CITY OF CLE ELUM WASTEWATER TREATMENT PLANT OUTFALL RELOCATION AND HANSON PONDS HABITAT RESTORATION AND ENHANCEMENT:

BIOLOGICAL EVALUATION OF POTENTIAL IMPACTS TO THREATENED AND ENDANGERED SPECIES AND ESSENTIAL FISH HABITAT

Prepared for:

CITY OF CLE ELUM
Cle Elum, Washington

Prepared by:

ENTRIX, INC.
Olympia, Washington

Project No. 396901

November 22, 2002

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ACRONYMS

BE	Biological Assessment
BE	Biological Evaluation
BMPs	Best Management Practices
BOR	Bureau of Reclamation
BPA	Bonneville Power Administration
BRT	Biological Review Team
City	City of Cle Elum
cfs	cubic feet per second
cms	cubic meters per second
cmz	channel migration zone
cy	cubic yards
DIP	Ductile Iron Pipe
DOE	Department of Ecology
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
HDPE	High density polyethylene
I-90	Interstate-90
LWD	Large woody debris
mgd	million gallons per day
MPR	Master Planned Resort
NMFS	National Marine Fisheries Service (now NOAA Fisheries)
NOAA Fisheries	National Oceanic & Atmospheric Administration Fisheries Division
NPDES	National Pollutant Discharge Elimination System
PHS	Priority Habitat and Species
PVC	Polyvinyl chloride
RM	River mile
ROW	Right-of-way
RSP	Regional sewer project
TWSA	Total water supply available
UGA	Urban Growth Area
USACOE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UV	Ultraviolet light
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WSDOT	Washington State Department of Transportation
WWTIT	Western Washington Treaty Indian Tribes
YKFP	Yakima/Klickitat Fisheries Project
YRBWEP	Yakima River Basin Water Enhancement Program

1.0 INTRODUCTION

This Biological Evaluation (BE) has been prepared in accordance with the U.S. Army Corps of Engineers (USACOE) publication CENWS-OD-RG, *Draft Guidance for Preparation of a Biological Evaluation (BE) or Biological Assessment (BA)* dated March 29, 2000, and CENWS-OD-RG, *Additional Information Necessary for Endangered Species Act Review*, also dated March 29, 2000. This BE addresses the potential impacts to threatened and endangered species from relocation of a Regional Sewer Project (RSP) outfall operated by the City of Cle Elum, and fisheries habitat restoration/enhancement proposed for the Hanson Ponds by the Yakama Nation. It also addresses potential effects of these project actions on *essential fish habitat* (EFH), as defined under the Magnusen Fisheries Conservation Act. As defined in Section 16 U.S.C. 1802(10) of the Magnusen Act, EFH includes the waters and substrate necessary for (managed) marine and anadromous fish populations to spawn, breed, feed, or grow to maturity. The Yakima River basin, including the project area, provides EFH for chinook and coho salmon.

The project involves three interrelated construction activities: (1) construction of a mainstem rock drop in the Yakima River to for flood protection and stabilization of the reach where the City's wastewater treatment plant outfall will be relocated; (2) restoration and enhancement of salmonid rearing habitat within the Hanson Ponds by creating a hydraulic connection to the Yakima River; and (3) relocation of the existing outfall alignment to a geomorphically stable region upstream of the current location where rapid mixing of wastewater can be assured over the long term. In accordance with Section 7 guidance, this BE focuses particularly on the preferred outfall alternative alignment, but also discusses other alternative outfall alignment locations considered, as it was used as a technical appendix to the SEPA Final FEIS on the RSP.

Species managed by the United States Fish and Wildlife Service (USFWS) or the National Oceanic and Atmospheric Administration, Fisheries Division ("NOAA-Fisheries," previously known as the National Marine Fisheries Service [NMFS]) that are currently listed under the ESA and are considered in this BE are summarized in Table 1.0-1.

Table 1.0-1. ESA-listed species potentially found within the action area.

Common Name	Scientific Name	ESA State Status	ESA Federal Status
BIRDS			
Bald Eagle	*Haliaeetus leucocephalus*	T	T
Northern Spotted Owl	*Strix occidentalis*	E	T
FISH			
Bull Trout	*Salvelinus confluentus*	C	T
Chum Salmon	*Oncorhynchus keta*	C	T
Columbia River Steelhead Trout	*Oncorhynchus mykiss*	C	E
MAMMALS			
Canada Lynx	*Lynx canadensis*	T	T
Gray Wolf	*Canis lupus*	E	E
Grizzly Bear	*Ursus arctos*	E	T
PLANTS			
Wenatchee Mountains Checkermallow	*Sidalcea oregana* var. *calva*	E	E
Ute Ladies' Tresses	*Spiranthes diluvialis*	T	T

Source: WDFW 2001 (map of T&E), and USFWS 2001 (website on T&E species)
C = Candidate, Co = Species of Concern, E = Endangered, T = Threatened

Letters from the USFWS and NOAA-Fisheries documenting the presence or absence of the above species within the action area addressed in this BE are provided in Attachment 1. These letters were provided in connection with a municipal water supply diversion structure modification project conducted approximately 0.5 mile upstream of the proposed action (Fisher and McArthur 2000, Entrix 2002). Conclusions reached by the Services relative to the occurrence of listed species within that project area are applicable to the presently proposed project. No changes have occurred within the action area, nor to the status of the species recognized in these earlier letters that would alter the species to be considered in this BE, with the exception that the Peregrine Falcon has been delisted and is therefore not considered in this document. These listings require that NOAA Fisheries and USFWS be consulted pursuant to Section 7 of the ESA by federal agencies making any decisions that may affect these species. For the project evaluated herein, the placement of fill rock for rock drop and wastewater treatment plant outfall construction will require permits from the US Army Corps of Engineers, establishing the project nexus for regulation under Section 7 of the ESA. The USFWS previously ruled on the Hanson Ponds components of the project, concluding that the restoration and enhancement of the ponds was not likely to adversely affect ESA-listed species under their management. This letter is also provided in Attachment 1; however, it must be noted that the USFWS did not consider the entire project action evaluated in this BE, and further analysis of the project's effects will be required by this agency as well as NOAA-Fisheries.

2.0 PROJECT DESCRIPTION

2.1 PROJECT AND ACTION AREAS

2.1.1 PROJECT AREA

The *project area* evaluated in this BE is considered that habitat directly affected by construction activities and permanent structures that would be created by the project action. The rock drop and wastewater treatment outfall realignment components of the project will bisect a section of the Yakima River in line with the western edge of Hanson Pond No. 2, at approximately river mile (RM) 181.2 (Figure 2.1-1). Waterward of the ordinary high water mark of the Yakima River, the outfall alignment will be built inside a rock drop, with a boat notch component mid-stream. The outfall will terminate in the boat notch (Figure 2.1-2). The rock drop will bisect a large and deep scour pool that currently exhibits back eddy hydraulics along the north bank dike of the Yakima River separating the river from the Hanson Ponds. As shown in Figure 2.1-1, the Hanson Ponds are located between the Interstate-90 (I-90) freeway, south of the existing City of Cle Elum sewage lagoons, and the north shoreline of the Yakima River. The Hanson Ponds cover an area of approximately 83 acres of floodplain, riparian, and instream habitat. The project area is located within portions of Section 35 and Section 36 of T20N, R15E of the Willamette Meridian, within Kittitas County, Washington.

2.1.2 ACTION AREA

The *action area* for this BE considers all habitat changes and/or construction activities that could affect listed species within a distance of 0.5-mile upstream and 1.5 miles downstream of the project action. This action area is within the Cascade ecoregion of the Yakima watershed (Cuffney et al. 1997). The upper Yakima River basin begins at RM 116.3, and is approximately 98 miles long (Rogowski 2000). The Yakima River is a large perennial stream that originates in Kittitas County from Keechelus and Kachess lakes, and continues southeast to the point where it discharges into the Columbia River near the Tri-Cities in southeastern Washington. The Yakima River drains approximately 6,155 square miles, and is a total of 214.5 miles long (Joy 2002). The average slope along the riverbank in the upper Yakima is approximately 35 to 40 percent.

Flows in the Yakima River have been regulated since 1990 as a result of the Yakima River Basin Water Enhancement Program (YRBWEP), and the Total Water Supply Available (TWSA) evaluations of minimum in-stream flows (Table 2.1-1). The fisheries benefits considered in establishing these flows were principally focused on improving conditions for chinook salmon spawning and smolt outmigration (BOR 2000). Although the minimum instream flows for the upper Yakima have been modified for fisheries benefits, the irrigation releases from Keechelus, Kachess and Cle Elum lakes continue to affect the hydrograph within the action area and broader Cascade ecoregion. These releases result in artificially high flows from mid-May until mid-September, and lower than normal flows during the winter and spring run-off and snowmelt periods (Figure 2.1-3).

Table 2.1-1. Flow records and regulations on the Yakima River at Cle Elum (cfs)

Year(s)	Agency	Minimum Recorded Daily, or Monthly Average[1] Flow	Maximum Recorded Daily, or Monthly Average[1] Flow	Regulated 7-day Average Low Flow	Minimum Recorded 7-day Average Flow at Cle Elum Gauge #124379500
1906-1989	USGS and BOR[2]	82.5[1]	7,105[1]	38	38
1990	BOR	363	10,600	NC	385
1991	BOR	363	5,828	NC	373
1992	BOR	210	3,900	NC	224
1993	BOR	211	3,494	NC	214
1994	BOR	211	3,466	NC	234
1995[4]	BOR	253	4,494	NC	262
1996[5]	BOR	NC	NC	318	349
1997[5]	BOR	NC	NC	476	509
1998[5]	BOR	NC	NC	398	423
1999[5]	BOR	NC	NC	365	391
2000[5]	BOR	NC	NC	556	560
2001[5]	BOR	NC	NC	393	430

[1]Monthly average flow (no subscript indicates a daily, not monthly, flow record).
[2]Bureau of Reclamation (BOR) took over gauge # 124379500 operation in 1980.
[3]NC—not calculable or specified from data records and/or sources acquired for this BE.
[4]Data examined were from January through September, data unavailable from October through December for review. Previous records indicated lowest flows were most commonly observed in late October.
[5]Flow (irrigation) releases from upper river impoundments revised under YRBWEP for fisheries protection, minimum instream flows appreciably increased over preceding years, and therefore used as basis for minimum 7q10 flow of 300 cfs for mixing zone study (Cosmopolitan 2002).

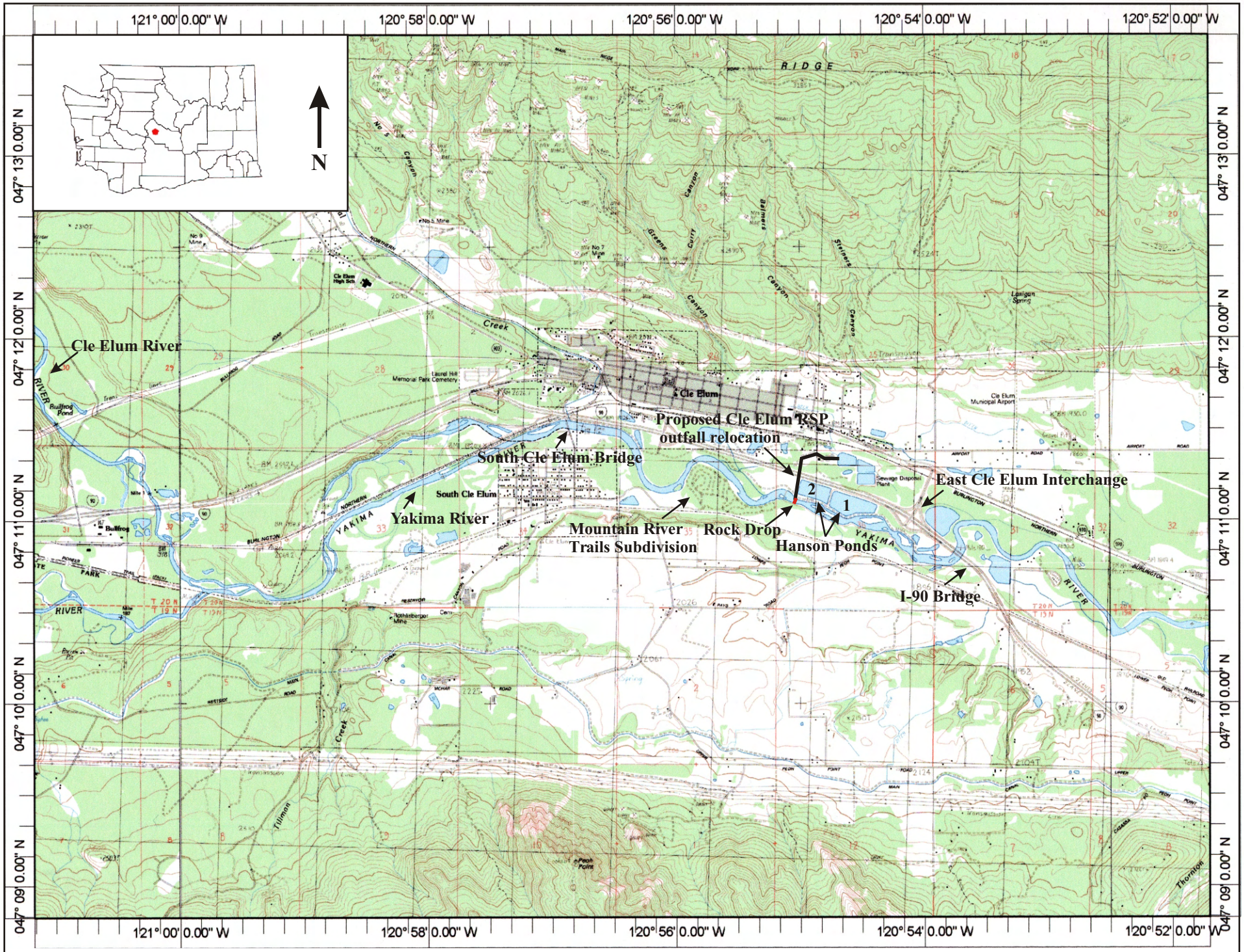


Figure 2.1-1. Proposed Cle Elum RSP outfall relocation and associated facilities within the mainstem Yakima River (RM 181.2). (MapTech, 1997)

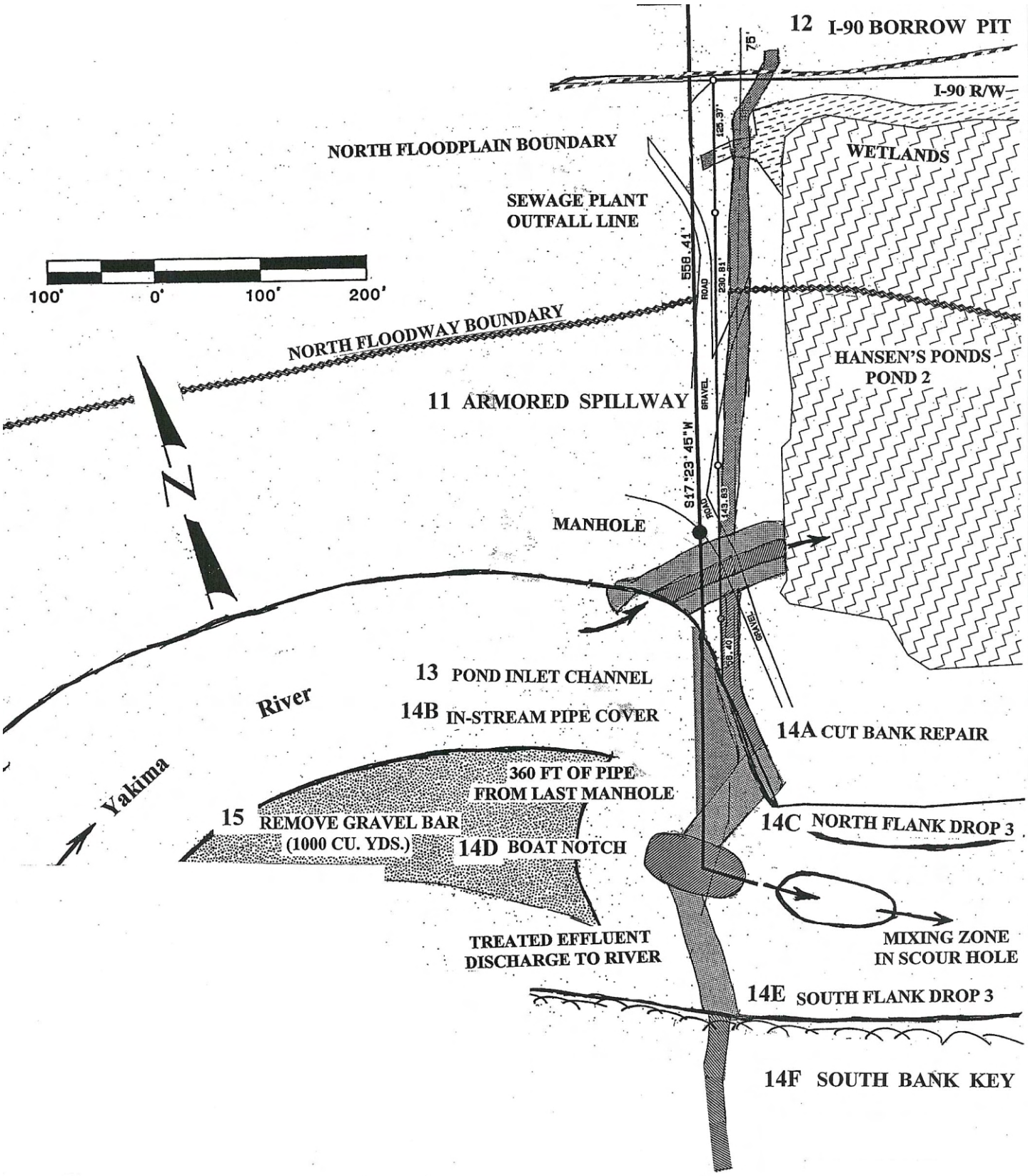


Figure 2.1-2. Schematic rock drop design and preferred instream alignment for the relocation of the Cle Elum RSP outfall (Reichmuth et al. 2002).

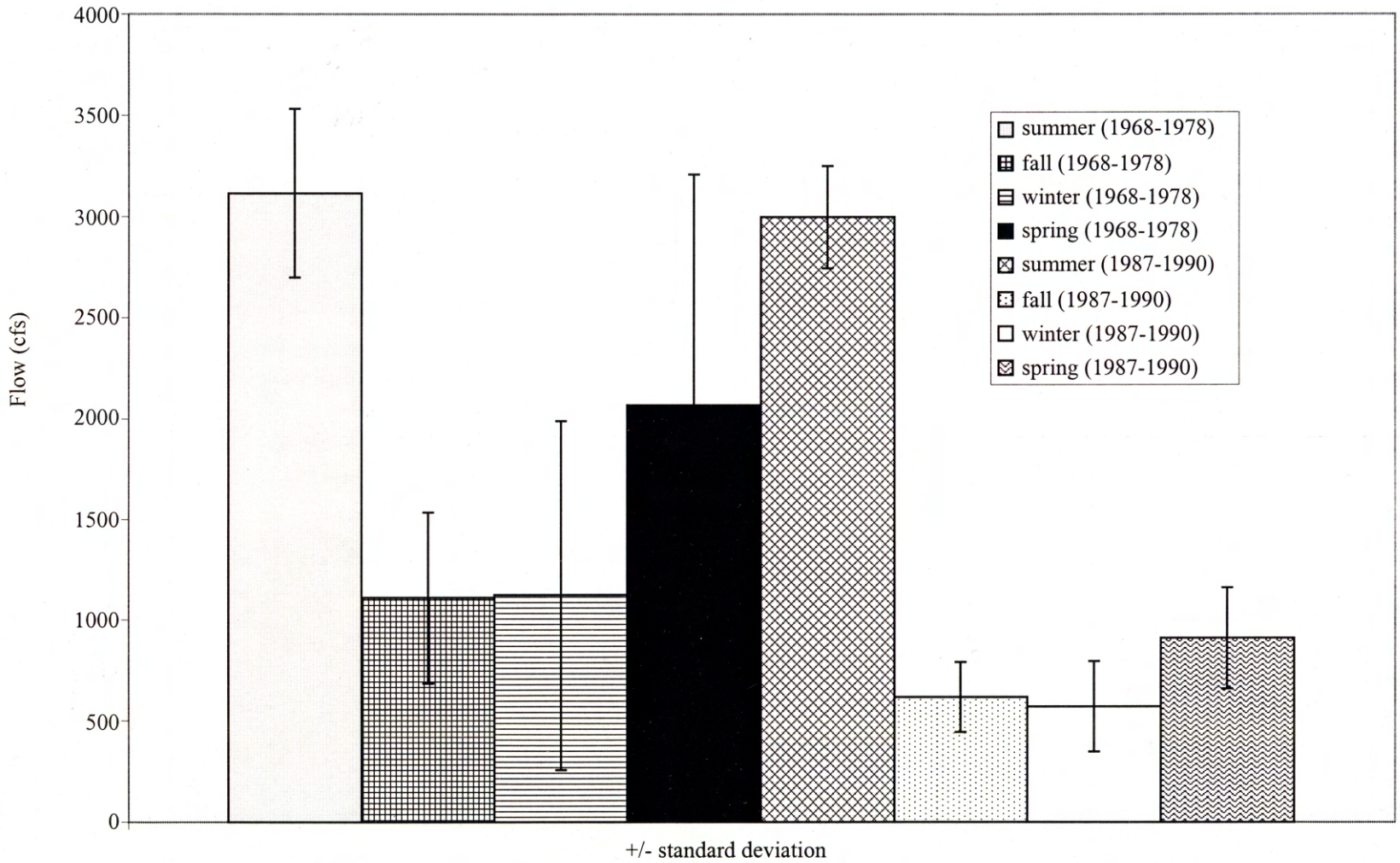


Figure 2.1-3. Seasonal flows in the Yakima River near Cle Elum (USGS gaging station 12479500). Source: USGS 2001

2.2 PROJECT DESCRIPTION

2.2.1 OVERVIEW

The City of Cle Elum proposes to expand and upgrade their wastewater collection and treatment facilities to serve the communities of Cle Elum, South Cle Elum, Roslyn, Ronald, and the Trendwest Master Planned Resort (MPR) (Figure 2.2-1). The additional quantity of treated wastewater that will be generated by the Regional Sewer Project (RSP) will require a larger outfall to handle increased flows, and a mixing zone capable of achieving compliance with the RSP's National Pollutant Discharge Elimination System (NPDES) permit conditions. Furthermore, the existing outfall is not functioning as originally designed due to river bedload deposition (Figure 2.2-2). In recognition of these conditions, the City of Cle Elum, with involvement from the Town of South Cle Elum, the City of Roslyn, and Trendwest Investments, prepared a Regional Sewerage Facilities Plan (Plan) that addressed collection and treatment of the region's wastewater (Earth Tech 2002).

The Environmental Impact Statement (EIS) subsequently prepared for the Plan (Cle Elum 2002) evaluated three alternatives for replacing the City's existing wastewater treatment plant outfall. A draft of this BE was incorporated as an appendix to the Final RSP EIS to expand upon the qualitative habitat analyses that was initially provided as Appendix E in the Draft EIS (*see* 'Attachment 2' to this BE). This final BE describes the potential impacts to threatened and endangered (T&E) species and EFH that could result from relocating the City's wastewater outfall to the preferred outfall location referenced in previous analyses (Cle Elum 2002). The preferred outfall location is in a deep and fast moving scour pool at RM 181.2 (Figure 2.2-3), coincident with the location of a rock drop essential for flood protection and for the proposed Hanson Ponds Fisheries Habitat Restoration/Enhancement Project sponsored by the Yakama Nation. Leading from the RSP, the preferred outfall alignment would be bored beneath I-90, paralleling the riparian zone of the western end of Hanson Pond No. 2, extend along an existing gravel road (Figure 2.2-4). The potential benefits and impacts to plants and animals from two downstream alternative outfall locations are discussed in Attachment 2.

The existing City of Cle Elum wastewater treatment plant outfall was constructed in 1981. The outfall alignment originated from the chlorine contact chamber at lagoon Cell No. 3 and covered a distance of 1,653 feet to Manhole 5, and then approximately 190 feet to the Yakima River at approximately RM 180.7 (Earth Tech 2002). Through the process of gravel transport within the river, approximately 8 feet of gravel has filled the Yakima Riverbed at the location of the original outfall, thereby impeding effluent discharge from the original outfall (Figure 2.2-2, Earth Tech 2002). A 12-inch diameter ductile iron pipe (DIP) relief line, constructed at the same time as the original outfall, was extended from Manhole 5 and discharges approximately 34 feet downstream from the original outfall. A significant portion of the City's wastewater effluent is discharged through the DIP outfall relief line, while the majority is presumed to be released into hyporheic (intragravel) flows of the Yakima River at the original outfall location.

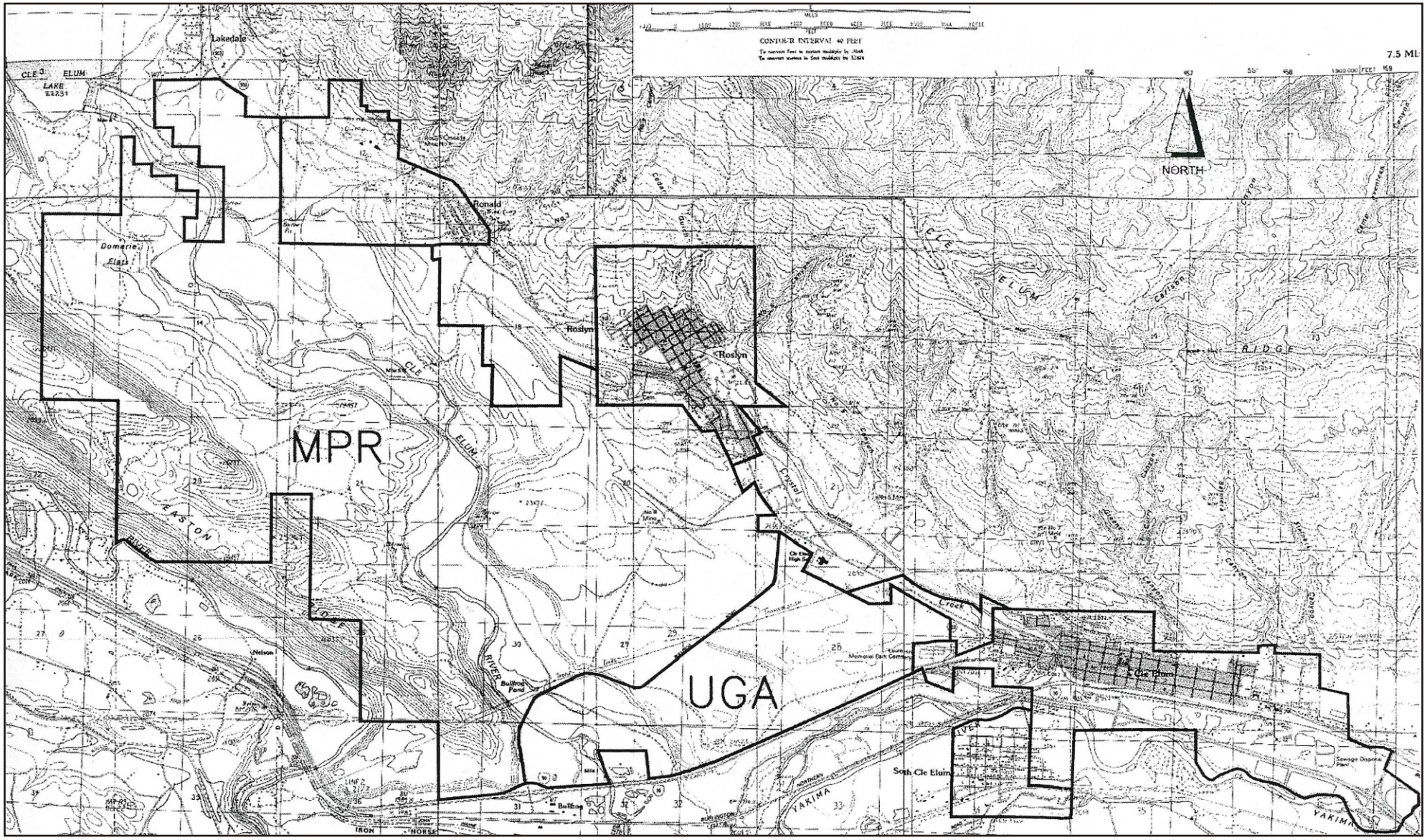


Figure 2.2-1. Cle Elum regional sewage facilities service area (Earth Tech 2002).
MPR = Trendwest Master Planned Resort
UGA = Urban Growth Area

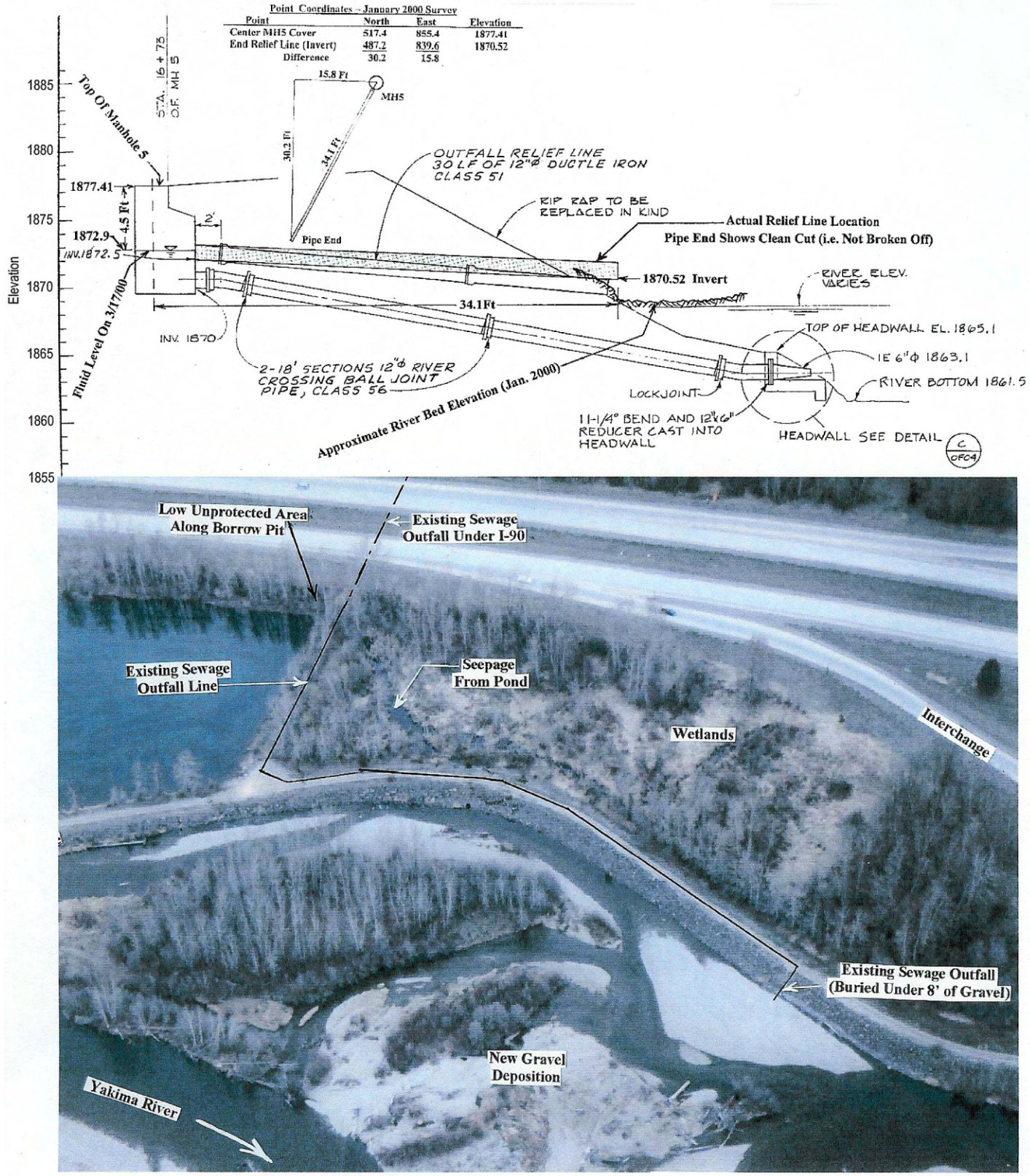


Figure 2.2-2. Original and existing Cle Elum wastewater treatment plant outfall.
Panel 1 (top): River discharge profile showing bed elevation differences after construction.
Panel 2 (bottom): Oblique aerial photograph of the existing wastewater treatment plant outfall buried under 8 feet of gravel.

Source: Reichmuth et al. 2002

Figure 2.2-3. North bank of the Yakima River near the armored dike protecting I-90 and the Hanson Ponds, and across the river through the proposed rock drop location (photographs taken September 27, 2002).
Panel 1 and 2 (top): North bank of the Yakima River where the bank is being eroded by riverine processes.
Panel 3 (bottom): Gravel bar/island near the south bank of the Yakima River upstream of the proposed rock drop alignment.

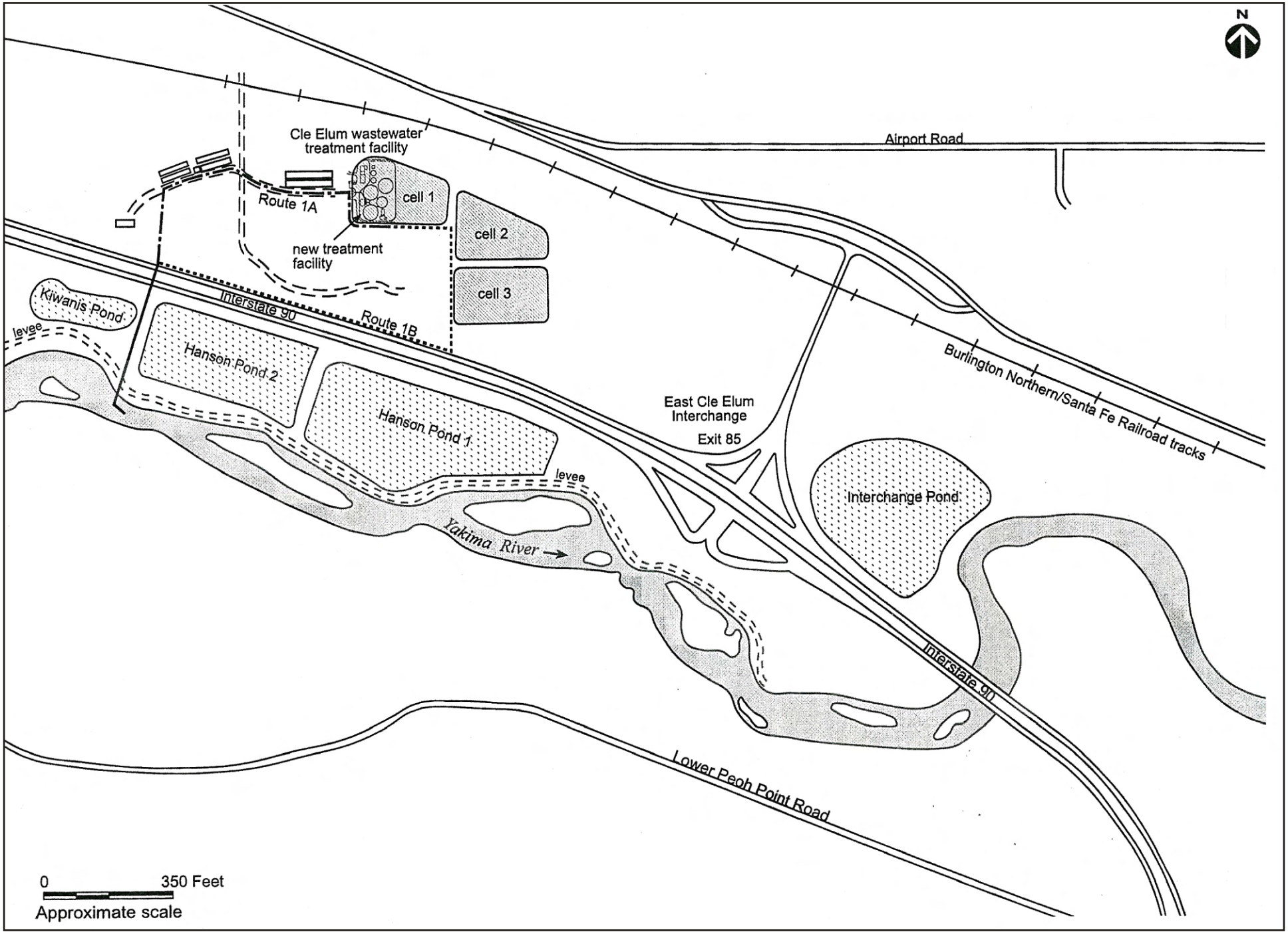


Figure 2.2-4. Alternative north bank upland alignment routes for the replacement wastewater treatment plant outfall pipeline (Cle Elum 2002).

The existing (buried) outfall and exposed DIP relief lines are located in a channel migration zone (cmz) of the Yakima River. The Yakima River channel within the action area was manipulated by WSDOT in the late 1960s to shift the river to the south during the construction of I-90. At the location of the existing outfall, the manipulated channel is wider than the natural channel of the river, with the result that low flows have insufficient velocity to carry bedload material (i.e., gravel-sized and larger sediments). The channel migration characteristics in this portion of the Yakima River cause rapid changes in bed morphology that are unpredictable and unstable. The cmz characteristics of the reach encompassing the existing outfall are ultimately the result of the river's bedload deposition rates exceeding transport rates within the reach. These cmz characteristics are naturally encouraged by a slightly lower gradient near the existing outfall than that which occurs in other portions of the action area. Channel migration within this reach is also encouraged by higher than normal gravel transport rates from upstream, where WSDOT dikes and other armoring has bracketed and constricted the channel, increasing stream velocities that impinge along the north bank (Figures 2.2-5 & 2.2-6).

The objective of the Hanson Ponds Restoration/Enhancement Project is to restore side channel rearing habitat for native and hatchery-reared salmonids by providing unobstructed and consistent flows from the Yakima River into the ponds and their natural outlet channel. The Yakama Nation has applied to the Bonneville Power Administration (BPA) for funds to acquire the Hanson Ponds from the City of Cle Elum to satisfy this objective. The BPA funds property acquisitions and other habitat enhancement measures as mitigation for the loss of fish and wildlife habitat caused by their development and operation of the Columbia River Power System. The restoration of side channel habitat ranks highly in the overall salmon recovery strategy for the Yakima River (Entrix 2001), largely because such habitat is considered very limited in the watershed (WCC 2000). A rock drop positioned at RM 181.2 has been identified as the most secure means to create a stable connection into the ponds (Reichmuth et al. 2002), while at the same time restoring bank stability along this unstable reach of the river. North bank instability is of concern to WSDOT and the City of Cle Elum, for the protection of I-90, a rock drop at RM 181.2 could also provide physical protection for the treated wastewater outfall at the preferred outfall alignment location. Wastewater discharged into the scour pool created by the rock drop would be vertically mixed nearly instantly, a condition unachievable at the other alternative outfall locations considered by the City of Cle Elum (Cosmopolitan 2002). Thus, the City of Cle Elum, the Washington State Department of Transportation (WSDOT), and the Yakama Nation are joint sponsors of the rock drop stabilization structure evaluated in this BE.

