US Army Corps of Engineers ®
Portland District

Coast Fork Willamette River, Oregon
Surplus Water
Letter Report

June 2014
Final Surplus Water Letter Report

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EXECUTIVE SUMMARY

The City of Creswell (City), a small bedroom community in Lane County, Oregon, has expressed an interest in purchasing surplus water to support municipal and industrial needs from the U.S. Army Corps of Engineers (Corps), Portland District reservoirs in the Coast Fork Willamette River basin. The City requested water from Dorena and Cottage Grove Reservoirs, both of which are operated as part of the Willamette Valley Project, a system of 13 dams and reservoirs located in the Willamette River Basin, Oregon.

To meet the immediate needs of the City of Creswell, the Corps initiated a general investigation study in the Coast Fork Willamette River sub-basin. The Oregon Water Resources Department acted as the non-federal, cost-share sponsor for this study. The purpose of the study was to identify whether 437 acre-feet of water stored in the Cottage Grove and Dorena reservoirs is available as surplus for municipal and industrial (M&I) use.

This report, titled *Coast Fork Willamette River, Oregon Surplus Water Letter Report,* outlines the study purpose and authority, including a description of the study's relationship to the *Willamette Basin Review Feasibility Study*, which was placed on hold in 2000 to allow for Endangered Species Act consultation among federal agencies.

The City of Creswell's water supply needs and potential alternatives are also discussed in this report. Of those alternatives, using surplus water from the Willamette Valley Project, specifically Dorena and Cottage Grove Reservoirs, is the most efficient water supply alternative for meeting the City of Creswell's immediate water needs.

The Willamette River Basin was modeled using the Hydrologic Engineering Center (HEC) Reservoir System Simulation Program (ResSim) to assess the individual project and system effects of the proposed action. The authorized project purposes of the Willamette Valley Project, including impacts from the proposed action, were examined as part of the study and are detailed in this report. The small amount of water released from the project reservoirs is not expected to measurably impact the authorized purposes, namely flood damage reduction, navigation, flow augmentation, hydropower, irrigation, municipal and industrial water supply, and recreation. Other considerations, such as the financial feasibility of purchasing water, environmental aspects, and dam safety considerations were also examined as part of this study.

The ResSim Program was also used to analyze the system-wide impacts of using stored water from all eleven Willamette storage projects to meet projected M&I basin-wide demands in the future. The results from this analysis were used in the cost analysis to determine the price structure for storage in the Willamette Project. A discussion of the modeling results and the calculations to determine user costs are detailed in the appendices.

The Corps, Portland District prepared an Environmental Assessment (EA) and requested comments on the document through a public comment period 5 May -20 May 2014. Comments on the EA will be addressed before finalizing this letter report to ensure compliance with environmental and historical preservation laws.

Based on the findings of the report and pursuant to Section 6 of the Flood Control Act of 1944, it is recommended to issue the City of Creswell a surplus water agreement for 437 acre-feet of surplus water from Dorena and Cottage Grove Reservoirs, combined, to satisfy current water demands for the City of Creswell. The report closes with steps needed for implementation, findings of the study, and recommendations from the District Engineer.

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ACRONYMS, ABBREVIATIONS AND GLOSSARY

aMW	average megawatt
BA	Biological Assessment
BiOp	Biological Opinion
BPA	Bonneville Power Administration
cfs	cubic feet (foot) per second
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
ESA	Endangered Species Act
FY	fiscal year
HYDSIM	Hydro Simulation (model)
IRRM	interim risk reduction measures
MAF	Million acre-feet
M&I	municipal and industrial
MSL	mean sea level
MW	megawatt(s)
MWh	megawatt hour
NMFS	National Marine Fisheries Service
O&M	operation and maintenance
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
OWRD	Oregon Water Resources Department
PDT	Product Delivery Team
PNCA	Pacific Northwest Coordination Agreement (established in 1996)
POR	Period of Record
PVA	Power Value Analysis
ResSim	Reservoir System Simulation (model)
RR&R	Repair, Rehabilitation, and Replacement
WBR	Willamette Basin Review
WCP	Willamette Conservation Plan

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1 INTRODUCTION

1.1 STUDY PURPOSE

The purpose of the Coast Fork Willamette River Sub-basin Surplus Water Supply Letter Report is to identify whether there is surplus water available in the Coast Fork Willamette River basin projects that the Secretary of the Army can use to enter into a water supply agreement with the City of Creswell for municipal and industrial (M&I) use. The term of the surplus agreement is for five years (5), with an optional one-time extension of five (5) years. The State of Oregon has identified the federal reservoirs in the Willamette Valley Project as the preferred source of new water supply for growing communities and industries in the Willamette Valley.

