ODFW DIVISION 33 APPLICATION REVIEW SHEET

Recommendations for Water Right Applications that may affect the
Habitat of Sensitive, Threatened or Endangered Fish Species, OAR 690-33-310 through 340.

Application #: S 87990 **Applicant's Name:** Manion, Richard and Ailene

1) Will the proposed use occur in an area that may affect the essential habitat of sensitive, threatened, or endangered fish species? [690-33-330(1)]

☐ NO ☒ YES Species: UWR Spring Chinook (T), Willamette Bull Trout (T) and Oregon chub (currently T, but proposed for delisting); Pacific lamprey (S) & Western brook lamprey (S) Status: ☒ Sensitive ☒ Threatened ☐ Endangered

If YES, continue to question (2). If NO, you may comment by completing the public interest review sheet on the back of this page.

2) Stage or value at risk (check all that apply): ☒ Spawning, ☒ Incubation ☒ Rearing ☐ Passage ☒ Habitat Value

3) Will the proposed use result in a **LOSS** in the essential habitat of THREATENED OR ENDANGERED SPECIES or a **NET LOSS** in the essential habitat of a SENSITIVE SPECIES? ☐ NO ☒ YES

A) Standard of NET LOSS applies to sensitive species statewide. [690-33-330(2)(b)]
B) Standard of LOSS applies to T or E species outside the Columbia Basin. [690-33-330(2)(a)]

4) Can conditions be applied to mitigate the impact to the essential habitat of a S, T or E species?
☐ NO ☒ YES; recommend from Menu of Conditions and skip to question 7.

See attachment.

5) If conditions cannot be identified to offset impacts to the essential habitat of S, T or E species, would the proposed use harm the species? ☐ NO ☒ YES [690-33-330(4)]

If YES, please explain: Loss of spawning, incubation and rearing habitats for S, T and E species identified above.

6) If WRD determines that it is in the public's interest to approve a permit even if the impact cannot be mitigated what conditions do you recommend? (select from Menu of Conditions) See attachment, as for Item 4.

7) Your recommendation under OAR 690-033-0330 (2): ☒ Approval with conditions
☐ Approval without conditions
☐ Denial

ODFW Representative signature: Kelly Reis Kelly Reis, Assistant District Fish Biologist Date: 09.11.2014

WRD Contact: **Caseworker**: Kim French, Water Rights Division, 503-986-0900 / Fax 503-986-0901

Attachment to ODFW Division 33 Application Review Sheet
Application S-87990
Applicant: Manion, Richard and Ailene

Application S-87990 requests a water right to withdraw 330 gallons per min (gpm) (equal to 0.735 cubic foot per second (cfs) based on conversion of 448.87 gpm = 1 cfs) from the McKenzie River using a point of diversion from Eugene Water and Electric Board's Walterville Canal. The McKenzie River is used by several state sensitive or federally Endangered Species Act (ESA) listed fish species: Bull trout, spring Chinook salmon and Oregon chub are state sensitive and federally listed (Oregon chub is proposed for delisting), and Pacific lamprey and western brook lamprey are state sensitive. All these species use the lower McKenzie River to rear, migrate or spawn.

OAR 690-033-0220 directs the Department to evaluate water right applications as to whether a proposed use is detrimental to the protection or recovery of a threatened or endangered species. The Oregon Department of Fish and Wildlife has recently completed an analysis of the Lower McKenzie River under (ORS 537.230(2)(c) and 537.630(2)(c)) to determine what flows are needed to maintain the persistence of fish species listed as sensitive, threatened or endangered under state or federal law. Additionally, a biological opinion has been developed for the "Willamette River Basin Flood Control Project" by NOAA Fisheries (2008) to address the recovery of Threatened Winter Steelhead and Spring Chinook. The Department's recommendations are based on the Lower McKenzie River analysis and the Willamette Basin Biological Opinion.

4) Conditions recommended:

4a) fishdiv33

4b) ODFW recommends that this water right be conditioned to allow diversion of water only when flows in the McKenzie River are met or exceed based on ODFW minimums flows. ODFW recommends a minimum flow of 2000 cfs be met year around before withdrawal of water is allowed in the Lower McKenzie River. Flows should be met at the McKenzie River immediately below the Walterville Canal intake.

See "ODFW's Division 315 Fish Persistence Evaluation of Municipal Extension Eugene Water and Electric Board Application # S-35037 (June 4, 2009)" for justification of the Department's recommended minimum flows.

In addition, although Walterville Canal is screened at its diversion point from the McKenzie River, it does contain non-ESA listed native fish species from tributaries entering the Canal and as such water withdrawals from the Canal must be screened.