Funds for the design and construction of the ponds' restoration and enhancement have already been secured through grant moneys dispersed through NOAA's Coastal Salmon Fund program (S. Nicolai, Yakama Nation, personal communication 11/12/02). However, the availability of BPA mitigation funds to the Yakama Nation for the acquisition of the Hanson Ponds property may lag the City of Cle Elum's schedule for proceeding with the RSP outfall replacement project by up to one year. If BPA funds to purchase the Hanson Ponds property have not been fully secured by the Yakama Nation at the time permit applications are submitted, the City will proceed with rock drop construction to accomplish the other purposes of this project element (i.e., to prevent dike breach and flood damage, and to provide a stable location and optimum mixing zone for the City's wastewater treatment plant outfall). The rock drop will be constructed in a manner that will enable the Yakama Nation to modify the structure for the Hanson Ponds inlet, when they are prepared to proceed in the near future.

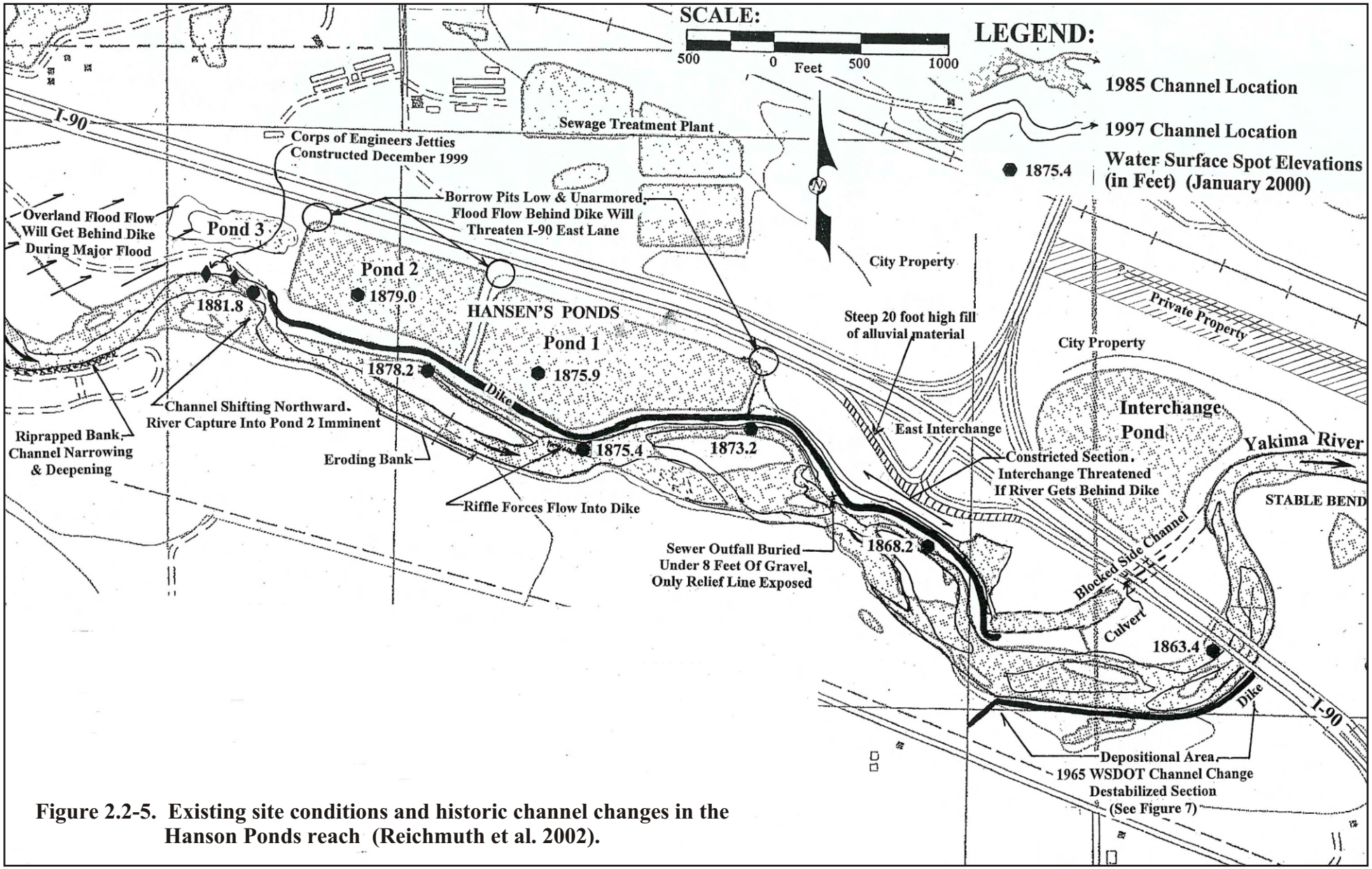


Figure 2.2-5. Existing site conditions and historic channel changes in the Hanson Ponds reach (Reichmuth et al. 2002).

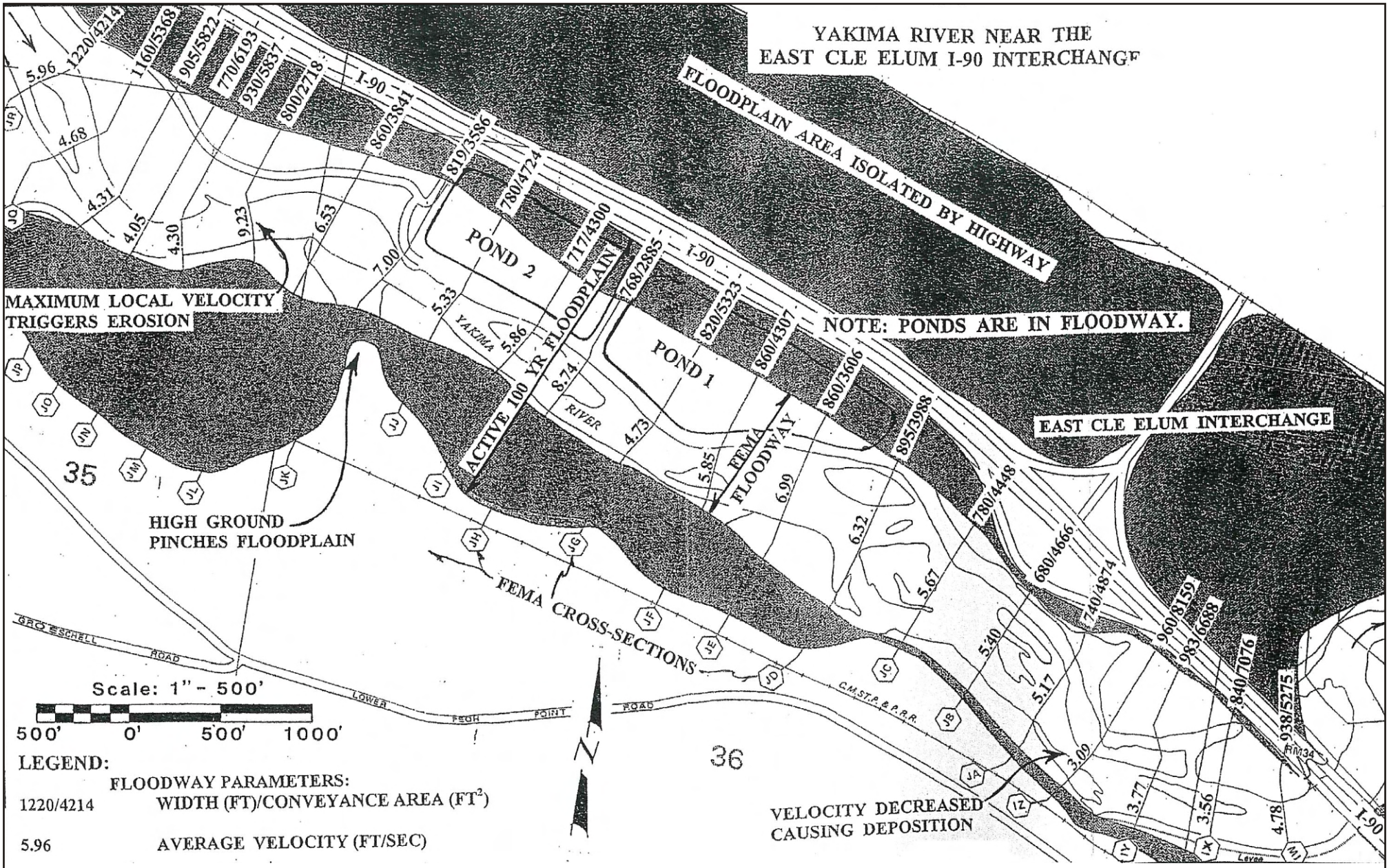


Figure 2.2-6. Velocity distribution along the Yakima River within the action area (Reichmuth et al. 2002).

2.2.2 WASTEWATER TREATMENT OUTFALL RELOCATION

Relocating the outfall will involve trenching and filling for pipeline placement through uplands, and rock fill for securing the outfall nozzle in the boat notch of the rock drop (Figure 2.1-2). The replacement outfall will be a 24-in diameter ductile iron pipeline with a 16-inch diameter nozzle. No trenching will be required in the river for placement of outfall nozzle. The following discussion provides an overview of the habitat affected by the outfall realignment. A more detailed discussion of the habitat inventories conducted in the project area is provided in Section 4.0.

Upland and Wetland Habitat Along Preferred Outfall Alignment

Construction and alignment of the pipeline for the outfall between the treatment plant and the Yakima River will disturb a band of (primarily) upland habitat approximately 50 feet wide. There are currently two upland alignment routes (i.e., 1a and 1b) under consideration for the pipeline to connect to the relocated outfall. (Table 2.2-1). Both alignment routes initiate from sewage lagoon Cell 1, and both follow the same alignment to the river after crossing under (to the south side of) I-90 (Figure 2.2-4). Route 1a runs from Cell 1 along the north side of the WSDOT I-90 right-of-way (ROW), crossing under I-90, and extending south along the berm that forms the western side of Hanson Pond No. 2. Route 1b runs along the berm that forms the western sides of lagoon Cells 2 and 3, then south from the southwestern corner of Cell 3 to the I-90 ROW.

All five wetland communities previously delineated on the north bank of the Yakima River, near wastewater treatment lagoon Cells 1, 2, and 3, would be avoided with route 1a of the preferred alignment (*see* Deubendorfer 2000 *in* Cle Elum 2002) Route 1b would traverse approximately 125 feet of wetlands between Cell 3 and the I-90 ROW. The estimated loss to palustrine wetland habitat with route 1b is approximately 0.14 acre (Cle Elum 2002). The City prefers route 1a because it creates no wetlands impact, less upland habitat impact, and requires less pipe.

The outfall alignment between I-90 and the Yakima River, for both options, would be constructed within currently disturbed upland habitat that contains imported gravels for road grade, and a plant community grossly characterized as exhibiting low diversity (Figure 2.2-7). A preliminary wetlands survey conducted for the Yakama Nation by Sheldon & Associates (Kim Harper, personal communication, 9/24/02) identified a small, 160 square foot palustrine emergent wetland at the northwestern corner of Hanson Pond No. 2 that could be affected by the alignment (Figure 2.1-2). Upland vegetation observed south of I-90 in the upland area that may be disturbed by the outfall alignment includes: hawthorn berry (*Crateagus douglasii)*, reed canary grass (*Phalaris arundinacea*), wild asparagus (*Asparagus oficinalis*), cattail (*Typha elephantina*), red osier dogwood (*Cornus stolonifera*), sage (*Salvia officinalis*), brier, ponderosa pine (*Pinus ponderosa*), snowberry (*Symphoricarpus albos*), red elderberry (*Sambucus racemosa*), Oregon grape (*Mahonia aquifolium*), bald hip rose (*Rosa gymnocarpa*), and a variety of upland grasses (Entrix 2002).

Table 2.2-1. Clearing and/or disturbance of upland and wetlands habitat for outfall relocation alignment, from wastewater treatment Cell 1 through the Yakima River (Cle Elum 2002).

Alignment Route for Outfall Relocation	Alignment Distance from Cell 1 to I-90 (feet)	Upland Area Disturbance from Cell 1 to I-90 (acres)*	Wetland Area Disturbance from Cell 1 to I-90 (acres)	Alignment Distance from I-90 to Yakima River (feet)	Area of Disturbance from I-90 to Yakima River (acres)*	South Bank Wetland Area Disturbance From Mainstem Rock Drop and Gravel Bar Scraping (acres)
Route 1a	400	0.46	0	800	0.92	0.48
Route 1b	1,900	2.20	0.14	800	0.92	0.48

*Based on a 50-foot-wide area of construction disturbance.

Construction of the rock drop key through the south bank of the Yakima River will also fill or otherwise disturb a narrow, 130 ft-long band of riparian, wetland and upland habitat (Figure 2.2-8). In addition, the preliminary project concept calls for the removal of approximately 1,000 cubic yards of gravel from the vegetated gravel bar immediately upstream of the proposed rock drop location (Figure 2.1-2), in order to direct the flow of the river across the center of the rock drop. A wetland delineation of the south bank and gravel bar that will be disrupted by the rock drop was conducted in early September 2002. The wetland community in these areas to be impacted by the rock drop is a composite of riverine and palustrine wetlands (Attachment 3). Riverine wetlands are freshwater areas with hydrophytic vegetation, hydric soils and consistent annual hydrology (flooding) provided by a fluvial system, whereas palustrine wetlands are considered those wetland areas isolated from fluvial, lacustrine, or marine surface water hydrology (USACOE 2000). The vegetated gravel bar upstream of the proposed rock drop that would be scraped to a depth of approximately 1-ft, although lacking in hydric soils, constitutes riverine wetland (Attachment 3). The areas along the south bank of the Yakima River that would be filled with rock from the rock drop exhibit both riparian wetland characteristics immediately adjacent to the river, and palustrine characteristics as the alignment proceeds up through the south bank into upland habitat. The preliminary wetland impact of the rock drop along the south bank was estimated at approximately 6,900 square feet. The impact to the vegetated gravel bars was estimated at approximately 13,800 square feet. Thus, the total wetland impact from the rock drop in the south half of the channel is conservatively estimated at approximately 20,700 square feet (0.48 acres).

Figure 2.2-7. North bank upland and riparian habitat along the proposed outfall alignment.
Panel 1 (top left): View downstream along the north bank through the riffle and lateral scour pool that would be bisected by the rock drop. The truck is positioned at point where rock drop would cross the river, extending to the right (south).
Panel 2 (top right): North shoreline (bankfull width) along run habitat immediately downstream of existing scour pool.
Panel 3 (bottom): Disturbed upland habitat through which the outfall alignment would travel. Precise alignment likely along the right edge of photograph.

Aquatic Habitat

Aquatic habitat in the Yakima River will be affected by the relocation of the City of Cle Elum's treated wastewater outfall, the construction of the mainstem rock drop for flood protection, and the Hanson Ponds Habitat Restoration/Enhancement. The aquatic habitat within the immediate project area and the broader action area varies in terms of substrate, bankfull width, stability, and productivity. Existing aquatic habitat within the project area affected specifically by the preferred outfall alignment is detailed in Section 4.4. Aquatic habitat along the other alternative alignments is described in Attachment 2.

2.2.3 MAINSTEM ROCK DROP CONSTRUCTION

As explained briefly in 2.2.1, the City of Cle Elum, the Yakama Nation and the WSDOT propose to construct a rock drop stabilization structure across the Yakima River and associated floodplain at an abrupt bend in the river channel at RM 181.2. The primary functions of the rock drop structure are to prevent flood damage, and to provide a foundation for a stable inlet structure (to be connected to the rock drop as part of the Hanson Ponds Restoration/Enhancement) that would direct waters from the Yakima River into the Hanson Ponds. A River Study conducted between January 2000 and January 2002 (Reichmuth et al. 2002) identified channel instability and bank erosion at an abrupt bend in the Yakima River near the southwest corner of Hanson Pond No. 2 (at RM 181.2). The erosion occurring in this reach is largely due to channel constrictions (rip-rap) along the south bank immediately upstream and the natural tendency for the river to move northward at this location (Figure 2.2.5). A 1980 Federal Emergency Management Agency (FEMA) study modeled the highest river velocities along this bend (Figure 2.2.6), and Geomax (Reichmuth et al. 2002) concluded that there is an imminent danger to nearby properties and I-90 infrastructure from velocity-driven bank erosion and the inherent channel instability. For this reason, the Washington State Department of Transportation (WSDOT) is also a project sponsor of the rock drop, in concert with the City of Cle Elum and the Yakama Nation. The construction of a rock drop at this location would stabilize the river channel and direct scouring energies in a southeasterly direction (i.e., away from the bend) in a controlled manner, thus minimizing risks to City of Cle Elum properties and I-90 infrastructure.

Figure 2.2-8. The south bank upland and riparian habitat along the proposed rock drop alignment (photographs taken Auguset, 2002).

In addition to its fundamental roles in providing flood damage protection to I-90, and flow control to the Hanson Ponds, the rock drop has been designed to:

- Maintain river navigability through the rock drop stabilization structure.
- Maintain fish passage through the rock drop stabilization structure.
- Minimize adverse environmental impacts during and after construction.
- Provide a stable and permanent structure for protection of the City's wastewater treatment plant outfall.

The maximum width of the rock drop (i.e., from the upstream to downstream end) within the river would be approximately 85 feet at the boat notch, and the average height would be 2 to 3 feet above the existing river bottom elevation (Figure 2.1-2). The boat notch would be centrally positioned in the rock drop structure. The in-river sections of the rock drop on either side of the boat notch would be approximately 25 feet in width. The wastewater treatment plant outfall would be constructed through the rock drop to discharge immediately downstream of the boat notch feature to diffuse treated wastewater into the mixing zone established in the NPDES permit (Figure 2.1-2). The turbulence of flow through the boat notch would create an optimum mixing zone for the treated effluent, resulting in near instantaneous mixing of effluent components.

Significant fill and gravel removal activities and alteration of channel characteristics will result from construction of the rock drop structure. Rock drop construction involves six sub-components: 1) cut bank repair, 2) in-stream pipe cover, 3) the north flank rock drop alignment, 4) south flank rock drop alignment, 5) the boat notch in mid-stream, and 6) the south bank key (Figure 2.1-2). Rock fill estimates provided in Table 2.2-2 for each of these components assume an average depth of rock of roughly 3 feet, which will raise the water surface elevation behind the rock drop approximately 1 foot over existing conditions (Reichmuth et al. 2002). No excavation of the river bottom is anticipated, and once the rocks are set, they will not extend above the water surface. An estimated 3,660 tons of rock are required for construction of the mainstem Yakima River rock drop. Approximately 1,000 cubic yards (cy) of gravel will be scraped from a gravel bar parallel to the south bank of the Yakima River, and upstream (adjacent to) the mainstem rock drop. This shallow excavation is required to direct water flow towards the center of the river and through the boat notch feature of the rock drop.

Table 2.2-2. Estimated rock quantities for construction of the mainstem Yakima River rock drop structure

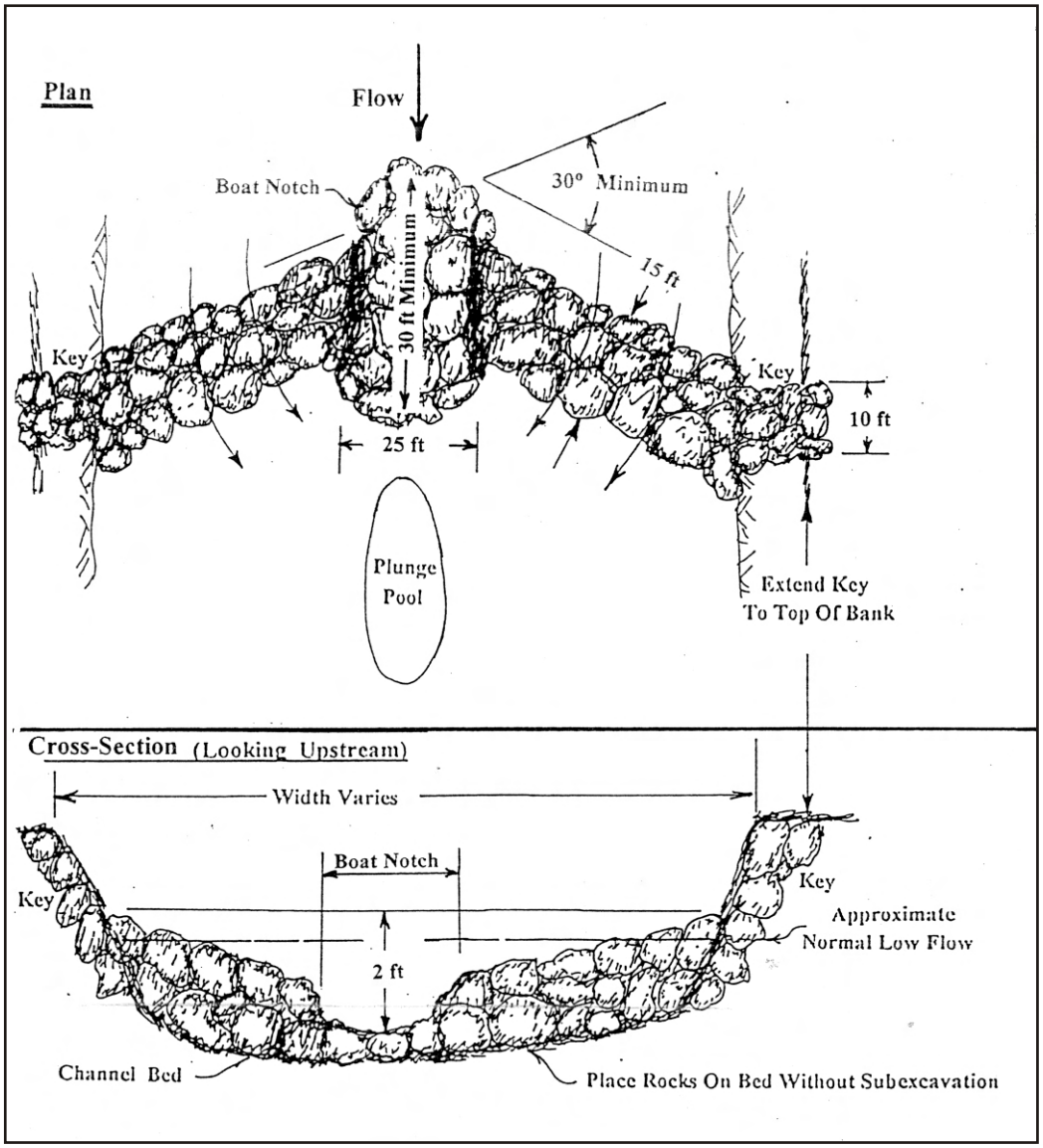
Description	Length (feet)	Unit Amount (tons/foot)	Total Amount (tons)
Cut Bank Repair	150	4	600
In-Stream Pipe Cover	150	2	300
North Flank Drop 3	70	10	700
Boat Notch	40	16	840
South Flank Drop 3	70	10	700
South Bank Key	130	4	520
TOTAL	480	na	3,660

Construction of the rock drop across the Yakima River will require the placement of large quarry (native) rock by an excavator across the alignment grade. The rocks will be placed one at a time, proceeding into the channel from a landward position. Figure 2.2-9 outlines the sequence of steps required for installation, typical of a mid-size rock drop. Photographic representation of a similar rock drop installation on the Yakima River in Cle Elum is provided in Figure 2.2-10. Equipment used for construction will primarily operate on rock "platforms" created by the progressive development of the rock drop so that it remains mostly within the wetted perimeter of the river during construction. Thus, the rocks will be placed in steps moving away from the shoreline, providing a working platform that slowly and sequentially extends across the river from each side.

In-water construction for the Yakima River rock drop, including the outfall placement, is not anticipated to require longer than two weeks (D. Reichmuth, Geomax, personal communication). Timing for in-water work would occur between mid-October and mid-November to avoid active migration periods for ESA-listed and non-listed salmonid species. Spring chinook, which actively spawn in abundance in the action area, will have completed their spawning by late September. Thus, eggs in the gravel from the relatively recent spawning will have developed beyond the period of sensitivity to physical shock. Sub-elements of the mainstem Yakima River rock drop outlined in Table 2.2-2 are described in greater detail below.

Cut Bank Repair

The north bank of the Yakima River, along the WSDOT dike, has experienced substantial erosion. To restabilize this section of the river, and position the rock drop along a stable bank, Geomax proposes to use approximately 600 tons of rock for the 150-foot section of the shoreline (Table 2.2-2). As demonstrated in Figure 2.2-3, the riparian habitat in this area is currently lined with riprap, previously placed by the USACOE for flood control protection. The riparian zone along this section of the reach is not properly functioning to provide shade, instream cover, or terrestrial contributions of organic matter. The cut bank repairs will not alter the existing biological functions of the riparian zone at this location.



Note:
On small Rock Drops (such as in the rock drops for Hanson Ponds) boat passage often is not required so the Boat Notch can be omitted. However, it may be desirable to provide a Small Notch to concentrate low flow in smaller Rock Drops.

Figure 2.2-9. Proposed construction sequence for the rock drop and boat notch structures for the Cle Elum RSP outfall alignment Reichmuth et al. 2002).

Detailed Rock Drop Construction Sequence

Sequence for Drop Structures

Placement of rock in an active channel shall normally follow the sequence listed below:

1. Excavate the keyway or sill in the farthest bank from the rock stockpile. Maintain a berm at the water's edge and deposit the spoils out of the water to protect the water quality.

2. Place structural rock and willow cuttings in the far key and backfill void with finer material that will promote vegetative growth.

3. Place rock along the specified alignment without subexcavation if possible. Begin at the far key and proceed across the channel no more than three-quarters (3/4) of the stream width. If necessary, use the partially completed structure as a work platform to avoid excessively deep water.

4. Excavate keyway in the near bank following instructions in Step No. 1 and then repeat Step No. 2.

5. Place rock along the specified alignment beginning at the near key and extend structure to meet and mesh with the previously placed rock.

6. Complete the installation by dressing up the key areas and upper banks.

When rock can be stockpiled near both ends of the Drop (at Rock Drop 4 for example), the order of keyway construction will normally depend on using the sequence that minimizes in-water activity and water quality disturbance. In the case of Rock Drop 4, the south keyway would be considered the far keyway in the above discussion.

The following instructions may be altered if bed or bank scouring will not occur when the channel is constricted during construction.

Figure 2.2-10. Construction of a rock drop structure similar to that proposed for the Cle Elum RSP outfall alignment.
Panel 1 (top left): Excavation and progression of rock drop across the Yakima River.
Panel 2 (center): Isolation of a section of the Yakima River to avoid the active channel.
Panel 3 (top right): Excavation of gravel island to provide river flow across the channel.
Panel 4 (bottom left): Working platform for rock drop construction.
Panel 5 (bottom right): Excavation of bank for bank key structure.

North and South Flank Rock Drop Alignments

The north and south flanks of the rock drop, each approximately 70 ft in length, will provide stabilization to the in-stream structures. They will be constructed with a thickness of two rocks, yielding a water surface differential of approximately 1 foot above the existing water surface elevation. The width of the flanks from upstream to downstream will be approximately 25 ft. Flows will be concentrated towards the scour hole of the boat notch by the placement of rocks on the north and south flanks.

Boat Notch

A boat notch will be constructed at the mid-channel location of the rock drop structure to ensure passage for recreational boats, and to ensure that the City's outfall is submerged under all flow conditions. A similar boat notch design was used in a rock drop constructed immediately downstream of the South Cle Elum bridge in the fall of 2000 (Figure 2.2-9). The proposed boat notch design will provide a mid-channel (i.e., north to south) gap of approximately 40 feet for the passage of boaters. The "wings" on each side of the notch will concentrate water through the center. This design will create turbulence below the boat notch, yielding a highly abbreviated mixing zone required for effluent dilution (Cosmopolitan 2002).

South Bank Key

The south bank key is necessary to prevent the rock drop structure from being by-passed by end failure during high flow conditions (Reichmuth et al. 2002). The south bank key of the rock drop will extend through the riparian zone and up to the floodplain boundary, a combined length of approximately 130 feet (Table 2.2-2). The south bank key will be similar in construction to the north and south flanks. However, minor excavation will be required initially to establish a trench for the rock placement through the south bank. The proposal is to construct the south bank key before the other elements of the rock drop, and to progress construction across the channel from this structure.

2.2.4 HANSON PONDS HABITAT RESTORATION/ENHANCEMENT

The Hanson Ponds were formed from abandoned concrete aggregate mining pits on the Yakima River floodplain after 1963, when coal mining ended in Kittitas County. In 1965, they were used for borrow pits during construction of the I-90 embankments (Cle Elum-Roslyn COC 2002; Reichmuth et al. 2002). Groundwater inundated the two main 10-foot-deep abandoned pits, and WDFW created suitable habitat in the ponds for a put-and-take rainbow trout fishery. Hanson Pond No. 1, the downstream pond, is located between the north shoreline of the Yakima River and I-90, directly south of the Cle Elum wastewater treatment lagoons that are on the north side of I-90. Hanson Pond No. 2 is directly west of Pond No. 1 (Figure 2.2-11). The surface area of Hanson Pond No. 1 is approximately 20 acres, and of Hanson Pond No. 2 (the upstream pond) approximately 12 acres (Figure 2.2-12). The ponds are separated from the Yakima River by an armored dike that extends the complete length of the ponds along the north bank of the river (Figure 2.2-11). The Hanson Ponds are currently owned by the City of Cle Elum, stocked with trout by WDFW, and operated by the City as recreational fishing and picnicking sites.

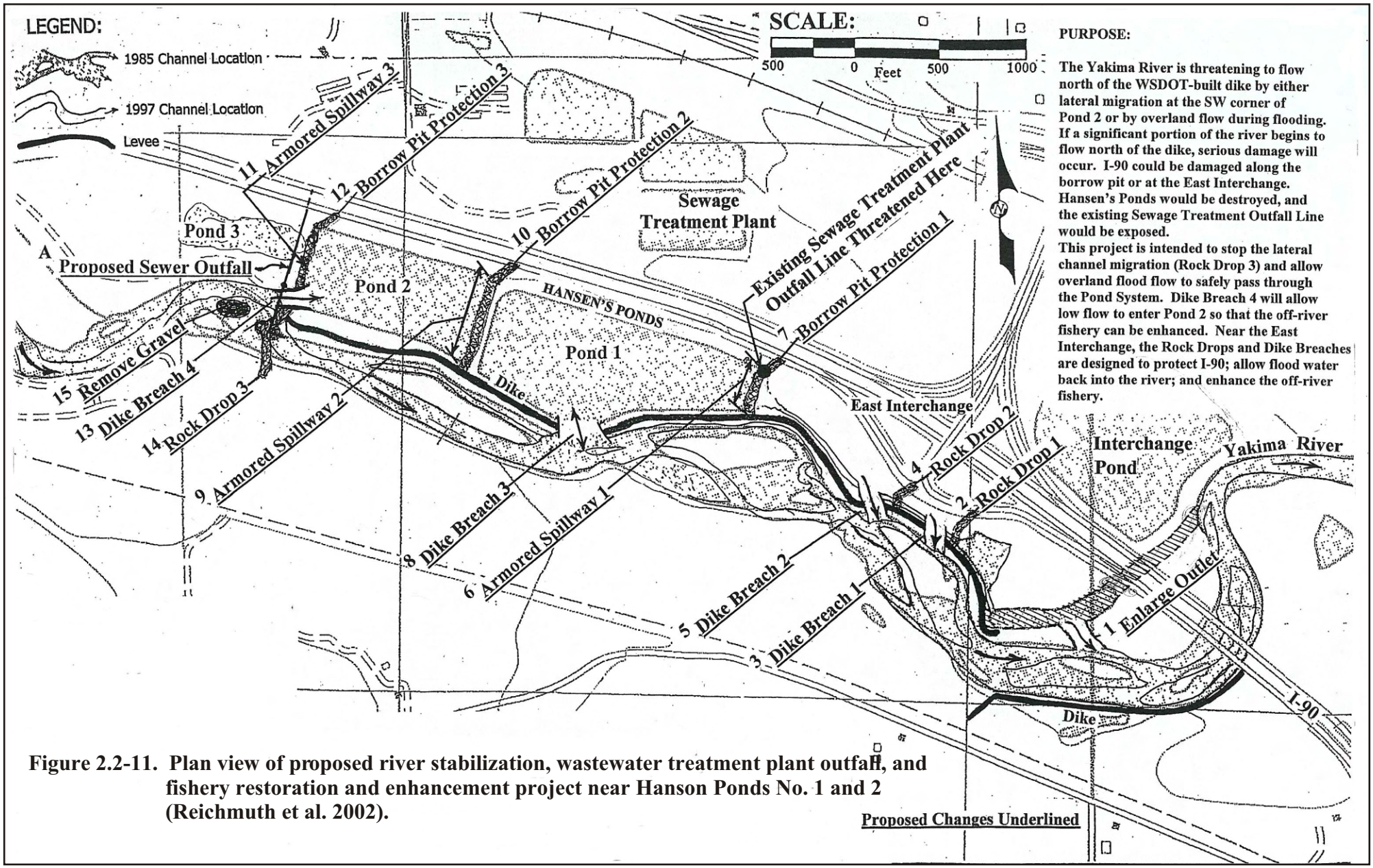


Figure 2.2-11. Plan view of proposed river stabilization, wastewater treatment plant outfall, and fishery restoration and enhancement project near Hanson Ponds No. 1 and 2 (Reichmuth et al. 2002).

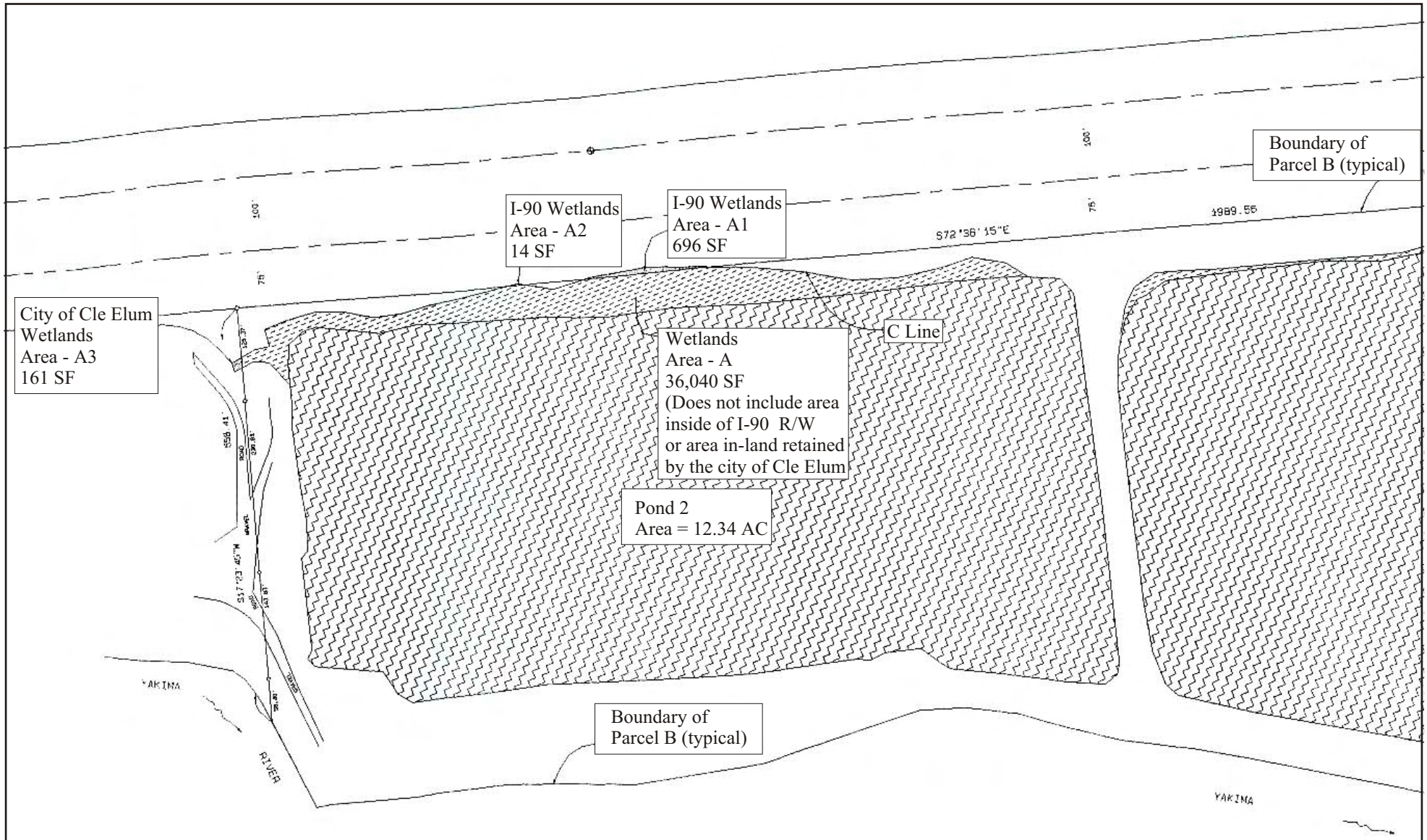
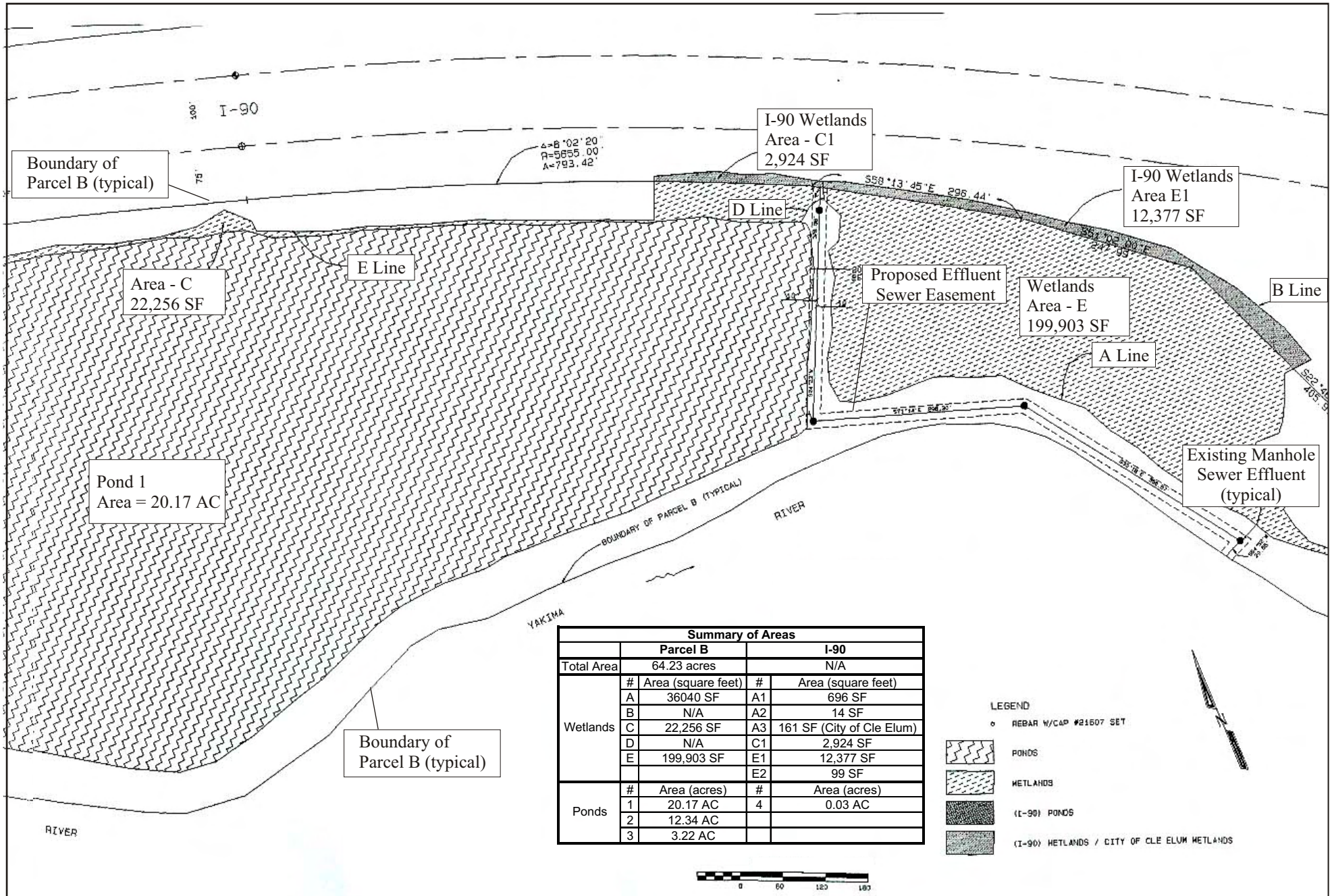


Figure 2.2-12a. Wetland delineation for the Hanson Ponds and I-90 wetlands.