1.2 STUDY AUTHORITY

Engineering Regulation (ER) 1105-2-100, paragraph E-57b(2) classifies surplus water as:

> *1) water stored in a Department of the Army reservoir which is not required because the authorized need for the water never developed or the need is reduced by changes which have occurred since authorization or construction or 2) water that would be more beneficially used as municipal and industrial water than for the authorized purpose and which, when withdrawn, would not significantly affect authorized purposes over some specified time period.*

The authority to sell surplus water for M&I purposes was granted to the U.S. Army Corps of Engineers (Corps) by Section 6 of the Flood Control Act of 1944 (Public Law 78-534), as amended. Under this authority, the Secretary of the Army is authorized to make agreements to sell surplus water to states, municipalities, private concerns, or individuals, at such prices and on such terms as deemed reasonable.

1.3 STUDY BACKGROUND

The Willamette Basin Review Feasibility Study was initiated in May 1996 between the U.S. Army Corps of Engineers, Portland District, and the Oregon Water Resources Department (OWRD). The purpose of the study was to analyze current water uses in the basin, to project water needs for some of the authorized purposes, and to identify reservoir water allocation options to assure the most public benefit within the policies and regulations of the Corps. Five specific goals were established for the study:

- Authorize a full range of beneficial uses (including anadromous fishery and water quality needs, municipal and industrial water supply, and recreation).
- Develop an operational agreement for low flow years.
- Determine appropriate institutional arrangements.
- Investigate modifications to water control diagrams and reduce downstream erosion during reservoir drawdown.
- Address municipal and industrial water demands and constraints.

In March 1999, steelhead and spring Chinook salmon in the upper Willamette Basin were listed as threatened under the Endangered Species Act (ESA). It was anticipated that the recommendations in the resulting biological opinion (BiOp) would include the use of stored water to meet flow requirements in the mainstem and tributary systems. The Corps and OWRD agreed to suspend the feasibility study

pending resolution of the ESA consultation and issuance of a BiOp. The *Endangered Species Act Section 7(a)(2) Consultation Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Willamette River Basin Flood Control Project* (NMFS BiOp, 2008) and *Endangered Species Act Section 7 Consultation Biological Opinion on the Continued Operation and Maintenance of the Willamette River Basin Project and Effects to Oregon Chub, Bull Trout, and Bull Trout Critical Habitat Designated Under the Endangered Species Act* (USFWS BiOp, 2008), cumulatively referred to as Willamette BiOps, were issued in July 2008 and included flow requirements for fish and a requirement to further study what are the most beneficial flow requirements for fisheries.

The Corps and OWRD have re-initiated the Willamette Basin Review Feasibility Study with a limited amount of funding to complete this Surplus Letter Report for the City of Creswell. Completing this Surplus Letter Report allows the Corps to meet an immediate need for municipal water supply. The City of Creswell has identified an immediate need for an additional source of water supply and therefore cannot wait for completion of the feasibility study, which is currently pending funding to restart. Upon completion of the feasibility study, the City could then pursue permanent storage to meet their supply needs.

2 PROJECT BACKGROUND

2.1 PROJECT AUTHORIZATION

The Corps operates a system of 13 dams and reservoirs in Oregon's Willamette River Basin, shown in Figure 1. These dams and reservoirs provide many benefits to the region and Nation. The Willamette Valley Project (Willamette Project) was authorized by the Flood Control Acts of 1938 (Public Law 75-761), 1950 (Public Law 81-516), and 1960 (Public Law 86-645). The 1938 Act led to the construction of Fern Ridge dam on the Long Tom River, Dorena dam on the Row River, Cottage Grove dam on the Coast Fork Willamette River, Detroit dam on the North Santiam River and Lookout Point dam on the Middle Fork Willamette River. The 1950 Act expanded the Willamette Project both in the number of projects and scope. The 1950 Act reauthorized the earlier dams, including Green Peter dam on the South Santiam River, that had not been started, and added the following dams: Big Cliff dam on the North Santiam River, Cougar and Blue River dams on the McKenzie River, Hills Creek and Dexter dams on the Middle Fork Willamette River, and Fall Creek dam on Fall Creek. The 1960 Act added Foster Dam on the South Santiam, as a multipurpose, reregulation dam for Green Peter dam.

The Flood Control Act of 1950 reauthorized the Willamette Valley Project through House Document 531 (HD 531), an 8-volume authorization of the Federal Columbia River Flood Control System that encompassed the entire Columbia River Basin, including the Willamette River Basin, and established a basin-wide flood control and multi-purpose water development and management plan for the Columbia River Basin. The Willamette Valley Project, as listed in HD 531, page 246, paragraph 527, was authorized for the primary purpose of controlling floods and as a solution to major drainage problems. Secondarily, after the flood season, stored water was intended to be released for navigation, generation of hydroelectric power, irrigation, water supply, and reduction of stream pollution for health, fish conservation, and public recreation. The Water Resources Development Act of 1990 also added environmental protection as a primary purpose at all Corps water resource projects.