Flow Need Conclusion (from the above reference document)
In the final analysis the Oregon Method derived numbers were used as a basis for streamflows needed for persistence of key species (Spring Chinook) during most of the year. Oregon Method

studies both downstream and upstream determined that 2,000 cfs was the minimum flow needed for all months except August and the first half of September. For that time period the downstream study identified 1025 cfs as the minimum flows while the upstream study found 1,400 cfs to be the needed minimum flow. However, to maintain Oregon Chub backwater and side channel habitat ODFW is recommending through an analysis of hydrologic low flows that to maintain Oregon Chub backwater and side channel habitat a minimum flow of 2,000 cfs (on a 7 day running average basis) is needed year around.

Oregon
Theodore R. Kulongoski, Governor

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June 5, 2009

Phil Ward, Director
Water Resources Department
725 Summer Street NE, Suite A
Salem, OR 97301

Re: ODFW's Division 315 Fish Persistence Evaluation of Municipal Extension Eugene Water and Electric Board Application # S-35037

Director Ward:

The Eugene Water and Electric Board has requested an extension of time to develop their municipal water right; the undeveloped portion of their permit is 178.18 cfs out of the McKenzie River at river mile 14.1. ORS 537.230(2)(c) and 537.630(2)(c) directs the Water Resource Department (WRD) to find that the undeveloped portion of the permit is conditioned to maintain, in the portions of waterways affected by water use under the permit, the persistence of fish species listed as sensitive, threatened or endangered under state or federal law. WRD is to base their findings on existing data and advice from the Oregon Department of Fish and Wildlife (ODFW). This letter is the advice provided to WRD by ODFW.

Information Considered

Streamflow requirements for fish:

The Water Resource Commission has recognized the need for maintaining flows in the McKenzie Basin for aquatic life and to minimize pollution through the adoption of Minimum Perennial Streamflows in the Willamette Basin Program (OAR 690-502-0050 (2) and Table 1). The Willamette Basin Program (OAR 590-502-0050) established a minimum perennial stream flow from natural flow for fish year around of 1025 cfs for the lower McKenzie River at river mile 7.1. Another minimum perennial streamflow was established near river mile 48 at 1400 cfs year-round. Each of the minimum streamflows is for "live flow." Since the dams were constructed there is also a storage component that has not been converted to an instream water right. According to the upper Willamette Basin plan there is an additional 700 cfs year-round

storage release component at Armitage Park (river mile 7.1) and 580 cfs year-round storage release component near river mile 48 upstream from Vida.

Additionally, several other streamflow levels have been evaluated to determine the needed streamflows to maintain the persistence of listed fish species including:

- Upper Willamette Basin flow study completed in the early 1960's (Hutchison et al., 1966) recommended streamflows from 1025-2000 cfs (Table 1) downstream at river mile 7.1 and from 1400 to 2000 cfs upstream at river mile 48 near Vida (Table 1). Both were based on the Oregon Method for determining streamflows needed to support fish life.

- Instream Flow Incremental Methodology (IFIM) studies available upstream in both the Leaburg and Walterville bypass reaches of the McKenzie River as part of the re-licensing activities for the hydroelectric projects upstream (EA Engineering, Science and Technology, 1991). There was considerable correspondence regarding the flow study and subsequent setting of bypass streamflows for the Leaburg/Walterville hydroelectric project, ODFW's perspective can be found in our memo to FERC "Oregon Department of Fish and Wildlife Input to Federal Energy Regulatory Commission for project No. 2496 Leaburg/Walterville Hydroelectric Re-licensing (April 25, 1996)".

- Finally, a biological opinion has been developed for the "Willamette River Basin Flood Control Project" by NOAA Fisheries (2008) to address the recovery of Threatened Winter Steelhead and Spring Chinook which include minimum flow release targets for recovering the species in the basin (Table 2-10, pg 2-46 and 47). The biological opinion does not set McKenzie River flows but calls for the development of minimum releases from Cougar and Blue River dams combined at 350 cfs year-round except in June when it is 450 cfs (Table 1). The Willamette BiOp also recommends that the action agencies conduct instream flow studies to better define appropriate fish flow needs in the mainstem Willamette and its major tributaries and then modify flow requirements in the BiOp if the studies indicate different flows are needed (pg 2-52, section 2.8.7).

Flow Restoration Priorities:

Based on the Oregon Plan Flow Restoration priorities (ODFW and OWRD, 2001), the lower McKenzie River and Willamette River downstream show a low need for flow restoration (if USACE target flows are maintained).