Summary of Areas				
	Parcel B		I-90	
Total Area	64.23 acres		N/A	
Wetlands	#	Area (square feet)	#	Area (square feet)
	A	36040 SF	A1	696 SF
	B	N/A	A2	14 SF
	C	22,256 SF	A3	161 SF (City of Cle Elum)
	D	N/A	C1	2,924 SF
	E	199,903 SF	E1	12,377 SF
			E2	99 SF
Ponds	#	Area (acres)	#	Area (acres)
	1	20.17 AC	4	0.03 AC
	2	12.34 AC		
	3	3.22 AC		

Figure 2.2-12b. Wetland delineation for the Hanson Ponds and I-90 wetlands.

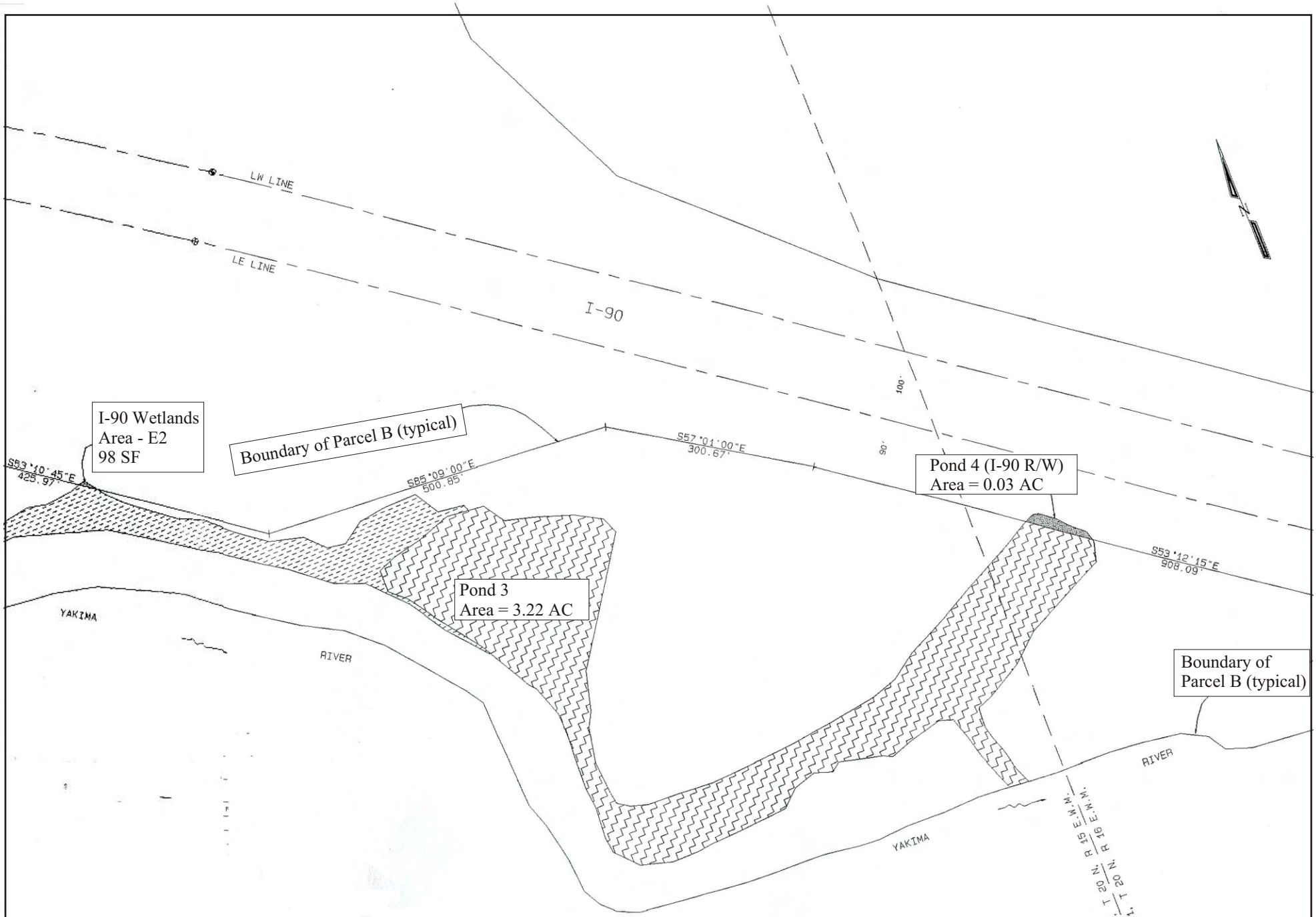


Figure 2.2-12c. Wetland delineation for the Hanson Ponds and I-90 wetlands.

As explained in section 2.2.1, the Yakama Nation has applied to the Bonneville Power Administration (BPA) for funds to acquire the Hanson Ponds from the City of Cle Elum. The Yakama Nation proposes to restore and enhance the aquatic and riparian habitat functions of the Hanson Ponds by providing a surface water connection and anadromous fish access into the ponds from the Yakima River. These actions will particularly benefit juvenile salmonids by providing low-gradient side channel rearing habitat available year around. After the outlet channel of the ponds is naturally flushed clean of accumulated sediments, it is possible that conditions suitable for spawning may also develop. Should such conditions develop naturally, they will most likely benefit coho salmon and steelhead trout, species more likely to use shallower waters for spawning than the spring chinook that are currently dominant in the action area. Ultimately, the project will result in the formation of a mosaic of pond and side channel habitats that will likely support multiple salmonid species and life history stages in the upper Yakima River.

Without intervention such as the mainstem rock drop described in Section 2.2.3, the Yakima River could potentially breach the dike during high flow conditions, inundate the Hanson Ponds in an uncontrolled manner creating a potential fish entrapment condition, and erode the unarmored embankments supporting the eastbound lanes of I-90. Should the dike along north bank be over-topped by a 100-year flood event (a condition distinct from the Hanson Ponds and interstate flooding that could occur from a lesser-flood flow dike breaching event), overland sheet flow would occur. Without some of the additional Hanson Ponds restoration elements described in this section, such overland flow could result in progressive headcutting up the channel created through and between the ponds. The discussion in this section describes the specific project elements for the Hanson Ponds' water exchange with the Yakima River, and for the associated habitat enhancement and 100-year flood protection needs inherent to the restoration plan.

Water Exchange Design Through Hanson Ponds and Related Restoration Components

Establishing functional salmonid rearing habitat *within* the Hanson Ponds and protecting against erosion and head-cutting caused by a potential 100-year flood, will involve the following design elements briefly summarized below, and cross-referenced spatially in Figure 2.2-11.

- Constructing a pond inlet channel associated with the Yakima River rock drop
- Breaching the dike in two or three locations to provide flood water conveyance from the ponds during high flows back to the Yakima River
- Constructing a channel between Hanson Pond No. 1 and Pond No. 2.
- Constructing grade control structures in the outlet of the ponds leading to the outlet channel
- Constructing rock drops to facilitate flood flow conveyance through associated dike breaches and to reduce erosive energies potentially impinging on the I-90 east bound lanes and east interchange (Exit 85).

<u>Hanson Ponds Inlet Channel</u>

To provide a surface water connection from the Yakima River into the Hanson Ponds, a 150-foot-long pond inlet channel is proposed at the southwest corner of Pond No. 2, Figure 2.1-2). A jetty hook would be constructed at the inlet channel's entrance, in the Yakima River, to provide

directed scouring at the inlet opening to retard debris and sediment accumulation. Geomax (Reichmuth et al. 2002) estimates that the pond inlet channel would direct approximately 10 percent of the river's discharge into the Hanson Ponds at base flow. As demonstrated in Table 2.1-1, 10 percent of base flows between 1990 and 2001 ranged between 21 and 56 cfs. As envisioned, only the dimensions of the rock-lined open channel would regulate flow through the inlet channel.

Final designs for the inlet channel have not been prepared, but cross-sectional dimensions should approximate a trapezoid, with 1.5H:1V side slopes and a channel bottom width of approximately 10 feet (D. Reichmuth, Geomax, personal communication to J. Fisher, 9/18/02). Given these dimensions, modeled peak discharges for the Yakima River (Table 2.2-34), and project area topographic survey data (displayed in limited fashion in Figure 2.2-5), estimates of peak flows conveyed into the Hanson Ponds can be generated. Under ordinary non-flood, bankfull conditions such as experienced during a typical regulated flow release, the water surface elevation would be approximately 1 to 2 feet below the dike crest (estimated water elevation 1884.5 feet). The unconstrained flow through the Hanson Ponds inlet channel under these bankfull conditions would approximate 250 to 350 cfs, varying with the channel velocity and the exact hydraulic head differential between the river and Pond No. 2. During a 100-year flood event the discharge into the Hanson Ponds through the inlet channel alone could approximate between 500 and 600 cfs, but overland flows must also be added to this flow estimate under such extreme conditions. Total flows into the ponds could range from approximately 2,000 to 2,500 cfs during a 100-year flood event. These estimates must be considered preliminary, but have been offered within a broad enough range to represent realistic flow expectations given design constraints and the historic hydrograph in the project area during a 100-year flood event.

Table 2.2-3 Modeled peak discharges (cfs) in the Yakima River upstream of Crystal Creek (FEMA 1980).

Drainage Area (sq. miles)	10-Year Peak Discharge	50-Year Peak Discharge	100-Year Peak Discharge	500-Year Peak Discharge
495	14,500	21,400	24,700	33,800

Dike Breaching for Flood Water Conveyance and Habitat Access

Excluding the inlet channel described above, a total of three breaches in the existing dike infrastructure along the north bank of the Yakima River are envisioned to facilitate flows through the Hanson Ponds (Figure 2.2-11). Dike breaching can enhance both the off-channel fishery habitat for rearing and potential salmonid spawning by facilitating access into side channel habitats at multiple locations. However, dike breaching is most important to the Hanson Ponds plan for ensuring that flood flows can be conveyed out of the area and back to the river when such flood conditions prevail. The three dike breaches associated with Pond No. 1 and the outlet channel are designed to serve related, but distinct functions. The unique benefits and concerns of each of these breaches are summarized in Table 2.2-4. Dike breach 1 may be omitted from the final design if conveyance requirements can be accommodated with dike breaches 2 and 3 alone.

Table 2.2-4. Benefits and concerns associated with dike breaching for the Hanson Ponds restoration/enhancement project (see Figure 2.2-11).

Dike Breach	Location	Benefits	Concerns
1	Just before the bend at the I-90 Bridge (Exit 85).	Protect I-90 and allow floodwater to return to the river. Potentially increase spawning habitat in action area by creating conditions in an outlet side channel suitable for spawning. Change from existing lacustrine conditions to fluvial habitat will discourage use of area by non-native brook trout (currently in residence) and encourage native salmonid use.	Minor potential for scouring of unvegetated gravel bar island in mainstem Yakima River at return point. Small loss of riparian vegetationfrom dike breaching, principally along side channel corridor. However, this existing vegetation is embedded within existing rip-rap already..
2	Near the wetlands downstream of Pond No. 1.	Protect I-90 and allow floodwater to return to the river. Provide fish access into the upper reaches of the existing side channel through which waters from Pond No. 1 will be conveyed (Exit 85).	In location represented in Figure 2.2-11, return flows to Yakima River have potential to scour upstream end of gravel bar island. Potential riverine wetland impacts on this island will need to be clarified. Shifting breach upstream could minimize wetlands impacts substantially.
3	Near the center of Pond No. 1.	Allow a major portion of the overland flows under flood conditions to re-enter the Yakima River upstream of the constriction at the I-90 interchange.	Final elevation of this dike breach will control flows to the egress channel of Pond #1. Therefore, design elevation must be higher than the egress channel outlet to ensure that this breach does not convey waters during low flow, otherwise the egress channel habitat downstream of Pond #1 could be dewatered.
4	Pond 2 inlet channel from Yakima River	Provide a continuous source of water to circulate through the pond system to improve salmonid rearing habitat.	Action will eliminate the put-and-take trout fishery utility of the Hanson Ponds that currently exists. Provides direct connectivity between the Yakima River and areas closer to the I-90 embankment fill.

Rock Drop Grade Controls

Rock drop grade control structures with rock sizes approximately 2.5 to 3 feet in diameter are proposed at one or two locations across the ponds' outlet channel (Figure 2.2-11). These rock drops are necessary to convey flood flows away from I-90 and back to the mainstem Yakima River, and to control the vertical gradient of the outlet channel to facilitate fish passage and use. Where pictured in Figure 2.2-11, the two rock drop grade control structures will protect the I-90 east interchange (Exit 85) by preventing erosion of the bank fill upon which the interstate is constructed. Recent (draft) wetland delineation survey data developed by Sheldon and Associates (*see* Figure 2.2-12), and acquired after the conceptual development of Figure 2.2-11, indicates that some upstream shifting of the proposed locations for the proposed "dike breaches 1 and 2" would be possible and prudent to minimize wetland impacts. It is also possible that dike breach 1 may be eliminated entirely from the final design by enlarging dike breach 2. The decision as to whether a single dike breach will suffice will depend on the hydraulic limitations of the egress channel. If a single dike breach is used, it must be large enough to prevent flood flows from eroding I-90 bank fill by the east interchange. Additional hydraulic analysis of the

egress channel will be conducted by a Yakama Nation contractor prior to construction to determine if a single breach will be adequate. For this current BE submittal, however, the more conservative assessment of impacts from the two dike breaches pictured in Figure 2.2-11 is considered. Agencies will be informed of any and all design changes well in advance of construction to provide time for consultation as necessary.

Armored Spillways and Borrow Pit Protection for Flow Conveyance and Erosion Protection Through Ponds

Armored spillways composed of riprap will be constructed at the berm between the ponds and at the outlet of Pond No. 1 to prevent headcutting and direct flows through the ponds (Figure 2.2-11). As depicted in Figure 2.2-11, there are three armored spillways envisioned for the Hanson Ponds, and each will extend north to stabilize the borrow pits along the southern embankments of I-90. The easternmost spillway, "Armored Spillway 1", will be composed of a lower and upper grade control that will stabilize the embankment at the east end of Hanson Pond No. 1 and facilitate grade transition to the existing egress channel (a head loss of 2 to 3 feet). The egress side channel presently conveys through wetland "E" (Figure 2.2-12), eventually connecting back to the Yakima River approximately 2,000 feet downstream after flowing through two more interconnected ponds (i.e., ponds '3' and '4' as pictured in Figure 2.2-12). Armored Spillway 2 will serve to protect the embankment between Hanson Ponds 1 and 2 and create grade control between these ponds. Armored Spillway 3 will be constructed to prevent the Yakima River from headcutting the west end of Pond No. 2 during a major flood event, keeping flows entering the ponds via the constructed inlet channel described previously. Final designs for these spillways are not developed. Utilizing the existing topography of the ponds, opportunities exist to utilize natural gradient changes by slightly lowering pond elevations, reducing spillway armoring at some or all of the proposed locations.

Pond and Egress Channel Habitat Enhancements

Rearing habitat improvements in the Hanson Ponds will be incorporated in the design by placing LWD at appropriate locations extending from and/or near the shoreline. Large woody debris may also be secured within the egress channel to improve habitat. As envisioned, fill removed from the gravel bar in the Yakima River for construction of the mainstem rock drop will be used to create vegetated gravel bars projecting into the ponds. These bars will increase the vegetated edge of the ponds to eventually provide more shade, and conditions more characteristic of fluvial habitat preferred by salmonids, as opposed to the lacustrine (lake-like) conditions that currently prevail. The LWD will be anchored within these "peninsulas" and they will be vigorously planted and monitored over the first five years. Detailed designs supporting these plans will be outlined in an addendum to this BA, when further developed. However, if the Yakama Nation has not secured funding for the acquisition of the ponds by the time the construction for the mainstem rock drop and outfall relocation are initiated, the City will still build the peninsulas within the ponds, as they will provide better fishing access to the ponds and improve fish habitat within the ponds regardless of whether or not they are connected to the Yakima River.

In addition to the focused pond and egress channel improvements, areas disturbed by the Hanson Ponds (and outfall relocation) project actions will also be revegetated (where practicable) with a variety of native trees and shrubs typical of the area. These may include: thinleaf alder (*Alnus incana*), serviceberry (*Amelanchier alnifolia*), water birch (*Betula occidentalis*), red osier dogwood (*Cornus stolonifera*), black or Douglas hawthorn (*Crataegus douglasii*), quaking aspen

(*Populus tremuloides*), black cottonwood (*Populus balsamifera* spp. *trichocarpa*), chokecherry (*Prunus virginiana*), willow (*Salix sp.*), Douglas fir (*Pseudotsuga menziesii*).

Access

Footbridges are considered desirable by the City at each of the dike breach locations depicted in Figure 2.2-11. These bridges would ensure that some recreational access to the ponds continues. Similar to the pond and egress channel habitat improvements, designs for the footbridges await final development. The incorporation of these footbridges into the design would require formal agreement with the Yakama Nation as part of the property acquisition.

Summary of Fill and Removal Activities for the Hanson Ponds Habitat Restoration/Enhancement

Table 2.2-5 summarizes the fill and removal activities required for each of the actions associated with the Hanson Ponds fisheries habitat restoration/enhancement project, as depicted in Figure 2.2-11.

Table 2.2-5. Project elements and fill activities associated with the Hanson Ponds habitat restoration/enhancement (project elements cross-referenced in Figure 2.2-11).

Project Element	Brief Description	Length (feet)	Rock Fill (tons)	Excavated Fill (cubic yards)
Existing Pond Outlet	Final location where pond flows will return to Yakima River. Existing 13-foot outlet could be enlarged to approximately 20 or 30 feet	150 feet	0	400
Rock Drop 1	Protects east interchange fill from bank erosion	150	600	
Dike Breach 1	Allows side channel to flow back to river below I-90 east interchange (Exit 85)	50	200	1200
Rock Drop 2	Protects I-90 east interchange (Exit 85) fill from bank erosion	180	720	
Dike Breach 2	Allows side channel to flow back to river just upstream of east interchange (Exit 85)	50	200	1200
Armored Spillway 1	Stabilizes embankment along eastern edge of Pond No. 1, requires two grade control structures			
lower grade control	as above	100	400	
upper grade control	as above	300	600	200
Borrow Pit Protection 1	Protects I-90 at eastern end of Pond No. 1	80	240	
Dike Breach 3	Allows flow equalization between Pond No. 1 and the Yakima River	50	200	1200
Armored Spillway 2	Protects embankment between Pond No. 1 and Pond No. 2	500	1000	200
Borrow Pit Protection 2	Protects 1-90 at eastern end of Pond No. 2	140	420	
Armored Spillway 3	Prevents Yakima River from breaking into the western end of Pond No. 2 during a major flood	350	1050	
Borrow Pit Protection 3	Protects I-90 at the western end of Pond No. 2	100	300	
Dike Breach 4 & Inlet Channel	Directs and controls flow from Yakima River into Pond No. 2	150	1800	3000
TOTAL			7,730	4,400

3.0 DESCRIPTION OF THE SPECIES AND HABITAT

There are three salmonid stocks, two avian species, three mammal species, and two plant species addressed in this BE that could potentially be affected by the project actions (Table 1.0-1). The following discussion provides information on each of these special-status species, their critical habitat as determined by the USFWS and NOAA-Fisheries, and their potential utilization of the action area.

3.1 BIRDS

3.1.1 BALD EAGLE

The bald eagle is a federally protected threatened species under petition to "delist". In Washington, courtship and nest-building activities generally begin in January and February. Egg laying begins in March or early April, with eaglets hatching between mid-April and early May. Eaglets usually fledge in mid-July and often remain in the vicinity of the nest for another month (Rodrick and Milner 1991).

Critical Habitat

The bald eagle is found along saltwater shorelines and the shorelines of freshwater lakes and rivers. In Washington, breeding territories are located in predominantly coniferous, uneven-aged forest stands with old-growth components (Anthony et al. 1982). Territory size and configuration are influenced by a variety of habitat characteristics including availability and location of perch trees for foraging, quality of foraging habitat, and distance between nests and waters supporting adequate food supplies (WDFW 1991). Steve Negri of WDFW (personal communication, 2000) indicated that habitat critical to urban forms of the bald eagle is generally an area approximately 250 feet from the shoreline, including foraging habitat, large trees for nesting and perching, and small trees for buffering.

The availability of suitable nest trees is often a limiting factor in the establishment of eagle territories. Federal timing restriction guidelines related to bald eagle nesting activities occur January 1 through August 15. Washington State timing restrictions occur February 1 through July 15.

Although bald eagles may occasionally fly over the action area, no bald eagle nesting, communal roosts, winter concentration areas, or regularly-used perch trees have been identified in the action area by the WDFW (Brookshire, J., personal communication, 2002). The closest nest documented is near the north end of Cle Elum Lake. Since the only known breeding territory close to the action area is 13.5 miles away, at Cle Elum Lake, and construction activities are planned for the fall, a timing restriction will probably not be needed for the outfall relocation and associated Hanson Ponds enhancement activities (Brookshire, J, WDFW, personal communication 2002). The increasing concentration of chinook spawning in the action area could be attractive to eagles and the occurrence of the species in the project and action areas during construction activities is certainly possible. At present, however, there is no bald eagle critical habitat identified within the action area.

3.1.2 NORTHERN SPOTTED OWL

The northern spotted owl is federally threatened under the ESA. An estimated 21 to 100 occurrences of the species have been documented in Washington State (WDNR 1997).

Critical Habitat

Spotted owls are cavity dwellers, inhabiting forests with large, tall, live trees often with broken tops, dwarf mistletoe, or platforms of branches capable of holding accumulated organic matter suitable for nesting. Tree stands where spotted owls are often found are multi-layered, and this forest structure is considered more important in determining the suitability of the habitat for the species than tree age. Such multi-age complexity is more common with old-growth forests; thus, old growth provides the attributes that owls prefer, but contrary to common understanding, the old growth itself is not an absolute necessity (DOI 1992a).

Forested habitat within the action area is dominated by relatively even-aged, low-density, second-growth Ponderosa pine. The action and project areas for the Cle Elum outfall relocation, rock drop, and Hanson Ponds restoration/enhancement projects do not lie within a northern spotted owl management circle. The low canopy closure does not provide suitable habitat for the spotted owl. The closest historic observation is to the southwest, on south Cle Elum Ridge (WSDOT 1998). Five nest territories have been recorded within approximately 5 miles of the action area in the Wenatchee National Forest (Fisher and McArthur 2000).

3.2 FISH

Spawning, rearing, and migrating salmonid species will be affected most by the timing of the project. Timing for the different life stages of the special-status salmonid species is provided in Table 3.2-1.

Table 3.2-1. Salmonid life histories within the Yakima River.

Species	Juvenile out-migration	Adult in-migration	Spawning Time	Time in freshwater	Time in marine
Bull Trout	Unknown in the Yakima (bull trout in action area presumed a resident, fluvial stock)	April - August	Late August - November	1-4 years (typically 2)	2-5 years
Chum Salmon	February - May	October - November	November - December	0	3-5 years
Spring-run Chinook Salmon	March to June	July - September	Late August- Early October	3 mo. to 1+ years	2-4 years
Coho Salmon	Pot. year around, but predom. March to June	September through November	October - December	1-2 years	1-3 years
Summer-run Yakima River Steelhead Trout	April - June	September - May	February - May	1-3 years	1-2 years

Source: Busby et al. 1996, McMichael et al. 1992, WDFW and WWTIT 1994 and NOAA-NMFS-NWFSC 2001.

3.2.1 BULL TROUT

The status and occurrence of anadromous populations of bull trout are subject to some scientific debate. Separation of anadromous bull trout from the closely related anadromous Dolly Varden char (*S. malma*) is difficult and can only be accomplished definitively by using electrophoretic techniques (Leary and Allendorf 1997). Yakima bull trout/Dolly Varden (native char) have been identified as a distinct stock based on their geographical distribution. Until further resolution is possible, the WDFW has made a decision to manage all upper Yakima River mainstem stocks as if they were a single native char complex with a fluvial life history (WDFW and WWTIT 1994).

Newly hatched anadromous native char emerge from the gravel in the spring. They typically spend two years in freshwater before they migrate to salt water, the mainstem of rivers, or reservoirs, although there are populations of bull trout that do not exhibit this behavior; these trout spend their entire lives in the same stretch of headwater stream. These fish may not mature until they are 7 or 8 years old and reach sizes greater than 14 inches in length (WDFW 1998).

Critical Habitat

The USFWS does not have sufficient information to determine critical habitat for bull trout at this time. As a result, USFWS has not yet designated critical habitat. Critical habitat for the Columbia basin population segment of bull trout is scheduled to be decided by October 2003 (USFWS 2002a). The historic and known distribution of bull trout within the Yakima basin is depicted in Figure 3.2-1. The WDFW recognizes nine bull trout stocks in the Yakima system, most of which are isolated to the upper river reservoir impoundments. Outmigrants from lakes Keechelus, Kachess and Cle Elum have the opportunity to utilize habitat in the action area considered in this BE. Passage restrictions at these reservoirs prevents such outmigrants from returning to these reservoirs, and life histories adopted by these fish require them to utilize mainstem habitats in the upper river. Migratory and resident forms of bull trout in the mainstem Yakima River can be assumed to use the project and action areas for rearing and migration. No data has been collected to date to document their direct presence in the project area. The species is assumed to primarily use the broader action area as a migratory corridor to spawning grounds in the upper basin. The deep scour pool through which the mainstem rock drop would be positioned could support this species for holding and rearing.

Abundance

The Yakima River population status of bull trout/native char is considered critical based on chronically low numbers of fish encounters (WDFW and WWTIT 1994, USFWS 1998). Native char inhabiting the upper Yakima River are believed to be fish that have outmigrated from the upper river tributaries as juveniles or were flushed out of upper river reservoirs during irrigation water releases as subadults (WDFW and WWTIT 1994). The upper mainstem Yakima River fluvial population is comprised of fish that inhabit the mainstem between Rosa Dam and the Cle Elum, Kachess, and Keechelus dams (Figure 3.2-1). Several (< 5) bull trout redds from the mainstem are also annually documented near Easton by WDFW (*as cited in* Entrix 2002). Isolated resident populations are recognized within the North Fork Teanaway River, Ahtanum Creek, Bumping Lake, Cle Elum Lake, Kachess Lake, and Keechelus Lake (USFWS 1998).

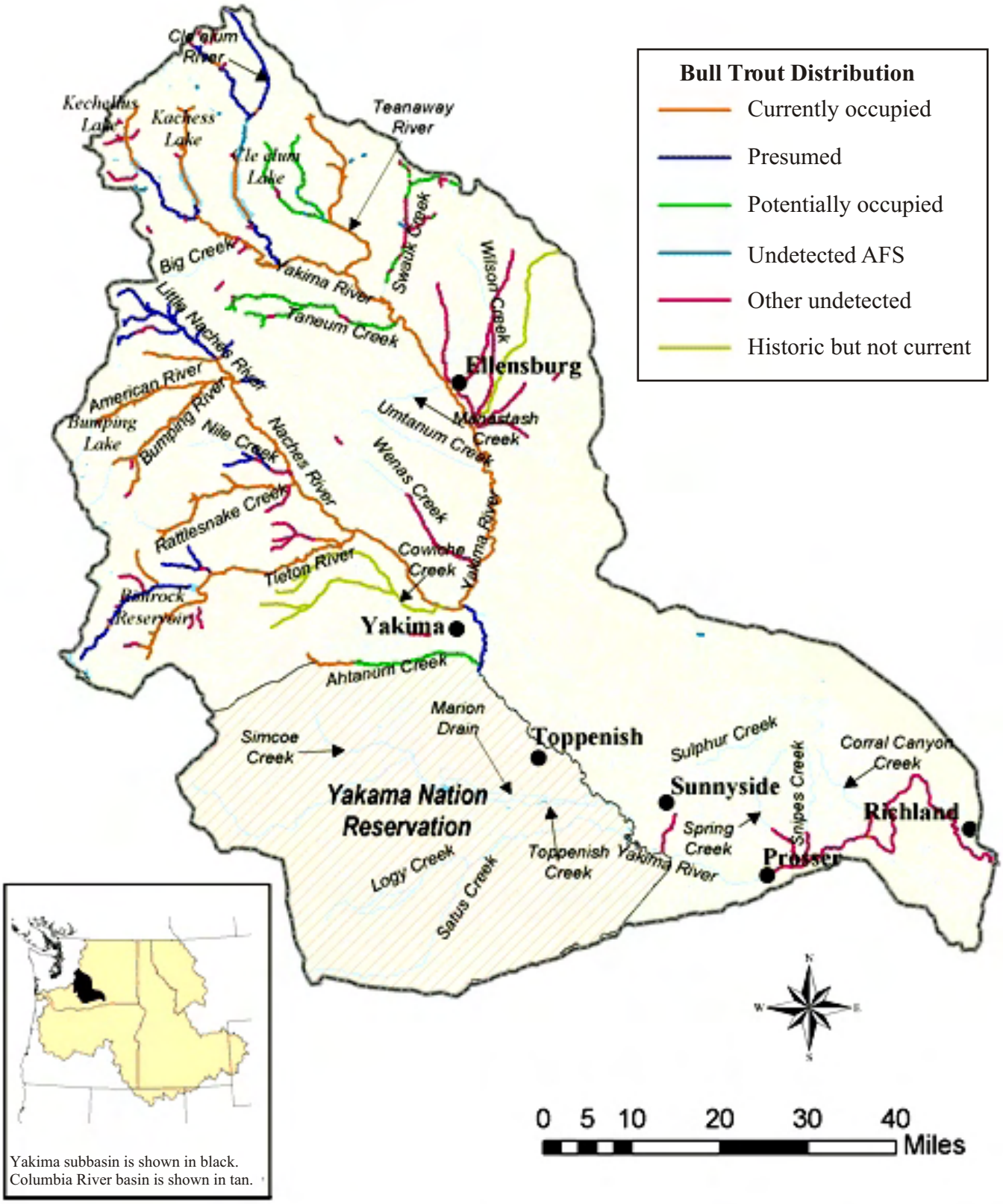


Figure 3.2-1. Current and historical distribution of bull trout (dolly varden) within the Yakima basin (StreamNet, 2002).

Populations in lakes Keechelus, and Kachess appear to be increasing in recent years (BOR 2000). However, all stocks isolated within upper river impoundments are considered at risk of stochastic extirpation due to their inability to be refounded, their single life-history form, their low abundance, and their limited spawning area (USFWS 1998). Construction of dams without fish passages, unscreened irrigation diversions, increased temperatures caused by development along shorelines and diking are the major factors responsible for the critical status of this species (WDFW and WWTIT 1994). Flow regulation by the Bureau of Reclamation is considered "likely to adversely affect" seven of the nine populations of bull trout recognized by the WDFW (BOR 2000), including the upper mainstem bull trout population presumed to utilize the action area considered in this BE.

3.2.2 CHUM SALMON

Chum salmon are limited to the lower 300 km of the Columbia River (Figure 3.2-2) (Groot and Margolis 1991). There are three stocks of chum in the Columbia River: Grays River, Hamilton Creek, and Hardy River stocks.

Critical habitat

Designated critical habitat for chum salmon includes all river reaches accessible in the Columbia River downstream from Bonneville Dam (DOI 2000a). Thus, none of the waters within the project and action area are designated as critical habitat for the Columbia River chum salmon ESU.

Abundance

Stock status for the Grays River and Hamilton Creek chum salmon is depressed based on the long-term escapement trend. Population status for the Hardy River chum is healthy. No targeted fisheries (commercial or sport) for chum salmon occur on the mainstem of the Columbia River. Poor gravel quality, instability, and availability of good-quality nearshore freshwater and marine water habitats are the primary factors limiting chum salmon. Timber harvest, road construction, and destruction of wetlands and near-shore habitats by dredge spoil placement are all major contributors to the poor gravel quality and lack of habitat for chum salmon.

3.2.3 STEELHEAD TROUT

Summer-run Yakima River steelhead are a distinct stock from the mid-Columbia River Evolutionary Significant Unit (ESU) based on their geographical isolation (WDFW and WWTIT 1994). Most Middle Columbia River steelhead remain in fresh water up to a year before spawning (McMichael et al. 1992). Spawning is not known to occur in the Cle Elum River (WDFW and WWTIT 1994); however, low numbers of resident trout and the relative abundance of loose clean substrate suggest the potential for steelhead spawning (Hindman et al. 1990).

Resident *O. mykiss* (Columbia River redband trout) co-occur with the anadromous form within this ESU and information suggests that the two forms may not be reproductively isolated, except where barriers are involved (Busby et al. 1996).

Because of their larger size when entering salt water, steelhead are considered less dependent on estuarine rearing than chinook or chum salmon. Steelhead tend to move through estuaries more

rapidly, using deeper waters along the shoreline. Steelhead diets are less diverse than other salmonid species and predominantly consist of epibenthic invertebrates, insects, and juvenile fish.

Critical Habitat

Designated critical habitat for steelhead trout includes all river reaches accessible in the Columbia River system including its tributaries between Mosier Creek, Oregon and the Yakima River, Washington (DOI 2000a). Thus, all of the waters within the project and action areas are designated as critical habitat for Middle Columbia River steelhead trout. Most spawning occurs between the mouth of the Yakima Canyon and Ellensburg, around the mouth of the Teanaway River, and in the area between Easton Dam and the mouth of Big Creek (Figure 3.2-2). These focal areas are all outside the action area, but affect the Yakima River steelhead population, and therefore are discussed within this BE.

Abundance

The population status is considered depressed based on fish passage counts at Prosser Dam and sport/Tribal estimates (Table 3.2-2). Wild steelhead were below the 2,000 fish escapement goal for 11 out of the 12 years between 1980 to 1992 (WDFW and WWTIT 1994). Historically, the Yakima River produced an estimated 80,000 to 100,000 adult steelhead annually, but the total annual run size of naturally produced steelhead now ranges from around 900 to 1,400 fish (Table 3.2-2). Within the upper Yakima basin (RM 116.3 to 214.5), which includes the action area, there is little production of this species, with less than 125 fish estimated to return to the area per year over the past 5 years. Bureau of Reclamation flow regulation, specifically the flip-flop flow regulation resulting in artificially elevated summer flows, negatively impacts the rearing habitat for this species (BOR 2000).

Table 3.2-2. Adult or juvenile steelhead counts at Prosser Diversion (RM 39.8) and the Yakima River (RM 0.0 to 220.9) (StreamNet 2002).

Dam	Location	Production	Life Stage	Year Range	Mean Value
N/A	Yakima River (RM 0.0 to 220.9)	Hatchery	Adult	1980-1994	111
Prosser Diversion	Yakima River (RM 39.8)	Hatchery	Smolt	1983-1995	12,469
Prosser Diversion	Yakima River (RM 39.8)	Hatchery	Adult	1987-1999	2618
Prosser Diversion	Yakima River (RM 39.8)	Natural	Smolt	1960-2000	55,532
N/A	Yakima River (RM 0.0 to 220.9)	Natural	Adult	1980-1994	846
Prosser Diversion	Yakima River (RM 39.8)	Natural	Adult	1984-1999	1335
Prosser Diversion	Yakima River (RM 39.8)	Natural	Sub-yearling (Age 0)	1986-1998	22,382

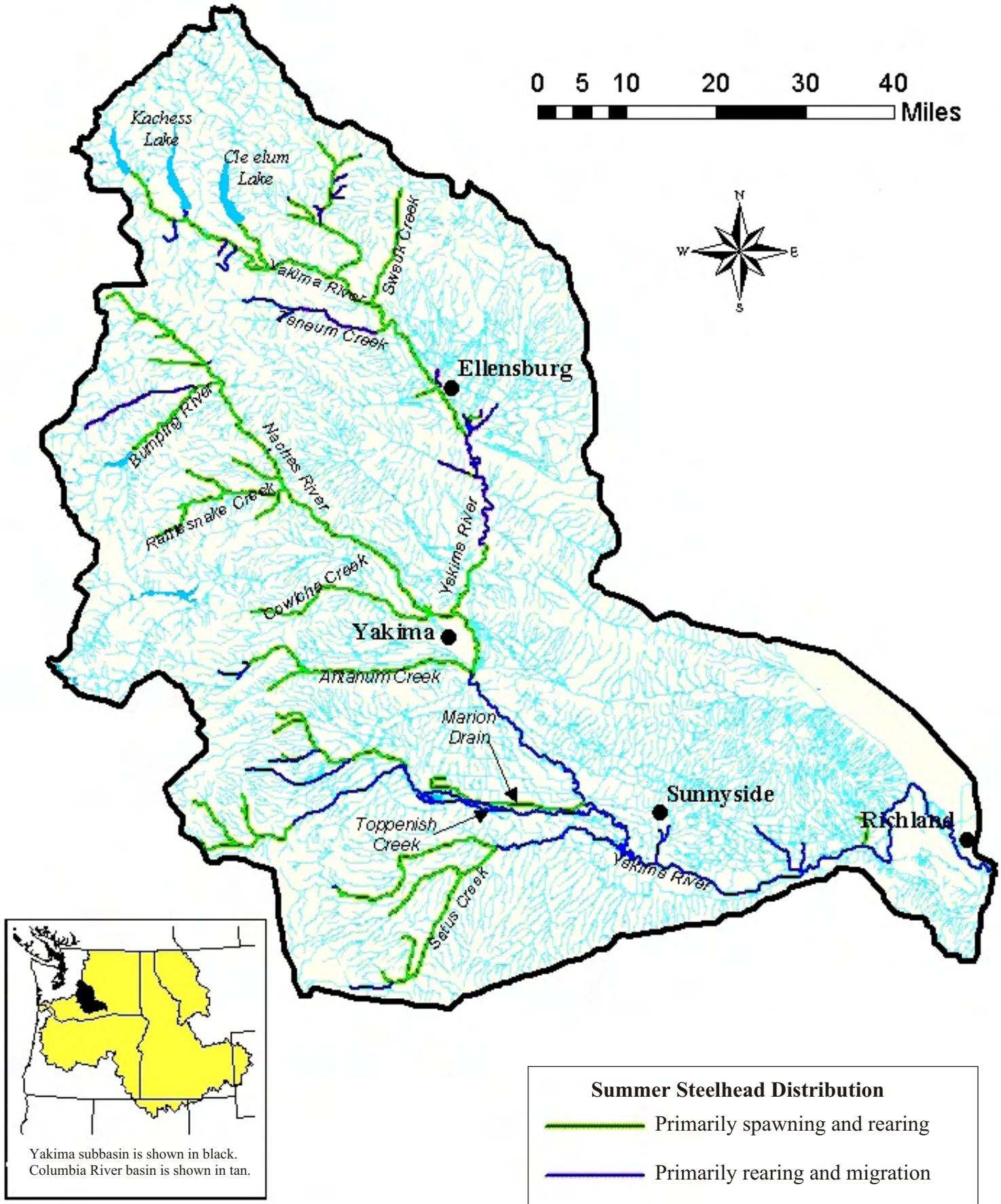


Figure 3.2-2. Distribution of summer-run mid-Columbia steelhead trout within the Yakima basin. (StreamNet 2002)

Impassible barriers for spawning adults, and mostly, poorly, or totally unscreened irrigation withdrawals, limit steelhead production in the upper Yakima River. It is likely that flow regulation in the upper Yakima basin, including within the action area, also limits the utility of potentially available rearing habitat for steelhead trout. Flow management entails the release of irrigation flows from upstream reservoirs during the summer, which creates a significant stranding risk to sub-yearling and yearling fish when flows are abruptly reduced in the fall. In addition, the high summer stream depths and velocities created by the "flip-flop" regulation of instream flows for irrigation in the Yakima and Cle Elum rivers limit the quantity and utility of low-velocity refuge habitats needed for rearing by juvenile steelhead. Finally, this flip-flop flow regulation also reduces the retention of LWD, a critical habitat component in most fluvial environments that has been positively correlated to rearing densities (Fisher et al. 2000). Flow regulation aside, the four mainstem Columbia River hydroelectric dams downstream of the Yakima River (McNary, John Day, the Dalles, and Bonneville) are considered the major factor responsible for the depressed status of the mid-Columbia River steelhead ESU in this basin (WDFW and WWTIT 1994).