The dams were built from 1941 to 1969. Today, the Willamette Valley Project provides important benefits of flood damage reduction, recreational navigation, hydropower, irrigation, flow augmentation for pollution abatement and improved fishery conditions, and reservoir based recreation. Conservation storage in the reservoirs was not allocated to any specific authorized purpose, but was instead left as general, joint use, conservation storage. The U.S. Bureau of Reclamation (Reclamation), the federal agency authorized to issue stored water contracts for irrigation, filed applications for water rights in 1954 and 1968 on behalf of the federal government. Subsequent state water right certificates have been issued to authorize the storage of more than 1.6 million acre-feet for irrigation uses only (Certificates 72755 and 72756). Less than five percent of the total storage is currently under contract for irrigation. Recreational use at many of the reservoirs is significant. Releases of water from the reservoirs provide instream benefits for fish, wildlife, recreational navigation and water quality.

2.1.1 Coast Fork Willamette River Projects

The City of Creswell is situated near river mile (RM) 13 of the Coast Fork Willamette River, downstream of the confluence with the Row River. Due to its geographic proximity to the Corps' projects in the Coast Fork Willamette River sub-basin (Figure 2), the City requested storage from Cottage Grove and Dorena reservoirs to support its municipal purposes.

The Coast Fork Willamette River watershed has a drainage area of 669 square miles, or about 6% of the entire Willamette River Basin. The mainstem of the Coast Fork is impounded by Cottage Grove Dam at RM 29.7. Dorena Dam is located at RM 7.5 on the Row River, which flows into the Coast Fork at RM 21. The drainage basins above Cottage Grove and Dorena Dams consist largely of steep, rugged mountainous terrain dissected by narrow river valleys.

Completed in 1942, Cottage Grove dam is a small multi-purpose storage project on the Coast Fork of the Willamette River (Upper Coast Fork Willamette River HUC 1709000203) in Lane County. Cottage Grove Dam was authorized for flood damage reduction, navigation, irrigation, domestic (municipal and industrial) water supply, and flow augmentation. The dam has no powerhouse. The earthfill dam has a concrete spillway and the reservoir is popular for water-related recreation during the summer months. Pertinent project information is shown in Table 1.

Table 1 Cottage Grove Dam and Reservoir Pertinent Information

Date Completed	1942
River Mile/Stream	29.7 Coast Fork Willamette River
Drainage Area (square miles)	104
Dam Height (feet)	95
Dam Crest, elevation	808.0 feet
Maximum Pool, elevation	802.6 feet (48,000 acre-feet)
Full Pool/Spillway Crest, elevation and volume	791.0 feet (32,900 acre-feet)
Maximum Conservation Pool, elevation and volume	790.0 feet (31,790 acre-feet)
Minimum Conservation Pool, elevation and volume	750.0 feet (3,139 acre-feet)
Spillway	Uncontrolled concrete gravity, ogee (40,800 cfs hydraulic capacity)
Regulating Outlets	Three (3,860 cfs combined hydraulic capacity)
Flood Control Storage	29,761 acre-feet
Conservation Storage	28,651 acre-feet

Source: Cottage Grove Water Control Manual. Elevations listed in mean sea level.

Completed in 1949, Dorena dam is a multi-purpose storage project on the Row River (Row River HUC 1709000202) also located in Lane County. As with Cottage Grove Dam, Dorena Dam was authorized for for flood damage reduction, navigation, irrigation, domestic (municipal and industrial) water supply, and flow augmentation. The dam is earthfill with a concrete spillway. The dam controls the Row River and reduces flooding downstream on the Willamette River. Like Cottage Grove Lake, Dorena Lake is popular for water-related recreation in the summer. The dam was not constructed with hydropower facilities, but a private company, Dorena Hydro, LLC, began construction of a private hydropower facility in 2012, including a new penstock through the dam and powerhouse. The plant is expected to be online in the summer of 2014. Pertinent project information is shown in Table 2.

Table 2 Dorena Dam and Reservoir Pertinent Information

Date Completed	1949
River Mile/Stream	7.5 Row River
Drainage Area (square miles)	265
Dam Height (feet)	145
Dam Crest, elevation	865.7 feet
Maximum Pool, elevation	860.0 feet (131,000 acre-feet)
Full Pool/Spillway Crest, elevation and volume	835.0 feet (77,600 acre-feet)

Maximum Conservation Pool, elevation and volume	832.0 feet (71,900 acre-feet)
Minimum Conservation Pool, elevation and volume	770.5 feet (7,094 acre-feet)
Spillway	Uncontrolled concrete gravity, ogee (97,500 cfs hydraulic capacity)
Regulating Outlets	Five (9,275 cfs combined hydraulic capacity)
Flood Control Storage	70,506 acre-feet
Conservation Storage	64,806 acre-feet

Source: Dorena Water Control Manual. Elevations listed in mean sea level.