Listed Species:

Fish Species	State Listing	Federal Listing
Cutthroat	Not listed	None
Bull Trout	Critical	Threatened
Spring Chinook	Critical*	Threatened
Oregon Chub	Critical*	Threatened
Pacific Lamprey	Vulnerable*	None

Based on information from 2005 Native Fish Status Report by ODFW (2005)

* - At risk interim assessment in 2005 status report

Fish Persistence Risk Analysis: (Stock Status and Flow Restoration)

Coastal Cutthroat –	Species occurs throughout the basin and meets all the stock status criteria.
Bull Trout -	The McKenzie from a relative prospective is a stronghold for Bull Trout and meets most of the stock status criteria.
Spring Chinook –	Some of the stock status criteria for this species are not being met. Information for Oregon method studies on the river focus on this species. This species is one the Willamette BiOp was developed to recover.
Oregon Chub –	Many criteria are met for this species but distribution and abundance do not meet criteria. Oregon Chub exist in the lower McKenzie River and utilize back waters and side channels. McKenzie River flow levels need to be maintained to keep chub habitat available.
Pacific Lamprey –	Species occurs throughout the basin, the stock status criteria for this species are not being met, populations are declining and there is little information about flow requirement needs.

Other information: (Special Considerations)

- None

Findings and Justification

The findings and justifications for these analyses are based on the municipal withdrawal point at river mile 14.1 on the McKenzie River and do not reflect fish flow needs upstream from the intake.

Fish Flow Needs

The minimum perennial stream flow values at river mile 7.1 were based on an instream flow study performed by Hutchison et al. 1966. Flow needs were based on Spring Chinook needs which are now federally listed as threatened under the Federal Endangered Species Act. When the minimum perennial stream flows were adopted by the Water Resources Board they were reduced from what was recommended as the minimum flow values needed to sustain fish life. Therefore the values from the Hutchison et al. study are greater than those used for the minimum perennial streamflow (Table 1). These flows range between 1,025 and 2,000 cfs. In addition Hutchison et al. determined needed minimum flows near river mile 48 that varied from 1,400 to 2,000 cfs. Since one study is downstream and one is upstream and these are minimum values the larger values (1,400 cfs) should be considered the absolute minimum at the intake at river mile 14 based on these two determinations. Based on a synthetic hydrograph developed from data from the Coburg and Vida gages on the McKenzie River and another stream gage on the Mohawk River, the lowest seven day average stream flow recorded over a 40 year period from

1968 to 2007 was 1,410 cfs . Details on how the synthetic hydrograph was developed are given in Appendix (A) following this advice (the model can be provided upon request).

An instream flow study was also completed upstream in the bypass reaches for the Leaburg and Walterville Canal projects (EA Engineering, Science, and Technology, 1991). The results of this study were disputed by ODFW citing several problems with the study that include:

- Use of the middle of the stream as viable habitat for juveniles at lower flows
- Creating lower habitat suitability values for higher depths without a basis
- No use of substrate codes
- Non standard cover criteria
- Difficulty dealing with adjacent velocity effects (i.e. fish prefer slow water habitat immediately adjacent to faster water for feeding lanes)

As an alternative ODFW staff reworked the original data set and found with the rework that flows between 1,400 and 1,750 cfs would be the recommended flow for adult trout and juvenile salmon in the two bypass reaches (Memo available upon request). In discussions with staff even this analysis is suspect due to techniques used in the original data collection: there were problems with substrate classification, and the spacing of intervals used in the PHABSIM analysis are so large that adjacent velocity cannot be adequately evaluated. Because these are bypass reaches vs. total mainstem reaches and because of the problems with the PHABSIM study these flows are not being used in this advice.

Another set of streamflow data is the perennial minimum streamflows for both live flow and storage releases. For the area near Coburg at river mile 7.1 downstream this is 1,025 cfs live flow + 700 cfs for storage releases year-round. Upstream from Vida near river mile 48, there is a perennial minimum streamflow of 1,400 cfs for live flow + 580 cfs for storage releases year-round. The combined value at river mile 7.1 (1725 cfs) and upstream from Vida (1980 cfs) are close to the Oregon method derived fish flows of 2000 cfs at both locations except for the month of August and the first half of September.

Oregon Chub

Oregon Chub were federally listed as an endangered species in 1993. Oregon Chub are endemic to the Willamette Valley and were formerly distributed throughout the valley in off-channel habitats such as beaver ponds, oxbows, stable backwater sloughs and flooded marches. Over the last 100 years these habitats have been drastically reduced and fragmented through numerous human actions such as flood control, canalization, diking and drainage of wetlands. Oregon Chub are currently only found in isolated populations within the valley including the lower McKenzie River. Much of the chub's habitat relies on the continued inundation of backwaters and side channels within the McKenzie River which in turn requires that minimum river flow levels be maintained to continually inundate these areas.

At this juncture ODFW does not have specific in-stream flow values identified to protect chub habitat. Additionally, ODFW must rely on available data in providing its advice to WRD rather than attempt to gather the necessary information to better define the flows necessary to maintain the persistence of federally listed Oregon Chub. Therefore, ODFW will assume that the current

or historic low flows were adequate to maintain Oregon Chub off channel habitat and at least those minimum flows are needed to maintain the persistence of the Oregon Chub in the McKenzie River.