The Biological Review Team (BRT) for NOAA Fisheries concluded that the mid-Columbia River steelhead ESU is not presently in danger of extinction, but reached no conclusion regarding its likelihood of becoming endangered in the foreseeable future (Busby et al. 1996). All BRT members felt special concern for the status of this ESU and concluded that NOAA Fisheries should carefully evaluate conservation measures affecting this ESU and continue monitoring its status.

Total steelhead abundance in the ESU appears to have been increasing recently (Table 3.2-2), but the majority of natural stocks for which data are available are declining, including those in the John Day River, which is the largest producer of wild, natural steelhead. The BRT members expressed strong concern about the pervasive opportunity for genetic introgression from hatchery stocks within the ESU. There is widespread production of hatchery steelhead within this ESU, but it is largely based on within-basin stocks. Estimated proportions of hatchery fish on spawning grounds is low in the Yakima River (Busby et al. 1996).

There are three major areas of uncertainty in this evaluation. First, run-size estimates are lacking for most populations. Second, the degree of interaction between hatchery and natural stocks within the ESU is uncertain. Third, the relationship between anadromous and resident forms of *O. mykiss* is unclear, particularly within the Yakima basin. There is little information regarding abundance of resident fish or their interactions with anadromous fish, but resident forms may play an important role in some areas of this ESU (Busby et al. 1996).

3.2.4 COHO SALMON

Wild stocks of coho salmon *Oncorhynchus kisutch* were once widely distributed within the Columbia River basin (Fulton 1970; Chapman 1986). However, coho salmon probably went extinct in the Yakima River in the early 1980s (Yakama Nation 1997 *as cited* in Dunnigan 2000). Efforts to restore coho within the Yakima basin rely largely upon releases of hatchery coho. The feasibility of re-establishing coho in the Yakima basin may initially rely upon the resolution of two central issues: the adaptability of a domesticated lower river coho stock used in the re-introduction efforts and associated survival rates, and the ecological risk to other species associated with coho re-introduction efforts.

Essential Fish Habitat

The action area upstream and downstream of the proposed wastewater treatment plant outfall relocation is suitable for coho spawning activities if re-introduction into the Yakima River is successful (Figure 3.2-3). The side channel habitat through which the Hanson Ponds will discharge will provide low-gradient fluvial habitat ideal for the rearing of this species.

Abundance

The Yakama Nation has released approximately 85,000 to 1.4 million coho smolts in the Yakima River watershed annually since 1985. Prior to 1995, the primary purpose of these releases was harvest augmentation; after 1995, the primary purpose became a test of the feasibility of re-establishing natural production. Currently, the Yakima coho program is part of the Yakima Klickitat Fisheries Project (YKFP). Through this program, hatchery coho are raised at the Eagle Creek, Willard, and Prosser hatcheries. The Yakama Nation is also the lead agency for the coho re-introduction project in the Wenatchee and Methow sub-basins. Although the mid-Columbia coho re-introduction project and the YKFP are administered by separate entities within the Yakama Nation, each project relies on the transfer of information between basins to some degree to resolve critical uncertainties that are not considered basin-specific issues.

3.2.5 CHINOOK SALMON

The predominant salmonids found in the action area are spring chinook, which were historically abundant throughout the Yakima River basin. Chinook salmon in the Yakima basin are not currently listed as threatened or endangered under the ESA, although numbers are substantially depressed relative to historic population figures (Snyder and Stanford 2000).

Essential Fish Habitat

The project and action areas considered in this BE provide essential fish habitat for the spring chinook (Figure 3.2-4). The reach of the Yakima River between RM 180.7 to 180 is a complex side channel and braided channel network. Spawning gravels, LWD, and overhanging riparian vegetation are abundant in this portion of the action area (Entrix 2002). Studies completed by the WDFW regarding interspecific competition noted that juvenile spring chinook were found primarily along the bank habitats of the main channel and in side channels of the Yakima River during the spring, summer, and fall (Pearsons et al. 1996, James et al. 1999). Moderate to heavy spawning and rearing utilization of the Yakima River near Cle Elum by spring chinook was also recorded in 2000 surveys by the WDFW (Cle Elum 2002). Substrate surveys completed in 2001 (Entrix 2002), indicated that the specific section of the river where the mainstem rock drop construction and outfall placement is proposed was not suitable and did not contain evidence of salmon spawning activity. However, suitably sorted spawning gravels and velocity gradients velocity gradients better suited for spawning and rearing activities improves markedly from the existing outfall location downstream. Salmon redds were flagged in increasing density in the portion of the Yakima River that parallels the mid-point of Hanson Pond No. 1 toward the existing outlet of the Hanson Ponds into the mainstem (*see* Attachment 2). Snorkel surveys results compiled on September 21, 2002, confirm these results (Figure 3.2-5).

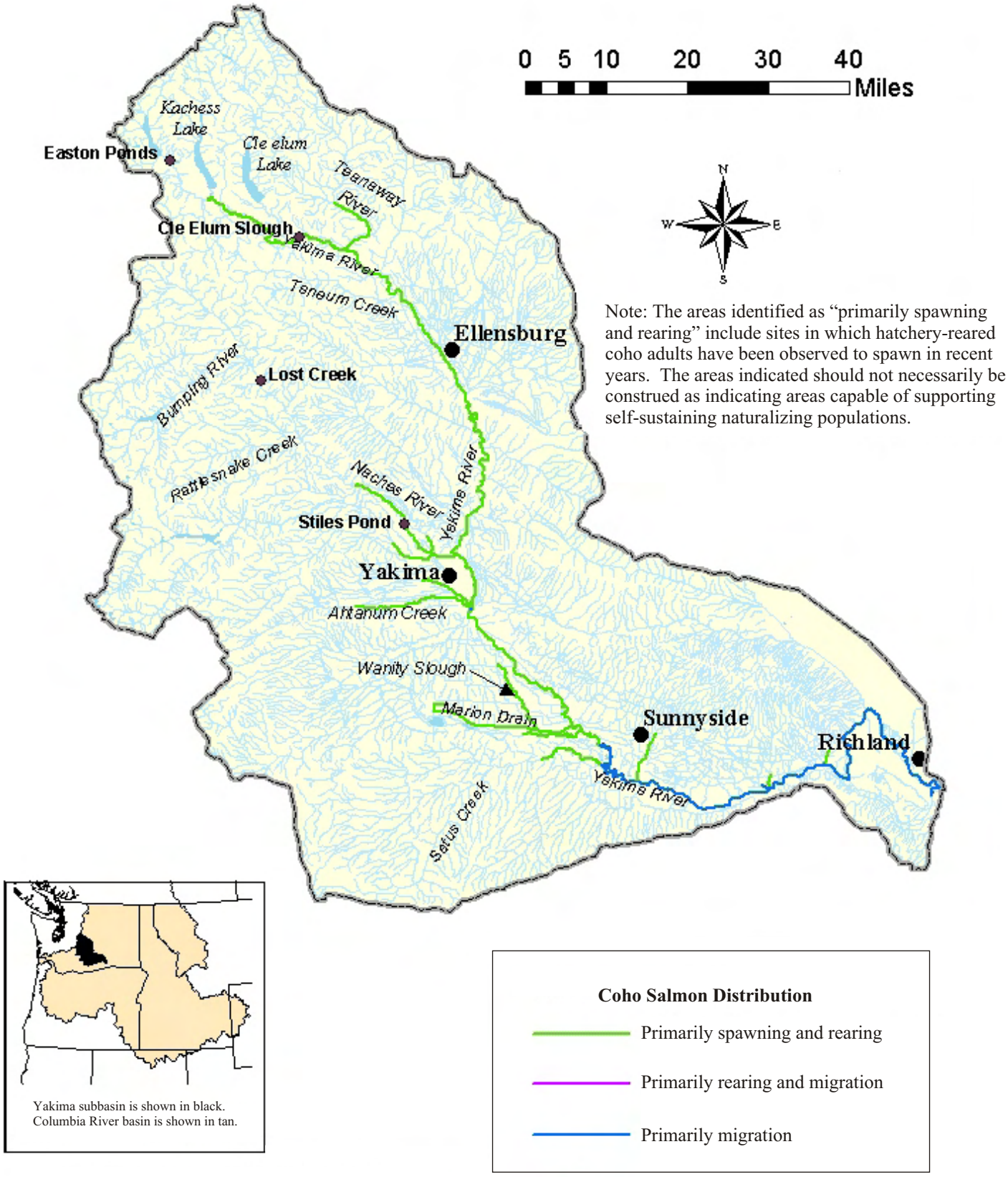


Figure 3.2.-3. Distribution of coho salmon within the Yakima basin (StreamNet 2002).

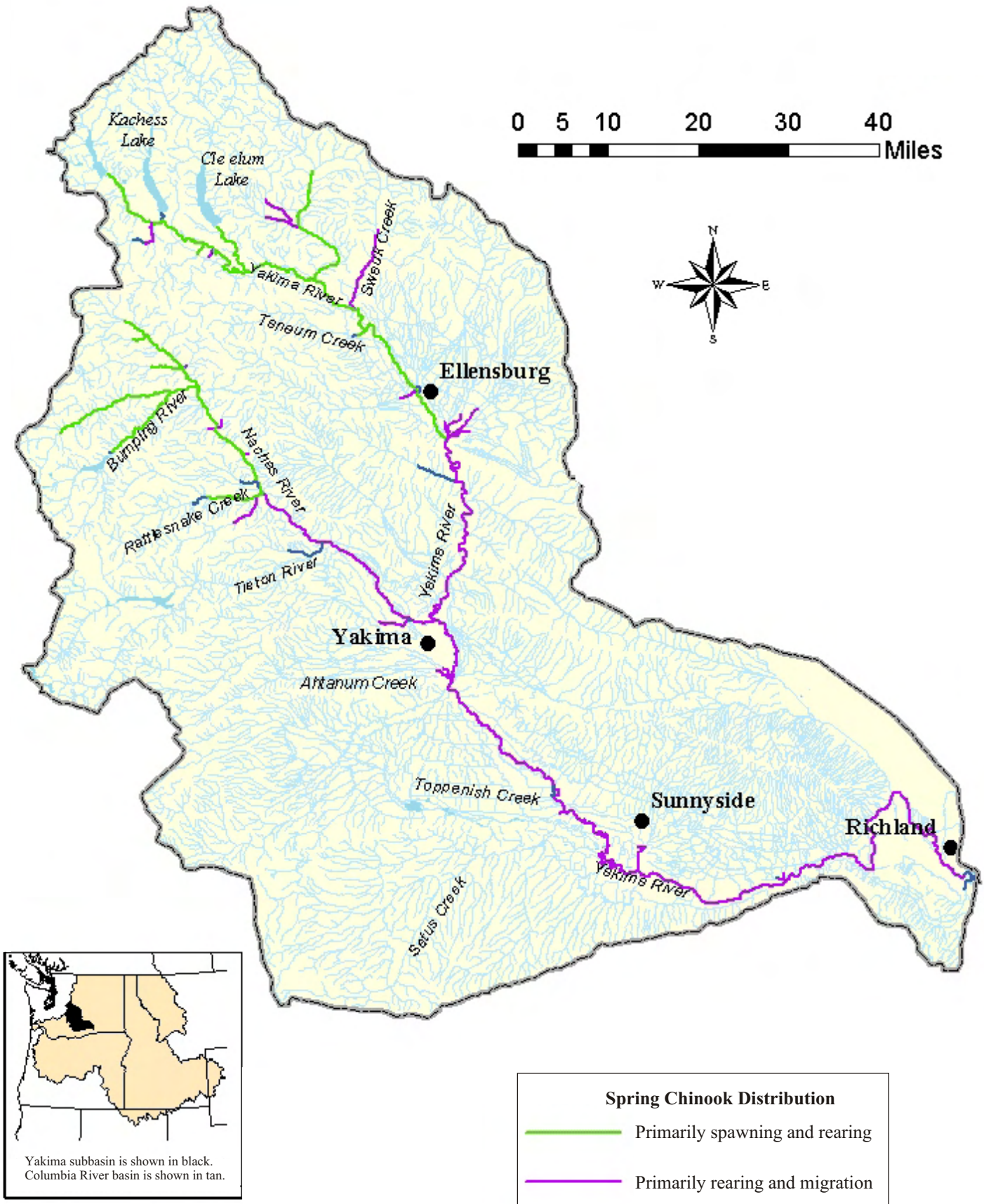


Figure 3.2-4. Distribution of spring chinook within the Yakima basin (StreamNet 2002).

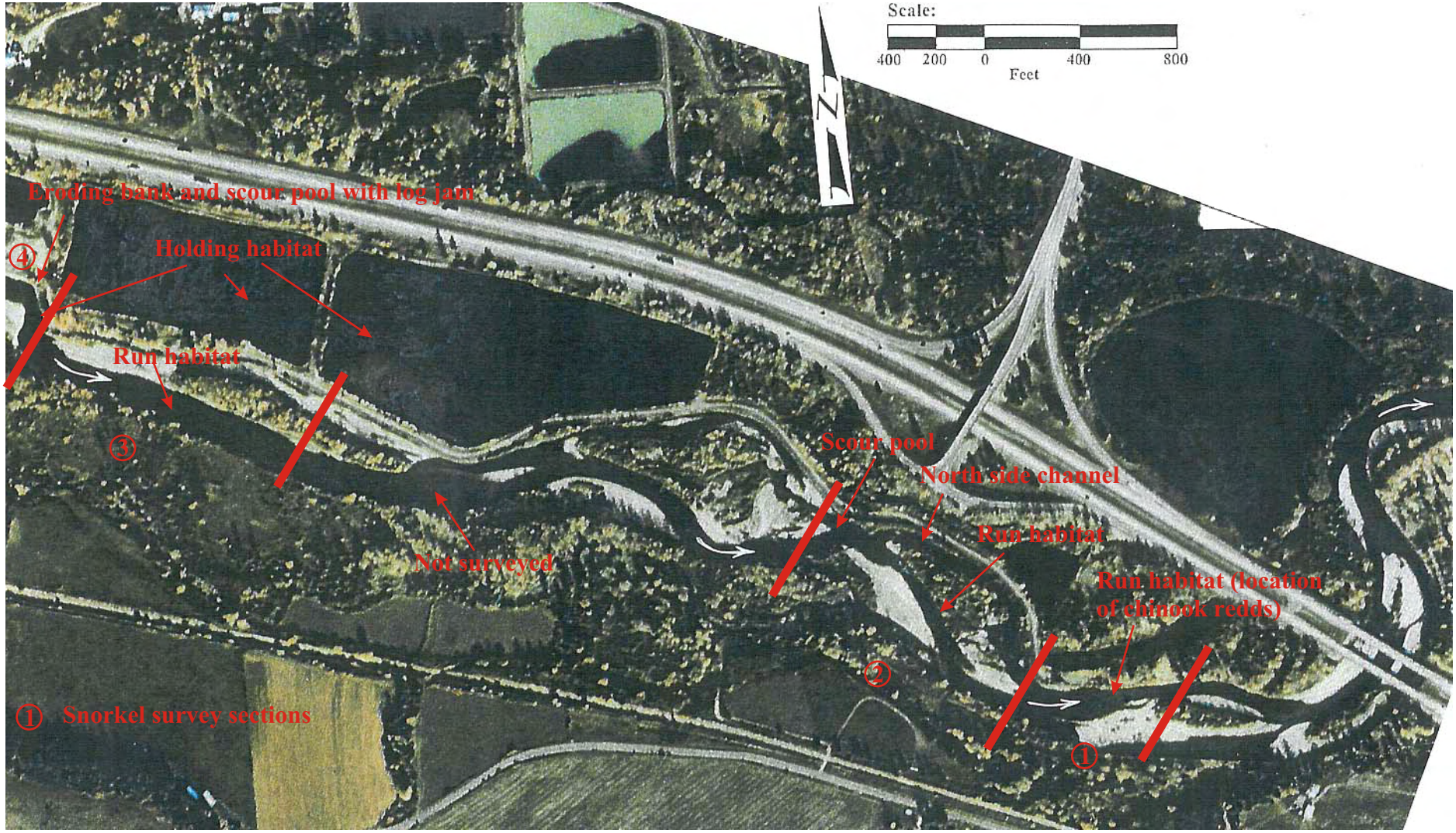


Figure 3.2-5. Post construction aerial view at the East Cle Elum I-90 Bridge site (Reichmuth et al. 2002). Map improvements indicate the sections of the Yakima River within the action area surveyed in September 2002 by Entrix, Inc.

Fall chinook salmon are documented predominantly within the lower Yakima River basin, outside of the action area. The reach from the mouth to Kiona (RM 29) is the main fall chinook spawning area (WCC 2000). Although habitat conditions within the project and action areas are suitable for spawning and juvenile rearing of fall chinook, the historic absence of this salmon stock indicates that the area does not provide essential fish habitat in the Yakima basin.

Summer-run chinook salmon were once highly abundant in the Yakima basin. Today, they are considered extirpated from the watershed. For this reason, the project and action areas cannot be considered to provide essential fish habitat for this stock.

Abundance

Historical abundance of spring chinook salmon in the Yakima basin probably ranged from about 38,000 to 100,000 fish. These figures are based on two documents: Kreeger and McNeil (1993), and the Yakima Subbasin Plan (Anonymous 1990). Kreeger and McNeil (1993) argue that 3.8 percent of the historical run of salmon and steelhead in the entire Columbia River basin should have been produced by the Yakima River basin because it represented 3.8 percent of the historical Columbia River basin watershed. This gross estimate does not consider accessibility of habitat within the basin relative to other basins. On the basis of a moving average of peak historical Columbia River catch data and assumed exploitation rates, the authors estimate that the historical run of summer chinook, and of spring and fall chinook combined, was on the order of 2.7 million and 2.0 million fish, respectively. If 3.8 percent of all spring and fall chinook entered the Yakima River, the historical run to the Yakima River basin would have been approximately 76,400.

It is often assumed that the historical summer chinook run was twice as large as either the spring or the fall chinook runs, which were approximately equal in size. If this held true for the Yakima River, the historical run of fall chinook was about 38,000 fish. The Yakima Subbasin Plan bases its considerably higher estimate on the amount of suitable spawning habitat for chinook historically present in the Yakima River basin, and the area taken up by a typical chinook redd. This approach yields estimates of ~200,000 for spring chinook, and ~200,000 for summer and fall chinook combined. If summer and fall chinook, for which spawning distributions overlapped broadly, were assumed to be equally abundant, the historical abundance of fall chinook will have been on the order of 100,000 fish.

3.3 MAMMALS

3.3.1 CANADA LYNX

The Canada lynx is a migrant species from the northern boreal forest of central Canada. The lynx is a medium-sized cat with long legs, well-furred paws, long tufts on the ears, and a short, black-tipped tail (DOI 2000b). It is a terrestrial carnivore with a diet that primarily consists of snowshoe hares, supplemented by rodents and birds. The Cle Elum RSP outfall action area is considered part of the Canada lynx recovery zone, though there have been no sightings within the project area, nor within the broader action area, in the recent record. Signs of snowshoe hare have been observed in the Cle Elum Bullfrog UGA; however, this area is 3 miles northwest of the action area considered for the outfall relocation and Hanson Ponds restoration/enhancement evaluated in this BE.

Critical Habitat

The Canada lynx may be found in subalpine and boreal forests in the mountains of north-central and northeastern Washington, with small but stable populations in the Okanogan region. Forested areas in this region have a patchy distribution, which adversely affects the lynx population. This primarily nocturnal mammal has a home range of 50 miles (80 km) or more, but a breeding range of only 5 miles (8 km). They live on primarily federal land (85 to 90 percent), as well as wilderness and other reserves (37 percent). The lynx prefers dens in sheltered areas such as hollow logs or beneath roots. They prefer successional forest stages that have a well-developed understory structure that will provide large woody debris for den sites and thermal cover (DOI 2000b). Mating season is generally from January to March with a gestation period of 68 to 72 days (Nicolai 2002). The proximity of the action area to the interstate highway (I-90) and other local development has degraded suitable habitat for lynx.

3.3.2 GRAY WOLF

The gray (timber) wolf is a federally endangered species whose occurrence in Washington State is considered accidental. The largest populations in the lower 48 states are found in the states of Minnesota, Montana, and Wyoming. Individuals that frequent areas within Washington State are considered to be migrants from British Columbia (WDNR 1997).

Critical Habitat

The action area provides habitat for the favored food items of gray wolf; i.e., black tailed deer, mule deer, and elk. Elk scat was observed in numerous locations within the riparian zone of the Cle Elum River during field surveys conducted in 2000 by Pentec Environmental (Fisher and McArthur 2000). Thus, the action area has the resources to support gray wolf, should the species frequent the area. The WDFW PHS database, however, indicates no recent activity for gray wolf in the action area (Sept 15, 2002). In 1993, a gray wolf was observed approximately 1.5 miles south of the Cle Elum weigh scales on I-90; two other wolf sightings were documented in the Wenatchee National Forest, almost 5 miles (8 km) south of the Cle Elum Weigh Scale Station on I-90 (WDOT 1998).

3.3.3 GRIZZLY BEAR

Grizzly bears are one of the largest land mammals and the largest omnivore in North America. They feed primarily (80 to 90 percent) on green vegetation, wild fruits and berries, nuts, and bulbs or roots. Grizzlies supplement their diets with insects, fish (especially salmon and trout), and animal carrion. The grizzly is a solitary animal and is only found with other grizzlies during mating or rearing cubs (USFWS 2002b).

Critical Habitat

Grizzly bear habitat has been drastically reduced since colonization of the contiguous United States, now covering approximately two percent of its original range. Grizzly bears prefer high altitudes in mountainous regions. According to the WDFW Priority Habitats and Species information, grizzly bears could occur in the south-central, eastern, north central and north Cascade Mountain regions, with the latter being the most likely. They are mostly solitary animals with a home range up to 50 miles, but generally no more than about 25 miles. Due to its

omnivorous/piscivorous diet, the action area is considered part of the grizzly bear recovery zone, though there have been no sightings within this area of contemporary record. No sightings of the species have been recorded south of Stevens Pass. The Cle Elum RSP project and action areas do not provide habitat currently used by the species, although the habitat in the action area supports plant and animal populations which are part of the regular diet of the grizzly bear.

3.4 PLANTS

3.4.1 WENATCHEE MOUNTAIN CHECKERMALLOW

The Wenatchee Mountain Checkermallow is a flowering plant that grows up to 5 feet (1.5 m). It has bright pink flowers that bloom from mid-June to the end of July (DOI 2001).

Critical Habitat

Critical habitat for the Wenatchee Mountain Checkermallow includes mid-elevation (1,600 to 3,300 feet) wetlands and meadows that have surface water or saturated soils during the spring and early summer. Other possible areas include open coniferous forests dominated by ponderosa pine and Douglas fir, and on the margins of shrub and hardwood thickets adjacent to seeps, springs, or small drainages (DOI 2001). Wenatchee Mountain checkermallow has a highly localized distribution, documented initially in 1893 around the towns of Leavenworth and Peshastin, Washington; it is unknown if the species has grown outside of this area. The population status of the checkermallow is poorly understood, but some 3,300 individual variants of the species area known to currently exist among five parcels of land in Chelan County (Thomas 1997). The Washington Department of Natural Resources (WDNR) database search (Sept 15, 2002) for this project did not note the presence of the Wenatchee Mountain checkermallow or any other rare plants within the action area. Although the checkermallow appears on the rare plant list for Kittitas County, all of its documented locations are within Chelan County. Thus, the action area is not considered to provide critical habitat for this species.

3.4.2 UTE LADIES'-TRESSES

Ute ladies'-tresses are perennial, terrestrial orchids. They reach up to 20 inches (50 centimeters) tall and consist of 3 to 15 small white or ivory-colored flowers clustered into a spike arrangement at the top of the stem (DOI 1992b).

Critical Habitat

Generally, Ute ladies'-tresses occur at elevations below the coniferous forest vegetation zone within steppe, shrub-steppe or pinyon-juniper woodland zones (USFWS 1998). It is typically found between the elevations of 4,000 to 6,000 feet, but has been found as high as 6,800 feet. The Washington population occurs at approximately 1,800 feet in elevation. No critical habitat has been designated for the species within the action area of the Cle Elum RSP outfall, although suitable wetland/spring habitat for the species occurs within the Bull Frog Pond wetland complex, approximately 3 miles west of the project area. A survey in and around the perimeter habitat of BullFrog pond was conducted on October 13, 2000, to address potential project impacts to this species (Fisher and McArthur 2000). No representatives of the species were observed (Fisher and McArthur 2000). One population of the species has been identified in Washington State in Okanogan County, and given its apparent broad distribution throughout sub-

alpine environments in western montane states, its presence within the action area cannot be absolutely discounted, although it is considered unlikely.

4.0 INVENTORIES AND SURVEYS

4.1 AQUATIC SPECIES

Recent surveys have been conducted, the results of which are relevant to addressing fish use and species interactions within the action area (Hindman et al. 1990; Pearsons et al. 1996; James et al. 1999; Associated Earth Sciences 1999b; Fisher and McArthur 2000). In general, carrying capacity within the action area is influenced by two main components: space and food. Competition is likely occurring for rearing habitat between chinook, rainbow trout, and redside shiner (*Richardsonius balteautus*) in the Yakima River. In addition, food was shown to be exploited by rainbow trout, redside shiner, and mountain whitefish (*Prosopium williamsoni*), suggesting that some chinook salmon were being denied access to prey through behavioral mechanisms (James et al. 1999).

4.2 YAKIMA RIVER AND HANSON PONDS FISH USE AND HABITAT SURVEYS

4.2.1 YAKIMA RIVER SURVEYS

In a 1990 WDFW survey (Hindman et al. 1990), the Yakima River was surveyed from the Cle Elum River confluence (RM 186) to 4.8 km downstream (RM 183). A total of 15 rainbow trout (5/mi) and numerous whitefish and suckers were observed. Although no spawning activity was observed, two depressional areas in a side channel were suspected of being steelhead redds. WDFW (1994) found that age 0+ rainbow trout and chinook salmon were closely associated with bank habitats, and that rainbow trout redds were patchy in the Yakima River (Pearsons et al. 1996). Unnaturally high flows caused by releases of water from upstream dams (e.g., Cle Elum dam), forced small salmonids to use a small fraction of the available habitat along the stream banks. Pearsons et al. (1996) found redds were often associated with reaches of unconstrained channels and abundant instream cover. In the same study, trout populations in five upper Yakima River reaches were monitored between 1991 and 1994. During this time, total trout abundance remained stable; however, distribution changed. WDFW speculates that this may be a result of fishing pressure in the reaches that showed a decline in abundance (e.g., between Rosa Dam and the confluence of the Yakima River and Umtanum Creek), and an increase in recruitment to the upper reaches (e.g., between Taneum Creek and the Cle Elum River confluence) (Pearsons et al. 1996; Martin and Pearsons 1994).

In a subsequent study performed in 2000, between RM 182.5 and RM 184.5 of the Yakima River, Pentec (Fisher and McArthur 2000) observed a total of 13 whitefish, 10 large (>250 mm) rainbow trout (5 fish/mile), and a school of juvenile chinook (> 100) associated with a log jam underlying the South Cle Elum bridge. It is notable that the same density of trout was recorded by the Pentec survey team as was reported by WDFW surveyors 10 years earlier.

Evidence of salmon spawning activity (redds) in the immediate project area to be crossed by the mainstem rock drop and outfall placement was lacking in a survey conducted on November 11, 2001 (Entrix 2002). No carcasses or redds (salmon spawning “nests”) were observed in the reach that will be affected by the mainstem rock drop or outfall construction in the preferred alignment, with the exception of a single redd flag observed upstream of the USACOE jetty, at the head-end of the riffle preceding the scour pool (Figure 2.2-2). As previously indicated in

Section 3.4, spawning conditions are not generally favorable for chinook salmon in this reach due to high-velocity gradients, and lack of suitably sized and sorted gravels (substrate throughout the reach was predominantly of cobble size). This observation was supported by the limited redds in the reach. However, the existing lateral scour pool through which the rock drop will be positioned appears to offer favorable holding habitat for migrating adult salmonids, and potentially favorable rearing conditions for adult resident rainbow trout.

Recent snorkel survey results conducted on September 21, 2002, through the immediate project area are detailed in Table 4.2-1, documenting current fish use and spawning activity. Two transects were surveyed within each sub-reach. Snorkeling was conducted between 1130 and 1700 in the afternoon. Results should be considered primarily to support presence/absence conclusions. Numbers depicted in Table 4.2-1 should be viewed as semi-quantitative only, as staff limitations prevented complete coverage of the surveyed areas. No bull trout or steelhead were observed in any of the areas snorkeled, and only 1 sculpin (*Cottis sp.).*

Table 4.2-1 Snorkel survey results in project and action area, September 21, 2002

Reach # and Descriptor*	Total Number of Juvenile Chinook Observed	Total Number of Adult Chinook Observed	Total Number of Chinook Redds Observed	Total Number of Rainbow Trout	Total Number of Mountain Whitefish
#1 Run habitat immediately upstream of existing Hanson Ponds outlet (~ RM 180.1 180.25)	42	3 via snorkel, (> 20 from bank)	13 redds flagged by WDFW, one large redd observed unflagged	1 mature, 6 fry in wood along channel margin	~ 70
#2a—Existing outfall to reach 1, along north side channel (~RM 180.25 180.5)	15	4 total (1 in effluent mixing hole, 3 in north side channel)	0	18 total (10 in scour hole @ effluent discharge, 5 within run downstream between north side channel, and 3 in north side channel to reach 1)	Too numerous to count (> 100)
#2b—as above, but along south channel thalweg	14 total (8 within mixing hole, 6 in thalweg)	1 (in effluent mixing hole)	0	7 (3 in mixing hole, 4 within thalweg)	Too numerous to count
#3—Run habitat downstream of proposed outfall (~RM 179.5 to 181.2)	~ 250 (all but 20 were observed within a root wad)	0	0	2	2
#4—Eroding Bank and Scour pool for Proposed Outfall (~RM 181.2 to 181.3)	5 (all in margins of scour pool, associated with small log jam)	2 (2 carcasses at bottom of scour pool All live chinook in riffle/run habitat upstream of scour pool)	0 (some exploratory digging at base of riprap above scour pool, but redds clearly formed)	10	50 (est.)

*See figure 3.2-5

4.2.2 HANSON POND SURVEYS

As part of a larger study investigating fish use of off-channel habitat throughout the Yakima watershed, the Yakama Nation electrofished and set gill nets within the Hanson Ponds over a 20.25 hour period. Table 4.2.-2 depicts the results of this study, documenting the presence of several centrarchid and cyprinid species uncommon to the upper Yakima River, including the largemouth bass, pumpkinseed sunfish and northern pikeminnow. With a reliable surface water connection and the creation of more fluvial conditions, the restored ponds will be less favorable to these species (given their more lacustrine preferences) and a shift in species dominance to salmonids could be expected. Complete removal of the non-native species cannot be assured, however, without stringent eradication methods.

Table 4.2-2. Current fish diversity and relative abundance in Hanson Ponds*

Capture Method	Bluegill Sunfish	Largemouth Bass	Northern Pikeminnow	Pumpkin-seed Sunfish	Hatchery Rainbow Trout	Redside Shiner	Sucker
Gill Net	8	7	71	19	5	6	12
Electro-shocking	0	6	89	11	2	47	43

*Total numbers represent a summation of captures from two gill nets, and three electroshocking passes per survey section, respectively. Gill nets were set for 20.25 hours on average. Boat electroshocking was conducted along each section for 10 minutes per session, at a depth of 8.5 feet. Fishing conducted by J. Kohr et al. (Yakama Nation 7/24/02).

4.3 EXISTING RIPARIAN AND AQUATIC HABITAT CONDITIONS WITHIN THE ACTION AREA

4.3.1 YAKIMA RIVER

Qualitative Habitat Observations

<u>RM 181.4 to RM 180.9</u>

The proposed location of the rock drop to be constructed across the bed of the Yakima River (RM 181.2) is currently a large and deep lateral scour pool with some back eddy hydraulics created by the force of the river into the north bank. As pictured in Figure 2.2-3, riffles precede the proposed rock drop and outfall alignment. Downstream of the existing lateral scour pool (and downstream of the proposed rock drop at RM 181.2), the river exhibits relatively featureless run characteristics for approximately one-quarter mile, to approximately RM 180.9 (Figure 2.2-5). The Yakima River in this location is separated from Hanson Pond No. 2 by a low-lying vegetated dike of quarry spalls along the edge of the river's bankfull width, with larger riprap at the top of the dike. The dike is vegetated with a moderately dense, mixed-age assemblage that consists predominantly of black cottonwood, Pacific willow, dogwood, and clusters of reed canary grass.

Smaller salmonid fry may be able to use the boundary layer created by substrate roughness throughout the run habitat immediately downstream of the proposed rock drop and outfall alignment. However, larger juveniles are largely restricted and snorkel survey results described in the preceding section revealed limited use of the run habitat, except in association with one large root wad where several hundred chinook juveniles were observed. Previous research has demonstrated that even under conditions where sufficient velocity refuge is available from suitably sized boulders, or open floodplain, salmonids will be found predominantly amongst wood in the channel – particularly if this resource is limited in the drainage (Fisher et al. 2000).

Thus, our snorkel survey results (Table 4.2-1) were not surprising. The wood offers both predation avoidance refuge, and an organic food source for the aquatic macroinvertebrates upon which the fish will forage.

Along the south bank of the run, the riparian zone, which is unconfined by riprap, is densely vegetated with a mixed-age overstory of black cottonwood and ponderosa pine (at higher elevations), and an understory of willow, dogwood and other assorted shrubs and grasses. Vegetation through this corridor of the project area is further described in Attachment 3. Substrate throughout the run was primarily medium-sized cobble. In all portions of the reach examined, from the USACOE jetties downstream through the scour pool and run, large woody debris was lacking in the wetted width of the channel, and very limited within the bankfull width, with a few pieces lodged on bar and island habitats within the floodplain. A side channel splits around a relatively large island through this run reach, flowing along the toe of the north bank dike, separating the side channel from the mainstem. Although rearing habitat within the side channel is better than that in the thalweg, the side channel offers little to no pool habitat at high flows, exhibiting run/riffle characteristics similar to the main channel.

<u>RM 180.9 to 180.1</u>

Downstream of the run habitat, the in-channel and riparian habitat becomes more complex - beginning approximately in line with the eastern one-third of Pond No. 2 and continuing downstream until the river crosses under I-90 (~RM 180.1). The habitat through this reach includes the area through which the existing wastewater treatment plant outfall discharges. The habitat through which the existing wastewater treatment plant outfall discharge is part of a complex, anastomosed channel network that proceeds upstream on either side of an island for approximately one quarter mile, and downstream for another quarter mile (Figure 3.2-5). At the time of survey, flows through the northernmost side channel, adjacent to the north bank dike, were visually estimated at 7 cfs. This north side channel was heavily vegetated on its south bank (from the island), but largely lacking vegetation along the riprap that constituted the channel's north bank. On the south side of the island just upstream from the existing outfall, another side channel is currently evident. This south side channel flows through a complex matrix of LWD and overhanging riparian vegetation, offering good juvenile salmon and adult resident rainbow trout rearing conditions. Hydraulic conditions in both of these side channels appear to provide suitable sorting for the establishment of spawning gravels for trout, and good to excellent rearing conditions for both trout and salmon. These side channels are part of a larger, braided channel migration zone (CMZ) that includes the entire bankfull width of the river in this section. In general, this CMZ will appear to offer exceptional rearing and high water refuge habitat for all salmonids utilizing this portion of the Yakima River.

The thalweg of the CMZ just upstream of where the existing wastewater treatment plant outfall discharge enters the Yakima River flows along the south portion of the main channel. It bends back to the north and mixes with the City's treated effluent in a complex scour pool created by the thalweg's confluence with the side channels previously described. Downstream of this "mixing pool", run characteristics are again exhibited, with the thalweg flowing along the north bank. Immediately downstream of this "mixing pool", flagging of salmon (spring chinook) redds was observed in increasing density, peaking a short distance upstream of where the existing Hansen Ponds outlet currently joins the mainstem (Figure 2.2-8). Several redd flags were also observed within the wetted perimeter of the CMZ.