Detailed information on the other 11 dams and reservoirs of the Willamette Project can be found in the *Biological Assessment of the Effects of the Willamette River Basin Flood Control Project on Listed Species Under the Endangered Species Act* (USACE, 2000).

2.2 WILLAMETTE SYSTEM RESERVOIR OPERATION

The dams and reservoirs of the Willamette Valley Project are located on five major tributaries and operated as a system to meet mainstem Willamette River flow targets at Albany and Salem. As recognized in the authorizing documents, the annual weather patterns in the Pacific Northwest and the runoff characteristics of the Willamette Basin allow the system to be operated to balance the range of authorized purposes, including flood control, irrigation, navigation, power generation, recreation, flow augmentation, and municipal and industrial water supply. The well-defined limits of the flood season and planned use of storage space after the flood season allow for the impoundment of spring runoff. Starting in February, the reservoirs begin storing water as guided by their water control diagram. From mid-April until the end of November, stored water is retained in the conservation pool for recreation and released downstream to meet multiple authorized purposes. Following Labor Day, water is released from the reservoirs to bring them back down to their minimum flood damage reduction pool elevations to accommodate storage for the winter flood season.

Flow management in the Willamette River basin is the responsibility of the Portland District, USACE. The District's responsibilities include coordination among agencies and interested parties and development of plans for water management within the basin. Consideration of power demands, irrigation demands, minimum stream flow requirements, and other uses of reservoir water must be considered during plan development. The Corps has a high degree of operational flexibility among the 13 projects in determining how to meet the authorized purposes at each project and for the system as a whole. Even though water may be withdrawn directly downstream of a specific project, it is necessary to coordinate releases elsewhere in the system to meet minimum flow requirements at Albany and Salem, as well as established tributary flows. Details of project operations for the multiple authorized purposes are described in Section 2.3 below.

As noted earlier, seasonal regulation of each Willamette reservoir is guided by the water control diagram for each reservoir. The water control diagrams for Cottage Grove and Dorena reservoirs are shown in Figures 3 and 4. A function of the water control diagram is to show how much storage space a reservoir should reserve for flood damage reduction at any given time of the year. There are three defined reservoir control periods in a year: flood damage reduction (winter), conservation storage (spring), and conservation holding and release (summer). The dates of these seasons vary slightly by reservoir.

