

3628 South 35th Street

Tacoma, Washington 98409-3192

TACOMA PUBLIC UTILITIES

July 8, 2005

VIA FEDEX

Secretary Federal Energy Regulatory Commission 888 First Street NE Washington, DC 20426

Re: City of Tacoma, **Cowlitz** River Project, FERC No. 2016 License Article 409 Side Channel Monitoring and Use Plan

Dear Secretary:

License Article 409 requires Tacoma Power to submit a Side Channel Monitoring and Use Plan within one year of issuance of the Order Amending New License dated July 9, 2005. This order added the terms and conditions to the License from NOAA Fisheries biological opinion for the Cowlitz River Hydroelectric Project that was issued on March 23, 2004. Enclosed are eight copies of this letter and the referenced plan.

If you have any questions regarding this submittal, please do not hesitate to contact Debbie Young, Natural Resource Manager, at (253) 502-8340 or Tom Martin, License Implementation Coordinator, at (253) 502-8298.

Sincerel

Patrick D. McCarty V Generation Manager

Enclosures

cc: Federal Energy Regulatory Commission, Portland Regional Office Fisheries Technical Committee Debbie Young Tom Martin bc: Mark LaRiviere Sarah Hahn Pam Klatt Binders (3)

City of Tacoma, Department of Public Utilities, Light Division Cowlitz Hydroelectric Project FERC 2016-071

License Article 409

Lower Cowlitz River Side-Channel Maintenance and Use Plan

1. Introduction

The new license for the Cowlitz River Hydroelectric Project, No. 2016, became effective on July 18, 2003. NOAA Fisheries issued their Biological Opinion and Incidental Take Statement on the continued operation of the Project on March 23, 2004, and FERC amended the license on July 9, 2004 to incorporate the terms included in the Incidental Take Statement. This plan is prepared to comply with license article 409 of the amended license.

License article 409 requires the City of Tacoma, Department of Public Utilities, Light Division (dba Tacoma Power) to develop and file a plan to monitor the maintenance and use of sidechannel habitat in the Cowlitz River downstream from Mayfield Dam within one (1) year of the license amendment date, or by July 9, 2005. The requirements of license article 409 duplicate the requirements of Cowlitz River settlement agreement and license article 15, Fish Monitoring Plan, which was filed with the Commission on July 14, 2004, and received approval on December 2, 2004. License article 15 requires that the effects of the Project's instream flow regime, including pulsing and channel maintenance flows, on the fisheries downstream of Mayfield Dam be monitored, and further provides that the Commission or the Washington Department of Ecology (WDOE) may modify the flow regime if monitoring indicates the flows are not adequate to protect spawning spring and fall Chinook and chum salmon. Additionally, settlement agreement and license article 11 requires the establishment of a fund to acquire high quality mainstem and side channel habitat to further protect the anadromous salmonid population in the lower Cowlitz River from impacts of future land development.

In effect, the requirements of license article 409 are being met through the plans and actions required by license articles 11 and 15, with the exception that license article 409 names NOAA Fisheries as an entity that may also require modification to the instream flow regime based on the results of monitoring. For clarity, Tacoma reiterates the plans and actions being undertaken to comply with license articles 11 and 15 below, and believes that these measures fill the requirements of license article 409.

PROJECT DESCRIPTION

The Cowlitz Project (FERC No. 2016) is Tacoma Power's largest electricity generating facility and is located on the Cowlitz River, Lewis County, Washington. The Project consists of two dams, the Mayfield Dam at river mile (RM) 52 and Mossyrock Dam, upstream at RM 65. In addition to the project generating electricity and providing flood control, Tacoma operates 3 major parks, manages approximately 14,000 acres of wildlife lands, and owns and funds operation of the Cowlitz Salmon Hatchery (RM 50) and the Cowlitz Trout Hatchery (RM 42). The Barrier Dam, associated with the Cowlitz Salmon Hatchery is located at RM 49.5. The original 50-year license for the Cowlitz Project was issued on December 28, 1951. A new thirty-five year license was issued and became effective on July 18, 2003.

The Mayfield development completed in 1963 includes a 250-foot-high, 850-foot-long, concrete arch and gravity dam that impounds Mayfield Lake, which has a maximum surface area of 2, 250 acres. In addition to the Cowlitz River, inflows from the Tilton River also contribute to Mayfield Lake, which supports public and private recreational facilities. An 854-foot-long power tunnel passes through the right abutment of the dam and terminates at a concrete forebay structure. Four penstocks continue from the forebay structure to the four generating units, which have an installed capacity of 162-megawatts (MW).

The Mossyrock development completed in 1968 includes a 606-foot-high double curvature concrete arch dam that creates Riffe Lake, a 23-mile long, 11,830-acre reservoir with 52 miles of shoreline. Riffe Lake supports several parks and other recreational facilities. Three penstocks, varying in length from 248 to 285 feet, extend down to the powerhouse, which is adjacent to the base of the dam. The powerhouse contains two generating units with room for a third, and has a total installed capacity of 300 MW. Transmission lines link the Mossyrock and Mayfield developments.

2. FERC License Article

Order Amending New License Article 409.

As required by condition 1(f) of the incidental take statement, within 1 year of issuance of this order, the licensee, in consultation with the Fisheries Technical Committee, shall develop and file for Commission approval, a plan to monitor the maintenance and use of side-channel habitat in the Cowlitz River downstream from Mayfield Dam. In the event flow management under the constraints contained in the license is insufficient to maintain the availability and anandromous fish habitat function of side channels, NOAA Fisheries and the Washington Department of Ecology can require changes to modify the flow constraints or require other measures to preserve side-channel habitat availability and function. Any such changes shall require Commission approval and any flow modifications that change the release schedule of license article 401 or 402 should be reported to the Commission within 10 days (per license article 401 and 402).

3. OBJECTIVES

The objectives of this plan are as follows:

- 1. To provide a description of the Tacoma Power plan to preserve and protect high quality side-channel habitat in the lower Cowlitz River.
- 2. To provide a description of the monitoring activities to evaluate the use and the function of the side-channel habitats in the lower Cowlitz River.

4. Side-Channel Habitat Protection Measures and Plans

As described in the Introduction, the plans and actions required to comply with license article 409 have been developed under license articles 11 and 15. The license article 11 and 15 plans

and actions that were submitted to the Cowlitz River Fisheries Technical Committee (FTC) for review, and the subsequent Commission orders are described below.