ODFW will evaluate two sets of flows to determine what flows are adequate to maintain McKenzie River Chub populations. The Coburg gage at river mile 7.1 will be evaluated to determine flow levels before the upriver dams were constructed and a synthesized hydrograph developed for the Hayden Bridge area at river mile 14.1 will be used to evaluate the past 30 years of flow data after the dams were completed in 1963 and 1969.

Before the dams were completed in the McKenzie basin low flow in the system typically was September through October with some low flows occurring some what earlier or later depending on the yearly climate variation. Using a 7 day running average the lowest daily flow averaged 1,828 cfs (median 1,827 cfs) at the Coburg gage for the period 1944 to 1962 (lowest 7 day running average flow was 1,325 on October 22, 1944 and the highest 7 day running average lowest flow was 2,269 on October 8, 1956; Lowest daily flow ranged from 1,310 cfs to 2,260 cfs). These low flows always occurred in September or October, and were the lowest daily flow for the year. It is not likely that maintaining flows at the absolute minimum low flow would maintain sufficient backwater habitat to maintain the persistence of the Oregon Chub.

ODFW assumes that to maintain the persistence of Oregon Chub in the McKenzie sufficient backwater habitat must be maintained to allow the Chub to persist through the low flow part of the year. ODFW proposes to use the average monthly 7 day running average flows for the lowest flow month (September) during the 1944 to 1962 time frame. This lowest 7 day running average monthly flow occurred in September and was 2,028 cfs (median 1,983 cfs). The assumption here is that the lowest flows before the dams were constructed were sufficient to maintain Chub habitat which in turn maintained the persistence of the Oregon Chub in the McKenzie. This flow should provide the Chub with sufficient backwater habitat to survive through the low flow period.

ODFW also considered using the average of the low flow periods after the dams were completed. To analyze flows after the dams were complete ODFW developed a synthetic hydrograph based at Hayden bridge (See appendix A). Review of the synthetic hydrograph shows that after the dams were completed the low flow period was expanded, where low flows now cover a greater time period encompassing summer (June), fall and into the late winter (February) with low flows occurring several times throughout the period instead of being concentrated in the fall. However, low flows are now typically higher than under natural conditions (before dams). The 7 day running average lowest yearly flow over the last 30 years is 2,234 cfs (median 2,239 cfs). The 7 day running average lowest monthly average now occurs in July with 2,541 cfs (median 2,458), continues through August and into September at 2,575 cfs (median 2,566 cfs). However, currently because of dam operations the river is "on average" running about 300 cfs lower in July, 400 cfs higher in August and 500 cfs higher in September than it did before the dams were completed. Low flows after the dams were completed appear to be on average higher, but with more variation in flows than under natural flow conditions.

Chub habitat is affected by numerous human caused alterations of their environment including reductions in available backwater habitat provided by flows from the McKenzie River. Assuming that the Oregon Chub population in the McKenzie River was more robust and faired better under natural flow conditions and river flows at that time provided adequate backwater and side channel habitat in the 1940's and 50's then the minimum flow needs would be those that occurred consistently during the low flow period of September or 2,028 cfs (median 1,983 cfs). For this analysis ODFW will round the flow requirement to 2,000 cfs.

This flow is the same as those needed for salmon during most of the year except August and part of September when flow needs for Chinook Salmon are less. To maintain backwater and side channel habitats for chub during August and September ODFW recommends maintaining the 2,000 cfs minimum flow year around. Maintaining a flow of at least 2,000 cfs year around should maintain the persistence of listed Chinook Salmon and the Oregon Chub.

Flow Need Conclusion

In the final analysis the Oregon Method derived numbers were used as a basis for streamflows needed for persistence of key species (Spring Chinook) during most of the year. Oregon Method studies both downstream and upstream determined that 2,000 cfs was the minimum flow needed for all months except August and the first half of September. For that time period the downstream study identified 1025 cfs as the minimum flows while the upstream study found 1,400 cfs to be the needed minimum flow. However, after an analysis of hydrologic low flows in order to maintain Oregon Chub backwater and side channel habitat ODFW is recommending a minimum flow of 2,000 cfs (on a 7 day running average basis) is needed year around.

Table 1 – Minimum Fish Flow needs on the lower McKenzie River to maintain listed fish persistence for EWEB municipal point of diversion near Hayden Bridge (river mile 14).

