
Enhanced whitewater and casual boating on the Green River -- in particular of the Green River Gorge -- with no negative Impacts, through natural flows

Sincerely,

Ned Sickels

NED Sickels
Woodinville

I01-I65 Comments noted.

2.6 MAILING ADDRESS FOR DRAFT FEASIBILITY REPORT AND DEIS

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	Belmondo Family Ltd. Partnership	5415 Pleasure Point Lane	Bellevue, WA 98006
	Bertha Miller	1307 N 32nd	Renton, WA 98056
Rachel Stallings	BOAS, Inc.	Broadway Station, P.O. Box 20275	Seattle, WA 98102
Mehdi Nakhjiri	Boeing Commercial Airplane Group	P.O. Box 3707, MS 63-01	Seattle, WA 98124-2207
	Bonneville Power Administration	5240 Trosper SW	Olympia WA 98502
	Bradley & Renita Gullstrand	51 Logan Avenue, S.	Renton, WA 98055
Renton Local 1797	Brotherhood Carpenters & Joiners	231 Burnett N.	Renton, WA 98055
Trent Hudak	Burlington Northern & Santa Fe Railroad	2454 Occidental Ave S. Ste 1A	Seattle, WA 98134-1451
	Burlington Northern Railroad	999 Third Avenue	Seattle, WA 98101
	Burlington Northern RR	Honeywell Ctr, #290, 373 Inverness Dr. S	Englewood, CO 80112-5831
Jean Shabro	c/o Nancy Oertel	6018 SW Cupola Drive	Newport, OR 97366-9625
Corrine Brown	c/o Wayfarer Nursery	21414 Ricci Road	Monroe WA 98272
	Caesar Tasca	221 N Williams Street	Renton, WA 98055
	Carol Dobson	P.o. Box 59	Renton, WA 98057
Rich Starr	CENAB-PL	P.O. Box 1715	Baltimore, MD 21203
Larry Buss	CENWO-PD, Omaha District Corps of Engineers	215 North 17th Street	Omaha, NE 68102-4978.
	Chamber of Commerce	950 Pacific Ave	Tacoma WA 98402
	Charlie Kiefer	10926 SE 274th Street	Kent, WA 98031
	Cherry Knight-Larson	6827 34th Avenue, NW	Seattle, WA 98117
	Cheryl Miller	3303 N 36th St	Tacoma WA 98407
Mr. John Lind	Citifor Inc	1425 N Washington	Olympia WA 98501
	Citizens for a Healthy Bay	771 Broadway	Tacoma WA 98402-3700
Public Works Director	City of Auburn	25 W Main St	Auburn WA 98001-4998
Public Works Director	City of Federal Way	33530 1st Way S	Federal Way WA 98003
ATTN: Howard Schesser	City of Fife	5213 Pacific Hoghway E.	Fife, WA 98424
Don Wickstrom, Director	City of Kent	220 4th Ave S	Kent WA 98032
Gary Sund	City of Kirkland	123 5th Avenue	Kirkland, WA 98033-6189
Glenn Boettcher	City of Mercer Island	9611 SE 36th Street	Mercer Island, WA 98040
ATTN: Public Works Director	City of North Bend	P.O. Box 896	North Bend, WA 98052
Tikva Breuer	City of Olympia Public Works	P.O. Box 1967	Olympia WA 98507-1967