Figure 1 Map of the Willamette Basin

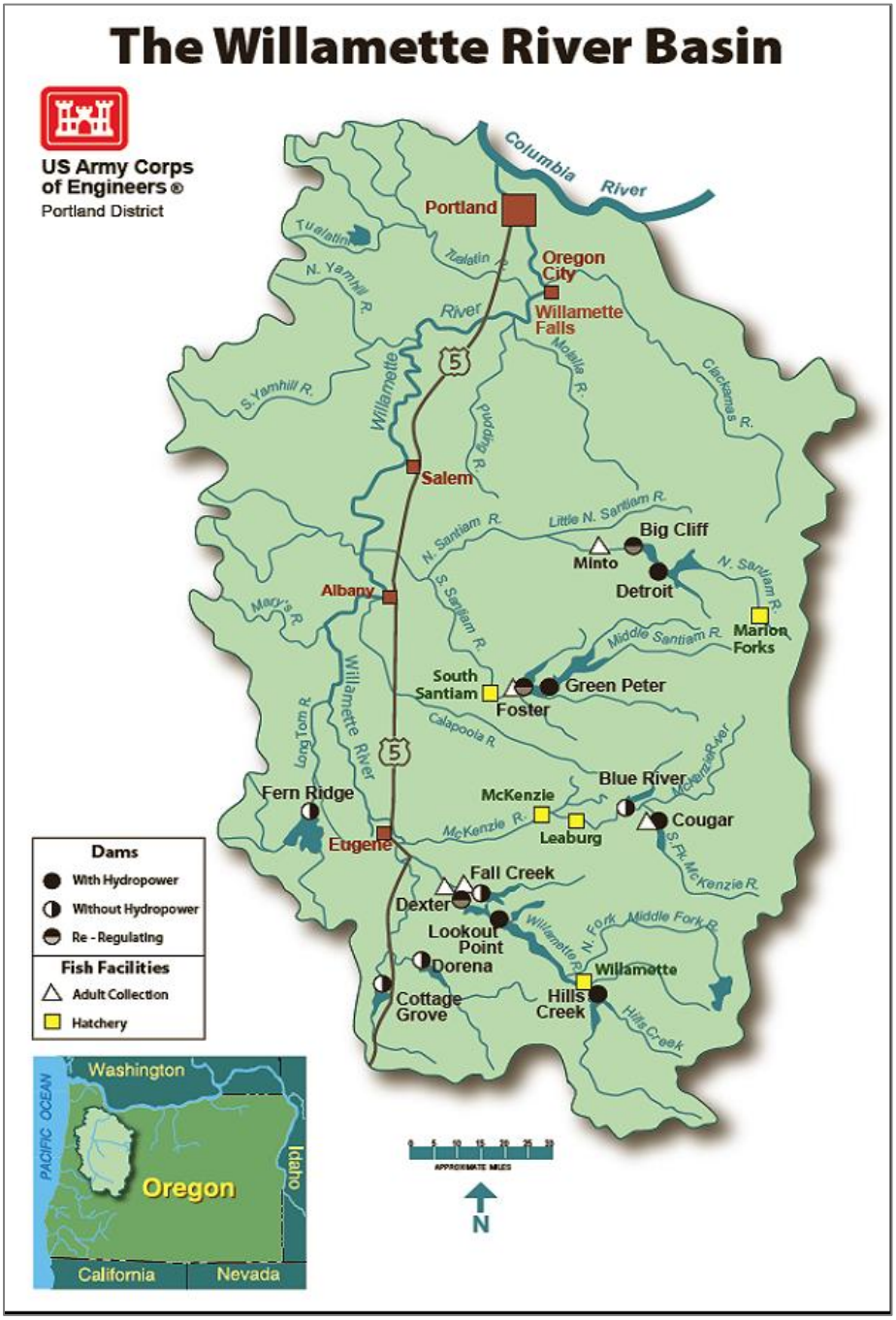


Figure 2 Map of the Coast Fork Willamette Basin

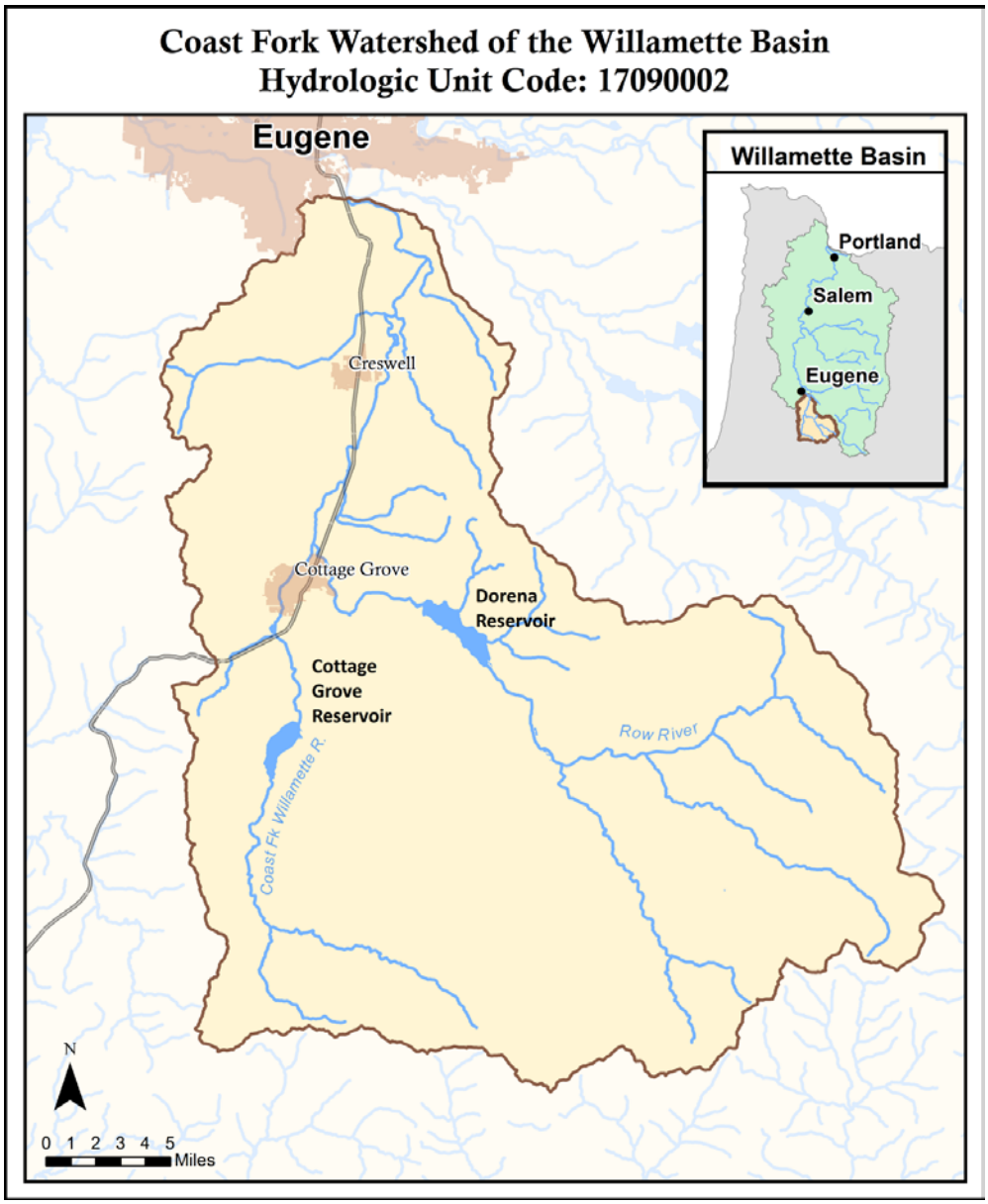


Figure 3 Cottage Grove Multi-Purpose Water Control Diagram

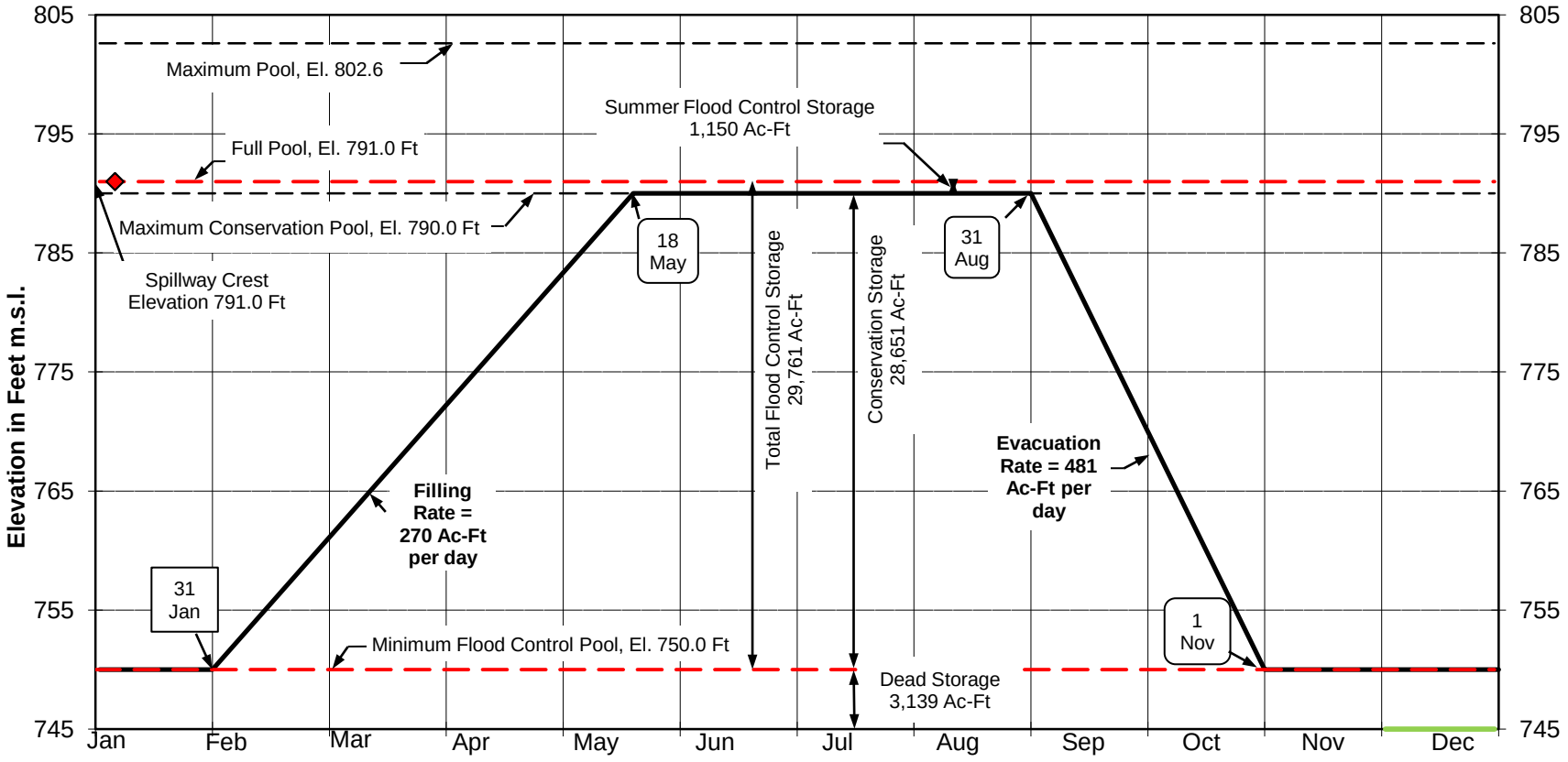


Figure 4 Dorena Multi-purpose Water Control Diagram

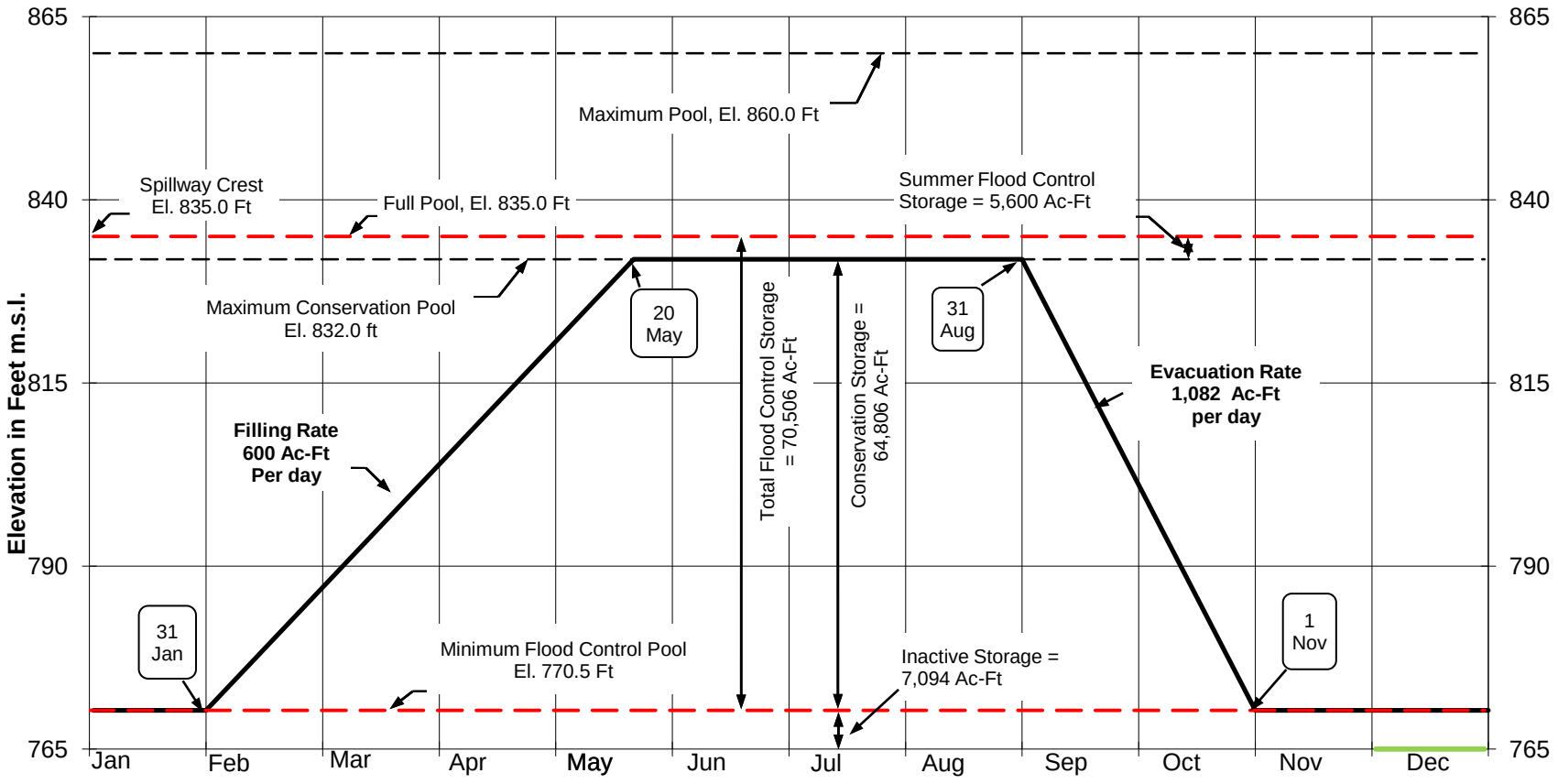


Table 3. Operational Data for the Willamette Valley Project reservoirs

Project	Minimum Flood Control Pool	Maximum Flood Control Pool	Total Conservation Storage	Authorized Minimum Release Feb-Jun	Authorized Minimum Release Jul-Nov	Current Typical Release Jun	Current Typical Release Jul-Aug	Drawdown Priority	Maximum Release for Power
	Feet, NGVD	**Feet, NGVD**	**Acre-Feet**	**cfs**	**cfs**	**cfs**	**cfs**		**cfs**
Hills Creek	1,448.0	1,541.0	194,600	100	100	1,000	400 - 800	4th	1,600 (Sep-Oct)
Lookout Point	825.0	926.0	324,200	1,200	1,000	3,000	2,500	1st	4,000 (Jun-Oct)
Fall Creek	728.0	830.0	108,200	30	30	250	200	5th	na
Cottage Grove	750.0	790.0	28,700	75	50	100	50	5th	na
Dorena	770.5	832.0	65,000	190	100	500	100	5th	na
Cougar	1,532.0	1,690.0	136,800	300	200	900	450 to 900	2nd	900 –1,000 (Jul-Oct)
Blue River	1,180.0	1,350.0	78,800	50	30	400	50 to 500	3rd	na
Fern Ridge	353.0	373.5	94,500	50	30	50	30	last	na
Green Peter	922.0	1,010.0	249,900	300	300	1,000	650 to 750	5th	up to 3,000 (Sep-Oct)