License Article 11. Fish Habitat Fund Allocation Plan. FERC issued an Order Modifying and Approving Downstream Fish Habitat Fund Allocation Plan pursuant to settlement agreement Article 11 on January 24, 2005. Modifications to the Plan as filed consist primarily of reporting timelines and a requirement to publish a notification of the availability of funds. The license article 11 plan as filed and approved by FERC, calls for the acquisition of conservation easements, in fee-title, of main stem and tributary habitats in the Cowlitz River between the Barrier Dam and the confluence with the Toutle River. Properties containing off-channel habitats such as side channels would be of the highest priority for purchase or protection. For more details see *Fish Habitat Fund Allocation Plan, July 6, 2004.*

License article 11 has been developed for the protection of habitat, specifically side-channel habitat in the lower Cowlitz River basin. The implementation actions of this article will serve to prevent habitat degradation and allow for both active and passive restoration activities of side-channel habitat in the lower Cowlitz River, from Mayfield Dam to the confluence with the Toutle River.

The acquisition or protection of these properties, critical to properly functioning conditions for juvenile and adult salmonid life history needs, are necessary due to current or future potential development and other human activities impacting the sites.

To this end, the Cowlitz River Project license issued by the Commission called for the formation of the Habitat Advisory Group (HAG) to oversee fish habitat protection, restoration, and enhancement on the Cowlitz River. The HAG consists of representatives from each settlement party that chooses to participate. Those parties that have participated or expressed interest in doing so are; Tacoma Power, US Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), American Rivers/Trout Unlimited, NOAA Fisheries, and Lewis County. The role of the HAG is to provide guidance in the use of the habitat fund established by Tacoma Power. The HAG will serve as the body responsible for reviewing and approving which projects are eligible and their relative priority within the basin.

License Article 15. Fish Monitoring Plan. FERC issued an Order Modifying and Approving Fish Monitoring Plan Pursuant to Article 15 on December 2, 2004. Modifications to the Plan as filed were for clarification of reporting timelines and to add provisions to investigate the effects of Project operations on anadromous fish redd abandonment and dewatering, and entrapment and stranding of juvenile and adult fish. The license article 15 plan, as filed and approved by FERC with added provisions, calls for the monitoring of main stem and side-channel habitats in the lower Cowlitz River with fixed point photo monitoring and aerial photo monitoring between the Barrier Dam and the confluence with the Toutle River. In addition, Chinook spawning will be monitored in the main stem and side-channel areas of the lower Cowlitz River. For more details see *Fish Monitoring Plan, July 19, 2004 and Addendum to Fish Monitoring Plan, March 18, 2005.*

Side-Channel Monitoring - Lower Cowlitz River.

Fixed point photo monitoring and aerial photo monitoring will be used in conjunction with mapping techniques to observe and track the channel changes of the Cowlitz River from RM 50 downstream to RM 20¹.

A baseline photo data set has been collected from relicensing studies and from 2003 and 2004 aerial flights. These maps and photos are included in Appendix 1 of the Plan. Tacoma Power envisions a plan map of the Cowlitz River between RM 20 and RM 50 that shows the shorelines, channels and islands from the baseline studies (2003-2004), superimposed upon the shorelines, channels and islands from the repeat studies done in 2006 and 2011. The resultant analysis will track the increase or decrease of side-channels in the lower Cowlitz River.

All records and photo data set will be repeated in 2006 and 2011 to develop a semi-decadal report of conditions. Photo data sets will be collected at the sites listed below following sustained high flow events in order to monitor the channel forming process. The photo data set would also be repeated after a "post-Cowlitz River Project" 5-year flow event of 34,600 cubic feet per second (Harza 1996). Regardless of flow events, the photo data sets will be repeated in 2006 and 2011.

- 1. Fixed point sites:
 - a. RM 50.0 Cowlitz Salmon Hatchery
 - b. RM 49.5 Barrier Dam
 - c. RM 49.2 Mouth of Mill Creek
 - d. RM 47.0 Cowlitz Timber Trails side channel
 - e. RM 44.5 unnamed side channel
 - f. RM 42.5 Otter Creek side channel
 - g. RM 42.0 Cowlitz Trout Hatchery
 - h. RM 41.3 Mouth of Blue Creek
 - i. RM 37.7 IFA Nursery (view upstream)
 - j. RM 33.5 Toledo, upstream from bridge
 - k. RM 33.5 Toledo, downstream from bridge
 - I. RM 33.0 Below Toledo, Washington
 - m. RM 29.8 Interstate-5 bridge
 - n. RM 27.5 Wallace Ponds
 - o. RM 24.4 Olequa boat launch
 - p. RM 20.0 Toutle River confluence
- 2. Aerial photography sites:
 - a. RM 52.0 Mayfield Dam
 - b. RM 50.0 Cowlitz Salmon Hatchery
 - c. RM 49.5 Barrier Dam
 - d. RM 49.2 Mouth of Mill Creek
 - e. RM 46.5 Cowlitz Timber Trails development
 - f. RM 44.5 unnamed side channel
 - g. RM 40.0 Bear Paw drift
 - h. RM 37.7 IFA Nursery

¹ All river mile (RM) references are from a U.S. Army Corps of Engineers (ACOE) aerial survey of the Cowlitz River conducted October 13, 1978 (ACOE 1978).

- i. RM 36.5 unnamed side channel
- j. RM 36.0 Massey Bar boat launch
- k. RM 33.0 unnamed side channel
- I. RM 31.0 unnamed side channel
- m. RM 30.5 unnamed side channel
- n. RM 26.0 unnamed side channel
- o. RM 25.2 Car Body Hole
- p. RM 20.0 Toutle River confluence

See Appendix No. 1 for pictures of these sites.