RM 180.1 to 179.7

This reach of the river crosses under I-90 in the vicinity of the Cle Elum east interchange (Exit 85), and flows around a sharp bend to the northeast (Figure 2.1-1). With the exception of lands disturbed by the I-90 overpass, the riparian zone along both banks of the river is densely vegetated with an overstory of black cottonwood and ponderosa pine. The nearly impenetrable, understory is dominated by upland and facultative wetland shrubs including: red osier dogwood, willow, bitterbrush, snowberry, black hawthorn, Douglas spirea, serviceberry and other species common to the region.

Although riffles are generally productive reaches for macroinvertebrate production, the aquatic conditions along this reach were of generally lower habitat value than the reach immediately upstream due to the reduced number and area of side channel habitat that maximizes the riparian contributions of organic matter. However, large woody debris was present in several locations within the wetted perimeter of this reach, and it is not confined by dikes along either bank, providing good floodplain connectivity and some, albeit lesser, spawning habitat where Outfall Alternative 3 would likely be placed. Given the established riparian corridor and lack of direct channel confinement by riprap on either bank, and the presence of stable large wood in the channel, the habitat value of this reach will be considered better than the uppermost reach through which Outfall Alternative 1 is proposed, and slightly less value than the reach immediately upstream (at the location of the existing outfall and replacement Outfall Alternative 2). Riparian and contiguous upland habitats in this reach will not be affected by any portion of the proposed project actions described in this BE.

There was also a difference in water surface elevation between the Hanson Ponds and the Yakima River. Hanson Pond No. 2 was 3.1 feet higher than Pond No. 1, and the Yakima River was 2.8 feet higher than Pond No. 2. Elevation differences in this area could create a dike breach. In 1999, USACOE constructed two emergency jetties (rock barbs) to stop north dike erosion during a high water event (7,200 cfs); however, the jetties are considered a short-term solution to channel stabilization in this section of the Yakima River. The bend near RM 180 is naturally stable due to no channel alterations. This area is a network of wetlands and small water-filled channels.

Quantitative Habitat Measurements

A quantitative habitat survey was conducted to provide metrics on the large wood loading and pool quality in the thalweg of the mainstem Yakima River through much of the action area. Data summaries from that exercise are provided in Attachment 4. The survey encompassed RM 181.4 to 180.2, slightly less than the reaches described qualitatively above. There is substantial debate over proper wood loading conditions in eastside rivers, and what size of wood would constitute a “functional” size piece to provide channel forming functions and fish habitat. We recorded our measurements using Washington State watershed analysis criteria, separating “functional” size classes into three categories: 4-8 inches diameter, 8 to 20 inches diameter, and greater than 20 inches diameter. All LWD greater than about 2 feet was tallied along this section of river for both the wetted perimeter and bank full width and individual pieces of log jams were also counted individually. Because logjams are made up of LWD piled upon one another, the habitat provided by each piece of a log jam is not equivalent to the habitat provided if these pieces were spread apart. Generally, logjams provide more habitat than a single piece of LWD, but not as

much habitat if all the wood in the jam was distributed as single pieces within the wetted width of the channel.

In brief, much of the LWD counted within the bank full width was located high on mid-channel islands or gravel bars, and would require flows above ordinary high water to be useful as fish habitat. Therefore, for properly functioning rating purposes, only LWD counted within the wetted perimeter was used in this habitat quality assessment. The NMFS (NOAA-Fisheries) criterion for eastside LWD loading (NMFS 1996) only incorporates LWD with diameters greater than 12 inches and lengths greater than 35 feet. We counted 36 pieces of moderate to large size diameters (greater than 8 inches) LWD, in the wetted perimeter (a NMFS rating of "good" if length of the piece was discounted) only about 3 were greater than 25 feet in length and 12 inches diameter, and many smaller pieces counted were part of log jams. This section of the Yakima has fairly dense riparian stands along its banks, especially for an eastside river, providing sufficient recruitment potential. Therefore, while the 3 LWD counted in the functional size considered by NMFS would rate as "poor", there is sufficient recruitment potential from the riparian stands along the thalweg to justify a "fair" rating for LWD loading in the thalweg. Wood loading along side channel habitat that flows along the northern dike through portions of the reach examined was not quantified, although qualitative examination of the habitat revealed few LWD pieces, and insufficient recruitment potential from the riparian zone because of the dike.

Similar to the LWD loading, pools are limited through the action area. Only two pools were identified in the thalweg under the moderately low flow conditions of the survey. This metric, using NMFS criteria, would rate as "poor". According to NMFS criteria, a minimum of 18 pools/mile is needed to justify a rating above poor. While we did not record pools in the side channel habitats, and there are clearly a number of pools in these side-channels, observations from the snorkel survey work and qualitative habitat reconnaissance supports the overall rating of "poor". The number of side-channel pools observed in reconnaissance (est. < 10) would not be sufficient to meet criteria, and many are dewatered after up-river irrigation releases cease in mid-September. During this survey, pool habitat consisted of only two percent of the total available habitat (Attachment 4). The lack of pools and LWD loading are often interrelated, as the LWD is a principal means for forming pools. Thus, the results for pool frequency in the project area are not unexpected, and are consistent with aerial photographs reviewed from the area.

4.3.2 EXISTING HANSON PONDS HABITAT

The proposed Hanson Ponds off-channel habitat restoration/enhancement project would incorporate approximately 83 acres of existing disturbed instream and riparian habitat along the north shoreline of the Yakima River floodplain. Water currently entering the ponds as groundwater and hyporheic flow (i.e., in intragravel hydraulic continuity with the Yakima River mainstem). The armored dike that protects the Hanson Ponds has disturbed most of the riparian corridor surrounding the ponds, and has prevented natural vegetation from reaching its maximum potential diversity and density. However, mature cottonwood, willow and a variety of shrub species currently encircle the pond at low to moderate densities.

A cross-sectional survey was conducted by Entrix, Inc. at the Hanson Ponds on August 6, 2002. During this survey, depths were measured at consistent distances along a west-to-east transect through Pond No. 1 and Pond No. 2 (Figure 4.4-1). Maximum depths recorded did not exceed 9 feet, and both ponds appear to slope to their greatest depths near their eastern ends. Substrate information was also taken to determine the potential quality of rearing habitat within the ponds (if they were to be made accessible). Submerged aquatic vegetation, principally *Potamageton natans* and *P. amplifolius* were prevalent in large colonies scattered throughout the ponds, particularly at depths between 3 and 6 feet (4.4-2). Visible substrate within the ponds was predominantly cobble and gravel, with a fine layer of silt overlying some of the deeper areas. Riparian conditions encircling the areas disturbed by gravel roads around the pond were consistent with adjacent riverine riparian habitat disturbed by the north bank dike. These areas were colonized with a moderate to low density of upland and facultative plants, including black cottonwood, Ponderosa Pine, Sitka alder (*Alnus sinuata),* Pacific willow (*Salix lucida*), and redstem dogwood (*Cornus sericea*), amongst others.

Preliminary wetland investigations performed for the Yakama Nation by Sheldon & Associates (Kim Harper, Sheldon Associates, personal communication 9/24/02) within the Hanson Ponds have not been finalized, but wetland area estimates within and encircling the Hanson Ponds project area are depicted in Figure 2.2-12. Wetland vegetation in the wetlands found along the northern borders of the Hanson Ponds consists of a variety of primarily herbaceous species, including sedges (*Carex spp.* and *Scirpus spp.*), rushes (*Juncus spp),* horsetail (*Equisetum spp.),* cattail (*Typha latfolia*) and reed canarygrass (*Phalaris arundinacea*). Along the pond edges within the pond largeleaf pondweed is also present (*Potamogeton amplifolius*). Downstream of the ponds, within, along and adjacent to the egress channel, similar wetland vegetation was observed. At higher elevations, the combination of previously mentioned upland and wetland facultative plants was observed.

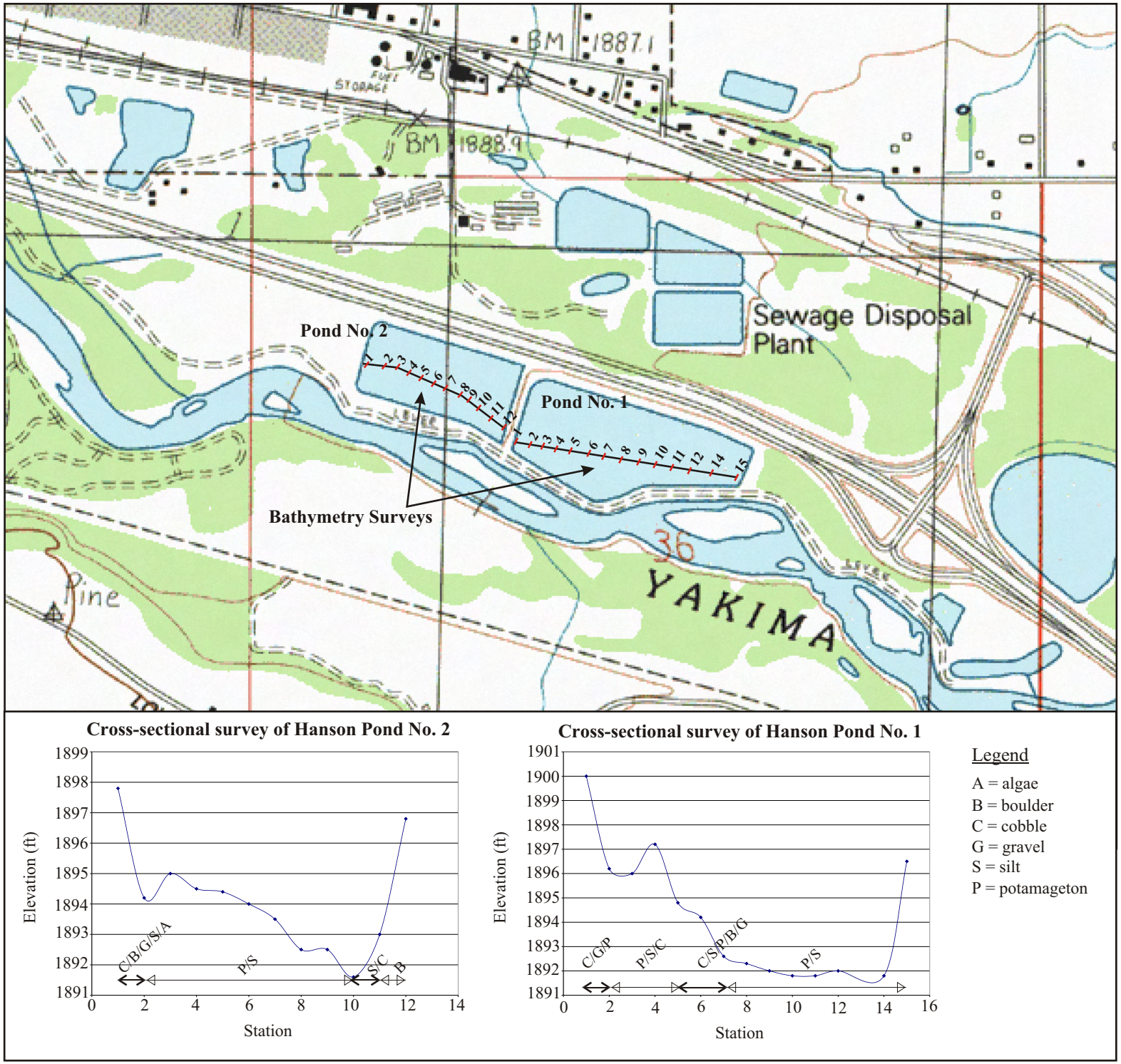


Figure 4.4-1. Cross-sectional bathymetry survey of Hanson Ponds No. 1 and 2. Substrate is indicated in order of dominance, with the most dominant first.

Figure 4.4-2. Hanson Pond characteristic habitat and resident fish species.
Panel 1 (top): View of pond weed (*Potamogeton natons*) found within the Hanson Ponds.
Panel 2 (bottom): Northern pikeminnow (*Ptychocheilus oregonensis*) found within the Hanson Ponds (photograph courtesy of the Yakama Nation).

5.0 ANALYSIS OF EFFECTS

5.1 EFFECTS ANALYSIS

The following analysis is based on an evaluation of a matrix of habitat quality indicators developed by NOAA Fisheries (1996) to consider the effects of a project action relative to environmental baseline conditions NMFS (1996) (Table 5.1-1). Under this schema, pathways that play the largest role in determining the viability of salmonid populations are identified, and measurable indicators that directly or indirectly affect these pathways are rated. For the following discussion, analyses of the short-term, long-term, interrelated, interdependent and cumulative effects of the project actions are considered by pathway for both of the main project elements considered in this BE - the outfall relocation and the Hanson Ponds habitat restoration/enhancement.

As indicated in section 1 of this BE, project funding for the Yakama Nation to acquire the Hanson Ponds for restoration may lag the timeline for the City's outfall relocation and mainstem rock drop installation by up to one year. For this reason, we have attempted to identify the impacts (by pathway and indicator) for the outfall relocation and mainstem rock drop both separately and apart from the project components associated with the Hanson Ponds Restoration/Enhancement. In Table 5.1-1, the temporary *and* permanent impacts unique to the outfall and mainstem rock drop are referenced with the qualifier 'x', and the Hanson Ponds Restoration impacts are referenced with the qualifier '+'. For these distinct project actions, actions that degrade the environmental baseline only temporarily are still considered to degrade the baseline because even a temporary disturbance, under some scenarios, could result in a "take" of an ESA-listed species. However, the temporary degradation of an environmental baseline does not presume that take has occurred.

For the interpretation of the net effects of both actions (i.e., the outfall relocation and the ponds' restoration) we considered the best management practices used to minimize the temporary construction disturbances, the mitigation for permanent losses to critical habitat, and the long-term habitat impacts and benefits from the combined actions. Temporary impacts were not considered to degrade the environmental baseline in the net effects analysis unless they also resulted in a permanent impact. The net effects of the actions referenced in Table 5.1-1 are highlighted with the qualifier '[o]' to identify our conclusions of the actions' potential effects.

Table 5.1-1. Effects of outfall relocation and mainstem rock drop installation (x), Hanson Ponds habitat restoration/enhancement (+), and net effects of both actions combined (o) on pathways and indicators of relevance to ESA-listed salmonids*

PATHWAYS: INDICATORS	**ENVIRONMENTAL BASELINE**			EFFECTS OF THE ACTION(S)		
	Properly Functioning	**At Risk**	**Not Properly Functioning**	**Restore**	**Maintain**	**Degrade**
Water Quality: Temperature		[o]		×, [o]		+
Dissolved Oxygen		[o]		x, [o]	+	
Sediment/Turbidity	[o]				[o]	×,+
Chemical Contam./Nut.		[o]		×, [o]	+	
Habitat Access: Physical Barriers (fish passage)		x	+	+, [o]	x	
Habitat Elements: Substrate	[o]			+, [o]	×	
Large Woody Debris		[o]		+, [o]	x	
Pool Frequency			[o]	+, [o]	x	
Pool Quality		[o]		+, [o]	x	
Off-channel Habitat			[o]	+, [o]	x	
Refugia		[o]		+, [o]	x	
Channel Cond. & Dvn: Width/Depth Ratio	[o]				x, +, [o]	
Riverbank Condition		[o]		+, x, [o]		
Floodplain Connectivity		[o]		+, [o]	x	
Flow/Hydrology: Peak/Base Flow			[o]	+, [o]	×	
Drainage Network Increase	[o]				x, +, [o]	
Watershed Conditions: Road Dens. & Loc.			[o]		x,+, [o]	
Disturbance History		[o]			x, +, [o]	
Riparian Reserves		[o]		+ [o]		x

* Temporary impacts from constructing the outfall and mainstem rock drop (x), and Hanson Ponds Restoration (+) are considered to degrade the environmental baseline. Interpretation of the net effects of both actions ([o]) incorporates consideration of best management practices used for temporary construction disturbances, mitigation for permanent losses to habitat (e.g., wetlands), and permanent habitat impacts and benefits from the combined actions of the outfall relocation and Hanson Ponds Restoration/Enhancement construction. The interpretation of the net effects of the action considers only the long-term effects of the combined actions, not temporary impacts from construction.

5.1.2 WATER QUALITY PATHWAY ANALYSIS

The Yakima River at the point of discharge near the City of Cle Elum is a freshwater Class A water body. The standards that must be met for a Class A waterbody are listed in Table 5.1-2.

Table 5.1-2. Washington State freshwater Class A water quality standards.

Water Quality Parameter	Projected Limits At RSP Build-Out (Cosmo. 2002)		Class A Numeric Water Quality Standards (WAC 173-201a)	
Fecal Coliform	NA		100 colonies per 100 mL maximum geometric mean; 90th percentile – 200 colonies/100 mL	
Dissolved Oxygen			8.0 mg/L minimum (via natural conditions)	
Temperature			18 °C maximum; no human-caused increase above 3 degrees Celsius (when natural conditions exceed 18C); point sources shall not exceed t = 28/(T+7) at mixing zone boundary	
pH			6.5 to 8.5 standard units	
Turbidity			Less than 5 NTU above background, w/background ≤50 NTU	
Dissolved Oxygen			Shall exceed 8.0 mg/L	
Toxics	Avg. Monthly Limit	Max. Daily Limit	Acute Water Quality Criteria	Chronic Water Quality Criteria
Ammonia-N (mg/L)	7.2	16.6	9.366	2.135
Chlorine (ug/L)	NA**	NA**	19	11
Cadmium* (ug/L)	5	1.4	0.75	0.35
Copper* (ug/L)	5.0	7.3	4.26	3.23
Mercury (ug/L)	0.2	0.3	2.1	0.012
Silver* (ug/L)	0.4	0.6	0.28	
Zinc* (ug/L)	39.8	58	33	30.1
Lead* (ug/L)	17.2	25	12.6	0.49

*hardness dependent, based on assumed hardness of 23 mg/L $CaCO_3$.
**NA. Not applicable. Chlorine treatment to be discontinued following conversion to ultraviolet disinfection system.

A detailed mixing zone study was conducted to examine the potential water quality benefits and impacts from the three outfall alternative locations under consideration in this FEIS (Cosmopolitan 2002). Alternative 1, the preferred outfall location coincident with the mainstem rock drop proposed, achieved complete vertical mixing in the shortest distance downstream from the discharge point (Table 5.1-3).

Table 5.1-3. Yakima River mixing zone study results for the three outfall alternatives assuming a 7Q10 of 300 cfs (Cosmopolitan 2002a).

Alternative	Acute Dilution	Acute Mixing Zone Distance (feet)	Chronic Dilution	Chronic Mixing Zone Distance (feet)
Alternative 1	1.77	2	14.5	21
Alternative 2	1.77	22	11.6	300
Alternative 3	1.77	7	14.5	140

Discharge from the existing Cle Elum wastewater treatment plant outfall exceeds end-of-pipe numeric water quality standards for temperature and ammonia, and no mixing zone has been granted due to the existing outfall configuration (Cosmopolitan 2002). In the development of the new RSP, the existing lagoon system will be converted to an extended aeration system and effluent quality prior to mixing will be improved over these existing conditions. The following discussion compares the environmental baseline of the water quality indicators relative to the expected quality of these indicators following outfall relocation, and Hanson Ponds Habitat Restoration/Enhancement.

Water Temperature Indicator

Environmental Baseline

The action area encompassing the preferred and alternative outfall locations is on the Washington Department of Ecology 303(d) list for temperature (Ecology 1998). Thermal inputs into and upstream of the action area are contributed by the headwater impoundments of the river, by the existing Cle Elum wastewater outfall, by Crystal Creek—which currently conveys treated effluent from the City of Roslyn, by the Yakama Nation's Cle Elum salmon hatchery approximately 1 mile upstream of the action area, by non-point sources, and by the lack of riparian shade over significant portions of the river.

Three excursions were recorded above Class A temperature criteria at Ecology monitoring station 39A090 (RM 191) between 1991 and 1996. This monitoring station is upstream of the Cle Elum River confluence and is the closest station to the project area. The Cle Elum River, which joins the Yakima at RM 186, has also been listed for temperature, with 26 excursions above Class A criterion recorded by the Forest Service (Ecology 1998). As the Cle Elum River can provide up to 50 percent of base flows in the action area (W. Larrick, BOR, personal communication 9/25/02), the thermal contributions of this tributary to the action area are significant. Although there are significant thermal inputs into and upstream of the action area, these inputs do not generally cause water temperatures to exceed "not properly functioning" thresholds for spawning and migration as identified by NOAA-Fisheries (60 and 64 degrees Fahrenheit, respectively). Therefore, we conclude that the action area environmental baseline for temperature is "at risk".

Effects of Outfall Relocation and Mainstem Rock Drop for Flood Protection

Wastewater effluent temperature at the proposed outfall relocation site was conservatively estimated to reach a maximum of 25 degrees Celsius (°C) (Cosmopolitan 2002). Due to rapid vertical mixing, the maximum estimated increase above ambient conditions will be 0.9°C, with a 90th percentile maximum temperature at the mixing zone boundary of 14.8°C. The NOAA-Fisheries temperature indicator criteria for "properly functioning conditions" is rated at 10 to 14°C, with "fair" conditions considered temperatures ranging from 14 to 17.8°C (NMFS 1996). Although the modeled increase in temperature at the new outfall location could reduce the temperature rating in the immediate project area (i.e., boat notch scour pool) from 'properly functioning' to 'fair', the actual occurrence of such an event would be extremely unlikely because of flip-flop flow regulation in the system. Lowest flows in the action area do not occur in the summer, but rather occur in late October and mid-winter months, when ambient conditions are much lower than 10°C. The outfall relocation moves the heated discharge away from areas

that are utilized heavily by salmon and trout at the present time. The effect of this project action is therefore concluded to qualitatively improve this indicator rating over the environmental baseline condition for ESA-listed salmonid species. Any measurable temperature changes possible from the outfall relocation should have no net effect on other T&E species.

Effects of Hanson Ponds Habitat Restoration/Enhancement Measures

Construction of the mainstem rock drop for bank protection and direction of Yakima River water into the Hanson Ponds will convey up to 10 percent of the river's flow. The ponds' exhibit lake-like (lacustrine) conditions at the present time, with minimal shade. There is an assumed potential for a marginal increase in Yakima River temperature following routing through the ponds. The ponds, even with a change to a more fluvial character after restoration, will likely slow the water slightly, providing time for the water temperature to increase before returning to the mainstem. Therefore, the effect of this project action is conservatively considered to degrade the baseline temperature conditions in the mainstem Yakima River. Due to flip-flop flow regulation, however, we again conclude this potential effect to be highly unlikely.

Dissolved Oxygen Indicator

Environmental Baseline

Ecology (1998) listed the Yakima River upstream of the action area for dissolved oxygen because there were three excursions out of 12 samples beyond the Class A criteria at Ecology station 39A090 between September 1991 and September 1996. Biological oxygen demand has consistently met Class A criteria at this station. Biological oxygen demand (BOD) at the outlet of the existing outfall along the northern dike likely is above ambient for some distance downstream. The environmental baseline for dissolved oxygen is therefore considered "at risk" (NMFS 1996).

Effects of Outfall Relocation and Mainstem Rock Drop for Flood Protection

Relocating the outfall to the preferred alignment will improve baseline dissolved oxygen conditions because wastewater discharge and its associated BOD will be rapidly mixed in the turbulence created in the scour pool downstream of the boat notch in the mainstem rock drop. The most significant benefit will accrue from the removal of the existing discharge, away from the shoreline, opening at least 60 feet of rearing habitat which juvenile salmonids cannot use at present because of high BOD (*see* Attachment 2, Plate Ie).

Effects of Hanson Ponds Habitat Restoration/Enhancement Measures

The Hanson Ponds Restoration/Enhancement should have no practicably measurable effects on dissolved oxygen, as flow rates through the ponds will yield water exchange rates that will prevent significant dissolved oxygen stratification.

Suspended Sediment & Turbidity Indicator

Environmental Baseline

Fine sediments are not heavily embedded into the interstices of stream gravel and cobbles in the outfall relocation project area because of the high velocity gradients in this reach. Thus, sources of fine sediments that could otherwise contribute to turbidity on rising hydrograph limbs are not excessive. Substrate underlying the scour pool where the outfall relocation is proposed is predominantly composed of cobble, with fines deposited only in the deepest quiescent portions of the existing scour pool. Boulders predominate in the high velocity reach impinging on the north bank, upstream of the scour pool. Turbidity and suspended sediments are rapidly transported through the project area due to high velocity gradients inherent in this reach. No TMDL listings have been established in the Cle Elum reach of the Yakima River for suspended sediment; TMDL listings downstream have not directed actions in the Cle Elum reach of the river. Turbidity and suspended sediment currently discharged into the Yakima River via the existing outfall are not significant. The environmental baseline for this indicator is therefore considered to be "properly functioning" according to NOAA-Fisheries criteria (NMFS 1996).

Effects of Outfall Relocation and Mainstem Rock Drop for Flood Protection

Relocating and installing the wastewater outfall for the RSP should have no effect on turbidity and/or suspended sediment in the project or action areas. Effects from the construction of the rock drop for flood protection in which the outfall would be secured are discussed subsequently. The addition of approximately 3,660 tons of rock for the mainstem rock drop along the banks and bisecting the Yakima River (the rock drop) will cause localized, temporary turbidity. Removal of approximately 1,000 CY of gravel from the vegetated bar upstream of the rock drop will also create turbidity. Turbidity created by that action should be largely confined to the bar by erecting a temporary gravel berm around the periphery of the excavation. This practice was used upstream in the construction of a rock drop in South Cle Elum, without transmitting any turbid waters into fish bearing waters downstream (Entrix 2002). Despite these best management practices, we conservatively conclude that there will be potential, albeit temporary, degradation of the environmental baseline.

Effects of Hanson Ponds Habitat Restoration/Enhancement Measures

Connecting the Hanson Ponds to the Yakima River will initiate a short-term pulse of turbidity, as the flow-through conditions created through the ponds and the outlet channel will suspend organic matter and sediments that have accumulated over many years. The addition of approximately 7,730 tons of rock for the ponds' inlet channel and the breaching of the dikes along the northern banks of the Yakima River will also cause localized, temporary turbidity. This turbidity will be controlled with best management practices. To the extent practicable, flows will be metered through the ponds in a controlled manner initially, so that turbid plumes can be avoided. Notwithstanding, any turbidity created from this action will be short term, as settling downstream of the channel, in existing pond habitats, will effect sediment deposition before the waters are ultimately returned to the Yakima River through the existing outlet channel. The effects of turbidity will be short-term and localized, but will represent degradation over existing conditions during that time.

Chemical Contamination and Nutrients Indicator

Environmental Baseline

Toxics released from municipal wastewater discharge generally include chlorine, ammonia and metals. The City has made interim improvements in their wastewater system to improve water quality. For example, the plant has been converted to an ultraviolet light (UV) treatment system, replacing the use of chlorine disinfection. The UV system removes the potential impacts of a chlorine discharge to the river. The City of Cle Elum is also considering a plan to use nitrification to convert ammonia into a less volatile form of nitrate (Earth Tech 2002). However, with the existing outfall alignment, the City cannot meet permitted discharge requirements for ammonia.

The Cascade ecoregion of the Yakima River that encompasses the action area of the preferred and alternative outfall locations is on the Washington Department of Ecology 303(d) list for water quality violations of 4,4'-DDE, and DDT. Ecology listed the Yakima River for 4,4'-DDE and DDT because there were excursions beyond the criterion in edible tissue of whitefish collected on August 19, 1985. Cadmium and copper are the only metals that have been detected by Ecology in ambient monitoring near Cle Elum (Ecology 1998). Historically, the City did not monitor metals potentially discharged from their existing wastewater outfall, but a more recent report (Johnson 2000) suggests that metals contamination of the upper river is not a problem. Considering both the City discharge, and other sources of potential contamination in the action area, the environmental baseline for chemical contamination and nutrients in the action area is considered "at risk".

Effects of Outfall Relocation and Mainstem Rock Drop for Flood Protection

Constituents discharged from the RSP via the relocated outfall will not contribute to the contaminant loading responsible for the 303(d) listings of DDT and DDE in the upper Yakima River. Such organic constituents will not be released from the RSP.

Cosmopolitan (2002), from a review of other municipal wastewater discharges of similar size, indicated that the copper, lead, silver, and zinc limits for the new NPDES permit are significantly lower than the permitted discharges in other regions. The NPDES permit conditions for the RSP specify metals monitoring, so a better water quality data base will ultimately be developed, improving the ability to respond to water quality conditions potentially harmful to T&E species using adaptive management.

Relocation of the mixing zone to its proposed location will greatly reduce the risks of impacting aquatic populations with discharged ammonia because of the substantially reduced length of the mixing zone facilitated by the placement location. Rapid mixing in the boat notch feature of the mixing zone should prevent toxic concentrations of unionized ammonia from affecting salmonids, as fish that may pass through the zone will not be confined, and will have the ability to move out of the area without restriction.

The erection of the mainstem rock drop by itself will have no effect on the chemical contamination baseline. However, the mixing zone at the preferred outfall location will improve the ability to dilute metal and ammonia effluent constituents within a shorter distance downstream of the outfall than currently occurs (Table 5.1-2). Thus, water quality conditions in

the action area will be improved over the existing environmental baseline (Cosmopolitan 2002). The net effect is an improvement over the environmental baseline.

Effects of Hanson Ponds Habitat Restoration/Enhancement Measures

Project elements associated with the Hanson Ponds Habitat Restoration/Enhancement will not affect the chemical contamination indicators of habitat quality. A spill prevention plan will be prepared in accordance with BMPs for on-site contractors. Hydraulic oils will be vegetable based.

5.1.3 HABITAT ACCESS PATHWAY ANALYSIS

Physical Barriers Indicator

Environmental Baseline

Salmonids from the Yakima River are restricted from utilizing all potentially available habitat in the Hanson Ponds and in the ponds' existing egress channel upstream of Pond 3 (*see* Figure 2.2-12 for 'Pond 3' reference). Passage restrictions are caused by physical obstructions, insufficient flows, and vegetation. The environmental baseline is considered "at risk" because of the inability of salmonids to access only some of the habitat potentially available within the Hanson Ponds habitat mosaic.

Effects of Outfall Relocation and Mainstem Rock Drop for Flood Protection

Relocating the outfall upstream in a controlled mixing zone would likely increase the water quality within the reach of the river that supports spawning populations of spring chinook. Thus, potential water quality restrictions to microhabitat access along the northern bank of the river near the existing outfall will be improved by the relocation of the outfall.

Construction of the mainstem rock drop coincident with the relocated outfall will reduce the rate of erosion and scouring along the north bank. The river's hydraulics would be channeled to the center of the river where a boat notch could redirect the energy into a mixing zone for wastewater effluent dilution. Although these outcomes are beneficial, they do not directly affect fish passage. As the rock drop is also necessary for the creation of the inlet channel to Hanson Ponds, the mainstem rock drop could be indirectly viewed as beneficial for improving floodplain access. Notwithstanding, the net effect of the mainstem rock drop and outfall relocation is considered to maintain the environmental baseline.

Effects of Hanson Ponds Habitat Restoration/Enhancement Measures

Connecting the Hanson Ponds to the Yakima River will improve off-channel habitat for salmonids. Associated improvements to the riparian habitat, in-channel habitat, and connecting the ponds to the Yakima River will encourage the change of this lacustrine environment into rearing habitat and refugia more fluvial in character, favoring juvenile salmonids.

5.1.4 HABITAT ELEMENTS PATHWAY ANALYSIS

Substrate Indicator

Environmental Baseline

High river velocities throughout the project area cause localized scouring and transport fine sediments and spawning-size gravels downstream (Figure 2.2-6). As a result, project area substrate within the preferred outfall alignment is principally composed of cobble, large gravel, and boulder, respectively. In the existing scour hole, at the pool bottom, some silt has also deposited (in depositional areas away from the scouring velocities). Fine sediments throughout the action area have not significantly embedded gravel beds where spawning is actively occurring. Smaller gravel deposition that supports salmon and trout spawning occurs beginning about one quarter-mile downstream of the project area as the channel enters a channel migration zone. The environmental baseline for substrate therefore rates as "properly functioning" according to NOAA-Fisheries criteria (NMFS 1996).

Effects of Outfall Relocation and Mainstem Rock Drop for Flood Protection

The outfall relocation alone will have no effect on substrate conditions in the Yakima River. Substrate conditions at the existing outfall location are not anticipated to change either because the existing outfall will be abandoned in place.

Benthic communities will be altered with the addition of the mainstem rock drop structure. Macroinvertebrates can colonize rock drop structures, and, where pool habitat is limited, rock drop structures can be expected to provide holding and rearing opportunities for fish also. For these elements of the overall project, gravel deposition can be expected behind the mainstem rock drop because lower velocities will prevail through this reach over the existing condition. Spawning conditions will likely improve over the existing conditions; however, the substrate conditions for supporting listed salmonids overall will maintain the environmental baseline.

Effects of Hanson Ponds Habitat Restoration/Enhancement Measures

Increased flows through the egress channel of the ponds can be expected to clean underlying alluvial gravels likely deposited there from historic channel movements that have since been cut off by diking along the north bank. The cleansing of these gravels will likely improve macroinvertebrate colonization opportunities, and potentially provide additional spawning opportunities for salmonids within the action area. Benthic communities could be shifted slightly to different sections of the Yakima River in the long-term by substrate changes. Habitat effects related to substrate changes will be considered long-term, but will not result in an adverse effect to the suitability of the action area's habitat to support ESA-listed species. We conclude that the Hanson Ponds Restoration/Enhancement elements of the project will ultimately improve substrate conditions over baseline conditions.

Large Woody Debris Indicator

Environmental Baseline

There is currently a lack of LWD in the action area, as discussed in section 4.3. Wood retention in the channel is likely affected by flip flop flows, so pools formed by wood are scarce in the action area. The recruitment potential of LWD into the channel is fair because of sufficient riparian reserves on vegetated islands and the south bank. Thus, the environmental baseline for LWD in the action area is "at risk" based on NOAA-Fisheries criteria (NMFS 1996).

Effects of Outfall Relocation and Mainstem Rock Drop for Flood Protection

The outfall relocation will have no effect on LWD loading in the project or action areas. The erection of the mainstem rock drop will avoid the removal of large trees that could recruit into the river from the south bank. The net effect of these actions is to maintain the environmental baseline.

Effects of Hanson Ponds Habitat Restoration/Enhancement Measures

Specific plans for the quantity, placement and design of LWD installations within the Hanson Ponds habitat mosaic are not developed yet but the importation of LWD into the Hanson Ponds design is a key element of the enhancement measures planned. This habitat indicator will therefore show an improvement over environmental baseline conditions.

Pool frequency Indicator

Environmental Baseline

The project area contains one scour pool located at the alignment of the proposed rock drop, but is dominated by run habitat for approximately one-quarter mile downstream of the pool. Based on our field examinations, pool frequency throughout the action area overall would rate as "not properly functioning" according to the NMFS criteria of less than 18 pools per mile (NMFS 1996).

Effects of Outfall Relocation and Mainstem Rock Drop for Flood Protection

The outfall relocation on its own will not effect pool frequency.

Construction of the mainstem rock drop and adjacent (upstream) gravel bed removal will alter stream hydraulics and shift pool habitat within the unstable project area slightly downstream of the boat notch in the rock drop. Additional pool habitat may be created in the backwater immediately upstream of the rock drop. Overall, however, pool frequency is conservatively assumed to be maintained at the environmental baseline.

Effects of Hanson Ponds Habitat Restoration/Enhancement Measures

There will be a substantial increase in the number of pools in the action area by connecting the Yakima River to the Hanson Ponds and the ponds' egress channel. Within the Yakima River, there will be no net loss in pool habitat, but likely no significant increase in pool habitat area

either. Because of the large pools made accessible within the Hanson Ponds, we conclude that this indicator will improve over existing baseline conditions.

Pool Quality Indicator

Environmental Baseline

Properly functioning (i.e., good) pool quality, according to NOAA-Fisheries, provides for pools with good cover, and depths greater than 1 meter, and limited filling with fine sediments (NMFS 1996). The pools within the project area consist of lateral scour pools and back eddies. Pools within the broader action area also principally formed by rock or lateral scouring around island and channel margin habitat. Few pools are formed from wood due to the low abundance, recruitment and retention of LWD apparent throughout the reach. The lack of woody debris presently limits good pool rearing habitat for juvenile salmonids in the action area; however, several large deep pools greater than 1 meter deep are found in the action area. Thus, the environmental baseline for this indicator supports an "at risk" rating.

Effects of Outfall Relocation and Mainstem Rock Drop for Flood Protection

The outfall relocation will not effect pool quality overall. Construction of the Yakima River mainstem rock drop will create a pool downstream of the boat notch that will provide suitable hydraulic conditions for fish holding during their migration. However, it is unlikely that the pool formed below the boat notch will be significantly better than that which currently exists. Thus, the net effects of the outfall and rock drop are considered to maintain the environmental baseline for this habitat indicator.

Effects of Hanson Ponds Habitat Restoration/Enhancement Measures

Connecting the Yakima River to the Hanson Ponds will create substantial pool habitat. Additional pool habitat will be created within the egress channel from the ponds. It is anticipated that the project will therefore improve pool quality over environmental baseline conditions.

Off-Channel Habitat Indicator

Environmental Baseline

Significant off-channel habitat exists downstream of the proposed egress channel for the Hanson Ponds (e.g., *see ponds 3 and 4 in* Figure 2.2-12 and existing outlet channel from these ponds to the Yakima River). The functionality of this habitat in particular is compromised because of a lack of an upstream (flow-through) surface water connection to the Yakima River. Furthermore, much of the potentially available off-channel habitat in the action area, and the Yakima River as a whole is not accessible to salmonids and its lacking is considered a "limiting factor' to stock recovery. For this reason, the baseline for off-channel habitat is considered "not properly functioning"

Effects of Outfall Relocation and Mainstem Rock Drop for Flood Protection

The outfall relocation and mainstem rock drop will have no effect on off-channel habitat and the environmental baseline will be maintained

Effects of Hanson Ponds Habitat Restoration/Enhancement Measures

Off-channel habitat will be improved within the action area by creating access to the Hanson Ponds from upstream, and by connecting the proposed egress channel from the ponds to the existing outlet of the ponds (*see* Figures 2.2-11 and 2.2-12 for reference). The removal of passage barriers into the Hanson Ponds will substantially increase off-channel juvenile rearing habitat. Thus, this habitat indicator will substantially improve over the existing environmental baseline.

Refugia Indicator

Environmental Baseline

Refugia habitat exists in side channel habitat created through the cmz downstream of the project area, but within the lower portions of the action area. Additional habitat refugia is available in the accessible portions of the existing outlet channel of the Hanson Ponds discussed above under 'off-channel habitat' (*see* Figures 2.2-11 and 2.2-12 for reference). A small area of flood-flow refugia is also available along the south bank of the river along the preferred outfall alignment. Existing refugia in the action area is insufficient in size and connectivity to maintain viable sub-populations, and is therefore considered "at risk".

Effects of Outfall Relocation and Mainstem Rock Drop for Flood Protection

The outfall relocation should have no net effect on refugia. Refugia could be reduced in the short-term from a localized increase in suspended sediment in the water column during relocation of the wastewater treatment plant outfall, but these effects will be insignificant. The south bank key of the mainstem rock drop will fill a very small area of refugia through the south bank. However, waters will be backed up behind the rock drop, creating new refugia in the process. Thus, the environmental baseline is considered to be maintained for this indicator.