Foster	613.0	637.0	24,800	600	400	1,500	800	last	(same as Green Peter)
Detroit	1,450.0	1,563.5	281,600	1,000	750	1,500	1100	last	up to 3,000 (Sep-Oct)

Project	Preferred Reservoir Pool Elevations
Hills Creek	Reservoir kept as high as possible (1,520 preferred) for recreation through Labor Day. Then drafted for flood control.
Lookout Point	Pool > 890 through Sep. for operational temperature control.
Fall Creek	Summer releases near 200 cfs needed for adult fish collection at trap.
Cottage Grove	Small reservoir. Held as close to full as possible for recreational use.
Dorena	Small reservoir. Held as close to full as possible for recreational use.
Cougar	Stay within range of tower (>1570) through September for temperature control.
Blue River	No restrictions.
Fem Ridge	Held high for recreational use until Oct 10, then drafted for flood control by Nov 15.
Green Peter	Held high except for helping Foster meet minimum releases. Try to keep above elevation 992 until Labor Day to ensure water for fall minimum flows.
Foster	For fish passage: elevation 614 through May 20; re-fill to 637 by Memorial Day from Green Peter and hold through Oct 15.
Detroit	Reservoir kept > 1543 for operational temperature control and >1546 for recreation through Sep.

1. Big Cliff and Dexter are re-regulating dams that have no storage and are thus not included in this table.