Spring and Fall Chinook Spawning Monitoring - Lower Cowlitz River

- Carcass sampling and coded wire tag recovery efforts will begin on September 1 annually. Surveys will occur on the Cowlitz River from the Barrier Dam to the mouth of the Toutle River by boat to recover Chinook salmon carcasses. Carcasses will be sampled for origin (hatchery vs. wild), race (spring vs. fall), sex, age and length. Snouts will be collected from all Chinook identified with coded wire tags.
- 2. Spring and fall Chinook aerial spawning surveys will occur annually to monitor natural spawning populations and to identify high quality habitat areas in the Cowlitz River from the Barrier Dam downstream to confluence with the Toutle River. Data collected will include adult fish and redd distributions. Flights will begin in mid-September, and occur every other week until aerial observations are impaired by high water (usually late in November).
- 3. Chum salmon spawning surveys will occur concurrently with the Chinook spawning surveys to monitor natural spawning populations of chum in the lower Cowlitz River downstream to the confluence with the Toutle River. Data collected will include adult fish and redd distributions; run timing based on spawning and abundance estimates. Data collected from aerial surveys will be augmented with walking surveys on the lower Cowlitz River, including some tributary mouths, to enumerate and monitor redds, and to collect samples for stock analysis.
- 4. Spring and fall Chinook redd surveys will occur annually. Surveys for potential redd dewatering and adult distributions of natural spawning Chinook populations will take place by foot in the main channel of the Cowlitz River at:
 - a. RM 42.4
 - b. Side channel site RM 42.5 (Otter Creek side channel)
 - c. Side channel site RM 47 (Cowlitz Timber Trails side channel)

These side channel sites have been reviewed by the Cowlitz FTC and the WDFW, and are proposed as the index survey sites for lower Cowlitz River side-channel habitats.

Data collected during the redd surveys will include; redd counts, live and dead adult counts, selected redd pit depth, tail spill area, overall redd length and width. Selected redds in the river

margin areas at the survey sites will be measured and examined for exposure and dewatering². Redd surveys will occur through early December annually.

Distribution of rearing salmonid populations - Lower Cowlitz River

Tacoma will examine the distribution of rearing salmonids in the lower Cowlitz River by seining for juvenile fall Chinook above the mouth of the Toutle River. To develop survival estimates of natural-origin fall Chinook, unmarked Chinook will be wire tagged and released back into the river at the collection site, or a nearby location. These observations and study results will be analyzed in support of license article 11 (Fish Habitat Fund Allocation Plan) to identify the highest quality habitats and increase the priority of those sites for protection.

Significant numbers of juvenile salmon that might be stranded by lower Cowlitz River flow reductions are present only in the springtime. Springtime flow reductions from Mayfield Dam are limited to nighttime hours to minimize this risk and to offer a balance between protection for the fish resource and limitations on hydroelectric operations. Site-specific and incident-specific Cowlitz River juvenile fish stranding surveys will be conducted and coordinated with the WDFW.

5 License Article 409 Plan

Tacoma Power is already implementing the provisions of the license article 15 Fish Monitoring Plan. The results of the monitoring activities prescribed by this plan will be reported to the FTC and to the Commission. Should the monitoring indicate that the Project's instream flow requirements are insufficient to maintain the availability and anadromous fish habitat function of side channels in the lower river the Commission, WDOE or NOAA Fisheries may modify the flow regime or require other measures to preserve this habitat, upon approval of the Commission.

6. Consultation and Comments

Consultation on this Lower Cowlitz River Side-Channel Maintenance and Use Plan took place with the resource agencies and settlement agreement parties through distribution of a review draft on May 17, 2005; followed by subsequent discussion at a FTC meeting and the filing of formal comments by the reviewers. The draft plan was revised based on these comments and re-submitted to NMFS and WDOE for additional review on June 5, 2005. A meeting was held on June 20, 2005 with these two agencies to resolve any outstanding issues. A chronology of these events appears below.

Date	Agencies/ Committees	Participants	Type of Communication	Topics
June 20, 2005	Cowlitz FTC	NMFS, USFWS, WDFW, American Rivers/Trout Unlimited, Tacoma Power, Yakama Tribe	Meeting	Discussion of, and comments upon, the draft Lower Cowlitz River Side- Channel Maintenance and Use Plan.
June 23, 2005	NMFS	Keith Kirdendall	Letter	Comments on Tacoma

² Exposed redd = redd that is exposed to the point that the pit is dry. Dewatered redd = redd that is exposed for 8 daylight hours consecutively or 12 darkness hours consecutively (prior to November 15) or 8 hours consecutively anytime after November 15.

				Power's Draft Plan for License Article 409.
June 23, 2005	WDFW	Craig Burley	Letter	 Comments on Tacoma Power's Draft Plan for License Article 409.

Abbreviations

NMFS	National Marine Fisheries Service
WDFW	Washington Department of Fish and Wildlife
FTC	Cowlitz River Fisheries Technical Committee

REFERENCES

Harza. 1996. *Cowlitz Hydroelectric Project, FERC No. 2016. Initial Consultation Package.* Prepared for Tacoma Power. Harza Engineering Company. May 1996.

APPENDIX No. 1

Fixed and Aerial Site Photographs Channel Monitoring Stations

Cowlitz River, Washington 2004

Appendix No. 2

Cowlitz FTC Reviewer Comments and Responses

TACOMA'S RESPONSES TO COMMENTS RECEIVED ON

DRAFT Lower Cowlitz River Side-Channel Maintenance and Use Plan, May 17, 2005

Comments from NMFS, June 23, 2005:

Comment 1:

The draft plan states that the FTC has previously approved requirements, plans, and actions related to this article (page 3). This is not an accurate statement. Although Tacoma provided the draft plan for NMFS' review, we did not approve them because we were unable to review them.

Response to Comment 1:

Tacoma Power has changed the text to indicate the plans were submitted for Cowlitz FTC review. Not all members of the FTC commented upon the draft plans.

Comment 2:

Another point of clarification is that, under the Biological Opinion, we expected that the assessment of whether the flow management regime is able to maintain both the availability of and the anadromous fish habitat function of side channels would include an evaluation of both adults and juveniles of all listed salmonid species.

Response to Comment 2:

The evaluations of adult and juvenile salmonids utilizing the side-channel habitat of the lower Cowlitz River is described on page 5 (for adults) and on page 6 (for juveniles) of the draft plan. The listed species included for assessment include spring and fall Chinook salmon, and chum salmon. The adult life history stage of the other listed salmonid species on the Cowlitz River (late winter-run steelhead and coho salmon) shows that they do not utilize main stem Cowlitz River side-channel habitat for spawning. Previous and on-going spawning surveys have not located late winter-run steelhead and coho salmon in the side-channel areas. Juveniles of all listed species may utilize the side-channels, and the proposed and on-going study – *Distribution of rearing salmonid populations* (page 6) will ascertain juvenile salmonid distribution and usage in the side-channels.

Comment 3:

We agree with the Washington Department of Fish and Wildlife's (WDFW) comments. These comments included, but were not limited to, looking at a broader range of juvenile species (with an expanded time frame) and conducting studies to provide better understanding of spring Chinook salmon life history in the lower river.

Response to Comment 3:

See the Comments from WDFW; Response to Comment 1.