Month	Basin Information Report Oregon Method River Mile 7.1 area (cfs)	Instream Water Right (minimum flow #528) (cfs) (RM 7.1) (cfs) [2]	Instream Flow point (from storage RM 7.1) (cfs)	USACE releases at Blue River + Cougar Dams (cfs)	Oregon Chub Flow needs	**Oregon Department of Fish and Wildlife Recommended Flow (cfs)**
Jan	2000	1025	700	350	2000	**2000**
Feb	2000	1025	700	350	2000	**2000**
Mar	2000	1025	700	350	2000	**2000**
Apr	2000	1025	700	350	2000	**2000**
May	2000	1025	700	350	2000	**2000**
Jun	2000	1025	700	450	2000	**2000**
Jul	2000	1025	700	350	2000	**2000**
Aug	1025	1025	700	350	2000	**2000**
Sep	1025/2000[1]	1025	700	350	2000	**2000**
Oct	2000	1025	700	350	2000	**2000**
Nov	2000	1025	700	350	2000	**2000**
Dec	2000	1025	700	350	2000	**2000**

1 - The Oregon Basin Information Report report values for river mile 48 are 2000 cfs year-round except for August and September and they drop to 1400 cfs instead of 1025 cfs.

2 - See text regarding live flow vs. storage component and the differences between river mile 7.1 and river mile 48. There is an additional 700 cfs year-round storage release component in addition to this live flow component at river mile 7.1. The storage release component has not been converted to an instream water right.

Table 2. Monthly life history activity chart for the McKenzie River for non anadromous species only (from ODFW Natural information management program: http://nrimp.dfw.state.or.us/nrimp/default.aspx?p=331)

McKenzie R above Blue R - Non-Anadromous Species

Timing Unit ID: 10343

Life Stage/Activity/Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Comments
Adult Fluvial or Adfluvial Migration													
Rainbow Trout		■	■	■	■	■							C17
Cutthroat Trout - Resident	■	■	■	■	■						■	■	C11
Bull Trout				■	■	■	■	■	■	■	■		C5
Adult Spawning													
Rainbow Trout			■	■	■	■							C13
Cutthroat Trout - Resident	■	■	■	■	■								C7
Bull Trout								■	■	■			C1
Adult/Sub-Adult Rearing													
Rainbow Trout													C16
Cutthroat Trout - Resident													C10
Bull Trout													C4
Egg Incubation through Fry Emergence													
Rainbow Trout				■	■	■	■	■					C14
Cutthroat Trout - Resident	■	■	■	■	■	■	■						C8
Bull Trout	■	■	■	■	■				■	■	■	■	C2
Juvenile Rearing													
Rainbow Trout													C15
Cutthroat Trout - Resident													C9
Bull Trout													C3
Juvenile/Sub-Adult Migration													
Rainbow Trout		■	■	■	■	■	■	■	■				C18
Cutthroat Trout - Resident		■	■	■	■	■					■	■	C12
Bull Trout		■	■	■	■						■	■	C6

■ Represents periods of peak use based on professional opinion.
■ Represents lesser level of use based on professional opinion.
Represents periods of presence, either with no level of use OR uniformly distributed level of use indicated

Based on professional opinion, 90% of the life-stage activity occurs during the time frame shown as the peak use period.
Based on professional opinion, 10% of the life-stage activity occurs during the time frame shown as the lesser use period.

This document was created on 12/19/2003.
Input to this data was contributed by
Jeff Ziller, ODFW

Comments

C1 - No adults believed to be present in the Middle Fork above Hills Creek in 2002, but progeny from supplementation project are near adulthood and may be present in 2003 or 2004.
C2 - Based on observation and trapping data
C3 - Based on data
C4 - Based on data from local watersheds and understanding that most bull trout remain in Hills Creek Reservoir or in the river upstream.
C5 - Based on data from local watersheds
C6 - Based on data
C7 - Based on data from local watersheds
C8 - Based on observation and trapping data
C9 - Based on data
C10 - Based on data from local watersheds
C11 - Based on data from local watersheds
C12 - Based on data
C13 - Based on data from local watersheds
C14 - Based on observation and trapping data
C15 - Based on data

Table 3. Monthly life history activity chart for the McKenzie River for anadromous species only (from ODFW Natural information management program: http://nrimp.dfw.state.or.us/nrimp/default.aspx?p=331)

McKenzie R above Blue R - Anadromous Species

Timing Unit ID: 10343

Life Stage/Activity/Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Comments
Upstream Adult Migration													
Summer Steelhead													C6
Spring Chinook salmon				■	■	■	■	■	■	■			C1
Adult Spawning													
Summer Steelhead													C8
Spring Chinook salmon								■	■	■			C3
Adult Holding													
Summer Steelhead													C7
Spring Chinook salmon						■	■	■	■				C2
Egg Incubation through Fry Emergence													
Summer Steelhead													C9
Spring Chinook salmon	■	■	■	■					■	■	■	■	C4
Juvenile Rearing													
Summer Steelhead													C10
Spring Chinook salmon													
Downstream Juvenile Migration													
Summer Steelhead													C11
Spring Chinook salmon	■	■	■	■	■	■	■			■	■	■	C5

■ Represents periods of peak use based on professional opinion.
■ Represents lesser level of use based on professional opinion.
Represents periods of presence, either with no level of use OR uniformly distributed level of use indicated

Based on professional opinion, 90% of the life-stage activity occurs during the time frame shown as the peak use period.
Based on professional opinion, 10% of the life-stage activity occurs during the time frame shown as the lesser use period.