Effects of Hanson Ponds Habitat Restoration/Enhancement Measures

Although the Hanson Ponds Habitat Restoration/Enhancement will alter the existing habitat conditions in the ponds so that they exhibit more fluvial characteristics, the lacustrine characteristics that currently exist will not be completely eliminated. Salmonid predators such as the northern pike minnow, and fish-eating waterbirds such as the hooded merganser prefer such lacustrine conditions. However, high velocity refugia will be created throughout the entire Hanson Ponds mosaic, greatly favoring the successful rearing of juvenile salmonids to smoltification. The habitat benefits created from the ponds' hydrologic restoration, particularly in concert with the LWD placement and other habitat improvements to be undertaken, will ultimately improve refugia conditions over the existing baseline, irrespective of potential refugia also created for salmonid predators.

5.1.5 CHANNEL CONDITION PATHWAY ANALYSIS

Width/Depth Ratio Indicator

Environmental Baseline

This indicator reflects how a watershed can exhibit channel widening when the sediment recruitment rate into a system exceeds its transport rate. These conditions do not generally occur in the action area. Dikes limit sediment recruitment from the banks in the action area. Dams occlude much of the sediment recruitment from upstream. While there is substantial sediment transport through the action area, the sediment recruitment rates are not in excess of the transport rates. Indeed, Geomax (2002) has identified several localized instances of "headcutting" within the thalweg of the mainstem. Such headcutting generally occurs when recruitment rates are less than that required to balance with transport conditions, and bedload scour progresses upstream ("headcutting"). Based exclusively on the NOAA-Fisheries criteria (NMFS 1996), the existing environmental baseline would achieve a rating of "properly functioning"—a width/depth ratio of less than 10.

Effects of Outfall Relocation and Mainstem Rock Drop for Flood Protection

The outfall relocation and mainstem rock drop will not alter the environmental baseline for this indicator.

Effects of Hanson Ponds Habitat Restoration/Enhancement Measures

The restoration and enhancement of habitats in the Hanson Ponds will effect the overall width/depth ratio of the mainstem Yakima River by diverting up to 10% of the river's flow through the ponds. Any movement in this indicator will be insignificant, or result in a reduction in the ratio (considered an improvement). Therefore, the Hanson Ponds Habitat Restoration/Enhancement can be considered to maintain the environmental baseline for this indicator.

Floodplain Connectivity

Environmental Baseline

Floodplain connectivity is restricted throughout much of the project and action area by diking. Connectivity is particularly confined along the north bank, preventing overland flows that could otherwise support fringing wetlands and other floodplain functions. Connection of the Hanson Ponds to the mainstem is also currently prevented. Large portions of the south bank floodplain are not restricted and the succession and integrity of riparian and riverine wetlands are properly functioning. Considering the conditions along both banks, the environmental baseline of this habitat indicator is considered "at risk"

Effects of Outfall Relocation and Mainstem Rock Drop for Flood Protection

Neither the outfall relocation or mainstem rock drop will have an effect on floodplain connectivity. These project elements will maintain the environmental baseline.

Effects of Hanson Ponds Habitat Restoration/Enhancement Measures

Opening the floodplain to the Hanson Ponds will result in a significant net improvement over existing conditions for this indicator.

Riverbank Condition

Environmental Baseline

This indicator references the degree of erosion along a riverbank, and how a project's action could effect this endpoint. A properly functioning riverbank is considered one with erosion affecting less than 10% of the riverbank (NMFS 1996). The riverbank of the project area is largely diked, particularly along the north bank where erosion continues to be a problem. The rip-rap dikes slow erosion, but obstructs natural bank conditions and vegetation from becoming established. The existing baseline is therefore considered 'at risk' for its erosion potential.

Effects of Outfall Relocation and Mainstem Rock Drop for Flood Protection

The outfall relocation will cause a minor disturbance of the riverbank through a portion of the dike along the north bank already lined with riprap. However, the risk of erosion and breaching of the north bank dike at RM 181.2 (that could imperil I-90 infrastructure) is the impetus for the mainstem rock drop. The riverbank condition will be temporarily disturbed by equipment operated from the shoreline to construct the mainstem rock drop, particularly through the south bank. After construction, local bathymetry and shoreline integrity will be consistent with pre-project conditions relative to the habitat values provided by the riverbank because all disturbed areas will be replanted. Most importantly, the mainstem rock drop will be constructed specifically to address the erosion and scour that are currently occurring along the north bank of the river. When the temporary disturbance and the erosion protection are considered on balance, we conclude that the net effect of the proposed action will be to improve the existing riverbank condition.

Effects of Hanson Ponds Habitat Restoration/Enhancement Measures

The bank conditions within the Hanson Ponds will become integrated within the overall riverbank conditions of the action area after the ponds are connected to the Yakima River. Diverting up to 10% of the river's flow will also provide a mechanism to dissipate erosive energies affecting mainstem riverbank conditions. Thus, the ponds' restoration will result in a significant improvement over the environmental baseline.

5.1.6 FLOW/HYDROLOGY PATHWAY ANALYSIS

Peak and Base Flows

Environmental Baseline

Peak and base flows within the Yakima River are altered on an annual basis by the BOR-managed irrigation flows released from headwater impoundments in the watershed (Table 2.1-1). These flow regulations causes high summer flows, and lower than normal fall, winter and spring flows. The flow regulation also dampens peak and base flows that would otherwise occur.

Because of the flow regulation, the environmental baseline for the peak and base flow habitat indicator is rated as "not properly functioning," consistent with the NMFS criteria relative to an undisturbed watershed of similar size.

Effects of Outfall Relocation and Mainstem Rock Drop for Flood Protection

The outfall relocation and mainstem rock drop elements of the overall project will have no effect on peak or base flows, and the environmental baseline for this indicator will be maintained.

Effects of Hanson Ponds Habitat Restoration/Enhancement Measures

Diverting up to 10 percent of the river's flow into the Hanson Ponds could affect peak and base flows in the Yakima River over the distance of the diversion. . Diverting flood flows will enable additional flood storage not presently available. Diverting base flows will provide habitat complexity over that provided alone within the Yakima River. The diversion is not a consumptive use, and will not affect the overall hydrograph within the broader action area. The effect of the Hanson Ponds restoration on peak and base flows within the action area can be considered an improvement over the environmental baseline.

Drainage Network

Environmental Baseline

This indicator references how the erection of roads and other infrastructure (e.g., irrigation withdrawals and ditches) can affect the distribution of surface and groundwaters in a project area. Significant (~ 20to 25%) increases in a drainage network are considered detrimental to fish habitat, increases of approximately 5% are considered to place a system "at risk". The only significant tributary entering the action area is Crystal Creek, which flows into the Yakima River just below the South Cle Elum bridge, at the upper edge of the action area. Stormwater discharge enters the river below I-90. Some flow also enters the Yakima River through the existing Hanson Ponds outlet. Source waters for this flow are likely a combination of hyporheic flows from the adjacent river, and groundwater contributions from the surrounding Cle Elum area. Although these drainages have been altered through diversion, these actions have not resulted in a significant increase in the drainage network of the project area. Therefore, this indicator is considered to be properly functioning.

Effects of Outfall Relocation and Mainstem Rock Drop for Flood Protection

The outfall relocation and mainstem rock drop will not significantly effect the drainage network of the Yakima River within the action area. Treated effluent discharge rates are not adequate to alter the hydrograph to a degree that would effect aquatic habitat within the action area. The outfall relocation and mainstem rock drop will therefore maintain the environmental baseline for this indicator.

Effects of Hanson Ponds Habitat Restoration/Enhancement Measures

Connecting the Hanson Ponds Habitat Restoration/Enhancement to the Yakima River will provide a natural flow-through system to the pool habitat and floodplain wetlands that currently exist there. At the local scale, the drainage network feeding the Hanson Ponds will be increased by flows from the river. However, there will be no net increase in the drainage network feeding the action area overall. Thus, we conclude that the ponds' restoration will maintain the environmental baseline for the drainage network indicator.

5.1.7 WATERSHED CONDITIONS PATHWAY ANALYSIS

Road Density and Location

Environmental Baseline

Road density along the Hanson Ponds and dikes in the action area, along with the inclusion of I-90 and other roads, would yield a rating of "not properly functioning" according to NOAA-Fisheries criteria (NMFS 1996). This rating requires the road density to exceed 3-miles/square mile. Closure of gravel roads around the ponds would likely improve this indicator to "at risk", a rating of 2-3 miles/square mile.

Effects of Outfall Relocation and Mainstem Rock Drop for Flood Protection

The outfall relocation will not effect existing road density. There may be new temporary access routes (roads or paths) created through uplands to construct the mainstem rock drop through the south bank of the Yakima River, but the north bank portions of the project will be reached through an existing gravel road network. No temporary roads created will be paved, and temporary roads or paths will be revegetated. The net effect of the outfall relocation and rock drop installation actions is therefore to maintain the environmental baseline for road density.

Effects of Hanson Ponds Habitat Restoration/Enhancement Measures

There may be new temporary access routes (roads or paths) created for the Hanson Ponds habitat restoration/enhancement construction elements, but this is unlikely as the construction areas can largely be reached by existing gravel roads and berms that encircle the ponds or run parallel to the dike along the north bank of the Yakima River. Any temporary access routes will be allowed to return to natural conditions after construction. Dike breaches associated with the Hanson Ponds habitat mosaic may result in a long-term net decrease in roadway access along the Yakima River shoreline, but these design elements require further development. At this time we conservatively conclude that road density and location will be effectively maintained at the environmental baseline

Disturbance History

Environmental Baseline

The City of Cle Elum has a history of development along the banks of the Yakima River. Coal was mined aggressively in the area between 1986-1929, and the last mine was abandoned in 1963 (Cle Elum-Roslyn COC 2002). Although these mines were not generally located along

the banks of the river, the commerce generated through the mines resulted in significant impacts to the river's water quality and habitat. The 1980s saw the construction of the Northern Pacific Railroad route along portions of the riverbank. More recent disturbance in the area was due to the development of I-90 and the associated WSDOT diking established to protect this interstate. Current disturbance in the area derives from fisherman and other users of the public access area along the river and within the Hanson Ponds recreation area. The environmental baseline for disturbance is ranked as "at risk" because of the historic impacts to the area, the current relatively high levels of public use of the area, and the close proximity of the project area to I-90.

Effects of Outfall Relocation and Mainstem Rock Drop for Flood Protection

Relocating the City's wastewater treatment plant outfall will cause short-term disturbance to upland, wetland, riparian and aquatic habitat.. The disturbance associated with the outfall relocation is minimal, but will cause a temporary degradation over the baseline levels of disturbance in the project area due to the presence and operation of heavy equipment associated with the project actions.

Effects of Hanson Ponds Habitat Restoration/Enhancement Measures

The project actions associated with the Hanson Ponds Restoration/Enhancement will cause short-term disturbance within the action area, with long-term habitat benefits. Since the disturbance will occur primarily in habitat where ESA-listed salmonids will not have access until the connection to the river is complete, (which will only occur *after* the other construction elements to the ponds' restoration are complete) we conclude that the ponds' restoration will maintain the disturbance history of the existing environmental baseline.

Riparian Reserves

Environmental Baseline

Riparian reserves along the north bank within the action area have been disturbed by construction of the armored dikes that protect the Hanson Ponds and I-90 from flood inundation, and by gravel road grade development in the riparian corridor within the Hanson Ponds recreational area. Diking is continuous along virtually the entire length of the north bank in the project area. Diking along the south bank upstream of the project area (along the Mountain Trails Trailer Park) has affected riparian reserves as well. The dikes (where present), along with consistent bankfull flow inundation throughout the growing season from the regulated flip-flop flows in the Yakima River, have prevented the establishment of a dense, multi-aged, and species-rich riparian corridor (*see* Figure 2.2-7, for example). Unlike the other portions of the project area, riparian reserves along the south bank through which the mainstem rock drop would be constructed are relatively intact. When considered overall, the environmental baseline for riparian reserves is therefore considered "at risk".

Effects of Outfall Relocation and Mainstem Rock Drop for Flood Protection

Riparian reserves along the south bank will be disturbed by the placement of rock fill during construction of the mainstem rock drop at RM 181.2. A total wetlands impact of approximately 0.48 acres has been delineated from the actions required to construct the mainstem rock drop and scrape gravel from the vegetated bar immediately upstream of the rock drop (Attachment 3).

North bank riparian habitat will also be disturbed by the removal of existing riprap and road grade fill for relocation of the outfall leading to the river. A small portion (est. 160 sq. feet) of wetlands that extends from the northwestern bank of the Hanson Pond No. 2 will also be disturbed by the placement of the pipeline along the preferred outfall alignment (*see* Figure 2.2-12). Although these effects will be short-term and will be mitigated, they constitute a degradation over the environmental baseline.

Effects of Hanson Ponds Habitat Restoration/Enhancement Measures

Impacts to riparian reserves from the construction of the Hanson Ponds Restoration/Enhancement (e.g., smaller rock drops, inlet channel, armoring for flow and flood control, etc.) is anticipated to be less than another 0.25 acres; however, this estimate is based on the conceptual designs and field reviews compiled for this BE, and it may change slightly when design plans are finalized. Thus, the total riparian disturbance will be short term and direct, and is not anticipated to exceed 0.5 acres. It must be noted that the Hanson Ponds project action also includes the planting of riparian vegetation around the Hanson Ponds where short-term construction disturbance occurs, and on peninsulas to be permanently created within the ponds. . Most importantly, providing surface water connection to the Hanson Ponds from the Yakima River will bring extensive existing riparian reserves along the ponds and pond egress channel in contact with circulating river flows. Thus, an immediate net increase in riparian reserves is ultimately anticipated and the project action is considered to improve the environmental baseline for this indicator.

5.2 NET EFFECTS OF PROJECT ACTIONS

The net effect of the outfall relocation and Hanson Ponds Restoration/Enhancement project actions on each of the habitat indicators discussed in section 5.1 is also provided in Table 5.1-1. In brief, relocating the wastewater outfall to RM 181.2, and construction of the rock drop at this location for flood protection and for establishing surface water connections to the Hanson Ponds will permanently change the hydraulics and improve stability within this section of the river by providing flood plain storage. The outfall location proposed is a substantial improvement over its existing location because of accelerated mixing there that will enable the compliance with water quality criteria nearly instantaneously (as opposed to several hundred feet downstream as currently occurs). The outfall relocation therefore can be considered to improve baseline water quality in the action area. The outfall relocation has the added benefit of removing the discharge away from its existing location of high fish abundance, to one of low abundance, thus reducing the potential exposure of fish to effluent constituents within the mixing zone.

The stability of the north bank will be substantially increased at the location where the outfall is proposed, by constructing a rock drop to reduce stream velocities impinging on the north bank, and by directing a portion of the flow of the river into the Hanson Ponds. Constructing a direct connection between the Yakima River and the Hanson Ponds will increase flow-through circulation, improve water quality, create off-channel salmonid rearing habitat, improve floodplain connectivity substantially, and provide for additional flood storage. Spawning habitat will likely develop upstream of the mainstem rock drop, facilitated by deposition of gravels that were previously transported downstream by the high scouring velocities currently existing at the mainstem rock drop alignment location.

Other aquatic biota, wildlife, and plant species temporarily restricted from accessing the project area during construction will not be adversely affected in the long-term. Access restrictions for species not found in the project area must be considered moot. Table 5.2-1 summarizes the potential use of the action area habitat by these species. Providing access to the Hanson Ponds habitat mosaic will result in a net improvement over existing conditions some of these species that do occur within the action area, but will have no effect on those species that do not occur in the area, or for which other aspects of the habitat (e.g., disturbance regime) make the habitat undesirable.

Table 5.2-1. Potential use of the action area by special-status species

Species	Available Habitat	Explanation
Birds		
Bald eagle	yes	Given that the size of the territory, bald eagles will have many other areas to forage during the construction period (between October and November).
Northern spotted owl	no	Lack of a developed canopy and close proximity to the interstate.
Fish		
Bull trout	yes	Require less impacted stream reaches then an outfall location can provide, but could use the area for migration and rearing to a limited extent.
Chinook salmon	yes	Heavy use of project and action areas for spawning and rearing currently exists. Hanson Ponds Habitat Restoration/Enhancement will increase utility of area for this species.
Coho salmon	yes	Use of action area not documented, but possible in the long term. Hanson Ponds habitat restoration/enhancement will increase the utility of the area for this species.
Chum salmon	no	Chum salmon are not found within the action area. Project will not affect this species.
Mid-Columbia steelhead trout	yes	Passage is inhibited by dam construction downstream of the action area and unscreened irrigation diversions. Use of action area is limited, but possible. Hanson Ponds habitat restoration/enhancement will increase the utility of the area for this species.
Mammals		
Canada lynx	no	Habitat necessary for survival, reproduction, and denning is not present within the project or action areas.
Gray wolves	no	Require a more successional forest habitat then the single story, homogenous-aged trees found within the action area. Species not expected within the action area.
Grizzly bears	no	Require a more continuous forested habitat. Species not in action area.
Plants		
Wenatchee Mountain checkermallow	yes	May be present within the wetland areas adjacent to the Cle Elum treatment plant lagoons and Hanson Ponds, but unlikely and not documented.
Ute ladies'-tresses	yes	Habitat type to support this species is generally available in wetlands associated with the Hanson Ponds egress channel; however, the understory vegetation is dominated by reed canary grass (*Phlaris arundinacea*), which competes for similar space where Ute ladies'-tresses are found.

5.3 INTERRELATED, INTERDEPENDENT, AND CUMULATIVE EFFECTS

Interrelated actions are actions that are part of a larger action and are dependent on the larger action for their justification. Interdependent actions are actions having no independent utility

apart from the proposed action. The construction of the rock drop to reduce velocity-driven erosion along the north bank and restabilize this unstable section of the river should be considered independent of the wastewater outfall relocation, as both projects would be pursued regardless of the status of the other. They are conjoined in the current effort to minimize in-water construction efforts, and because of the advantages to wastewater mixing at the location.

The restoration/enhancement measures outlined for the Hanson Ponds must be considered interdependent and interrelated to the mainstem rock drop and bank stabilization construction because the rock drop is necessary to tie into the ponds' inlet from the Yakima River.

Riparian and aquatic habitat enhancements within the Hanson Ponds could be considered independent actions outside of establishing surface water connectivity of the ponds to the Yakima River. However, such habitat improvements would serve little function to listed T&E salmonids without connecting the ponds to the Yakima River.

5.4 TAKE ANALYSIS

Incidental take of special-status salmonids and other T&E species during construction of the relocated outfall, Yakima River mainstem rock drop construction, and other associated Hanson Ponds habitat enhancements is extremely unlikely due to proposed construction timing BMPs that will be implemented. The mainstem rock drop will alter channel hydraulics, and stabilize riverbank conditions. It may also improve spawning habitat immediately upstream of the rock drop by sorting gravel-sized sediments in lowered velocity sections upstream of the rock-drop.

Benthic macroinvertebrates will be temporarily displaced in the section of the Yakima River where the rock drop will be constructed, but increased stabilization will encourage propagation of these organisms around and upstream of the rock drop. Connecting the Yakima River to the Hanson Ponds should also improve benthic production, resulting in a net increase in food supply for salmonid rearing.

Limited riparian and wetland vegetation will be cleared during construction of the City's replacement wastewater treatment plant outfall. Because special-status wildlife have the ability to avoid the action area during construction, incidental take of these species is not anticipated.

Designs for breaching sections of the Hanson Pond embankments and creating a flow-through system may create suitable habitat for predator species of salmonids as well as juvenile salmonids. Access to the ponds will not be restricted on a species level, so predator species (e.g., northern pike minnow) that thrive in lower velocity areas could prey upon juvenile salmonids entering the ponds for rearing habitat. Interstices within the mainstem rock drop may also provide refuge for salmonid predators. Some incidental take from these predators is likely. Ultimately, predatory encounters are part of the salmonid life history that must be successfully negotiated to complete full life history strategies in the Yakima basin. The potential take that may be caused by predators will be vastly overcompensated for by the increase in rearing habitat made available through the Hanson Ponds habitat restoration/enhancement project, and through the improvement of water quality and habitat conditions in the mainstem Yakima River as a result of the outfall relocation to an area of improved mixing and lower fish use.

6.0 CONSERVATION AND MITIGATION MEASURES

Relocating the wastewater outfall for the City of Cle Elum's RSP, implementing flood control measures to include a mainstem rock drop stabilization structure associated bank protection, and implementing the Hanson Ponds habitat restoration/enhancement project will alter upland and aquatic habitats in a localized section of the Yakima River. The net effect of these actions on threatened and endangered species are positive; however, construction actions have the potential to negatively impact some of these species or their habitat temporarily during construction. The following discussion summarizes the conservation and mitigation measures that will be used to reduce the potential impacts of these actions.

6.1 CONSERVATION MEASURES

- Construction is proposed to occur during the low flow period, October through mid November 15, 2003. This construction period will fall outside the sensitive period of chinook salmon eggs that will be incubating within gravel redds (nests) in the action area. This construction timing is outside of the spawning season and area, respectively, for steelhead or bull trout. Construction will also occur outside of the mating season for bald eagles. The total time required for in-water construction within this window should not exceed two weeks (D. Reichmuth, [Geomax] personal communication to J. Fisher, 9/21/02), but the window recognized here is broader to accommodate construction crew logistics.

  If the Yakama Nation's acquisition of the Hanson Ponds is not completed by the fall of 2003, construction for this element of the work will be delayed over the schedule indicated above for the outfall relocation and mainstem rock drop. However, most of the construction elements for the ponds' enhancement can occur without entering the bankfull width of the Yakima River. Thus, these actions could occur at a later time in 2004, as logistics dictate. If the schedule is delayed, the portions of the Hanson Ponds Restoration/Enhancement that require involvement with the Yakima River (dike breaching, inlet channel, etc.) would occur in the same time frame as referenced above, only one year later (2004).
- Restoration/enhancement of the Hanson Ponds aquatic habitat will occur before connection to the river is complete to avoid any impacts to spawning adults or emerging fry.
- Should bald eagles be observed during the construction period, contractors will stop activity until the animal moves out of the area.
- All elements of the project will acquire and comply with mitigating conditions listed in all necessary permits, and environmental review.
- Construction designs and placement will be reviewed by NOAA Fisheries, USFWS, and WDFW.
- Work will be performed on upland habitat as much as possible to avoid disturbance of aquatic organisms.
- Temporary construction routes will be selected to minimize impact to riparian or wetland habitat.

- Erosion control measures and best management practices (BMPs) will be employed along the banks and instream to minimize turbidity effects during and after construction activities.
- Any changes to the project timing or design will be coordinated with NOAA Fisheries, USFWS, WDFW, the Corps of Engineers, local shoreline permitting agencies and WDNR.
- All trees in the vicinity of the construction will be marked prior to construction for avoidance, if possible. All losses of trees will be recorded by species. The revegetation proposal is discussed below under Mitigation Measures.
- Only clean fill material free of fines, and native rock will be used for construction of the rock drop structure.
- The water surface elevation will not be raised more than 1.0 feet above current conditions by rock drop construction. This will minimize the plunge effect and excessive turbulence.
- Hydraulic fluids used in heavy equipment will be vegetable based
- The construction contractor will administer a spill prevention plan.

6.2 MITIGATION MEASURES

- Where necessary and practical, revegetation of riparian or wetland habitat will occur after completion of construction activities.
- Plantings will occur at the site of clearings.
- To mitigate for the loss of trees from the alignment of the replacement outfall and rock drop construction, mitigation planting will be conducted at a ratio of 6:1 for each species lost.
- The City will improve the aquatic and riparian wetland habitat in the overall action area over the environmental baseline by incorporating LWD with riparian plantings along peninsular projections in the Hanson Ponds. These peninsula will be created from the gravel spoils scraped from the vegetated bar in the Yakima River upstream of the mainstem rock drop, as previously described. The creation of these peninsulas will follow the timing of the outfall relocation and mainstem rock drop (fall 2003); they are *not* dependent on approval of the funds for the acquisition of the Hanson Ponds by the Yakama Nation.
- Wetland mitigation for the loss of wetlands due to rock drop construction and other project elements will achieve in-kind ratios established through consultation with wetland management agencies (USACOE, DOE).

7.0 DETERMINATION OF EFFECT

Potential impacts associated with constructing and operating the replacement outfall for the City of Cle Elum Regional Sewer Project, constructing an in-river rock drop stabilization structure, and implementing the Hanson Ponds habitat restoration/enhancement project will be highly localized and predominantly short-term in nature. As described, the greatest potential impacts are associated with the placement of approximately 3,660 tons of rock to construct the mainstem rock drop, the removal of approximately 1,000 cubic yards of gravel from a vegetated bar in the mainstem upstream of the proposed rock drop, the impacts to a small flood-water refugia along the south bank from the placement of the mainstem rock drop, and the placement of 7,730 tons of rock for the Hanson Ponds Habitat Restoration/Enhancement components. The following discussion summarizes the potential impacts to special status species, on the basis of the effects and take analyses provided in Section 5 of this document.

7.1 BIRDS

There is a lack of trees suitable for nesting or roosting by special-status species of birds within the action area. Bald eagle activity within the action area is comprised solely of foraging along the shoreline of the Yakima River. A natural avoidance of the action area during project activities is anticipated. Suitable habitat for nesting and foraging for the northern spotted owl is not present within the action area. The closest nesting pairs of the northern spotted owl are located approximately 5 miles from the action area.

7.2 FISH

Salmonids will be affected by the project in varying degrees based on their activity within the project area during the construction period. Spring-run mid-Columbia chinook salmon are the most sensitive salmonid species within the action area because they are known to spawn and rear in the action area. Proposed construction activities are proposed to occur outside the prime migration period for this species; therefore, juveniles will not likely be present in the area when the work will be accomplished. All critical habitat for chum salmon is limited to the lower 300 km of the Columbia River and the species is therefore outside of the area of concern. There is no evidence of bull trout spawning within the action area; but bull trout are considered to use the action area as a migration corridor. Project actions will not restrict bull trout migrations permanently, but could temporarily disturb their migrations during in-water construction work.

Refugia (critical habitat) will be significantly altered in the project area, but the net alterations should benefit steelhead spawning, incubating, and rearing areas principally by enlarging the floodplain in the action area through the establishment of a surface water connection to the Hanson Ponds habitat mosaic.

There will be no adverse long-term effects to the water quality or substrate within or downstream of the project area that could be degraded over existing conditions Significant water quality improvements benefiting all salmonid species are anticipated from the relocation of the wastewater outfall.

7.3 MAMMALS

The effects of project construction on statewide lynx recovery cannot be estimated because of the potential impacts to its principal forage and management factors are beyond the scope of this project. However, the absence of the Canada lynx in the general area (i.e., beyond the action area) indicates the project may affect but is not likely to adversely affect the Canada lynx.

No gray wolf activity is known to occur within the action area according to the WDFW Priority Habitat and Species database. There have been rare sightings within the region; however, there will be insignificant impact to gray wolf habitat as a result of the proposed project.

Grizzly bears are not found within the action area. The available forested habitat is too sparse to support these large mammals.

7.4 PLANTS

Ute ladies'-tresses have not been found within the action area. Habitat for this species is available in the wetland associated with the Hanson Ponds habitat mosaic; however, this area is dominated by reed canary grass, which competes for the same habitat. Therefore, the presence of this species within the action area is unlikely, and since the project will affect the wetland habitat close to the Hanson Ponds, no impact to the Ute ladies'-tresses is expected.

The action area is not listed as critical habitat for the Wenatchee Mountain checkermallow according to the WDNR database.

7.5 DETERMINATION OF EFFECT

The determination of this Biological Evaluation concerning the potential construction-related and long-term effects of the City of Cle Elum's RSP replacement outfall, the in-river rock drop stabilization structure, and the Hanson Ponds habitat restoration/enhancement is that the project *May Affect but is Not Likely to Adversely Affect* the northern spotted owl, Canada lynx, gray wolf, grizzly bear, Wenatchee Mountain Checkermallow, Ute ladies'-tresses, or chum salmon and their associated habitats within (or outside) the action area. This Biological Evaluation also concludes that the project elements described *May Affect, but are Not Likely to Adversely Affect* the summer-run mid-Columbia steelhead, bull trout, or bald eagles, and their associated habitats within the action area. Essential fish habitat for chinook and coho salmon will ultimately be increased by the project action, benefiting both species. Construction impacts to EFH will be temporary in nature. Thus, it is also the conclusion of this BE that the project actions *May Affect, but are Not Likely to Adversely Affect* EFH for coho or chinook salmon.

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ATTACHMENT 1

AGENCY COMMUNICATIONS

ATTACHMENT 2

PRELIMINARY BIOLOGICAL RESOURCE IMPACT EVALUATION OF OUTFALL ALTERNATIVES

PRELIMINARY
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This report provides a qualitative assessment of conditions around each of the alternative outfall alignments for the City of Cle Elum's Regional Sewer Plant (RSP). Opinions represented within this report reflect findings from field reconnaissance on 11/27/01 and 1/2/02, and review of relevant materials on biological resources and river mechanics and mixing in this reach of the Yakima River. Attachment I of this appendix provides photographic depiction of habitat conditions along each of the alignment routes under consideration. The findings of impact from each of the alternative alignments are limited by the time of year they were examined (late fall, early winter), which prevented a full assessment of wetland plant communities potentially affected by the routes considered due to leaf fall, light snow cover, and lack of bloom. Quantitative surveys of biota use were not considered in the scope of this current effort; thus, conclusions on microhabitat use are based principally on professional opinion and experience, coupled with an understanding of the literature heretofore assembled for the area.

1.0 PROBABLE BIOLOGICAL RESOURCE USE OF ALL OUTFALL LOCATIONS

The portion of the Yakima River to which any of the alternative outfall alignments would discharge is considered part of the Cascade ecoregion of the Yakima watershed (Cuffney et al. 1997). The outfall reach is considered part of a smaller reach of the mainstem Yakima River characterized by Snyder and Stanford as Reach 9—Teanaway River to Cle Elum River (RM 176.1 to 185.6), "This reach is primarily a large main channel, with some side channels (BOR 2000). The channel is mainly confined by the highway and railroad berms." Cufney et al. 1997 examined fish and macroinvertebrate communities throughout numerous sites of the upper and lower river to address baseline and impacted conditions of biological communities. The findings of Cuffney et al. (1997), of particular relevance to an assessment of the outfall alignments within the Cle Elum reach, are summarized below:

- Fish communities of headwater streams in the Cascades (upstream extreme of Yakima and Naches Rivers and tributaries) and Eastern Cascades (mid-reaches of the Naches R. and tributaries) ecoregions of the Yakima River Basin were primarily composed of salmonids and sculpins, with cyprinids dominating in the rest of the basin;
- The most common of the 33 fish species taxa collected (i.e., throughout the Yakima mainstem) were: speckled dace, rainbow trout, and Paiute sculpin. Each of these species would be expected to utilize habitats near the outfall alignments, although the dace would be less common due to its preference for warmer waters lower in the watershed.
- Invertebrates presented the highest number of taxa (193), with sensitive insect species (e.g., mayflies, stoneflies, and caddisflies) formed the majority of the invertebrate communities of the Cascades and Eastern Cascades regions;
- Diatoms dominated algal communities throughout the basin (134 algal taxa were found on submerged rocks, the only stream microhabitat sampled);
- Sensitive red algae and diatoms predominated in the Cascade and Eastern Cascade ecoregions, including the Cle Elum reach.
- Ordination of physical, chemical and biological site characteristics indicated that elevation was the dominant factor determining the distribution of biota; agricultural intensity and stream size were of secondary importance;
- Three community types were identified by ordination: a) high elevation, cold-water communities associated with low agricultural intensity; b) lower elevation, warm-water communities associated with low agricultural intensity; and, c) lower elevation, warn-water communities associated with moderate to high agricultural intensity. The Cle Elum (outfall alignment) reach would be part of the high elevation, cold-water community-type associated with low agricultural intensity.
- Multimetric community condition indices indicated that Cascade and Eastern Cascade sites were largely unimpaired; however, all but 2 sites in the Columbia Basin site group were impaired;

- High levels of impairment at large-river sites corresponded with high levels of pesticides in fish tissues and the occurrence of external abnormalities. These findings have not been recorded from fish in the Cle Elum reach.

Salmonids that utilize the Cle Elum reach through which the outfall alternatives are being evaluated include: (1) spring chinook salmon, (2) summer-run steelhead, (3) resident rainbow trout, (4) bull trout, and (5) mountain whitefish. The Yakama Nation has embarked upon a coho reintroduction effort in the basin as well, that, over time, may incorporate use of habitats near the proposed outfall. To address the potential impacts of the tribe's ongoing and proposed hatchery supplementation programs, the WDFW has embarked on extensive studies to address interspecific competition, particularly between chinook juveniles and resident rainbow trout (Pearsons et al. 1996, James et al. 1999). The preliminary results of these studies have provided data of relevance for assessing potential impacts of the alternative outfall alignments on fishery resources that are known to utilize the Cle Elum reach. Principal findings include:

- Age 0+ rainbow and spring chinook were associated with bank habitats in the Yakima River during spring, summer, and fall – few were observed in the middle of either mainstem or side channel habitats.
- The number of fish and number of fish species captured in Swauk Creek (confluence with Yakima River downstream of the Teanaway confluence) and immigration of rainbows and spring chinook decreased with increasing elevations – annual variations in assemblage structure did not appear to differ among sites.
- Spatial distribution of rainbow redds in the Yakima River was patchy – most were observed in reaches with unconstrained channels and abundant instream cover.
- Large tagged rainbow trout tended to move downstream more often than upstream, but more fish were recaptured at upper elevations. These results suggest that upper river resident rainbows may show greater fidelity to specific rearing areas.
- Trout densities in 5 index sections of the Yakima River averaged 297/km (approx. 475/mile) during 1994 and were not as temporally variable as tributary sites. All juvenile spring chinook were observed in sites less than 730 km elevation.
- Variation in species assemblage structure was larger in space than in time in tributary and mainstem index sites (as in previous data). In other words, species diversity varied more by the specific location surveyed, than it did by the time of year the survey was conducted.
- Results from competition experiments performed in the North and Middle Forks of the Teanaway River suggest: 1) hatchery-reared steelhead negatively impacted growth of naturally produced rainbow but not of chinook, 2) hatchery-reared chinook negatively impacted growth of wild chinook, and 3) wild chinook did not impact the growth of wild rainbows.

2.0 ALTERNATIVE 1 – WESTERN OUTFALL ALIGNMENT WITHIN ROCK DROP

Alternative 1 represents the westernmost outfall alignment under consideration. Under this alignment, the outfall would be buried under the riverbed and discharge would occur within a rock-drop constructed of large riprap. The outfall's discharge location would be roughly aligned with the western terminus of "Pond 2" of the Hansen Ponds (Figure 2-1). As depicted conceptually in Figure 2-1, the outfall would be buried beneath a boat notch positioned centrally within the rock-drop. The boat notch would create a scour pool downstream that would provide rapid mixing of the RSP effluent. The rock-drop design has been considered necessary to address bank instability and erosion along the bend of the river immediately upstream of the proposed rock-drop alignment (Geomax 2002). In this reach, maximum velocities exceeding 9 feet per second (fps) create force profiles triggering local erosion that threatens encroachment into the active 100 yr. floodplain (Figure 2-2). A breach of the existing dike along this bend of the river would result in uncontrolled inundation of the Hansen Ponds, and a potentially threatening condition to Interstate 90. Construction of the rock-drop will reduce the velocity gradients impinging on the northern riverbank, and thereby lessen the risk of a breach. Thus, while a rock-drop is not considered necessary for the outfall, the proposed alignment within the rock-drop would take advantage of the security provided the outfall by the rock-drop construction.

2.1 FIELD OBSERVATIONS

2.1.1 AQUATIC HABITAT

The outfall alignment route for Alternative 1 was examined on 11/27/01. The proposed rock-drop alignment within the river bed is currently a large, and deep lateral scour pool with some back eddy hydraulics created by the force of the river into the northern bank (Plate Ia). As pictured in Plate Ia, riffles precede the alignment location. The US Army Corps of Engineers (USACE) placed a rock barb deflector as a temporary stabilization measure for the impingement occurring along the northern bank in this location (Plate Ib). Plate Ib also reflects how this barb appears to be causing accretion of cobble and large gravel immediately downstream of the barb along the northern bank.

Downstream of the existing lateral scour pool (and downstream of the proposed rock-drop) the river exhibits relatively featureless run characteristics for approximately 600 ft. This run roughly parallels the southern edge of Pond 2 of the Hansen Ponds (Figure 2-1), and is separated from the pond by a low-lying vegetated dike of quarry spalls along the edge of the river's bankfull width, with larger rip-rap at the top of the dike. The dike is vegetated with a moderately dense, mixed-age assemblage of black cottonwood, willow, red osier dogwood, and reed canary grass, amongst other plant species (Plate Ic). Along the southern bank of the run the riparian zone, unconfined by riprap, is densely vegetated with a mixed-age overstory of black cottonwood and ponderosa pine and an understory of willow, dogwood and other assorted shrubs and grasses (Plate Ia). Substrate along the run was primarily medium-sized cobble. In all portions of the reach examined, from the USACE rock barb downstream through the scour pool and run, large woody debris was lacking in the wetted width of the

channel, and very limited within the bankfull width, with a few pieces lodged on bar and island habitats in the floodplain (e.g., see Plate 1b).

Evidence of salmon spawning activity (redds) was lacking in the reach that would be affected by the rock-drop and outfall under Alignment 1, with the exception of a single redd flag observed upstream of the USACE rock barb, at the southern head-end of the riffle preceding the scour pool. Spawning conditions are not favorable for chinook salmon in this reach due to the high velocity gradients apparent there, and lack of suitably sized and sorted gravels. (Substrate throughout the reach was predominantly of cobble size). This observation was supported by the lack of visible redd flagging in the reach that were, in contrast, observed in other locations of the river in abundance where conditions were more suitable. However, the existing lateral scour pool through which the rock-drop would be positioned appears to offer favorable holding habitat for migrating adult salmonids, and potentially favorable rearing conditions for adult resident rainbow trout. Algal growth in the run habitat downstream of the proposed rock-drop was moderate, offering forage for aquatic macroinvertebrates.

The lack of woody debris and other pool-forming structures in the run habitat immediately downstream of the Alternative 1 outfall alignment may limit the use of the habitat for rearing by juvenile salmonids in this reach, as velocity gradients within the reach are largely prohibitive during the spring and summer rearing season when flows (and velocities) would be at a maximum in this reach. Swimming capacity is a function of fish size and there is general agreement that approximately 6.5 to 7.0 body lengths/sec is the velocity tolerated by salmonids for prolonged swimming periods. For example, a 2-inch coho fry using prolonged swimming could tolerate approximately 1.2 ft/sec (fps) velocity. Burst swimming speeds measured in coho fry have ranged from 2.1 to 3.4 fps; prolonged swimming speeds have ranged from 1.1 to 1.2 fps; and maximum sustained velocities have been measured at 1 fps for under-yearling fry and 1.3 fps for yearlings (Taylor and McPhail 1985). Sazaki et al. (1972) indicated the “practical” velocity limit for salmonid fry of 40 mm (1.6 in.) was 0.5 ft/sec. Adult swimming speed tolerance values are represented in Table 2-1. A reach that does not offer velocity refuges within these tolerance limits, would be unlikely to support significant long-term juvenile rearing or adult holding.