Comments from WDFW, June 23, 2005:

Comment 1:

Distribution of rearing salmonid populations-lower Cowlitz River

Fall Chinook juvenile rearing in the lower Cowlitz occurs primarily in spring and early summer, however Coho, Steelhead and Cutthroat rear year-round in the lower Cowlitz. We suggest studies, which include examining rearing in the side-channel areas in particular, year round to determine impact of project operations during periods of lowest flows and most limited habitat and during higher flows when side channel may represent habitat refugia. Protocols should focus on achieving quantifiable study results.

Response to Comment 1:

On-going studies, and studies conducted during the Cowlitz Project relicensing process, have established that the lower Cowlitz River side-channels are critical and important adult and juvenile habitats. The settlement agreement parties and the Commission have recognized the specific value of the lower Cowlitz River side-channels, and the need to protect these habitats (through purchase or conservation easement). The purpose of this plan, as well as the previously approved license article 15 plan, is to evaluate the instream flow regime (i.e., project operations) impacts on the lower Cowlitz River and to identify those side channels that provide high quality habitat.

The biological evaluation proposed in the plan, as well as on-going evaluation activities for license article 15, will adequately monitor the maintenance and use of the side-channel habitat in the Cowlitz River downstream of Mayfield Dam.

Comment 2:

All hatchery fall Chinook should be adipose clipped. WDFW Cowlitz Evaluations Staff should continue to CWT wild juvenile fall Chinook to develop survival estimates. Also, sampling should be extended next year to determine if hatchery fall Chinook are using similar habitats as wild fall Chinook. If there is a suspected interaction between hatchery and wild fish a subsample should be radio tagged to examine microhabitats and duration of rearing in the river.

Response to Comment 2:

All hatchery fall Chinook from the Cowlitz Salmon Hatchery will be mass marked (adipose finclipped) beginning with the brood year 2005 fish, scheduled to be released in May and June 2006. All subsequent fall Chinook releases from the hatchery will be adipose clipped in accordance with the *Regional Coordination and Agreements on Marking and Tagging Pacific Coast Salmonids, Regional Mark Committee of the Pacific States Marine Fisheries Commission.*

Hatchery fall Chinook are reared in the Cowlitz Salmon Hatchery to maximize smolting characteristics and minimize residualism. WDFW adheres to a combination of acclimation, size, and release timing guidelines. Based on past facility history and time and size-at-release parameters, the fish are in a smolted condition and migrate quickly upon release. The likelihood that smolted fall Chinook would be present in lower Cowlitz River side-channel habitats is small, but will be examined by an expanded survey effort. The size differential between hatchery-origin and natural-origin (wild) fall and spring Chinook in the lower Cowlitz River, after the hatchery release in mid-June, will preclude radio tagging studies as the natural-origin fish will be too small to effectively tag.

Tacoma Power has an annually renewable contract with WDFW to fund Cowlitz Evaluations tasks. The 2005 Work Plan includes the lower Cowlitz River fall Chinook wild stock capture and tagging project. Tacoma will continue to support this wild stock capture and tagging project on an annual basis. The study results have multiple purposes for the analysis of the fall and spring Chinook stocks in the Cowlitz River including; harvest management, juvenile distribution, hatchery versus wild fish determinations and fall and spring Chinook differentiations. Annual surveys of lower Cowlitz River juvenile salmonid distributions will be expanded after the implementation of mass marking of the hatchery stock until the decrease in the catch-per-unit of effort precludes effective and efficient sampling.

Comment 3:

Finally, since Chinook salmon are listed, it would seem to warrant increased understanding of their life history strategies. We would suggest evaluating the duration that wild Chinook rear in the river. Do they out-migrate the river as sub-yearlings or as yearlings? USGS is currently doing a study in Oregon where they have found 65% of the fall Chinook reared in the river for a year before immigrating. Also, the lower river Cowlitz study could be combined and evaluated with the life-history strategies of the (spring/fall) Chinook rearing in Mayfield and captured at the Mayfield trap and released into the lower Cowlitz River.

Response to Comment 3:

Tacoma Power agrees that a further understanding of the life history strategies of all Cowlitz River Chinook stocks is warranted. To accomplish this, Tacoma will continue to support the Chinook marking studies underway on downstream migrants at Mayfield Dam, and the lower Cowlitz River fall Chinook wild stock capture and tagging project. These studies will result in juvenile and adult samples that will yield the life history information suggested by WDFW in this comment.

In addition, a further study on the origin of Chinook outmigrants has been recently proposed by WDFW, and is under consideration for funding by Tacoma. This DNA study on Chinook collected at the Mayfield migrant trap is an out-growth of the information gathered at Mayfield in recent years, and is an example of the application of adaptive management. Other sources of existing data that should be further scrutinized include the scales collected by WDFW from adult spring and fall Chinook returns at the Cowlitz Salmon Hatchery for many years. Closer scrutiny of the scales, and associated database, will yield riverine rearing life history patterns.

Comment 4:

Fixed Point Photo Monitoring

The plan should elaborate on how the photo monitoring results will be used in the future. Will the photos be correlated to flow timing, high flow frequency or other flow data? It would be useful when tracking channel movement to take it a step further to incorporate the dynamics (or management) of the river flows. Is the river becoming unnaturally stable (minimal channel movement)? If so, has the flows been relatively monotypic. Is there side-channel loss or decrease in the deposition related to loss of a dynamic hydrograph?

Response to Comment 4:

The plan proposes mapping techniques to observe and track the channel changes of the Cowlitz River from fixed point and aerial photo monitoring. The exact mapping techniques are not specified as there are several commercially available products that would yield a meaningful outcome. At a minimum, Tacoma Power envisions a plan map of the Cowlitz River between RM 20 and RM 50 that shows the shorelines, channels and islands from the baseline studies (2003-2004), superimposed upon the shorelines, channels and islands from the repeat studies done in 2006 and 2011. The resultant analysis will track the increase or decrease of side-channels in the lower Cowlitz River. Tacoma Power has changed the text to accommodate this comment.

Correlation to flow timing is factored in the plan through repeat collection of the photo data sets whenever a 5-year flow event of 34,600 cubic feet per second or greater occurs below Mayfield Dam. The Cowlitz River Project alters the river dynamics below Mayfield Dam by means of power production; release of flows for fish habitat, fish transport and recreation, and flood control, among other purposes. This study specifically tracks the maintenance and (possible) formation of main stem and additional side-channel habitat in the lower Cowlitz River; it does not investigate the magnitude of fluvial geomorphologic processes present in the lower Cowlitz River.