ATTN: Traci Disher	City of Redmond	15670 NE 85th St	Redmond, WA 98052
Housing Authority	City of Renton	200 Mill Avenue, S., City Hall	Renton, WA 98055
W.E. Bennett	City of Renton	200 Mill Avenue, S.	Renton, WA 98055
	City of Renton	200 Mill Ave So.	Renton WA 98055
Ron Straka	City of Renton, Surface Water Utility	200 Mill Avenue, S.	Renton, WA 98055
ATTN: City Hall City Planner	City of Snohomish		Snohomish, WA 98290
	City of Tacoma	747 Municipal Building	Tacoma, WA 98402-3793
ATTN: Mayor	City of Tukwila	6200 Southcenter Blvd.	Tukwila, WA 98188
ATTN: Director, Pub. Works Dept	City of Tukwila	6300 Southcenter Blvd.	Tukwila, WA 98188
Phil Fraser, Senior Engineer	City of Tukwila Dept. of Public Works	6300 Southcenter Blvd., Suite 100	Tukwila, WA 98188
	Clover Creek Council	1602 129th St E	Tacoma WA 98445
Scott Winn	Community Coalition for Environment	205 17th Ave, Suite A	Seattle, WA 98122
	Conrad Hermsted	201 union SE #186	Renton, WA 98059
P.C. Planning & Land Services	County Public Services Building	2401 S 35th St	Tacoma WA 98409
Don Sutherland, P.C. Executive	County-City Building	930 Tacoma Ave S	Tacoma WA 98402
Pierce County Commissioners	County-City Building	930 Tacoma Ave S	Tacoma WA 98402
Judy Nelson	Covington Water District	18631 SE 300th Pl	Kent WA 98042
	Craig & Margaret Simpson	111 Wells Avenue, N.	Renton, WA 98055
	Crescent Family Partnership	7510 Eastside Drive, NE	Tacoma, WA 98422
	Dale Mesecher	913 N 2nd Street	Renton, WA 98055
	Danilo & Gloria Delmundo	16546 SE 19th St	Bellevue, WA 98008
	David Mason	231 Williams Avenue, N.	Renton, WA 98055
	David Swanson	4616 S 124th	Seattle, WA 98178
	Dean Bitney	2727 Mt. View Avenue, N.	Renton, WA 98056
	Debra Johns	E 3690 Hwy 106	Union, WA 98592
	Dennis Moore	34900 212th Ave SE	Auburn, WA 98092
Bonnie Bunning, Region Manager	Dept. of Natural Resources	P.O. Box 68	Enumclaw WA 98022-0068
Jennifer M. Belcher	Dept. of Natural Resources	P.O. Box 47000	Olympia WA 98504-7000
Pat Clark, Federal Highway Admin.	Dept. of Transportatlon	222 SW Columbia Street Suite 600	Portland, OR 97201
Terry Ebersole, Urban Mass Trans. Admin.	Dept. of Transportatlon	915 Second Ave, Suite 3142	Seattle, WA 98174-1002
Stu Blocker	Dept of Natural Resources	P.O. Box 68	Enumclaw WA 98022
	Dino Patas	1815 Rolling Hills Avenue, SE	Renton, WA 98055
Kara Whitstock	Document Dept. Library	Colorado State University	Fort Collins, CO 80523-1019
Fred C. Schmidt	Document Dept. The Libraries	Colorado State University	Fort Collins, CO 80523-1019
	DOE - NW Regional Office	3190 160th Ave SE	Bellevue WA 98008-5452
	DOE - Water Quality Program	P.O. Box 47600	Olympia WA 98504-7600
Keith Phillips	DOE - Water Resources Program	P.O. Box 47600	Olympia WA 98504-7600
Greg Grunenfelder	DOH - Division of Drinking WaterAirdustrial Center Building #3	P.O. Box 47822	Olympia WA 98504-7822
	Don Morrison	14601 SE 173rd	Renton, WA 98055
	Donald & Margaret Schumsky	2019 Jones Avenue, NE	Renton, WA 98055
	Douglas & Claudia Buck	904 N Riverside Drive	Renton, WA 98055
Holly Kean	East King County RWA	1309 114th Ave SE, Suite 300	Bellevue WA 98004
	Edward S. Syrjala	P.O. Box 149	Centerville, MA 02632
Howard Johnson	Enumclaw Plateau	30304 SE 392nd	Enumclaw, WA 98022