Smaller salmonid fry may be able to use the boundary layer created by substrate roughness throughout the run habitat immediately downstream of the alternative outfall alignment I; however, larger juveniles would be largely restricted. Previous research has demonstrated that even under conditions where sufficient velocity refuge is available from suitable sized boulders, or open floodplain, salmonids will be found predominantly amongst wood in the channel – particularly if this resource is limited in the drainage (Fisher et al. 2000, Fisher and Fisher 2001). The wood offers both predation avoidance refuge, and an organic food source for the aquatic macroinvertebrates upon which the fish will forage.

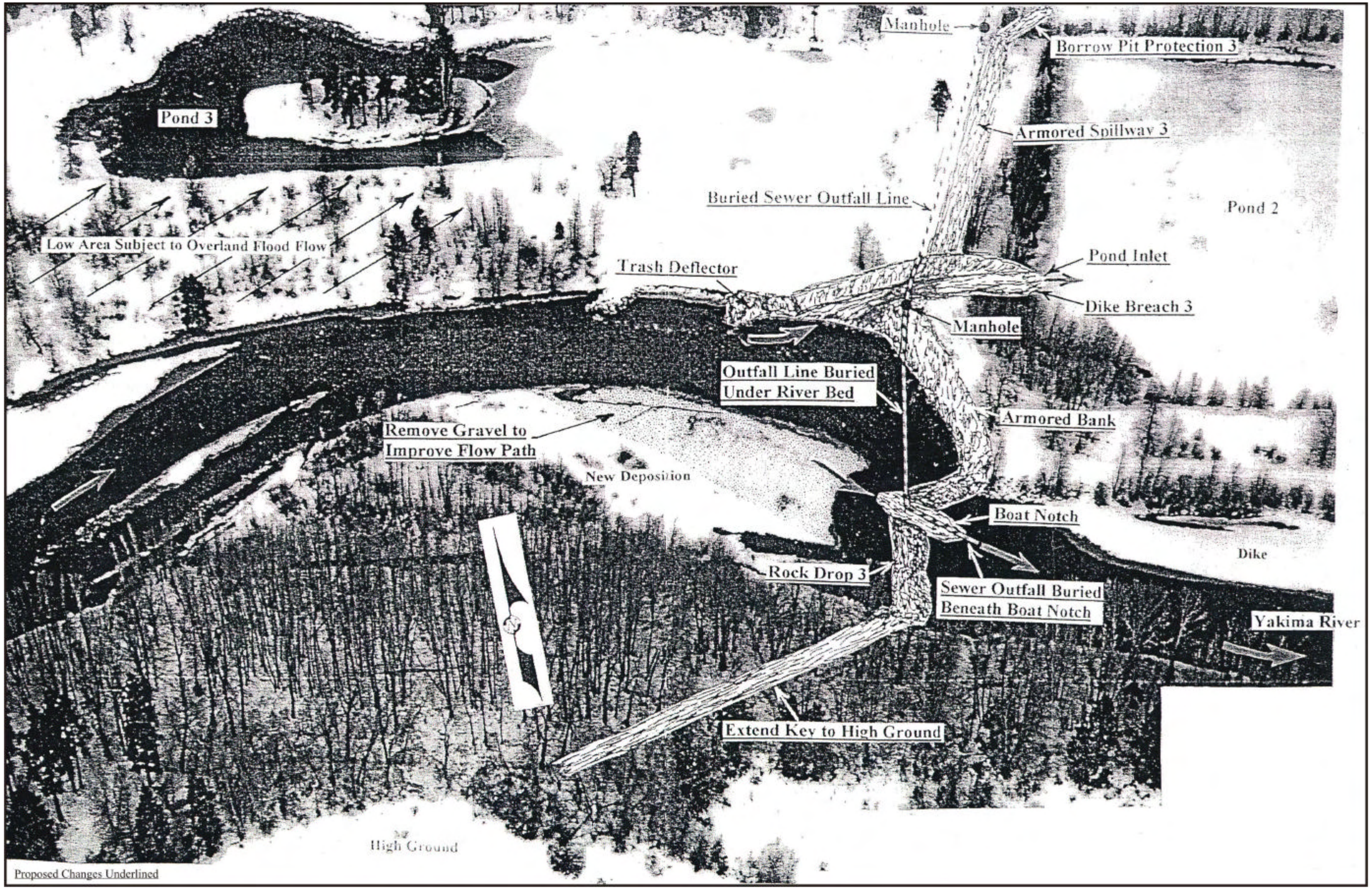

Figure 2-1. Aerial view of habitats through which outfall alignments are under consideration (Geomax 2000).

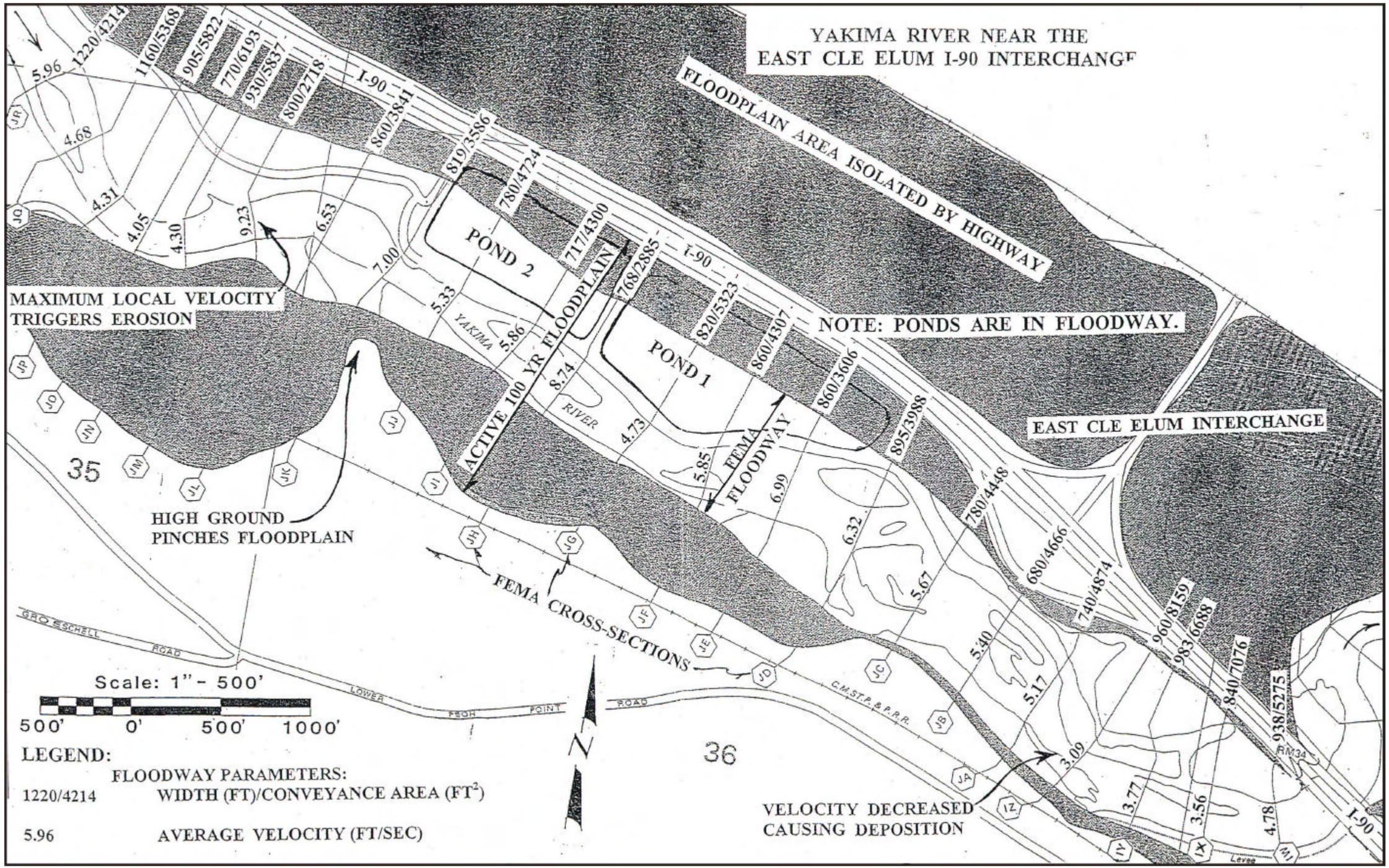

Figure 2-2. Estimated velocities along reach of Yakima River where outfall alignments are proposed (Geomax 2000).

Table 2-1. Fish speed (ft/sec) of average size adult salmon and steelhead trout as reported by Bell (1973)

Species	Sustained Swimming Velocity	Prolonged Swimming Speed	Burst Swimming Speed
Steelhead	0 to 4.6	4.6 to 13.7	13.7 to 26.5
Chinook	0 to 3.4	3.4 to 10.8	10.8 to 22.4
Coho	0 to 3.4	3.4 to 10.6	10.6 to 21.5
Sockeye	0 to 3.2	3.2 to 10.2	10.2 to 20.6
Pink & Chum	0 to 2.6	2.6 to 7.7	7.7 to 15.0

2.1.2 UPLAND HABITAT

Upland habitat through which the Alternative 1 outfall alignment would be positioned is disturbed (Plate Id). The alignment would run north for about 500 ft from the existing dike through gravel fill towards I-90. Impacts to upland vegetation and plant communities can be largely prevented with this alignment, given its current state as gravel. Vegetation identified in the vicinity of the proposed upland route of the Alternative 1 alignment included hawthorne, reed canary grass, wild asparagus, cattail, red osier dogwood, sage, brier, snowberry and ponderosa pine. Dependent on the precise placement of the outfall pipe through this habitat, the loss of large trees would appear avoidable.

Alternative 2 would utilize the existing outfall location currently operated by the City of Cle Elum. As summarized by Earth Tech (2002), the existing outfall was completed in 1981 and consists of 1,673 ft of 15-inch diameter polyvinyl chloride (PVC) pipe that conveys from the chlorine contact chamber at lagoon cell #3 of the existing WWTP, through upland habitat towards the river. This pipe is reduced to a 12-inch diameter ductile iron pipe (DIP) in the river's floodplain, conveying 44 ft, to the river. The outfall was originally constructed in a location that had a water depth of 7 ft, roughly 2 ft above the riverbed. The river has migrated significantly since construction of the original outfall, and the pipe is now buried by roughly 8 ft of gravel. A 12-inch diameter DIP relief now discharges the City's effluent downstream of the original outfall location because of the occluded condition of the originally-constructed outfall pipe (Figure 2-2). The DIP relief outfall is roughly parallel to the eastern terminus of Hansen Pond 1 (Figure 2-1). At bankfull width flows the discharge from the City's DIP line flows across a gravel bar in front of the outfall. At lower flows the discharge travels downstream (eastward) along rip-rap lining the edge of the northern bank (Plate Ie).

3.1 FIELD OBSERVATIONS

The Alternative 2 alignment was examined on 11/27/01. Flows at the time of survey were less than bankfull, and effluent from the sewer plant was conveyed along the shoreline for a distance of approximately 80-ft prior to entering the Yakima River.

3.1.1 AQUATIC HABITAT

The habitat through which the DIP discharge is initially conveyed is part of a complex, anastomosed side-channel network that proceeds upstream on either side of an island for approximately 1/3 mile (Geomax Photo 2a). At the time of survey, flows through this northern side channel were visually estimated at 7 cfs. The northern side channel was heavily vegetated on its southern bank (from the island), but largely lacking vegetation along the riprap that constituted the channel's north bank (Plate If). On the southern side of the island just upstream from the outfall another side channel is currently evident. This southern side channel flows through a highly complex matrix of large woody debris (lwd) and overhanging riparian vegetation, offering exceptional juvenile salmon and adult resident rainbow trout rearing conditions (Plate Ig). Flows in the southern side channel were visually estimated at 12 cfs. Hydraulic conditions in both of these side channels appear to provide suitable sorting for the establishment of spawning gravel gravels for trout, and good to excellent rearing conditions for both trout and salmon. These side channels are part of a larger, braided channel migration zone (CMZ) that includes the entire bankfull width of the river in this section (Geomax Figure 2a). In general, this CMZ would appear to offer exceptional rearing and high water refuge habitat for all salmonids utilizing this portion of the Yakima River.

The thalweg of the CMZ just upstream of where the DIP discharge ultimately enters the Yakima River (i.e., at lower flows) runs along the southern portion of the main channel. It bends back to the north and mixes with the City's treated effluent in a complex scour pool

created by the thalweg's confluence with the side channels previously discussed (Plate Ih). Downstream of this "mixing pool", run characteristics are again exhibited, with the thalweg flowing along the northern bank (Plate Ii). Immediately downstream of the mixing pool, flagging of salmon (spring chinook) redds was observed in increasing density, peaking a short distance upstream of where the Hansen Ponds outlet currently joins the mainstem (Plate Ij). Of note, however, several flags were also observed within the wetted perimeter of the CMZ.

Because of the high quality spawning and rearing conditions both upstream and downstream of the existing outfall location, effluent from the RSP would be better located elsewhere in the long term. The current operation effectively yields concentrated effluent that exceeds WQ criteria for a length of at least 80-ft along the shoreline (during low flow), and increases risks to aquatic resources in the event of a release from the plant for a significant distance downstream under all flow conditions. Chronic exposure to unregulated components should be minimized by recent results from England and elsewhere have demonstrated feminization in fish downstream of sewage treatment plants (Jobling et al. 1998). The feminization is thought to be the result of exposure to endocrine disrupting chemicals (environmental estrogens) in the waste stream. Estrogens released as urinary biproducts of contraception and postmenopausal hormone treatment, and environmental chemicals typically associated with detergents (e.g., nonylphenol) have been identified as eliciting these responses in both field and laboratory studies (Jobling and Sumpter 1994, Madsen et al. 1997). Recently, endocrine disruption was also identified in chinook salmon from the Columbia River (Nagler et al. 2001). While such an effect is unlikely to occur to salmonids or other fishes in the Yakima River, given the amount discharged by the RSP, it is nevertheless prudent to locate the outfall where exposure to any RSP constituents is minimized.

3.1.2 Upland Habitat

The use of the existing outfall, or some modification of the outfall in its existing location, would involve little to no upland or wetland habitat disturbance, because of the prior existence of the outfall placement.

Two eastern alignments have been considered for the RSP outfall, hereafter considered alignments 3a and 3b. Both alignments would enter the Yakima River downstream of the I-90 crossing, in a reach that exhibits predominantly riffle or run characteristic (variation dependent on flow) (Plate Ik). Precise alignments have not been established, although alignment 3a would be piped through a stormwater collection pond adjacent to I-90 (Geomax Figure 2b), and alignment 3b would be piped south of the stormwater pond. Because the precise alignments have not been surveyed, assessments of impacts to upland and wetland vegetation encountered along the alignments are necessarily qualitative only. Either of the eastern alignments would be placed within the 100-year FEMA floodplain of the Yakima river currently isolated by I-90.

4.1 FIELD SURVEY OBSERVATIONS

General habitat conditions along the conceptualized eastern outfall alignments were examined on 11/27/01 and 1/3/02.

4.1.1 AQUATIC HABITAT

The outfall discharge location, as conceptualized for these alternatives, would enter within a riffle/run reach of the Yakima River, offering suitable mixing. At this location, the river flows around a bend to the northeast (Figure 2-1). The riparian zone along the northwestern bank through which the outfall would bisect is densely vegetated with an established tree layer of black cottonwood and ponderosa pine, and a very thick, nearly impenetrable, understory of red osier dogwood, willow, bitterbrush, snowberry, hawthorne, Douglas spirea, service berry, and other shrub species common to the region. Riffles are generally productive reaches for macroinvertebrate production, but the aquatic conditions along the reach were of generally lower habitat value than the Alternative 2 alignment due to the lack of side channels. However, large woody debris was present in several locations within the wetted perimeter of the reach where the outfall would likely be placed. Given the established riparian corridor and lack of direct channel confinement by rip-rap on either bank, and the presence of stable large wood in the channel, the habitat value of the reach in which either of the Alternative 3 outfall alignments would be constructed can be considered better habitat than that of the Alternative 1 Alignment.

4.1.2 UPLAND HABITAT

Both upland and wetland habitats would be affected by either of the alternative alignments (3a or 3b). Depressional pockets providing regular hydration were observed along both conceptual alignments. In several cases, these depressions had developed characteristic palustrine scrub-shrub wetland plant communities dominated by facultative wetland plants also present in the riparian corridor of the river. The presence of obligate wetland flowering plants could not be identified given the time of year of survey.

Ponderosa pine was dominant in drier habitats above the depressional pockets. Some of the wetland plant communities appeared associated with overflow areas from a stormwater ditch that conveyed waters to the stormwater pond, and as such, Alignment 3a would likely result in greater impact to such habitats than Alignment 3b. Wetland habitat along the Alternative 3b alignment was minimal and could probably be avoided. The density of vegetation outside the riparian corridor of the river and stormwater pond was moderate. It appears that the loss of trees in the upland habitat along both conceptualized alignments could be minimized significantly with careful surveying.

Wildlife use of the existing habitat along the Alternative 3a and 3b alignments is significant. During the late fall/early winter survey, ruffed grouse, mule deer and eagle were observed. Deer density is substantial, as evidenced by heavy grazing pressure on wetland vegetation (e.g., horsetail).

5.0 EVALUATION OF PROPOSED EFFLUENT LIMITS FOR IMPACTS TO FISH AND WILDLIFE

As revealed by comparing Class A water quality criteria (Table 5-1) to the projected NPDES permit limits at full build-out (Table 5-2), several constituents within the sewage effluent will not meet water quality criteria at the end of the pipe. Thus, a mixing zone study has been commissioned (Cosmopolitan 2002). The permit limits projected for the maximum build-out scenario in this study also exceed several risk thresholds for fish and invertebrates, as demonstrated by the hazard quotient calculations that exceed '1' depicted in Table 5-2. Given these anticipated conditions, outfall placement where the mixing zone provides the least hospitable habitat for aquatic biota in the Yakima River, will minimize exposure to treated effluent, and reduce toxicant-associated risks in-kind. Basically, the outfall Alternative 1 alignment would be most desirable.

Table 5-1 Class A Freshwater Quality Criteria for the Yakima River (Cosmopolitan 2002)

Conventional Parameters	Criteria	
Dissolved Oxygen	Shall exceed 8.0 mg/L	
Temperature	Shall not exceed 21°C. No human increase above 34/ (T+9)	
Fecal Coliform	Geo. mean – 100 colonies/100 mL 90th percentile – 200 colonies/100 mL	
pH	6.5 to 8.5	
Toxic Parameters	**Acute Criteria (µg/L)**	**Chronic Criteria (µg/L)**
Ammonia-N	9,366	2,135
Chlorine	19	11
Cadmium	0.75	0.35
Copper	4.26	3.23
Mercury	2.1	0.012
Lead	12.6	0.49
Silver	0.28	–
Zinc	33.0	30.1

Table 5-2 Projected Water Quality-Based Effluent Limits at Full Build-Out (Cosmopolitan 2002)

Parameter	Projected Average Monthly Limit at Full Build-Out	Aquatic Life Hazard Quotient[1] from Monthly Limit Based on Chronic Criteria	Maximum Daily Limit	Aquatic Life Hazard Quotient[1] from Daily Limit Based on Acute Criteria
Ammonia-N, mg/L	7.2	3.37	16.6	1.77
Cadmium, µg/L	1.0	2.86	1.4	1.87
Copper, µg/L	5.0	1.55	7.3	1.71
Mercury, µg/L	0.2	16.67	0.3	0.14
Lead, µg/L	17.2	35.1	25.0	1.98
Silver, µg/L	0.4	4[2]	0.6	2.14
Zinc, µg/L	39.8	1.32	58	1.76

[1]Hazard Quotient (HQ) calculation is used to screen risks to aquatic receptors based on measured or predicted concentration of a substance relative to a screening criteria. For this table, HQ = permit limit (presumed maximum discharge)/acute or chronic criteria (denominator appropriate to limit).

[2]Based on the "lowest chronic value" from Suter and Tsao (1996). No federally promulgated chronic criteria have been specified.

6.0 SUMMARY OF ALTERNATIVE ALIGNMENT BENEFITS AND IMPACTS

6.1 ALTERNATIVE 1—WESTERN ALIGNMENT OPTION

6.1.1 IMPACTS

Alternative 1 would involve the erection of a rock drop across the Yakima River, resulting in significant fill and alteration to the channel characteristics from existing conditions. There would be a small loss of riparian, scrub-shrub wetland on the gravel bar bisected by the rock drop, probably less than ¼ acre. The key of the rock-drop, as proposed, would extend into riparian habitat along the north and south channel. The extension of the rock-drop key to the north would not impact existing functional habitat because it would be placed in an area that is already disturbed. Extending the rock drop key "to high ground" (Figure 2-1) to the south would result in a loss of riparian wetlands and upland vegetation.

Loss of existing pool habitat from the erection of the rock-drop would be displaced by the creation of pool habitat downstream of the boat notch in the rock drop. While it is likely that there would be no net loss to pool habitat, a net gain in productive habitat cannot be assumed with the current information.

6.1.2 BENEFITS:

- The location of the outfall envisioned in Alignment 1 appears, from reconnaissance evaluation, the least biologically productive of the reaches considered for outfall placement. Use of the area for spawning is minimal, and conditions within the run habitat immediately downstream of the outfall alignment are not optimal for rearing. Thus, the potential exposure of fish to outfall constituents can be assumed to be the lowest at this location.
- Upland habitat disturbance at this location would not affect priority species or habitats of the state, as the area that would be affected is already disturbed. Impacts from this disturbance would be equivalent to using the existing outfall location (Alternative 2).

6.2 ALTERNATIVE 2—USE OF EXISTING OUTFALL

6.2.1 IMPACTS

Use of the existing outfall would result in the maximum potential exposure of fish to outfall constituents in the reach because the high quality of the habitat in the reach attracts fish to the area for spawning and rearing.

6.2.2 BENEFITS

Continued use of the existing outfall would not require the placement of new pipe, or disturbance to upland or wetland habitats.

6.3 ALTERNATIVE 3—EASTERN ALIGNMENT OPTIONS

6.3.1 IMPACTS

- The Alternative 3a and 3b outfall alignments as envisioned would discharge into productive riffle habitat, and bisect an intact and mature riparian corridor that currently recruits large woody debris into the channel.
- Wetland disturbance would be likely, (particularly under Alignment 3a) although significant impacts could be either mitigated or avoided.
- Upland habitat disturbance would be unavoidable under either the Alternative 3a or 3b alignment. There would likely be a significant loss of trees, and disturbance of wildlife habitat that is heavily used at the present time.

7.0
CONCLUSION

To minimize potential exposure and long term effects on existing productive aquatic habitat, the alternative 1 outfall alignment is most preferred. Impacts from construction of the rock-drop at this location will require further exploration.

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Attachment I

Photo Plates

Plate Ia: View downstream along northern bank through riffle and lateral scour pool that would be bisected by rock-drop for outfall alignment 1. Truck is positioned at point where rock drop would cross the river.

Plate Ib: View upstream of pool and upper riffle conditions at outfall alignment 1 option. Note rock barb placed by USACE in upper right of picture.

Plate Ic: Northern shoreline (bankfull width) along run habitat immediately downstream of existing scour pool and proposed outfall alignment #1

Plate Id: Disturbed upland habitat through which outfall alignment #1 would travel. Precise alignment likely along right edge of photo.

Plate Ie: Existing outfall discharge along northern bank. Mixing pool through which discharge ultimately dilutes is seen in background.

Plate If: View of northern side channel just upstream of existing outfall. Good rearing conditions for all juvenile salmonids here, particular along left (southern) side of channel. Note sparse vegetation along the riprap on the northern side of the side channel.

Plate 1g: Dense riparian overhanging vegetation of willow and red osier dogwood provide exceptional rearing habitat conditions for trout and juvenile salmon along the southern side channel just upstream of the existing outfall.

Plate Ih: Close-up view of complex mixing pool where existing outfall's discharge is ultimately diluted. Note side channel entry to right and thalweg entry into the pool from the left.

Plate Ii. View downstream over mixing pool into which existing outfall discharge mixes. Salmon redds were flagged abundantly just downstream of this pool and continuing for several hundred feet.

Plate Ij: Existing outlet of Hansen Ponds, downstream of existing outfall. Highest density of redds found just upstream of this area.

Plate Ik: River morphology in vicinity of outfall alignment alternatives 3a and 3b. Outfall would bisect riparian corridor of Ponderosa Pine in background.

Plate Il. Typical upland vegetation that could be affected by outfall alignment alternatives 3a or 3b, dependent on precise alignment. Photo reveals Ponderosa pine, Oregon grape, snowberry, hardhack, and service berry, amongst other common shrubs.

ATTACHMENT 3

CITY OF CLE ELUM FLOOD PROTECTION ROCK DROP: SOUTH BANK YAKIMA RIVER WETLAND DELINEATION

CITY OF CLE ELUM
WASTEWATER TREATMENT PLANT OUTFALL
RELOCATION AND ROCK DROP CONSTRUCTION:

SOUTH BANK YAKIMA RIVER WETLAND DELINEATION

Prepared for:

CITY OF CLE ELUM
Cle Elum, Washington

Prepared by:

ENTRIX, INC.
Olympia, Washington

Project No. 396901

November 25, 2002

CITY OF CLE ELUM

WATERWATER TREATMENT PLANT OUTFALL RELOCATION AND ROCK DROP CONSTRUCTION

SOUTH BANK YAKIMA RIVER WETLAND DELINEATION

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Table 1. Summary of Sample-Plot Data, Identified Plant Communities and Wetland Classifications 4-3

Entrix, Inc. conducted a routine wetland determination through a portion of the south bank of the Yakima River and within a vegetated gravel bar of the Yakima River, where a rock drop (a.k.a. submerged rock weir) stabilization structure is proposed. The City of Cle Elum (City) and the Yakama Nation propose to construct the rock drop across the Yakima River and associated floodplain at an abrupt bend in the river channel at approximately Rivermile (RM) 181.2. The Washington State Department of Transportation is also a project sponsor, having contributed funds toward the cost of design. Construction of the rock drop has two primary objectives: 1) to provide an inlet structure to direct a portion of the flow of the Yakima River through Hanson Ponds for fisheries habitat restoration, and 2) to stabilize the river in its present location to prevent flood damage to public and private properties and facilities (including Interstate 90) from flooding and river migration. The City has also chosen to relocate its wastewater treatment plant outfall to RM 181.2 and use the rock drop as a stable structure in which to extend the outfall and diffuser to the center of the river.

Neither construction nor operation of the outfall will affect wetland plant communities; however, constructing the rock drop will require filling a small wetland along the south bank of the river with rock, and excavating a small portion of a vegetated gravel bar in the mainstem Yakima River. This wetland delineation was performed to identify and quantify the specific impacts to these vegetation communities. Wetland boundaries were delineated using the Routine Determinations method specified in the Washington State Wetlands Identification and Delineation Manual to comply with state and federal regulations.

Wetland determinations were made for five vegetation types within the study area on September 21, 2002. Most of the study area is covered by mature, closed riparian forest, which is upland. One palustrine wetland was delineated in the study area. This wetland supports persistent emergent, mesic forested/scrub-shrub, and open scrub-shrub vegetation classes. Because there are clear surface water drainage patterns between this wetland and the Yakima River, it appears to be a jurisdictional wetland. We estimate the proposed rock drop will impact approximately 0.48 acre of the emergent and open scrub-shrub components of the wetland. Restoring access to the Hanson Ponds along with the enhancement of the ponds' side channel habitat to the Yakima River, as described in greater detail elsewhere (ENTRIX, Inc. 2002) will create substantially more wetland habitat than that potentially lost or altered by the project action. As a result, there will be no net loss of wetland or wetland functions from the construction of the rock drop structure after all project elements are completed.

Entrix, Inc. (Entrix) conducted a wetland delineation in the area of a proposed rock drop stabilization structure across the Yakima River at RM 181.2 on September 21, 2002. The rock drop is proposed to 1) provide a stable inlet structure to a fisheries habitat restoration project within the Hanson Ponds, and 2) protect against flooding over the north bank of the river. The City of Cle Elum also plans to use the structural support provided by the rock drop to secure a realigned Regional Sewer Plant (RSP) wastewater outfall in the riverbed. The RSP will be constructed by expanding and modernizing the City of Cle Elum's existing sewage treatment facilities (Earth Tech 2002). The RSP, once completed, is envisioned to service the City of Cle Elum, the Town of South Cle Elum, the City of Roslyn, the Urban Growth Areas (UGA) of these communities, and unincorporated areas of Kittitas County in the vicinity.

The proposed alignment for the rock drop and RSP outfall will extend into a deep and fast moving scour pool at RM 181.2 of the upper Yakima River. The study area for the wetland delineation included a vegetated gravel bar upstream of the outfall/rock drop that would be scraped to redirect river flows to mid-channel. The proposed rock drop, outfall, mixing zone, and study area are shown in Figure 1.

Sample plots were established in representative vegetation types in the floodplain forest and emergent vegetation types found in the study area. The south bank key and southern floodplain sill of the rock drop structure would be positioned through an emergent plant community located in a narrow depression between two slightly higher terraces. The ordinary high water mark (OHWM) of the Yakima River is about 1883 feet MSL at the proposed rock drop/outfall alignment, and the 100-year flood elevation is about 1886 feet MSL at this location. Floodway boundaries, as developed by FEMA, are reflected in Figure 2.

South bank vegetation is relatively homogeneous, consisting primarily of a closed black cottonwood forest on the higher alluvial terraces. Features located in depressions on the terraces appear to be emergent wetlands. One sample plot each was established in these vegetation types.

In addition to these communities on older alluvial terrace landforms, there are younger pioneer vegetation types on the gravel bar. Scrub-shrub and early seral-forested types are the dominant types on the less well-developed soils of the bar. It is assumed that all of the area east of the riparian forest type on the bar was wetland; therefore, no sample plots were established. The area of the younger scrub-shrub communities dominated by pioneer willow species located on the bar was surveyed.

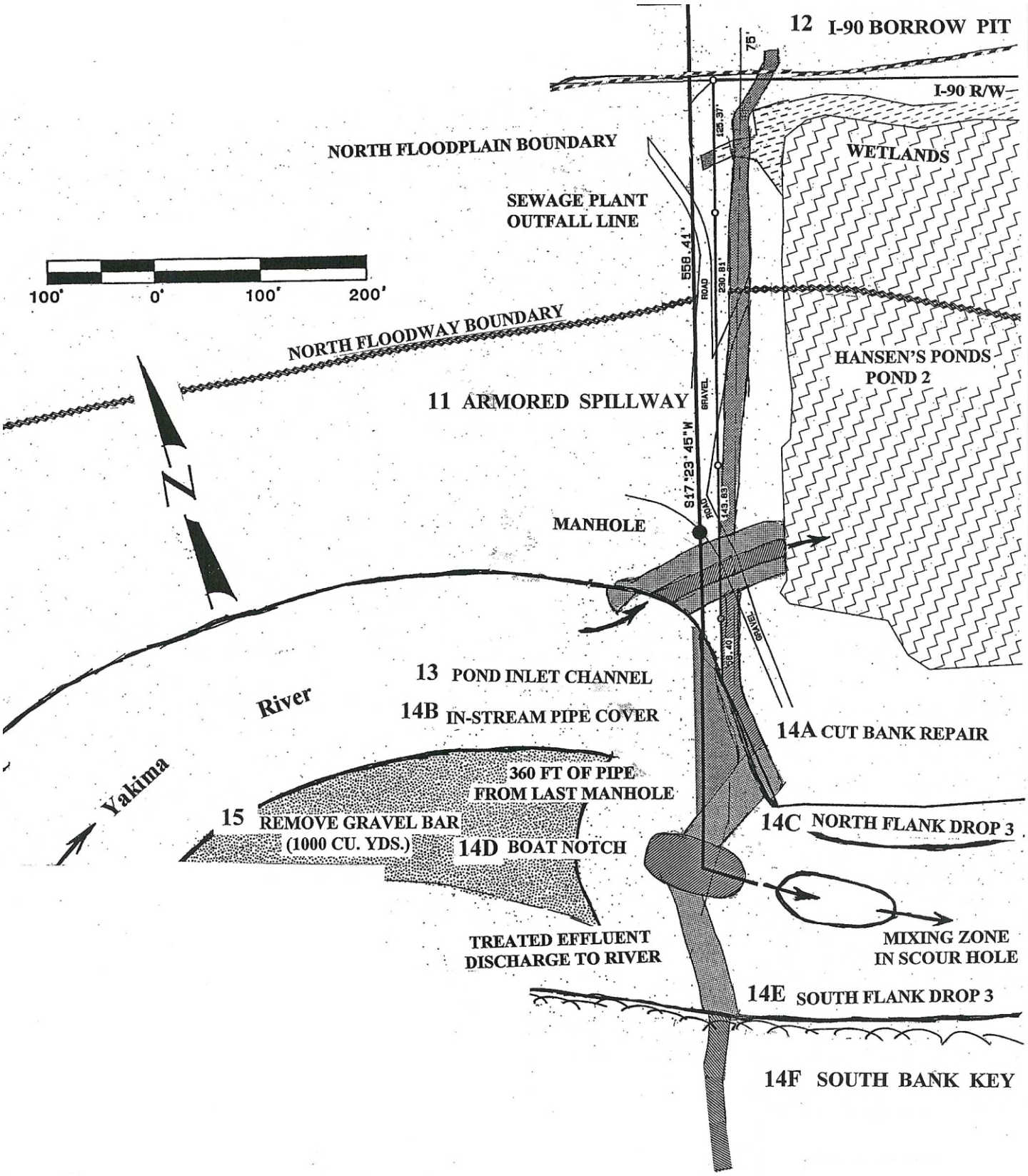


Figure 1: Study Area Showing the Proposed Rock Drop, Outfall Alignment, Mixing Zone, and Affected Gravel Bar

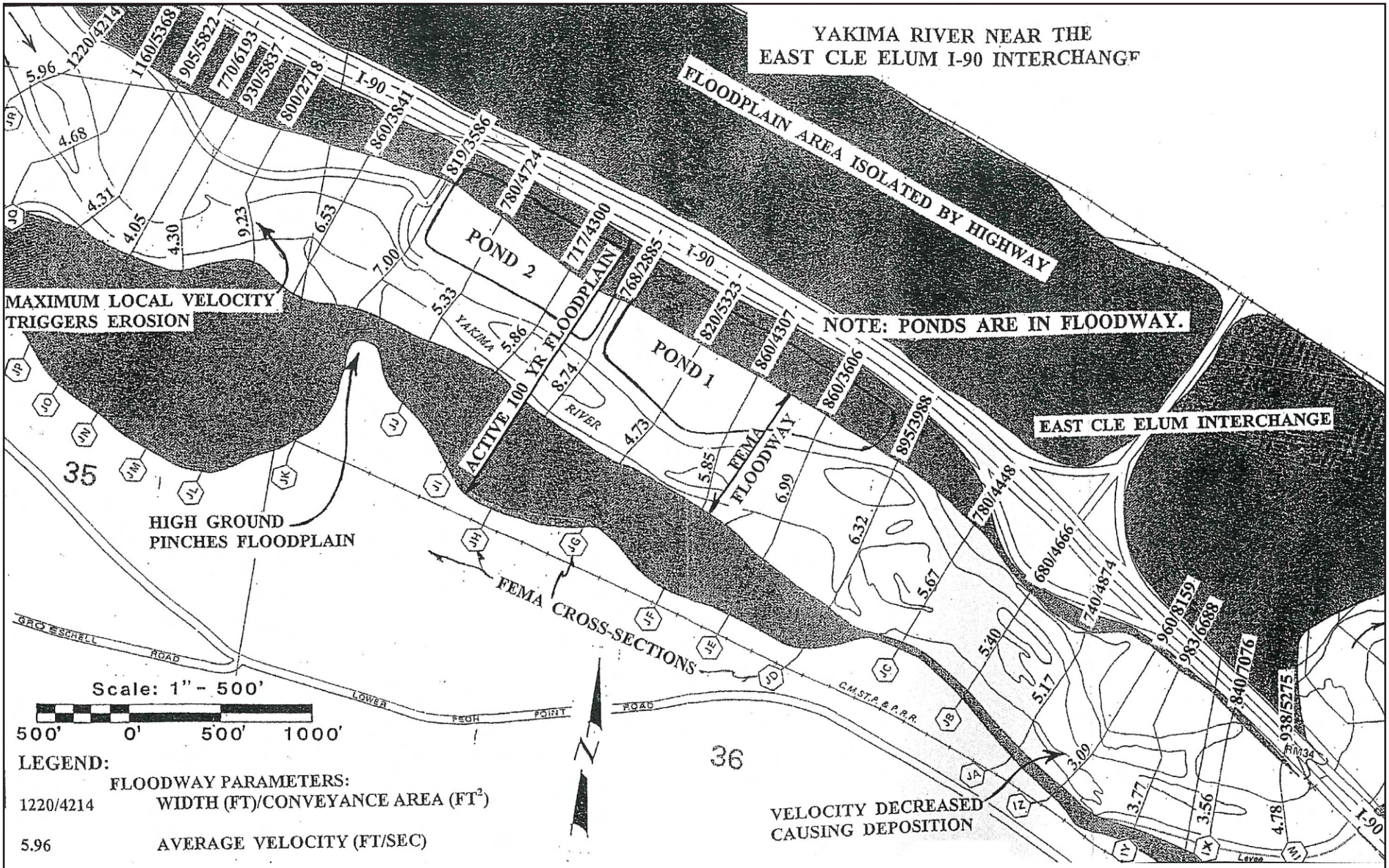


Figure 2: FEMA Floodway and flood plain in vicinity of wetland delineation for City of Cle Elum rock drop and outfall realignment.

2.1 WETLAND DELINEATION

Before conducting the jurisdictional wetland determination, ENTRIX biologists reviewed background information and completed a reconnaissance of the site. Background information that was reviewed, included:

- A recent (2001) color aerial photo
- U.S. Fish and Wildlife Service National Wetland Inventory map
- Site maps and preliminary plan drawings developed by Geomax (2002)
- Draft Biological Assessment (Entrix 2002).

This information was used to guide the wetland delineation. The entire site was walked and sample plots were established in each of the vegetation types and landscape positions representative of those present except as noted in the introduction.

ENTRIX staff delineates wetlands based on best professional judgment, existing site conditions during field analysis, and information provided by the client. Wetland boundaries were delineated using the Routine Determinations method described in the Washington State Wetlands Identification and Delineation Manual (Ecology 1997). This manual was developed as mandated by state law to be consistent with the US Army Corps of Engineers (Corps) 1987 manual (Corps 1987). It has been adopted into state regulations, and all state and local governments must use this delineation manual to implement the state Shoreline Management Act and local wetlands regulations developed to comply with the Growth Management Act. With few exceptions, the Corps and Washington State Department of Ecology (Ecology) typically require that the following three characteristics are present for an area to be identified as a wetland: (1) hydrophytic vegetation; (2) hydric soil; and (3) wetland hydrology. The methods used to determine the presence of each characteristic are described in the following subsections. Delineated and surveyed wetland boundaries are subject to verification and approval by jurisdictional agencies. A more detailed description of the methods used to determine the presence of each characteristic is described in Appendix A. In addition to using the standard Routine Determinations method to delineate the wetland boundaries, a hand auger was used to examine soils and hydrology to determine the presence of hydric soils and wetland hydrology.