Comment 5:

What about vegetation response related to the channel movement and hydrograph? This can have affects on productivity and woody debris recruitment to the river

Response to Comment 5:

Large woody debris recruitment into the lower Cowlitz River is being studied under the settlement agreement license article 9 plan – *Large Woody Debris Plan.* The monitoring, evaluation and reporting sections of that plan will track the accumulations of large woody debris in the lower Cowlitz River, regardless of wood source. Observational data by biologists familiar with the lower Cowlitz River indicate that naturally occurring large woody debris (primarily from established riparian corridors in the lower Cowlitz River) are a very significant contributor to the overall large woody debris budget in the river. The analysis of the fixed point and aerial photo data sets will yield quantitative estimates of naturally occurring woody debris recruitment rates into the lower Cowlitz River.

Comment 6:

Additionally, a GPS location and compass angle should be specified at the initial photo so that they can be matched in subsequent photos.

Response to Comment 6:

Tacoma Power does not have the capability to to this and believes it to be impractical.



UNITED STATES DEPARTMENT OF COMMERCE National Oceanic and Atmospheric Administration NATIONAL MARINE FISHERIES SERVICE 525 NE Oregon Street PORTLAND, OREGON 97232-2737 F/NWR5

June 23,2005

Debbie C. Young, Natural Resources Manager Tacoma Power 3628 South 35th Street Tacoma, Washington 98409-3192

RE: Comments on Tacoma Power's Draft Plans for License Articles **409,4**13, and 415 for the Cowlitz River Hydroelectric Project (FERC No. 2016).

Dear Ms. Young:

The National Marine Fisheries Service (NMFS) has the following comments on the subject draft plans. We envision Tacoma Power (Tacoma) working closely with the Fisheries Technical Committee (FTC) to resolve these issues.

Comments on **City** of Tacoma **draft** Lower **Cowlitz** River Side-Channel Maintenance and Use Plan (License Article 409)dated 5/17/2005

The draft plan states that the FTC has previously approved requirements, plans, and actions related to this article (page 3). This is **not** an accurate statement. Although Tacoma provided the draft plans for NMFS' review, we did not approve them because we were unable to review them.

Another point of clarification is that, under the Biological Opinion, we expected that the assessment of whether the flow management regime is able to maintain both the availability of and the anadromous fish habitat function of side channels would include an evaluation of both adults and juveniles of all listed **salmonid** species.

We agree with the Washington Department of Fish and Wildlife's (WDFW) comments. These comments included, but were not limited to, looking at a broader range of juvenile species (with an expanded time frame) and conducting studies to provide better understanding of spring Chinook salmon life history in the lower river.

Comments on Deficiencies in **City** of **Tacoma Draft Anadromous** Fish Trap and Haul Plan (License Article **413**) and **Anadromous** Fish Passage Plan (License **Article 415**) dated **5/17/2005**

There *are* three different plans that deserve discussion at this point: the Adaptive Management Plan, the Fish Passage Plan, and the Trap and Haul Plan. All are **terms** and conditions in the NMFS March 23,2004, Biological Opinion, and all are requirements of the **FERC** order amending the new license issued July 9,2004. The Adaptive Management Plan is overarching



and incorporates all the various aspects of reestablishmentefforts in the basin (including, but not limited to, fish passage [both juveniles and adults – including trap and transport], operation of the projects that may affect salmonids, etc.). The Fish Passage Plan could be considered part of the Adaptive Management Plan; it specifically covers all the aspects of the fish passage facilities. The Trap and Haul plan could also be considered part of the Adaptive Management Plan; it specifically focuses on the Trap and Haul aspects.

Adaptive Management Plan

From the Biological Opinion:

Reasonable and Prudent Measure 4

Ensure that the reestablishmentis occurring at a level needed to avoid jeopardy and that sources of mortality to listed **fish** are **reasonably considered** and improved to meet the overall objective of viable populations of spring chinook salmon and a contributing population of **steelhead** by incorporating a strong adaptive management component.

Term and Condition 4. a. Adaptive management will be implemented as described in the Analysis of Effects of the Proposed Action (Section 6) in this Opinion.

Tacoma must develop an overall adaptive management plan for reestablishment of **salmonid** populations in cooperation with, or the involvement of, the FTC; obtain NMFS approval; and submit it to FERC. Among other factors, the plan must specify annual and periodic monitoring and reporting factors critical to the success of reestablishment. Tacoma must prepare and submit to the FTC, including NMFS, an annual report throughout the life of the license, addressing all of the **metrics** identified in the overall plan, no later than July 18 of each year. Reviews will be conducted annually by NMFS and the **FTC**, with major reviews at 3 and 5 years following issuance of the Opinion (which was issued March 23,2004) and every 5 years thereafter. If a significant shortfall is detected in expected performance (as specified in the Opinion or in further adaptive management), corrective actions must occur. See the Analysis of Effects of the Proposed Action (Section 6) of the Biological Opinion for more details.

While the Biological Opinion and the FERC order amending the new license were not explicit on the due date for the initial Adaptive Management Plan, it is implicit that it was due by July 18 of the first full year following the Biological Opinion (which is July 18,2005). The Biological Opinion was specific that an annual report must be submitted by no later than July 18 of each year throughout the life of the license. We have not seen a draft of the Adaptive Management Plan, nor have we received answers to our inquiries regarding the Adaptive Management Plan which were included in our comments on the FHMP. For example, in a July 20,2004, letter to you from Keith Kirkendall, NMFS, regarding Comments on the July 2,2004, Final Draft of the Cowlitz River Fisheries and Hatchery Management Plan, comment number 45 was about the Adaptive Management Plan. Specifically, that comment was:

NOAA Fisheries looks forward to working cooperatively with' Tacoma Power on the adaptive management plan for the FHMP. It is our expectation that there will either be 1) a whole separate adaptive management plan developed as described in the March 23,2004, Biological Opinion on the **Cowlitz** River Hydroelectric

¹Added "with" to the quote.

Project, or 2) the adaptive management plan described in the FHMP document will be part of the overarching adaptive management plan, including that described in the Biological Opinion.

In our February 23,2005, letter to Magalie R. Salas, FERC, we asked for a clarified response to the above comment since Tacoma had only replied "comment noted." We do not know if this implies acceptance or disagreement. Tacoma must initiate discussions and provide a draft of the Adaptive Management Plan. Again, the Adaptive Management Plan must be carried out according to the description in the Analysis of Effects of the Proposed Action (Section 6) of the Biological Opinion. This is different than that described by Tacoma in the Adaptive Management portion of the FHMP.