Comments

C1 - Mostly comprised of hatchery fish but natural production from areas upstream is significant.
C2 - Based on data
C3 - Based on data
C4 - Based on data
C5 - Based on studies in the McKenzie
C6 - Most summer steelhead are of hatchery origin
C7 - Based on data
C8 - Based on hatchery spawning timing and adult maturation schedules
C9 - Based on observation and understanding of spawning timing
C10 - Rearing fish mostly be comprised of residual hatchery fish but some natural production occurs.
C11 - For hatchery fish only - Released from hatchery

This document was created on 12/19/2003.
Input to this data was contributed by
Jeff Ziller, ODFW

Fish Use in the Lower McKenzie River

The Mckenzie River is used by several anadromous and resident salmonids including resident Rainbow and Cutthroat trout and Bull trout (char) and anadromous species such as Spring Chinook Salmon and Pacific and Brook Lamprey. Oregon Chub occupy backwater and off channel areas in the lower river. Additionally, there are a number of introduced species such as summer steelhead using the river.

Summer Use
For the summer months (July and August) the most critical use is Oregon Chub spawning which occurs in June and July with incubation continuing on through August. Backwater areas need to be maintained especially during this period to allow successful reproduction of chub. Other fish uses during the summer include adult spring Chinook migration and rearing. All salmonid species identified in Tables 2 and 3 may utilize the lower river for rearing through the summer months, with the most prevalent use being spring Chinook as well as Rainbow and Cutthroat Trout. There is also use by Bull Trout but it is not as prevalent as upstream. The lower 14 miles of the McKenzie represent a large area of some of the most desirable rearing habitat available in the basin. Based on recent surveys conducted by ODFW this lower section of the river does not have much spawning activity.

Fall Use
In the fall there is still rearing use for all species (Tables 2 and 3) with chub relying heavy on backwater areas. Spawning in the basin occurs for Spring Chinook salmon during this time, however, according to spawning surveys use of the lower 14 river miles for spawning is low.

Winter and Spring Use
During the winter and spring months (January through June) spawning and incubation continues for spring Chinook through April. Steelhead egg incubation and fry emergence continue through June with lower river fry emergence expected to occur earlier while tributary emergence continues further into June. Oregon Chub in the backwaters begin spawning in June continuing on through July. For all species rearing is an important use in the lower river.

ODFW's Advice to WRD on Maintaining the Persistence of Listed Fish Species as the Eugene Water and Electric Board Develops the Undeveloped Portions of it's Water Right Permits for the Lower McKenzie River:

General Considerations
As directed by ORS 537.230 (2)(c) and ORS 537.630 (2)(c) ODFW provides the following advice to WRD to maintain, in the portions of waterways affected by water use under the permit, the persistence of fish species listed as sensitive, threatened or endangered under state or federal law. ODFW's advice is based on existing data. ODFW recommends the following flows and advises WRD to develop conditions which allow the Eugene Water and Electric Board to meet its water needs while maintaining the persistence of listed fish species.

- The main influence on river flow levels is the federal management of the dams.

- ODFW recognizes that long term climatic variations will affect the amount of water the USACE will be able to release in any given year. In favorable water years fish populations tend to increase and in unfavorable water years fish populations contract. The long term objective for a listed species is to have the population increase to a sustainable level over time and be able to maintain itself through natural fluctuations in the environment.

- ODFW also recognizes that municipalities return a certain amount of flow to a river or stream through their effluent discharge. If the withdrawal point(s) and effluent discharge(s) are within reasonable proximity to each other, such that fish habitat between the two points is not impacted significantly then ODFW recommends that curtailment of the water right extension be based on the monthly estimated ratio of the difference between the total water withdrawals and their return flows.

  In the case of the Eugene Water and Electric Board their return flows do not return to the McKenzie River but instead return to the Willamette River above the confluence with the McKenzie River. Because the return flows do not contribute to flows in the lower McKenzie River ODFW recommends not applying a credit for return flows.

- Flows should be measured at the Point of Diversion

Specific Advice by Season of Use

This advice only pertains to the lower 14 miles of the McKenzie River and is contingent on EWEB locating its points of diversion in this reach and withdrawing water only from this reach of the river.

January through June

The primary concerns during these months are downstream migration of salmonids, summer steelhead spawning, egg and fry incubation, and rearing needs. Oregon Chub begin spawning at the end of this period making the need to maintain backwaters and side channels important. The Basin report recommends a flow of 2,000 cfs throughout this period. Flows in the river during this time of the year are typically well over 2,000 cfs . Flows rarely drop below the target flows during this period with the majority lower flows occurring late in the period (June).