Chuck Keenan	Environmental & Economic Balance Council	777 - 108th Avenue NE, Suite 1601	Bellevue, WA 98004
	EPA - Regional Administrator	1200 Sixth Ave	Seattle WA 98101
	Esell Corporation	126 Wells Avenue, S.	Renton, WA 98055
	Eugene A & Christine Frasier	778 Ashley Court	Buckley, WA 98321
Dennis Ossenkop	FAA, Airport Division	1601 Lind Avenue, SW	Renton, WA 98055-4056
	Fairwood Library	17009 - 140th SE	Renton, WA 98058
Ray Williams	Federal Emergency Management Agency	130 - 228th Street	Bothell, WA 98021-9796
Bob Frietag	Federal Emergency Mgmt Agency	140 228th SW	Bothell, WA 98021-9796
	Federal Way Regional Library	34200 First Way S	Federal Way, WA 98003
Steve Wieneke, Dir. of Engineering	Federal Way Water & Sewer District	P. O. Box 4249	Federal Way, WA 98063
Pete Soverel	Federation of Fly Fishermen	16430 72nd Avenue, W.	Edmonds, WA 98026-4908
	First Federal Savings & Loan	P.O. Box 358	Renton, WA 98055
Milo Bell	Fish Passage Technical Committee	P.O. Box 23	Muklteo, WA 98275
Ed Donahue	Fish Pro, Inc.	3780 SE State Hwy 160	Port Orchard, WA 98366
	Friends of the Earth	4512 University Way NE	Seattle WA 98105
Pat Sumption, Pres.	Friends of the Green	10510 11th Ave NE	Seattle, WA 98125
Pete Sikora	Giustina Resources	P.O. Box 529	Eugene WA 97440
	Glenn Reynolds	55 Logan Avenue	Renton, WA 98055
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Tim Thompson	Gordon, Thomas, Honeywell	P.O. Box 1157	Tacoma WA 98401
	Grace Storwick & John Giuliani	P.O. Box 78327	Seattle, WA 98178
	Green/Duwamish Watershed Alliance	742 S. Southern St	Seattle, WA 98108
	Greg & Deborah Devereaux	909 North 1st Street	Renton, WA 98055
	Hadi Fakharzadeh	11226 Auburn Avenue, S.	Seattle, WA 98178
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	Howard & Doreen Johnson	30304 SE 392nd	Enumclaw WA 98022
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	James Kirkman	1002 North 35th	Renton, WA 98055
	Janet Thompson	3190 160th Ave SE	Bellevue, WA 98008-5452
	Jeffery Eustis, P.S.	505 Madison #209	Seattle, WA 98104
	John A. & Carol M. Veness	36 Logan Avenue, S.	Renton, WA 98055
	John Burkhalter	803 North 1st Street	Renton, WA 98055
	John Gould	806 N 2nd Street	Renton, WA 98055
	John Hargrove	105 Wells Avenue, N.	Renton, WA 98055
	John Sparrow	908 N Riverside Drive	Renton, WA 98055
	Joseph Marchetti	801 North 2nd Street	Renton, WA 98055
	Josephine Morrison	112 Wells Avenue, N.	Renton, WA 98055
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	June Evans	817 North 1st Street	Renton, WA 98055
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Bob Fuerstenberg	KC DNR - Water & Land Res. Div.	700 Fifth Ave., Suite 2200	Seattle WA 98104