Fish Passage Plan

From the Biological Opinion:

Reasonableand Prudent Measure 4

Ensure that the reestablishment is occurring at a level needed to avoid jeopardy and that sources of mortality to listed fish are reasonably considered and improved to meet the overall objective of viable populations of spring chinook salmon and a contributing population of steelhead by incorporating a strong adaptive management component.

Term and Condition **4**. b. Tacoma Power will create a Fish Passage Plan (FPP) and update it annually subject to NOAA Fisheries' review and approval. The **FPP** shall include, but is not limited to, plans for the operation and maintenance of all fish passage facilities, emergency operation of said facilities, protocols for emergencies, schedule for inspection of facilities (to ensure operation within established criteria), reporting **procedures** of inspection results, anticipated special operation of the facilities for research, etc.

Trap and Haul Plan

From the Biological Opinion:

Reasonable and Prudent Measure 3

Minimize the likelihood of incidental take from handling of anadromous fish during any trap and haul operation by development of a plan that addresses such issues. NOAA Fisheries must approve the plan.

Term and condition 3. a. Tacoma Power must develop a plan, in consultation with the FTC, including NOAA Fisheries, and with NOAA Fisheries' approval, that addresses and minimizes harm to anadmmous fish during any trap and haul operation. This plan must be completed and implemented within 1 year of the completion of this Opinion. The plan should adhere to the most updated criteria at the time of plan finalization regarding trapping and hauling of anadromous fish as outlined in the document "Draft Anadromous Salmonid Passage Facility Guidlines and Criteria" Biological Opinion on the Cowlitz River Hydroelectric Project March 23,2004 availableat http://www.nwr.noaa.gov/1hvdrop/hvdroweb/docs/release_draft.pdf. The guidelines will be updated shortly.

At a minimum, Tacoma must systematically step through each area of the projects that affect fish passage and provide in detail plans for the operation and maintenance of all fish passage facilities, emergency operation of said facilities, protocols for **emergencies**, schedule for inspection of facilities (to **ensure operation** within

established criteria), reporting procedures of inspection results, anticipated special operation of the facilities for research, etc. This plan should also incorporate project operations **or** maintenance issues that may affect passage and how these are carried out in a manner to minimize impacts to fish passage, e.g., how scheduled maintenance to the projects is done during the least impacting time for fish.

Tacoma must evaluate each component of the fish passage facilities based upon the standards outlined in the NMFS' Anadromous **Salmonid** Passage Facility Guidelines and Criteria (Guidelines and Criteria) and identify how each facility component meets these standards. Any deficiency should be accompanied by an explanation of when and how the facility component will be brought up to current standards, or the reasons Tacoma believes the facility component does not need to meet the Guidelines and Criteria unless waived by NMFS, based on **scientific/biological** reasons that show the same level of protection will be achieved. This applies to both the Fish Passage Plan and the Trap and Haul Plan. The idea is to have a complete review of all of the routes of fish passage, including the trap and haul portions, against all of the pertinent sections of the Guidelines and Criteria. In cases where site-specific conditions warrant, NMFS reserves the right to require more restrictive site-specificcriteria.

Fish transport, passage, and handling operations will meet NMFS and WDFW standards and protocols (if there is a difference, the most protective standards and protocols must be used). Records regarding these operations will be available in a timely manner upon request by NMFS, and should be included in the annual reports among other reported items. Fish transport plans will include alternate release sites to be used in case of high water temperatures (seven-day average of maximum temperatures exceeds 18°C **a** weekly mean temperatureexceeds 16°C [EPA 20011 or if the instantaneous temperatureat the release site exceeds 18°C) at the primary release site, or other factors that preclude use of the primary release site. Operating plans will include detailed procedures far fish truck breakdowns, including measures to be taken if a truck full of fish breaks down en route to the release site. All transport personnel will be trained in these measures. Detailed operating plans for fish passage and transport operations will be provided to NMFS at least annually for review and approval. Additionally, if there is evidence of significant problems such as increased mortality, fallbacks, etc., there should be additional review.

Overall, the plans Tacoma has submitted give a fair description of the fish facilities associated with the **Cowlitz** River **Hydroelectric Project**; however, they lack some specific details regarding compliance with current NMFS Guidelines and Criteria. Tacoma has used an older copy of the draft Guidelines and Criteria and should use the latest version during revision of the plans, since some elements in the Guidelines and Criteria have changed. The plans also need more specificity regarding triggers and actions, such as details on what triggers maintenanceon an "as-needed" basis, and what is covered in inspections.

The plans as they exist now almost totally ignore the documentation and reporting of fish transport and passage. For NMFS and other resource management agencies to monitor and evaluate the success of the fish passage and transportation operations, documentation of the operations must be made available in a timely manner. We want to look at the history of what went wrong and what worked and learn from it. The adaptive management measures required in both the FERC License and the Biological Opinion require the availability of timely, complete, and accurate data for the adaptive management paradigm to be functional. Annual reports should include data down to the level of individual fish truck hauls, with summaries including averages for parameters and detailed descriptions of mortalities and deviations from established operating standards. Incidents which are reported to supervisors should be reported along with corrective actions taken.

By letter dated July 15,2004, to Debbie C. Young, Tacoma, from Keith Kirkendall, NMFS, we expressed that the existing downstream passage facility at **Mayfield** may not be adequate for long-termcollection and that the facility or portions of it will likely need to be updated to current NMFS Guidelines and Criteria. In that July 2004 letter, we also noted that Tacoma should promptly develop a plan including information on the rehabilitation of the ladder and trap at the Barrier Dam to bring it up to current criteria and working conditions. We stated then that we had concerns with both facilities. We intend the fish passage plans to address these facilities now and not wait until the required time frames identified under Settlement Agreement License Article 2 and 3.

Several notable deficiencies in the Plans follow. We will provide just a few illustrative examples here, but there are numerous other deficiencies.

Anadromous Fish Passage Plan (License Article 415)

- The Anadromous Fish Passage Plan should also include an evaluation of the downstream fish passage facilities based upon NFMS Guidelines and Criteria. The current plan only provides a description, not a detailed evaluation of the existing facilities.
- The notification of a fish kill should include NMFS staff as identified in the Pollution Erosion Control Plan:

Michelle Day of NMFS at 503-736-4734. If Ms. Day cannot be reached at that number, call her cell phone at 503-351-4393. If Ms. Day cannot be reached, leave a message for her, then call Keith Kirkendall at 503-230-5431. NMFS Law Enforcement Office shall also be contacted at 800-853-1964. Notification shall **include** a description of the nature and extent of the problem, any actions taken to correct the problem and any proposed changes in operations to prevent further problems.