Advice: Use of water under the portion of this permit that was undeveloped as of the date of the extension final order should be conditioned to maintain persistence of listed fish species consistent with the recommended flows in Table 1. If flows do not meet targets, EWEB should plan to reduce its water use. Low flows during this time period appear to be mostly related to operation of the reservoir system. The severity of the measures taken should be reflective of how much the recommended flows are being missed by and the percentage of water that is withdrawn by the municipality as compared to the overall streamflow level. In order to monitor streamflows the recently installed gage near the intake near river mile 14 should be maintained for compliance during all seasons including the late spring and early summer.

July, August
The primary concern during these months is providing sufficient flows to maintain backwater and side channel habitat for the Oregon Chub that continue to spawn through July and rearing for the remainder of the period. Flows are also necessary to maintain moderate water temperatures for juvenile and adult salmonids and provide summer rearing habitat. The stream flow for fish persistence are identified as 2000 cfs for both salmonids and Oregon Chub in July, 1,400 cfs for salmonids and 2000 cfs for Oregon Chub. This time of year the stream flow does drop below those flows needed to maintain minimum fish persistence target flows and is also when municipal water demands peaks.

Advice: Use of water under the portion of this permit that was undeveloped as of the date of the extension final order should be conditioned to maintain persistence of listed fish species consistent with the recommended flows in Table 1. If flows do not meet targets, EWEB should plan to reduce its water use during times when the fish persistence flow levels are not being met. The severity of the measures taken should be reflective of how much the recommended flows are being missed by and the percentage of water that is withdrawn by the municipality as compared to the overall streamflow level.

September, Through December
During the fall and winter the lower 14 miles of the McKenzie River provides minimal spawning habitat for salmonids, but provides significant rearing habitat for salmonids and backwater and side channel habitat for the Oregon Chub. The recommended flows continue to be 2000 cfs throughout this period. This time of year has the most events where streamflow drops below stream persistence flow levels, is the time period when natural flows were lowest before the reservoirs were in place, but is also the time period when municipal water demands are declining.

Advice: Use of water under the portion of this permit that was undeveloped as of the date of the extension final order should be conditioned to maintain persistence of listed fish species consistent with the recommended flows in Table 1. If flows do not meet targets, EWEB should plan to reduce its water use. The severity of the measures taken should be reflective of how much the recommended flows are being missed by and the percentage of water that is withdrawn by the municipality vs. the overall streamflow level.

This concludes ODFW's advice to WRD on Application #S-35037. If you have questions about our advice or need further clarification please contact me at 503-947-6044 or the manager of our Water Quality/Quantity Section, Rick Kepler at 503-947-6084.

Sincerely;

Curt E. Melcher

Curt Melcher
Deputy Director

Bc: Eugene Water and Electric Board
Jeffrey Ziller, ODFW Springfield Office
Steve Marx , ODFW Adair Village Office
Chris Wheaton, ODFW Clackamas Office
Rick Kepler, Fish Division
Bruce McIntosh, Fish Division

Appendix A

Development of a synthetic hydrograph for the McKenzie River near the Hayden Bridge area

Why a synthetic hydrograph:

The Eugene Water and Electric Board has applied for an extension for the undeveloped portion of a municipal water right. The point of diversion is located near the Hayden bridge site near river mile 14. Recently a gage was installed at the site but there is no long term gaging record at this site. There is a gage downstream at river mile 7.1 that was discontinued in September 1972 and there is a gage with a long-term record near river mile 48. In addition between river mile 7 and 14 the Mohawk River joins the Mckenzie River. In order to understand what types of streamflows this site experiences to understand them in relation to proposed fish persistence flows a synthetic hydrograph was created from gage information from the other three sites.

Approach:

The average daily streamflow records of Vida stream gage (river mile 48), the Coburg gage (river mile 7) and the Mohawk River gage were downloaded from the USGS surface water website database that stores this information. The flow values at the intake at river mile 14 can be represented by subtracting the Mohawk gage from the Coburg gage. However, the record at Coburg was discontinued in the fall of 1972. Therefore it could not be used as a long-term record since the dams were only completed up basin in 1968. The approach was to take the long-term record at Vida and add the accretion that occurs between Vida river mile 48 and river mile 14. The level of accretion was characterized as:

Accretion = Coburg Gage value – (Mohawk Gage value – Vida Gage value)

There were only three years where these values were stable until the Coburg gage was discontinued so the level of accretion was calculated for each day. After making this calculation it was discovered that there was poor correlation due to downstream transit effects during different times of the year. To smooth out this effect the 14 day running average was used to minimize this transit effect instead of the raw daily values.