	Kenneth King	350 Sunset Blvd., N	Renton, WA 98055
	Kenneth Shellan	591 N Patencio Road	Palm Springs, CA 92262
	Kent Regional Library	201 Second Avenue N	Kent, WA 98032
	Kevin & Eugenia Beckstrom	206 Wells Avenue, N.	Renton, WA 98055
	Kevin & Kathy Bruce	921 North 1st Street	Renton, WA 98055
	King Cnty Dept. of Dev. & Env. Serv	3600 -136th Place SE	Bellevue, WA 98006
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ATTN: Dave Clark	King Cnty Sur. Water Div.	700 5th Ave, Suite 2200	Seattle, WA 98104
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	King County Council	516 3rd Ave, Room 402	Seattle WA 98104
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Documents Dept.	King County Library System	1111 110th Ave NE	Bellevue, WA 98004
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Tim Goon	King County METRO	821 Second Avenue, MS-120	Seattle, WA 98104
Richard Tucker	King County Resource Planning	506 Second Ave, Ste 708	Seattle, WA 98104
Advisory Council on Historic Preservation	King County Surface Water Management	700 Fifth Ave, Suite 2200	Seattle, WA 98104
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Gino Lucchetti	King County Surface Water Management	700 5th Avenue, Suite 2200	Seattle, WA 98104
Heather Stout	King County Surface Water Management	700 Fifth Ave, Suite 2200	Seattle, WA 98104
John Lombard	King County Surface Water Management	700 5th Avenue, Suite 2200	Seattle, WA 98104
Roz Glasser	King County Surface Water Management	700 Fifth Ave, Suite 2200	Seattle, WA 98104
Stephanie Lucash	King County Surface Water Management	700 Fifth Ave, Suite 2200	Seattle, WA 98104
Terry Butler	King County Surface Water Management	700 Fifth Ave, Suite 2200	Seattle, WA 98104
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Melinda Garcia	Lakehaven Utility District	P.O. Box 4249	Federal Way WA 98063
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	Larry Pape	16541 Redmond Way #C350	Redmond, WA 98052
	Lavina Kessler	310 Pelly Avenue, N.	Renton, WA 98055
	Lee York	2200 Aberdeen Avenue, NE	Renton, WA 98055
	Leonard Leathley, Jr.	809 N 2nd Street	Renton, WA 98055
	Louis Peretti	1102 Bronson Way	Renton, WA 98055
	Marion Lauck	904 North 1st Street	Renton, WA 98055
	Marjorie Bellando	P.O. Box 70217	Bellevue, WA 98007
	Martha Parker	18028 187th Avenue, SE	Renton, WA 98058
	Mary Ann Leggitt	375 Union Avenue, SE, #115	Renton, WA 98059
	Mary Patricia Ryan	P.O. Box 336	Renton, WA 98057
Steve Whitcher	Master Gardener Program Coordinator	3049 S 36th St., #300	Tacoma WA 98409-5739
Honorable Paul Schell	Mayor of Seattle	1200 Municipal Bldg., 600 Fourth Avenue	Seattle, WA 98104
	McLendon Hardware, Inc.	710 2nd Avenue	Renton, WA 98055
ATTN: Katherine McKee	METRO	821 Second Ave	Seattle, WA 98104-1598