• The plan lists the two fishway entrances at the Barrier Dam (page 11). We understand that only one entrance is functional (i.e., that fish are actually

using it). Generally, fish are not using the left bank entrance (left when facing downstream). This is contrary to what the plan is implying.

- The right bank ladder entrance is described (on pages 15 and 16) as containing two entrances. The primary entrance is a 5.75-inch-wide vertical slot with a sill elevation of 216.0 ft. A second entrance is a 1.0-ft vertical slot entrance located adjacent to the area under the Barrier Dam. Section 5.2.6 of the Guidelines and Criteria states that the minimum **fishway** entrance width should be 4 ft and the entrance depth should be at least 6 ft. Little information is provided regarding the conditions at the left bank entrance: What are the ladder entrance gate dimensions (minimum and maximum, since they are adjustable in width, and what are their sill elevations)? How much auxiliary water is provided to the entrance pool? How does this entrance pool transition to the transportationchannel'? **Fishway** entrance gates should be adjustable (or the auxiliary water system adjustable) to maintain 1 to 1.5 ft of head across the entrance gate for the full range of design flows (Section 5.2.2 and 5.2.5 of the Guidelines and Criteria).
- The auxiliary water system (as describedon page 16) seems to be small for a river of this size. According to section 5.2.4 of the Guidelines and Criteria, the attraction flow from the **fishway** entrance should be between 5% and 10% of the high design passage flows for stream with mean annual discharges exceeding **1000** cfs. It is unclear that these facilities meet this guideline.
- **Forebay** and tailwater rating curves should be provided for the Barrier Dam so the effectiveness of the dam and ladder entrances can be determined. What is the minimum, maximum, and normal design flow for proper facilities operation?
- The transportation channel (page 16) that runs from the left bank ladder to the right bank ladder entrance is described as 10 ft wide and 2 ft deep. No information is provided on how much flow passes through this channel. Section 5.5 of the Guidelines and Criteria details the requirements for transport channels; transportation channels should be a minimum of 5 ft deep with a flow velocity between 1.5 fps and 4 fps. In addition, what is the depth and velocity of flow in the transport pipe portion of the adult fish ladder (described on page 16) above the Barrier Dam?

Anadromous Fish Trap and Haul Plan (License Article 413)

• Regarding the reference to section 8.7.2 in the plan (page 16), what is the maximum time an individual fish could be held in the trap facility? Excluding late September through mid-November, it seems that an individual fish may spend upwards of approximately48 to 72 hours in the Cowlitz Salmon Hatchery trap over a weekend, and longer at the Cowlitz Trout Hatchery trap. Maximum holding time should be 24 hours (Section 7.5.3 of the Guidelines and Criteria).

- Section 8.7.3 (plan page 16). According to NMFS Guidelines and Criteria (section 7.3.3), fish should be anesthetized before handling. What proof is there that Chinook salmon and cutthroat trout undergo less stress and damage without anesthetic, and what guarantee is there that an experienced operator is performing the work? Furthermore, we have concerns regarding the proposed use of electroanesthesia.
- Section 8.10 (page 17). What is the maximum number of fish expected to enter the trap in any one day, and how often is the trap operated? We are concerned that the holding pool may become overcrowded during times of peak migration or when the trap is operated intermittently. Additionally, it is unclear how the finger weir at the outlet of the Cowlitz Salmon Hatchery holding pool effectively limits the amount of adult salmonids in the pool (as stated in section 8.10.1). Finger weirs are typically employed to prevent fish from leaving a pool, not from entering one.

Again, we expect to Tacoma to immediately commence efforts to work closely with the FTC to resolve these issues. If you have any questions, please contact Michelle Day of my staff at 503-736-4734.

Sincerely,

Patilia J. Amore

Keith Kirkendall, Chief FERC & Water Diversions Branch HydropowerDivision

cc: Craig **Burley**, WDFW Brad Caldwell, WDOE Mark LaRiviere, Tacoma George Lee, Yakama Nation Tammy Mackey, Washington Council, Trout Unlimited Brian Peck, USFWS

References

EnvironmentalProtection Agency (EPA) 2001. Draft EPA region 10 guidance for state and tribal water quality standards. Public Review Draft.

National Marine Fisheries Service (NMFS) Anadromous Salmonid Passage Facility Guidelines and Criteria (latest draft available on line at http://www.nwr.noaa.gov/hydrop/hydroweb/docs/Passagecriteria.extrevdraft ,pdf and is marked 1-31-04 external review draft).



CC D. Young M. La Riviere P. Klatt

STATE OF WASHINGTON DEPARTMENT OF FISH AND WILDLIFE 2108 Grand Blvd Vancouver WA 98661 (360) 696-6211

June 23,2005

Mr. Thomas E. Martin .LicenseImplementation Coordinator Tacoma Power 3628 South **35th** Street Tacoma, Washington 98409-3192

Dear Mr. Martin:

Enclosed please find Washington Department of Fish and Wildlife comments on Settlement Agreement License Articles 409,413 and 415 drafts. Should you have any questions please contact me by phone at 360-906-6711 or by **email** at <u>burleccb@dfw.wa.gov</u>.

Sincerely,

Craig Burley Region 5 Fish Program Manager



WDFW Comments on Tacoma Power License Articles **409,413** and **415** Drafts

June 15,2005

Article 409 Draft- Lower Cowlitz River Side Channel Maintenance and Use Plan

Distribution of rearing salmonid povulations-lowerCowlitz River

Fall Chinook juvenile rearing in the lower Cowlitz occurs primarily in spring and early **summer**, however Coho, **Steelhead** and Cutthroat rear year-round in the lower Cowlitz. We suggest studies, which include examining rearing in the side-channel areas in particular, year round to determine impact of project operations during periods of lowest flows and most limited habitat and during higher flows when side channel may represent habitat **refugia**. Protocols should focus on achieving quantifiable study results.

All hatchery fall Chinook should be adipose clipped. WDFW Cowlitz Evaluation Staff should continue to **CWT** wild juvenile fall Chinook to develop survival estimates. Also, sampling should be extended next year to determine if hatchery fall Chinook are using similar habitats as wild fall **Chinook.If** there is a suspected interaction between hatchery and wild fish a subsample should be radio tagged to examine microhabitats and duration of rearing in the river.