There were three good years of data where this accretion relationship could be determined. The first couple of years had strange values possibly because of reservoir filling during this time period and the Coburg gage was discontinued in 1972. The calculated accretion was stongly correlated with streamflows of the Mohawk River (Figure A-1) during the storage season. This make intuitive sense because it should be expected that runoff from the relatively low elevation Mohawk basin would mirror that from low elevation tributaries between Vida and river mile 14. The correlation breaks

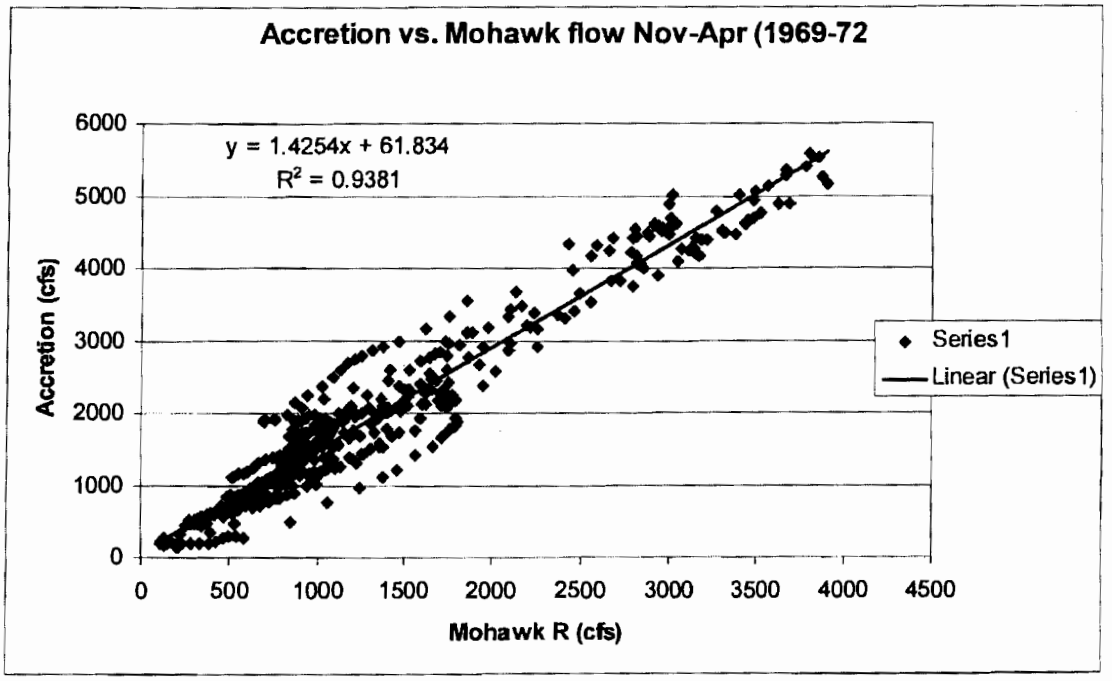

Figure A-1. Accretion vs. Mohawk flow

down during the irrigation season probably because of the nature of diversions and how unpredictable water use can be. This relationship was used to extend the flow record from November – April at river mile 14.1 by using the following equation:

Flow RM 14 (cfs) = Vida flow (cfs) + 1.4254 (Mohawk flow (cfs)) + 61.8 cfs

During the irrigation season the conservative assumption of simply adding the minimum accretion values for each month (April – October) to the Vida river flow values was made. These values were for a 3 year period 1970-72.

Flow RM 14 (cfs) = Vida flow (cfs) + Minimum accretion flow for month (cfs)

The following values for accretion were determined based on 14 day moving averages over a three year period (Table A-1). For the year 1998, the storage season values were not estimated using the equation based on Figure A-1 because there were no Mohawk River flow data available. For this year they were estimated by adding the minimum accretion for the storage season between river mile 48 and 14 for the three year period. This gives a relatively conservative value for accretion but the flows at Vida remained well above the persistence flow level throughout the storage season of 1998.

Table A-1. Streamflow accretion between river mile 48 and river mile 14 over a 3 year period (1970-72).

Streamflow accretion in cfs

Month	Minimum	Median
May	84.7	569.5
June	15.8	111.5
July	-85.4	69.1
August	-88.9	-20.6
September	15.6	147.8
October	56.9	169.5

The synthetic hydrograph spans from October 1968- September 2007. Since there is high correlation and low standard error there is good confidence that the accretion values during the storage season are relatively accurate. During the irrigation season, conservative assumptions are made (minimum monthly accretion for a three year period) so the resulting hydrograph is not as accurate but the flow values are relatively conservative (i.e. probably somewhat lower than actual values that would have been measured at the gage). Considering the bulk of streamflow is determined at Vida and the accretion values in the summer and fall are relatively low the values are fairly accurate. However, no diagnostics for the relationship were determined. The synthetic hydrograph results were used in the analysis of how often the persistence flow levels may be breached in the historical record in the advice. A spreadsheet with all calculations can be provided by request.