	Milton Memorial Library	1000 Laurel Street	Milton, WA 98354
Eric Warner	Muckleshoot Fisheries Dept.	40405 Auburn-Enumclaw Road	Auburn, WA 98002
Karen Walter	Muckleshoot Fisheries Dept.	39015 SE 172nd Avenue	Auburn, WA 98002
Chantal Stevens	Muckleshoot Indian Tribe	39015 172nd Avenue S.E.	Auburn, WA 98092
Don Finney	Muckleshoot Indian Tribe	39015 172nd Avenue S.E.	Auburn, WA 98092
Fish Committee	Muckleshoot Indian Tribe	39015 172nd Ave SE	Auburn WA 98002
Fisheries Dept.	Muckleshoot Indian Tribe	39015 172nd Ave SE	Auburn WA 98002
Hunting Committee	Muckleshoot Indian Tribe	39015 172nd Ave SE	Auburn WA 98002
Paul Hage	Muckleshoot Indian Tribe	39015 172nd Avenue S.E.	Auburn, WA 98092
Pete Jerry, Wildlife Commission	Muckleshoot Indian Tribe	39015 172nd Avenue S.E.	Auburn, WA 98092
Tribal Council	Muckleshoot Indian Tribe	39015 172nd Ave SE	Auburn WA 98002
Walter Pacheco, Cultural Res Coordinator	Muckleshoot Indian Tribe	39015 172nd Avenue S.E.	Auburn, WA 98092
	Nancy Davidson	400 Yesler Way, Room 700	Seattle WA 98104-1637
Ben Meyer	National Marine Fisheries Service	525 NE Oregon Street, Suite 500	Portland, OR 97232-2737
Mike Grady	National Marine Fisheries Service	510 Desmond Drive SE, Suite 103	Lacey WA 98501
Robert Turner, WA Area Director	National Marine Fisheries Service	510 Desmond Drive SE, Suite 103	Lacey WA 98501
Steve Fransen	National Marine Fisheries Service	510 Desmond Drive SE, Suite 103	Lacey WA 98501
William Stelle, Jr., Regional Administrator	National Marine Fisheries Service	7600 Sand Point Way NE	Seattle WA 98115
	Nature Center at Snake Lake	1919 S Tyler	Tacoma WA 98405
	Neal Jensen	P.O. Box 353	Renton, WA 98057
Donna Weiting	NOAA	14th & Constitution Ave NE, HCHB, Room 6222	Washington DC 20230
	Norman & Marian Schultz	7634 Sunnycrest Road	Seattle, WA 98178
	North American Refractories	500 Halle Bldg, 1228 Euclid Avenue	Cleveland, OH 44115
Karen Bergeron	North Bend Ranger District, Mt. Baker-Snoq NF	42404 SE North Bend Way	North Bend, WA 98045
Sarah Humphries	Northwest Rivers Council	1731 Westlake Avenue, N, Suite 202	Seattle, WA 98109-3043
H. Paul Friesema	Northwestern Univ., Center for Urban Affairs	2040 Sheridan Road	Evanston, IL 60208-4100
Executive Director	NW Indian Fisheries Commission	6730 Martin Way	Olympia, WA 98506-5540
Mr. Dick Sanderson	Off of Fed. Activities(A-104), EPA Rm 2119-1	401 M St SW	Washington D. C. 20460
Ikuno Masterson	Office of Budget & Stratigic Planning	516 3rd Ave, Room 42	Seattle, WA 98104
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Carol Borgstrom, U.S. Dept. of Energy	Office of NEPA Oversight Room #E-080	1000 Independence Avenue SW	Washington DC 20585
Advisory Council on Historic Preservation	Office of Program Review & Education	1100 Pennsylvania Ave., NW, #803	Washington, DC 20004
Ronald Anzolone	Office of Program Review & Education	1100 Pennsylvania Ave., NW, #803	Washington, DC 20004
Curt Smitch	Office of the Governor	Legislative Building, AS-13	Olympia WA 98504
Honorable Gary Locke	Office of the Governor	Legislative Building, AS-13	Olympia WA 98504
	Olimpia Audubon Society	P.O. Box 2524	Olympia, WA 98507
Cary Feldmann	P.S. Power & Light Co	411 108th Ave NE	Bellevue WA 98004-5515
Lee Moyer	Pacific Water Sports	16055 Pacific Hwy., S.	Seattle, WA 98188
David Mainer	Paddle Trails Canoe Club	P.O. Box 24932	Seattle, WA 98124
Gerald Eller	Paddle Trails Canoe Club	502 13th Ave., W.	Kirkland, WA 98033
John Rundberg	Paddle Trails Canoe Club	6219 41st Avenue N.E.	Seattle, WA 98115