Finally, since Chinook salmon are listed, it would seem to warrant increased understanding of their life history strategies. We would suggest evaluating the duration that wild Chinook rear in the river. Do they out-migrate the river as subyearlings or as yearlings? USGS is currently doing a study in Oregon where they have found 65% of the fall Chinook reared in the river for a year before immigrating. Also, the lower river Cowlitz study could be combined and evaluated with the life-history strategies of the **(spring/fall)** Chinook rearing in **Mayfield** and captured at the **Mayfield** trap and released into the lower Cowlitz River.

Fixed Point Photo Monitoring

The plan should elaborate on how the photo monitoring results will be used in the future. Will the photos be correlated to flow **timing**, high flow **frequency** or other flow data? It **would be useful** when **tracking** channel **movement** to take it a step **further** to **incorporate** the dynamics (or management) of the river flows. Is the river becoming unnaturally stable (minimal channel movement)? If so, has the flows been relatively monotypic. Is there . **side-channel** loss *a***r** decrease **in** the deposition **related** to loss of a dynamic **hydrograph**? What about vegetation response related to the channel movement and hydrograph? This can have affects on productivity and woody debris recruitment to the river.

Additionally, a GPS location and compass angle should be specified at the initial photo so that they can be matched in subsequent photos.

License Article 413-Anadromous fish Trap and Haul Plan

Trap and Haul Facililties Operation Cowlitz Salmon Hatchery

Minor correction-the proper name for the Cowlitz Falls collector is: "Cowlitz Falls Fish Facility" (CFFF).

Pg.5-CFFF staff have indicated problems with the recirculation pumps, DO meters and the fish release chute (fish are injured due to slow operation) on the new haul truck. This needs to be examined.

Pg.7-Summer Steelhead regularly pass Barrier Dam, probably most often when the electric barrier is deactivated.

Pg.8-The south bank ladder is not functional.

Adherence to Draft NOAA Fisheries Criteria

Pg.16.-The ability to trap cutthroat broodstock needs to be maintained at the Cowlitz Trout Hatchery because they do not trap well at the Salmon Hatchery

Pg.17.-Separator capacity. **Is** the handling procedure meeting NOAA standards when fish spend **extended** time in ladder due to inability for separator to keep up with **recruitment**. The bigger issue here is **separator** capacity relative to fish **abundance moving** up the ladder.

Pg.17.-WDFW technicians and *biologists* assist at the separator-planmentions only technicians.

Pg.21-Water Tempering procedure-The procedure should be modified as follows: When the difference between the transport and receiving water is greater than 7-10 deg. F, it should be tempered to within 5 deg. F at the rate of 1 deg. F every 6 minutes. When the difference between transport and receiving water is greater than 10 deg. F, it should be tempered to within 5 deg. F at the rate of 1 deg. F every 12 minutes. (Mark Johnson-WDFW update).

Additionally, when receiving water temperatures are too high for safe release such as in Lake Scanewa during mid-summer, alternate release sites must be chosen such as the upper Cowlitz near **Packwood** or the **Cispus** River. These sites may require improvement for safe **release**.

Pg.21-Add to the protocol the use of salt in the tankers when hauling under all conditions at the rate of 0.5% by weight ie.1000 gallons would get 50 **pounds** of salt. (Type of salt to be specified by the Cowlitz Complex pathologist.)

Pg.21-Add section specifically describing disinfection of the tanker trucks between hauling adults and juveniles.

License Article 415-Andradomous Fish Passage Plan

aeration-Counting House

Pg.9-The **Mayfield Counting** House fish handling protocols should conform with the **Anadromous Salmonid** Passage Facility Guidelines and Criteria developed by the National Marine Fisheries Service-Northwest Region.

General **comment-WDFW** staff is concerned about the excessive fish handling and associated stress necessary to process fish at the **Mayfield** Counting House. Fish are netted into and out of several consecutive vessels. We understand Tacoma will evaluate **the** facility and modify the facility as part **of the** new license **requirement**.

· Cowlitz Salmon Hatchery Facilities

Pg.11-There are 12 SRPs plus one smaller **fry** raceway (plan indicated 8). Also the hose **outlets on** the Tacoma **trucks** are 5" not 6" **as** stated. **Smolts** released into the **SRPs** are released to the river after less than 24 hours. Operations should be reviewed to determine if **current** protocols are optimal: mortality levels, condition of fish **(descaling)** etc.

Truck Transportation

Pg.14-BWT, unmarked and some hatchery fish are taken to the Tilton River/Mayfield Lake. Mayfield Lake is used as an alternate site when the water is too low to release in the Tilton. Although some preliminary work has been conducted by WDFW, a comprehensive study should be conducted to determine the fate of adults released into Mayfield Lake. This could be similar to the 2005 study being conducted in Lake Scanewa where radio tags are being used to track adult spring Chinook hauled from the Cowlitz Salmon Hatchery Separator and released in the lake.



RM 50.0 — Cowlitz Salmon Hatchery



RM 49.5 — Barrier Dam



RM 49.2 — Mouth of Mill Creek



RM 47.0 — Cowlitz Timber Trails side channel



RM 44.5 — Unnamed side channel



RM 42.5 — Otter Creek side channel



RM 42.0 — Cowlitz Trout Hatchery



RM 41.3 — Mouth of Blue Creek



RM 37.7 — IFA Nursery (view upstream)



RM 33.5 — Toledo, WA, upstream from bridge



RM 33.5 — Toledo, WA, downstream from bridge



RM 33.0 — Below Toledo, WA



RM 29.8 — Interstate 5 bridge



RM 27.5 — Wallace Ponds

RM 24.4 — Olequa boat launch

RM 20.0 — Toutle River confluence

RM 52.0 — Mayfield Dam

RM 50.0 — Cowlitz Salmon Hatchery

RM 49.5 — Barrier Dam

RM 49.2 — Mouth of Mill Creek

RM 46.5 — Cowlitz Timber Trails development

RM 44.5 — Unnamed side channel

RM 40.0 — Bear Paw drift

RM 37.7 — IFA Nursery

RM 36.5 — Unnamed side channel

RM 36.0 — Massey Bar boat launch

RM 33.0 — Unnamed side channel

RM 31.0 — Unnamed side channel

RM 30.5 — Unnamed side channel

RM 26.0 — Unnamed side channel

RM 25.2 — Car Body Hole

RM 20.0 — Toutle River confluence

RM 42.5 — Otter Creek side channel

RM 47.0 — Cowlitz Timber Trails side channel

RM 42.4 — Ken Hanson's