Plant nomenclature generally follows Hitchcock and Cronquist (1973), except for a few recent taxonomic changes. More recent taxonomy follows Kartesz as found on the website of the National Plants Database of the Natural Resources Conservation Service (USDA, NRCS, 2000) at http://plants.usda.gov/.

Three areas of potential impact were examined in our survey: (1) closed riparian forest, (2) emergent plant communities within the riparian floodplain, and (3) gravel bar communities. Within the areas surveyed, five distinct vegetation types were identified. Wetland determinations are presented for each of the five vegetation types found in the upland, riparian and wetland habitats on the site. All wetland boundaries are subject to verification by regulatory agencies. Summaries of the dominant plants, hydrology, and soils, and a wetland determination are discussed for sample plots established within the different vegetation types identified. A brief discussion of the apparent functions for each of the wetlands is presented. Formal categorization of the identified wetlands (Ecology 2002) are only estimated because the boundaries of some of the vegetation types classified as wetlands extended beyond the area of impact from the rock drop, and were not formally surveyed.

3.1 CLOSED RIPARIAN FOREST COMMUNITY

A closed deciduous riparian forest type covers most of the study area. Mature black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) averaging an estimated 20 inches or more diameter at breast height and 50 feet tall forms a virtually continuous canopy. Understory vegetation ranges from a relatively open and depauperate herb-dominated association to associations with more species-rich and well-developed shrub and herb strata. One sample plot (SP-1) was established in this upland forest type (Figure 3). Photographic representations of upland conditions found within this area are pictured in Figure 4.

3.1.1 UPLAND VEGETATION TYPE

3.1.1.1 Vegetation

Sample plot SP-1 was established on the top of a low terrace just north of a small linear depression and the proposed outfall alignment (Figure 3). As shown in the SP-1 field data (Appendix B), dominant species included western hemlock black cottonwood, red-osier dogwood (*Cornus sericea*), a rose (*Rosa* sp.), common snowberry (*Symphoricarpos albus*), and evergreen horsetail (*Equisetum hyemale*). Because 67 percent of the dominant species have a FAC or FACW wetland indicator status, this forest type was considered hydrophytic (wetland) vegetation.

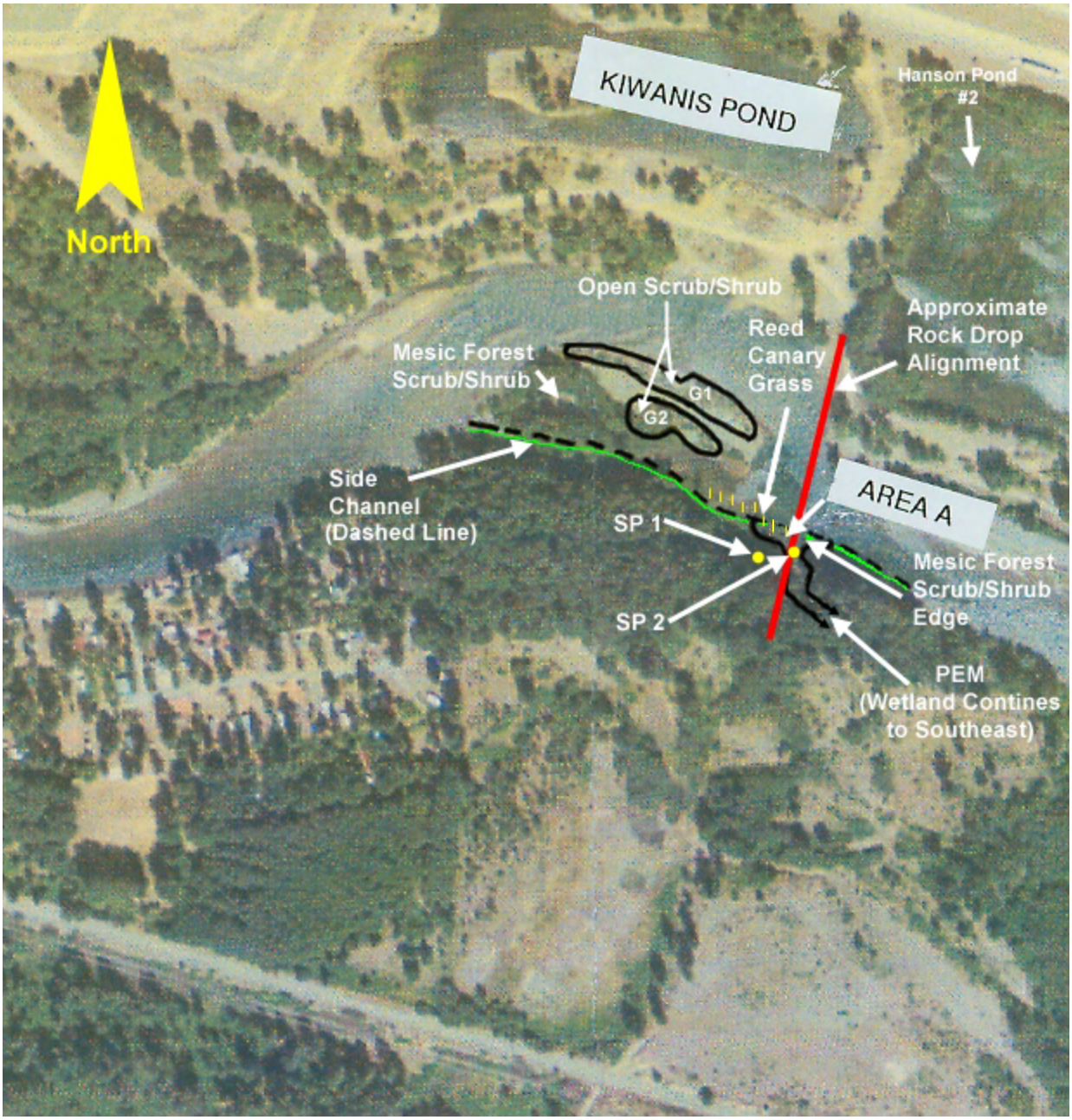


Figure 3. Wetland boundary and sample plot overlaid on 2002 Kittitas County aerial photograph (likely areas of impact bounded by solid black lines).

3.1.1.2 Hydrology

All of the riparian forest in the project area appears to be within the 100-year floodplain (Figure 2), indicating that at least portions of this forest are likely periodically flooded. Historic flooding appears to have resulted in the deposition of lenses of coarser alluvium as well as smaller silt and clay-sized particles. This coarser texture appears to have resulted in relatively well-drained properties. No saturation, oxidized rhizospheres, water-stained leaves, or other positive indicators of wetland hydrology were observed in the riparian forest sample plot within 16 inches of the ground surface. Therefore, the wetland hydrology criterion was not met.

3.1.1.3 Soils

The SP-1 sample pit was dug to a depth of more than 16 inches. The surface horizon consisted of about four inches of very dark brown (10YR 2/2) loam. Beneath this horizon the soils were dark grayish brown (10YR 4/2) loamy sand to a depth of approximately 16 inches. There were no redoximorphic features or other positive indicators of hydric soil in this apparently well-drained alluvium.

3.1.1.4 Wetland Determination and Rating Estimate

Although the deciduous forest vegetation meets the hydrophytic vegetation criterion, there were no positive indicators of either wetland hydrology or hydric soils. Because there was no wetland hydrology or hydric soil, this riparian forest community type was determined to be uplands.

3.2 EMERGENT COMMUNITIES

There are two emergent community types within the study area, a mixed sedge/grass community, and a monoculture plant community of reed canary grass (*Phalaris arundinacea*). The combined areas of these two contiguous plant communities, referenced as "Area A" in Figure 3, constitutes approximately 5,865 square feet—based on AutoCad estimations of surveyed boundary flags. (Area A in Figure 3 also includes a mesic fringe of approximately 1,035 feet, as described in 3.3.1. When all three plant communities are included, the total area for Area A is 6,900 square feet.)

The second sample plot (SP-2) was established in the mixed sedge-grass vegetation type found in the narrow depression where the south bank key and southern floodplain sill of the rock drop structure would be located (Area A). The depression is located between closed riparian forest dominance types found at higher elevations on the alluvial terrace. In addition to this community, there is a reed canarygrass (*Phalaris arundinacea*) monoculture in a narrow band between the closed riparian forest type and OHWM of the Yakima River (Figures 4 and 5). No sample plots were established in this hydrophytic vegetation type, which was assumed to be wetland. Based on hand auger borings, the hydrology and soils in the reed canayrgrass monoculture are similar to those for the sedge-dominated vegetation type described below.

3.2.1 MIXED SEDGE-GRASS TYPE

Sedges and grasses are the dominant plants found in depressional areas scoured in the alluvial terrace south of the active river channel. This community was identified within the boundary of Area A in Figure 3. These plants appear to be infrequently flooded by overbank flows, and have relatively well-developed soils.

3.2.1.1 Vegetation

SP-2 was established in an overflow channel carved in the alluvial terrace. The test pit and sample plots are approximately 40 feet southeast of SP-1 (Figure 3). Dominant species found in this emergent type were slough sedge (*Carex obnupta*), reed canarygrass, and red-osier dogwood (Figures 4 and 5). Two small red-osier dogwood plants were found in the sample plot but otherwise this species was absent in the depression. Although the canopy of the riparian forest extends over this community, there were no trees rooted in the sample plot. Figure 4 provides photographs of the communities delineated in Area A, as well as the progression to uplands moving to the south. Because 100 percent of the dominant species have a FACW or OBL wetland indicator status, this emergent type was considered hydrophytic vegetation.

3.2.1.2 Hydrology

There is a clear wetland drainage pattern in this overflow channel. Surface scouring is found at the entrance to this feature and at the western end of the depression. Oxidized root channels, water-stained leaves, and other positive indicators of wetland hydrology were observed. The source of hydrology appears to be infrequent overbank flooding and possibly seasonally high groundwater, as well.

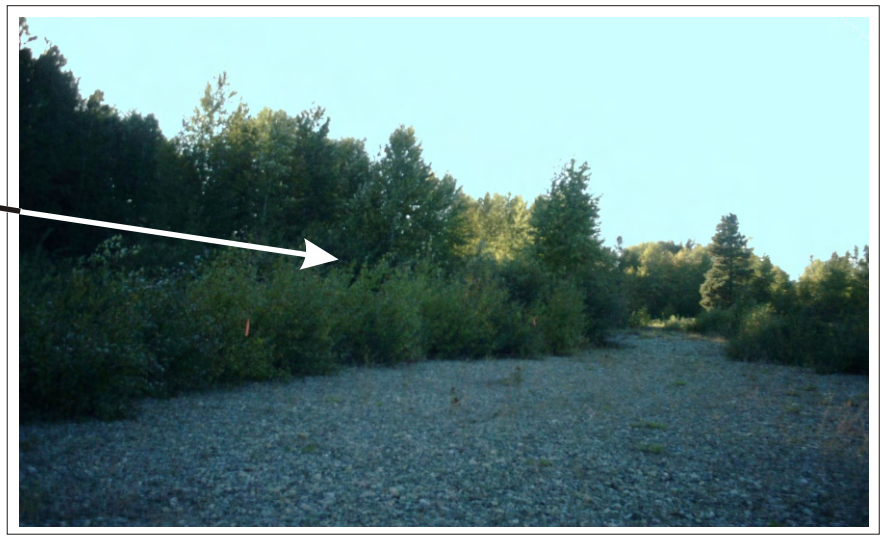
3.2.1.3 Soils

A pit was dug at SP-2 to a depth of more than 12 inches. The surface horizon consisted of about 4 inches of very dark brown (10YR 2/2) loam. From about a depth of 4 to 8 inches was a layer of dark grayish brown (10YR 4/2) sand. Below a depth of about 8 inches was a dark grayish brown (2.5Y 4/2) sandy loam. There were many coarse, distinct yellowish brown (10YR 5/8) mottles. Soils with a matrix chroma of 2 and mottles are considered hydric.

3.2.1.4 Wetland Determination and Rating Estimate

All three wetland parameters were satisfied in the mixed sedge-grass community. Therefore, the sample plot and plant community are considered wetland. Surveyed wetland boundaries are shown in Figure 3. According to the U.S. Fish and Wildlife Service's wetland classification system (Cowardin et al., 1979), this is a palustrine emergent, persistent, and seasonally saturated wetland (PEM1C). It exhibits rating characteristics consistent with a Category II wetland (Ecology 2002).

Figure 4. The south bank upland, riparian, and wetland vegetation along the proposed rock drop alignment.



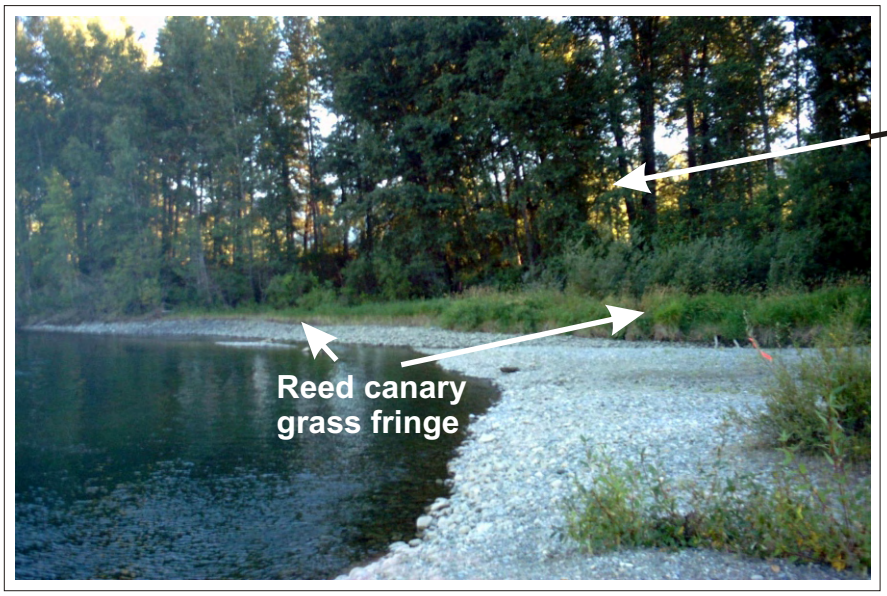


Figure 5. Photographs of scrub-shrub communities on gravel bar to be scraped and contiguous portions of Area A with emergent reed canary grass and mixed sedge wetland plant community.

3.3 SIDE CHANNEL AND GRAVEL BAR COMMUNITIES

Two vegetation types were identified on the gravel bar that would be scraped under the proposed project action. A more mesic forested/scrub-shrub vegetation type is found on the southwest portion of the gravel bar, whereas scrub-shrub vegetation is found in northern and northeaster portions of the bar, near the active channel. The mesic community is dominated by willows, particularly Pacific willow (*Salix lucida* var. *lasiandra*), Sitka willow (*S. sitchensis*), and sandbar willow (*S. exigua*), and immature black cottonwood. The mesic forested/scrub-shrub vegetation type is bisected (and hence associated with) a side channel of the river that conveys flood flows between the higher alluvial terrace to the south (such as where SP-1 was dug), and the non-forested scrub-shrub vegetation community on the northern portions of the gravel bar. The mesic community has better developed soils than the more barren scrub-shrub portions of the gravel bar to the north. Although no formal sample plots were established in this area, vegetation, soils, and hydrology are described below.

3.3.1 SIDE CHANNEL—MESIC DECIDUOUS FOREST/SCRUB-SHRUB TYPE PLANT COMMUNITY

This community is bisected and associated with a side channel of the Yakima River that projects predominantly west from the palustrine emergent plant community described in 3.2, along the riparian fringe of the river. The southern boundary of this plant community is conceptually indicated as a green line in Figure 3, extending west from Area A (mostly contiguous with the side channel alignment). The northern boundary of this vegetation type on the gravel bar is not indicated in Figure 3, because this portion of the community will not be affected by the project action so a full delineation of its boundary was not necessary. The plant community overall is characterized by a mixture of well-developed and closed forested and scrub-shrub vegetation. This dense vegetation has trapped large volumes of silt and sand resulting in moderately well developed alluvial soils. Soils ranged from dry to saturated at the surface in this community. Depressional areas adjacent to the side channel tended to be wetter than soils at higher elevations on the bar.

3.3.1.1 Vegetation

Trees and shrubs are codominant and provide most of the areal cover in this mesic deciduous forest/scrub-shrub type. Cover and abundance of associated herbs is variable, ranging from sparse and virtually absent to dense and abundant. In addition to the willows and immature black cottonwood, dominant plants observed included red-osier dogwood, red alder (*Alnus rubra*), Pacific ninebark (*Physocarpus capitatus*), black twinberry (*Lonicera involucrata*), evergreen horsetail, reed canarygrass, and hedge nettle (*Stachys cooleyae*). Beneath better-developed portions of the upper stratum, there are few understory associates. In areas where tree cover is sparse or absent, reed canarygrass forms dense cover. Because more than 50% percent of the dominant plants have FAC or wetter wetland indicator statuses, this forested/scrub-shrub type met the hydrophytic vegetation criterion.

3.3.1.2 Hydrology

Water flows in the side channel at higher stages in the river providing varying levels and durations of inundation and saturation. Surface scouring, evidence of inundation, wetland drainage patterns, and saturation at or near the surface following an unusually dry summer are some of the positive indicators of wetland hydrology apparent in this lower lying area.

3.3.1.3 Soils

Although no soil pits were dug in this area, a hand auger was used to investigate soil characteristics. Characteristics were variable ranging from saturated silt loams with an aquic moisture regime and accumulation of organic matter in the surface horizon to soils with redoximorphic features that were similar to those observed in SP-1. These were among the positive indicators of hydric soils observed in the mesic deciduous forest/scrub-shrub community type.

3.3.1.4 Wetland Determination and Rating Estimate

Positive indicators of all three wetland parameters were present. The vegetation type met the wetland criteria. The boundaries of this community type also extend west and east along the Yakima River as a narrow band (between the OHWM and riparian forest) through the south bank key, and southern floodplain sill of the rock drop. The southern boundary of this plant community is conceptually indicated as the green line in Figure 3, extending west from "Area A" and through the northern boundary of the Area A polygon, to the east (contiguous with the side channel). Thus, it is contiguous with the PEM1C wetland previously described in section 3.2.

According to the U.S. Fish and Wildlife Service's classification system, this portion of the wetland is classified as a palustrine forested/scrub-shrub broad-leaved deciduous and seasonally flooded wetland (PFO/SS1C). The wetland provides functions consistent with a category II wetland, but should not be disturbed by the rock drop installation, with the exception of that narrow portion along the northern boundary of Area A.

3.3.2 GRAVEL BAR—OPEN SCRUB-SHRUB TYPE PLANT COMMUNITY

There are two pioneer communities composed of willows on portions of the gravel bar east of the mesic deciduous forest/scrub-shrub type. These communities will be largely removed when gravel is scraped from the bar, as proposed for the project action (*see* Figure 1). Soils are poorly developed in this area of the bar, which is sparsely vegetated except for two relatively long ellipsoidal areas covered by early seral vegetation (Figure 5). These areas are delineated as G1 and G2 in Figure 3.

3.3.2.1 Vegetation

Sandbar willow is the dominant species in this open vegetation type and reaches a maximum height of about 12 feet (Figure 5). In addition, there are scattered immature black cottonwood saplings and other willows. Average height of vegetation is about 10

feet. Based on Auto-Cad estimates of the surveyed boundary flags of contiguous vegetation, this community type covers about 13,800 square feet in two ellipsoidal areas separated by a sparsely vegetated and more or less barren area approximately 37 feet wide on the highest part of the bar (*see G1 & G2 in* Figure 3). The ellipses are about 214 feet and 355 feet long, respectively and range in width from about 8 to 40 feet. Because the dominant species have FAC or wetter wetland indicator statuses, the vegetation is hydrophytic.

3.3.2.2 Hydrology

The gravel bar is clearly an aggrading part of the river resulting from depositional processes. Fluvial processes have resulted in sorting gravels and sands and formation of this bar. It is assumed that much if not all of the bar is flooded for sufficient duration during spring thaw to continue to support the hydrophytic vegetation on this bar and to meet the wetland hydrology criterion.

3.3.2.3 Soils

Soils are poorly developed in the gravel bar, consisting predominantly of gravels and sands. They are classified as fluvaquents. Fluvaquents are entisols, and entisols with an aquic moisture regime are hydric soils.

3.3.2.4 Wetland Determination and Rating Estimate

Because all three parameters appear to have been met, this open scrub-shrub type is considered wetland. Because shrubs dominate it, this wetland is classified as a palustrine scrub-shrub broad-leaved deciduous, seasonally saturated wetland (PSS1C). This scrub-shrub vegetation class is part of the larger wetland mosaic that includes the PEMC and more mesic PFO/SS1C vegetation classes. As a stand-alone wetland, it would likely rate as a category 3 wetland by Ecology standards (Ecology 2002). Although the open scrub-shrub wetland community is within the channel migration zone of the Yakima River, the community appears to provide functions of less unique value than the wetland plant communities encompassed by Area A, and represents habitat that can be recreated naturally or with mitigation plantings.

It is assumed that the more mature vegetation types, including the closed riparian forest and mesic forested/scrub-shrub wetland types provide greater levels of function compared to mixed sedge-grass and open scrub-shrub communities. Therefore, potential impacts to these communities from the proposed rock drop construction will be minimized to the maximum extent practicable.

Potential impacts to palustrine emergent and open scrub-shrub wetland vegetation classes could occur from the proposed rock drop project where pictured in (Figure 3). The closed polygon of Area A in Figure 3, references the maximum wetlands impact area from the rock drop construction. This area, approximately 6,900 square feet (0.16 acre), is predominantly composed of the (palustrine emergent) mixed sedge-grass dominance type wetland described in Section 3.2, but also includes the small area of monoculture reed canary grass, and a small portion of the palustrine forested wetland (mesic edge) described in Section 3.1 that extends to the east and west of the project action area. Potential impacts to palustrine emergent portions of the wetland will be minimized by maintaining connectivity between the similar community to the south and by restoring surface topography after construction to ensure that the overbank flooding hydrology is maintained for the emergent wetlands to the south.

In addition to direct impacts to the palustrine emergent portions of this wetland at the rock drop location, open scrub-shrub vegetation on the bar would be directly affected by the project. Excavation of gravels from the bar will remove about 13,800 square feet (0.32 acre) of open scrub-shrub wetland vegetation in order to direct the flow of the river across the center of the rock drop. Potential impacts to the more mature mesic vegetation and palustrine forested riparian fringe to the south will be avoided by preventing excavation of the bar beyond the projected impact areas delineated as G1 and G2 in Figure 3.

Table 1. Summary of Sample Plot Data, Identified Plant Communities and Wetland Classifications.

Sample Plot	Vegetation	Hydrology	Soils	Wetland Determination	Wetland Classification[1]	Jurisdictional Wetland[2]	Approximate Wetland Area
SP-1	Closed riparian forest; 67% dominants FAC or FACW; Hydrophytic	No positive indicators of wetland hydrology.	No positive indicators of hydric soils. Nonhydric	Upland	NA	NA	NA
SP-2	Mixed sedge-grass type; 100% FACW or OBL Hydrophytic	Several positive indicators of wetland hydrology.	Mottles in a matrix with a chroma of 2; Hydric	Wetland	PEM1C	Adjacent to Yakima River	6,900 square feet (includes mesic fringe and reed canary grass monoculture)
-	Mesic forested/scrub-shrub type forest; >50% dominants FAC or FACW; Hydrophytic	Several positive indicators of wetland hydrology.	Mottles in a matrix with a chroma of 2; Hydric	Wetland	PFO/SS1C	Adjacent to Yakima River	Not formally, determined, area of impact estimated as 15% of Area A (~1,035 sq ft)
-	Reed canarygrass monoculture; 100% FACW; Hydrophytic	Several positive indicators of wetland hydrology.	Mottles in a matrix with a chroma of 2; Hydric	Wetland	PEM1C	Adjacent to Yakima River	Not formally determined, estimated as approximately 15% of Area A (~ 1,035 sq ft)
-	Open scrub-shrub type; 100% dominants FAC or FACW; Hydrophytic	Assumed aquic moisture regime, seasonal flooding meets wetland hydrology criterion.	Soils are fluvaquents, a hydric soil.	Wetland	PSS1C	Adjacent to Yakima River	13,800 square feet

1: Wetland classification follows Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al., 1979).
2: Final wetland boundaries and jurisdictional determinations must be verified by the Seattle District of the U.S. Army Corps of Engineers and Washington State Department of Ecology.

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APPENDIX A

METHODS

APPENDIX A
METHODS OF DETERMINING WETLAND CHARACTERISTICS AND CLASSIFICATION

WETLAND CHARACTERISTICS

In most cases, the US Army Corps of Engineers (1987) and Ecology (1997) requires that the following three characteristics are present for an area to be identified as a wetland: (1) hydrophytic vegetation, (2) hydric soil, and (3) wetland hydrology. There are a few exceptions to requiring presence of all three of these parameters, such as for atypical situations or problem areas. There were no atypical situations or problem areas encountered during this investigation. The following subsections summarize the routine determinations methods used to determine whether these characteristics are present on site.

HYDROPHYTIC VEGETATION

To determine whether an area has hydrophytic vegetation, the dominant plant species are identified. Dominant plants typically are those with greater than 20 percent cover. Reed (1988) has evaluated many plant species common in the Alaska region and assigned a wetland indicator status to each based on the species' probability of occurring in wetland (Table 1). A plant community dominated (>50 percent) by species with a status of OBL, FACW, or FAC is considered hydrophytic.

Plants are identified in this report by their common and scientific names as found in Flora of Pacific Northwest (Hitchcock and Cronquist, 1973).

Table 1. Key to wetland indicator status.

Code	Wetland Indicator Status	Probability of Occurrence in Wetland
OBL	Obligate wetland species	> 99 percent
FACW	Facultative wet	67 to 99 percent
FAC	Facultative	34 to 66 percent
FACU	Facultative upland	1 to 33 percent
UPL	Obligate upland	< 1 percent

HYDRIC SOIL

To determine whether an area has hydric soil, test pits are dug to a depth of at least 12 inches and the soil color and other characteristics described. Some of the positive indicators of hydric soils include:

- Low chroma. Soil with a low chroma (gray soil) typically develops when mineral soil is inundated; lack of oxygen reduces magnesium and iron compounds in the soil to a gray color. Soil colors are determined using a Munsell color chart (Kollmorgen Corp. 1994), which uses abbreviations to describe colors; e.g., 10YR 2/1. In the abbreviation, the last number indicates the chroma; a chroma of 1 or 0 is considered low.

- Mottles. In seasonally saturated wetlands, fluctuating water levels can trap air bubbles in the soil. The air pockets allow magnesium and iron compounds in the soil to oxidize; forming rust-colored mottles (spots or blotches). Mottles found in soil with a chroma of 2 or less indicate the soil is hydric.

- High organic content. Deep organic soils form if inundation prevents decomposition and organic debris accumulates. Organic content is considered high if the soil is composed of more than half organic material (by weight) in the upper 32 inches of the soil profile.

WETLAND HYDROLOGY

To determine whether an area has wetland hydrology, the area is examined for inundation, soil saturation, or shallow groundwater tables, or for hydrologic indicators. An area in which soils are saturated to the surface for at least one continuous week during the growing season meets the criteria for wetland hydrology; however, seasonal changes in water levels and immediacy of precipitation events must be considered when an area's hydrology is evaluated. When wetland hydrology is not present at the time of the site visit, it can be inferred from the presence of any of the following hydrologic indicators: watermarks on vegetation, drift lines, sediment deposits, water-stained leaves, surface-scoured areas, wetland drainage patterns, or oxidized root channels.

CLASSIFICATION

Wetlands are classified according to Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979). Under the Cowardin classification scheme, wetlands and deepwater habitats are grouped into systems based on shared hydrologic factors. The systems described in Cowardin et al. (1979) are palustrine, marine, estuarine, riverine, and lacustrine.

The palustrine system includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, mosses, and lichens, and all such wetlands that occur in tidal areas where the salinity due to ocean-derived salts is below 5 parts per thousand. Wetlands included in the palustrine system are commonly referred to as marshes, swamps, bogs, fens, prairies, seeps, and intermittent ponds.

Palustrine wetlands are divided into classes by the dominant vegetation: Forested wetlands are dominated by trees greater than approximately 20 feet tall with 30 percent cover, scrub-shrub wetlands are dominated by woody shrubs, and emergent wetlands are dominated by nonwoody plants.

APPENDIX B

FIELD DATA SHEETS

Routine Wetland Determination

DATA FORM 1 *(Revised)*

(WA State Wetland Delineation Manual or 1987 Corps Wetland Delineation Manual)

Project/Site: Applicant/owner: Investigator(s): Scott Luchessa	Date: 9/21/02 County: Kittitas State: WA S/T/R:
Do normal circumstances exist on the site? ☒ Yes ☐ No Is the site significantly disturbed (atypical situation)? ☐ Yes ☒ No Is the area a potential problem area? ☐ Yes ☒ No Explanation of atypical or problem area:	Community ID: Riparian forest Transect ID: Plot ID: SP-1

VEGETATION (* = dominant plant species using the 50/20 rule)

Dominant Plant Species	Stratum	% cover	Indicator	Dominant Plant Species	Stratum	% cover	Indicator
*Populus balsamifera**	T	85	FAC				
*Cornus sericea**	S	65	FACW				
*Symphoricarpos albus**	S	20	FACU				
Rosa sp.	S	15	FAC				
Equisetum hyemale	H	Trace	FACW				

HYDROPHYTIC VEGETATION INDICATORS:

% of dominants OBL, FACW, & FAC: 67%

Check all indicators that apply and explain below:

- ☒ Visual observation of plant species growing in areas of prolonged inundation/saturation
- ☐ Morphological adaptations
- ☒ Technical Literature
- ☐ Physiological/reproductive adaptations
- ☒ Wetland plant database
- ☒ Personal knowledge of regional plant communities
- ☐ Other (explain)

Hydrophytic vegetation present? ☒ Yes ☐ No

Rationale for decision/Remarks: More than 50% of the dominants have FAC and FACW wetland indicator statuses.

HYDROLOGY

Is it the growing season? ☒ Yes ☐ No	Water Marks: ☐ Yes ☒ No on	Sediment Deposits: ☐ Yes ☒ No
Based on: ☐ Soil temp (record temp) ☒ Other (explain) – plant growth	Drift Lines: ☐ Yes ☒ No	Drainage Patterns: ☐ Yes ☒ No
Depth of inundation: None	Oxidized Root (live roots) Channels <12 in.: ☐ Yes ☒ No	Local Soil Survey: ☐ Yes ☐ No
Depth to free water in pit: >16 inches Depth to saturated soil: >16 inches	FAC Neutral: ☐ Yes ☒ No	Water-stained Leaves: ☐ Yes ☒ No
Check all that apply & explain below: ☐ Stream, lake or gage data ☐ Aerial photographs ☒ Other – site investigation, topo elevations	Other (explain):	

Wetland hydrology present? ☐ **Yes** ☒ **No**

Rationale for decision/remarks: Positive indicators of wetland hydrology are lacking

SOILS

Map Unit Name (Series and Phase) :

Drainage Class

Field observations confirm mapped type? ☐ Yes ☐ No

Taxonomy (subgroup)

Profile Description

Depth (inches)	Horizon	Matrix color (Munsell moist)	Mottle colors (Munsell moist)	Mottle abundance size and contrast	Texture, concretions, structure, etc.	Drawing of soil profile (match description)
0-4	A	10YR 2/2			loam	
4-16+	B	10YR 4/2			loamy sand	

Hydric Soil Indicators: (check all that apply)

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma (=1) matrix
- ☐ Matrix chroma ≤ 2 with mottles
- ☐ Mg or Fe Concretions
- ☐ High Organic Content in Surface Layer of Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on National/Local Hydric Soils List
- ☐ Other (explain in remarks)

Hydric soils present? ☐ **Yes** ☒ **No**

Rationale for decision/Remarks: Positive indicators of hydric soil are lacking.

Wetland Determination

Hydrophytic vegetation present?	☒ **Yes**	☐ **No**
Hydric soils present?	☐ **Yes**	☒ **No**
Wetland hydrology present?	☐ **Yes**	☒ **No**
Is the sampling point within a wetland?	☐ **Yes**	☒ **No**

Rationale/Remarks: The forest community is upland because there are no positive indicators of either hydric soils or wetland hydrology.

NOTES: This black cottonwood-dominated forest may be in the 100-year floodplain and has developed on alluvial soils. However, the sandy soils appear to be well drained and are located on ground 2-3 feet higher than that of adjacent wetlands (see SP-2 data).

Routine Wetland Determination

DATA FORM 1 *(Revised)*

(WA State Wetland Delineation Manual or 1987 Corps Wetland Delineation Manual)

Project/Site: Applicant/owner: Investigator(s): Scott Luchessa	Date: 9/21/02 County: Kittitas State: WA S/T/R:
Do normal circumstances exist on the site? ☒ Yes ☐ No Is the site significantly disturbed (atypical situation)? ☐ Yes ☒ No Is the area a potential problem area? ☐ Yes ☒ No Explanation of atypical or problem area:	Community ID: Slough sedge/reed canarygrass Transect ID: Plot ID: SP-2

VEGETATION (* = dominant plant species using the 50/20 rule)

Dominant Plant Species	Stratum	% cover	Indicator	Dominant Plant Species	Stratum	% cover	Indicator
*Cornus sericea**	S	20	FACW				
*Carex obnupta**	H	75	OBL				
*Phalaris arundinacea**	H	20	FACW				

HYDROPHYTIC VEGETATION INDICATORS:

% of dominants OBL, FACW, & FAC: 100%

Check all indicators that apply and explain below:

- ☒ Visual observation of plant species growing in areas of prolonged inundation/saturation
- ☐ Morphological adaptations
- ☒ Technical Literature
- ☐ Physiological/reproductive adaptations
- ☒ Wetland plant database
- ☒ Personal knowledge of regional plant communities
- ☐ Other (explain)

Hydrophytic vegetation present? ☒ Yes ☐ No

Rationale for decision/Remarks: All of the dominants have FACW and OBL wetland indicator statuses.

HYDROLOGY

Is it the growing season? ☒ Yes ☐ No	Water Marks: ☒ Yes ☐ No on	Sediment Deposits: ☒ Yes ☐ No
Based on: ☐ Soil temp (record temp) ☒ Other (explain) – plant growth	Drift Lines: ☐ Yes ☒ No	Drainage Patterns: ☒ Yes ☐ No
Depth of inundation: None	Oxidized Root (live roots) Channels <12 in.: ☐ Yes ☒ No	Local Soil Survey: ☐ Yes ☐ No
Depth to free water in pit: >16 inches Depth to saturated soil: >16 inches	FAC Neutral: ☒ Yes ☐ No	Water-stained Leaves: ☒ Yes ☐ No
Check all that apply & explain below: ☐ Stream, lake or gage data ☐ Aerial photographs ☒ Other – site investigation, topo elevations	Other (explain):	

Wetland hydrology present? ☐ **Yes** ☒ **No**

Rationale for decision/remarks: There are many positive indicators of wetland hydrology.

SOILS

Map Unit Name (Series and Phase) :

Drainage Class

Field observations confirm mapped type? ☐ Yes ☐ No

Taxonomy (subgroup)

Profile Description

Depth (inches)	Horizon	Matrix color (Munsell moist)	Mottle colors (Munsell moist)	Mottle abundance size and contrast	Texture, concretions, structure, etc.	Drawing of soil profile (match description)
0-4	A	10YR 2/2			loam	
4-8	B	10YR 4/2			sand	
8-12+	C	2.5Y 4/2	10YR 5/8	Many, coarse, distinct	sandy loam	

Hydric Soil Indicators: (check all that apply)

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☒ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☒ Gleyed or Low-Chroma (=1) matrix
- ☒ Matrix chroma ≤ 2 with mottles
- ☐ Mg or Fe Concretions
- ☐ High Organic Content in Surface Layer of Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on National/Local Hydric Soils List
- ☐ Other (explain in remarks)

Hydric soils present? ☒ **Yes** ☐ **No**

Rationale for decision/Remarks: Redoximorphic features and low chroma are positive indictors of hydric soils.

Wetland Determination

Hydrophytic vegetation present?	☒ **Yes**	☐ **No**
Hydric soils present?	☒ **Yes**	☐ **No**
Wetland hydrology present?	☒ **Yes**	☐ **No**
Is the sampling point within a wetland?	☒ **Yes**	☐ **No**

Rationale/Remarks: All three criteria are met. Therefore the sample plot and community are wetland (PEM1C).

NOTES: Soils in this depressional feature would likely be classified as a fluvaquent. There is clear evidence of surface scouring and seasonal inundation in the depression, which is 2 to 3 feet lower than the surrounding riparian forest. Except for the narrow channels connecting the emergent communities in the depressions, there are no black cottonwoods rooted in the depressions.

ATTACHMENT 4

FISH HABITAT DATA COLLECTED FROM PROJECT AREA

Cle Elum Outfall Analysis Data for Large Woody Debris. 9/19/2002

			Bank Full Width						Wetted Perimeter					
Reach Distance (feet)	Reach Length (feet)	Habitat Type	LWD Tally by Habitat [1]			LWD Tally by Distance			LWD Tally by Habitat			LWD Tally by Distance		
			10-20cm	20-50cm	>50cm	10-20cm	20-50cm	>50cm	10-20cm	20-50cm	>50cm	10-20cm	20-50cm	>50cm
0-150 [2]	150	RIF	5	6	4	5	6	4						
0-220 [3]	220	RUN	5	5	3									
150-450	300	RUN	15	12	4	15	12	4						
220-250	30	RIF	12	4										
450-545	95	RIF		5	5		5	5						
545-705	160	RUN	1	3	1	1	3	1						
705-770	65	RIF	2			2								
770-830 [4]	60	POOL	5											
770-1790	1020	RUN	23	16	11	23	16	11	3	5		2	5	
1790-1880	90	RIF		12	1		12	1		12			12	
1880-2490	610	RUN	3	5	2	3	5	2		1			1	
2490-2600	110	RIF	2			2								
2600-3350	750	RUN	9	9	5	9	9	5	3		2	3		2
3350-4250	900	RIF	36	33	16	36	33	16	7		10	7		10
4250-5250	1000	RUN	45	27	4	45	27	4	7	4	2	7	4	2
5250-6050	800 [5]	RIF	20 [5]	10 [5]	5 [5]	20	10	5						
5830-5900	70 [5]	POOL	5 [5]											
Total Distance	**Total Length**					**Total LWD**		**357**				**Total LWD**		**55**
6050	6430					161	138	58				19	22	14

1, Number and type of LWD found within each habitat unit.
2, Mid channel bar at start of study site, 150-foot riffle to right of bar.
3, Mid channel bar at start of study site, 220-foot run on left of bar.
4, Pool habitat along bank of run.
5, Based on estimates from map data and habitat notes from field visit.