Jeff Osborne	Parametrics	5808 Lake Washington Blvd. Suite 200	Kirkland, WA 98033
Sabine Renn	Parametrix	5808 Lake Washington Blvd NE	Kirkland, WA 98033
	Paul Szewczykowski	26226 187th Place, SE	Kent, WA 98042
Glenda Daniel	People For Puget Sound	1326 Fifth Ave Suite 450	Seattle, WA 98101
	People for Puget Sound	1402 3rd Ave, Suite 450	Seattle WA 98101
	Peter & Nancy Forras	2030 Rolling Hills Avenue, SE	Renton, WA 98055
	Peter Allan	25 Hickory Place, H-22	Chatham, NJ 07928-3014
Parkland Spanaway Branch	Pierce County Public Library	13718 Pacific Avenue S	Tacoma, WA 98444
	Pierce County Surface Water	2401 S. 34th	Tacoma, WA 98409-7487
Juli Wilkerson, Director	Planning & Development Services	747 Market St	Tacoma WA 98402
Gary Johnson	Plum Creek Timber Co	P.O. Box 248	Enumclaw WA 98022
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Puget Sound Power & Light Co.	Property Tax Dept.	P.O. Box 90868	Bellevue, WA 98009
	Proteam Marketing	514 Auburn Way, N.	Auburn, WA 98002
	Puget Sound Regional Council	1011 Western Ave #500	Seattle, WA 98104-1040
	Puget Sound Regional Council	1011 Western Ave, Suite 500	Seattle WA 98104-1035
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Kathy Minsch	Puget Sound Water Quality Authority	P.O. Box 40900, MS PV-15	Olympia, WA 98504-0900
	Puyallup Public Library	324 S Meridian	Puyallup, WA 98371
ATTN: Wilson V. Binger	R. W. Beck	1001 Fourth Avenue, Suite 2500	Seattle, WA 98154-1004
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Phil J. Hilgert	R2 Resource Consultants Inc.	15250 NE 95th St	Redmond WA 98052-2518
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	Ralph Storey	1012 N Riverside Drive	Renton, WA 98055
	Randall Reeves	7050 150th Avenue, NE	Redmond, WA 98052
	Randy Aliment	14511 SE Fairwood Blvd	Renton, WA 98058-8533
	Randy Rogers	2273 Dorre Don Court, SE	Maple Valley, WA 98038
	Raymond Barry	1625 Jones Drive, SE	Renton, WA 98055
Bob Everitt,	Regional DirectorWDFW	16018 Mill Creek Blvd	Mill Creek WA 98012-1296
	Ren Four, Inc.	P.O. Box 59	Renton, WA 98055
	Rena McMillan	121 Wells Avenue, N.	Renton, WA 98055
	Renato & Paz Santos	1815 Lake Youngs Way, SE	Renton, WA 98058
	Renton Public Library	200 Mill Avenue S	Renton WA 98055
	Renton School District 403	435 Main Avenue, S.	Renton, WA 98055
Honorable Adam Smith	Representative in Congress	3600 Port of Tacoma Rd, Suite 204	Tacoma WA 98424
Honorable Jack Metcalf	Representative in Congress	3273 Saratoga Rd	Langley, WA 98260
Honorable Linda Smith	Representative in Congress	10009 Ridgecrest Avenue NW	Vancouver, WA 98685
Honorable Norm Dicks	Representative in Congress	1717 Pacific Ave	Tacoma WA 98402-4411
Honorable Jim McDermott	Representative in Congress ATTN: Mr. Steve Johnson	1809 Seventh Ave, Suite 1212	Seattle WA 98101-1399
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Joy Huber, Executive Director	Rivers Council of Washington	1731 Westlake Ave N, #202	Seattle WA 98109-3043
	Robert & Geraldine Hyler	127 Pelly Avenue, N.	Renton, WA 98055
	Roger Davis	P.O. Box 452	Renton, WA 98055
	Roger Lowe	12708 NE 144th, #B-202	Kirkland, WA 98034
	Ronald & Colleen Nelson	17221 163rd Place, SE	Renton, WA 98058

	Ronald & Jacqueline Forte	P.O. Box 816	Renton, WA 98057
	Ruby Heitman	50 Logan Avenue, S.	Renton, WA 98055
	Rudolph & Beverly Starkovich	810 N Riverside Drive	Renton, WA 98055
	Russell E. Storwick	106 Burnett Ave S.	Renton, WA 98055-2110
	Sally Fisher	854 Redmond Avenue, NE	Renton, WA 98056
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Shelley Lawson	Seattle Public Utilities	710 Second Ave	Seattle WA 98104
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George Schneider	Seattle Water Dept.	710 Second Avenue, MS 15101	Seattle, WA 98104
Rand Little	Seattle Water Dept.	710 Second Avenue	Seattle, WA 98104
Ray Hoffman	Seattle Water Dept.	710 Second Ave	Seattle WA 98104
Alonzo Plough, Director	Seattle-King County Dept of Public Health	999 3rd Ave, Suite 1200	Seattle WA 98104-4039
	Sierra Club NW Office	180 Nickerson St, Ste 103	Seattle, WA 98109-1631
	Simon & Hanna Young	6531 83rd Place, SE	Mercer Island, WA 98040
Dennis Holder	SKCRWA	18631 SE 300th Pl	Kent WA 98042
Barry Gall	Skykomish Ranger District, Mt. Baker-Snoq NF	P.O. Box 305	Skykomish, WA 98288
	Slapshot, Inc.	999 Third Avenue, Suite 3600	Seattle, WA 98104
	Snohomish Cnty Planning Dept	Courthouse	Everett WA 98201
	Snohomish County Executive	County Exec. Off. MS 407, 3000 Rockefeller Ave	Everett, WA 98201
Guillemette Regan	Snohomish PUD #1	P.O. Box 1107	Everett WA 98206
	Soren & Karen Sorenson	706 North 1st Street	Renton, WA 98055
Don Wright	South King Co. Regional Water Assn	27224 144th Ave SE	Kent, WA 98042
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	State Senator Jim Horn	407 Legislative Office Bldg.	Olympia, WA 98504-0460
	State Senator Margarita Prentice	419 John Cherberg Office Bldg.	Olympia, WA 98504-0482
	State Senator Stephen Johnson	401C Legislative Office Bldg.	Olympia, WA 98504-0460
Director	Student Conservation Association	605 13th Ave	Seattle, WA 98122
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Tribal Council	Suquamish Indian Tribe	P.O. Box 498	Suquamish, WA 98392
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Cleve Steward	Sustainable Fisheries Foundation	P.O. Box 206	Bothell, WA 98041-0206
Glen Aurdahl	Sverdrup Civil	600 108th Ave NE, Suite 700	Bellevue, WA 98004
Judith Lorbier	Tacoma Environmental Commission	747 Market St., Room 900	Tacoma WA 98402
Ken Heany	Tacoma Metro Parks	4702 S 19th St	Tacoma WA 98405-1175
	Tacoma Public Library	1102 Tacoma Avenue S	Tacoma, WA 98402
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Brian King, Watershed Inspector	Tacoma Public Utilities, Water Dept.	P. O. Box 11007	Tacoma, WA 98411
Dennis Ellison, Watershed Manager	Tacoma Public Utilities, Water Dept.	P. O. Box 11007	Tacoma, WA 98411
Jane Evancho, Natural Resources Manager	Tacoma Public Utilities, Water Dept.	P. O. Box 11007	Tacoma, WA 98411
John Kirner, Deputy Superintendent	Tacoma Public Utilities, Water Dept.	P. O. Box 11007	Tacoma, WA 98411
Ken Merry, Superintendent	Tacoma Public Utilities, Water Dept.	P. O. Box 11007	Tacoma, WA 98411

Paul Hickey, Fish Biologist	Tacoma Public Utilities, Water Dept.	P. O. Box 11007	Tacoma, WA 98411
Steve Marek	Tacoma-Pierce County Health Dept	3629 South 'D' St	Tacoma WA 98408
	Tahoma Audubon Society	2601 70th Ave W #E	University Place, WA 98466-5430
	Tennessee Group	710 S. Second Street	Renton, WA 98055
	Tennessee Group	11316 85th Avenue, S.	Seattle, WA 98178
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