2. All projects "originally designed" to begin drawdown after Sep 1 except Fem Ridge (on Sep 20) and Foster (on Sep 30).
3. During a drought, project releases may be cut back to "Minimum Authorized Flows" or below after coordination with state and federal agencies.
4. "Typical Releases: Jul and Aug" shown in column above will vary annually, depending on amounts of precipitation and naturally occurring snowmelt conditions.

2.3 PROJECT OPERATIONS

The Willamette Valley Project dams and reservoirs are operated as a system for multiple authorized purposes, including flood damage reduction, hydropower, navigation, irrigation, and flow augmentation for water quality, fish, wildlife, and recreation. Basic operational project data for the 11 storage reservoirs is listed in Table 3 above.

2.3.1 Flood Damage Reduction

The flood season in the Willamette basin normally extends over a six month period, with 70% of the annual precipitation falling between November and April. Runoff from minor to moderate storms during this period historically resulted in overbank flows on tributaries and portions of the mainstem.

Flood control is the most important purpose of the Willamette Project. The Willamette Project reservoirs are drawn down to minimum flood control pool beginning in September and ending in December according to established operating criteria for each dam and reservoir. Releases are made within the normal operating criteria considering state water management objectives. For instance during the middle of September to the middle of October there is salmon spawning activity downstream of projects such as Cougar, Dexter (Lookout Point), and Big Cliff (Detroit). State water management objectives include attempting to keep flow levels constant and within site specific flow ranges to prevent salmon redds from being dewatered.

Given the rain driven nature of the Willamette River basin and how quickly river levels can rise, timing of such reductions is of crucial importance in reducing the peak flow and flood damages. The large size of the Willamette River basin may influence which projects have their releases controlled when during a flood event, depending on storm track and subbasin-specific antecedent conditions, and project-specific features may constrain how each project is operated. Continuous monitoring of hydrometeorological conditions in and near the basin is accomplished with a real-time data collection system. The real-time data are used to prepare flood forecasts and schedule project releases, generally for the next 72 hours in 6-hour increments. Inflows are generally passed through each project until flood forecasts predict that a reduction in outflows is necessary to prevent project releases from combining with uncontrolled local flow from downstream areas to exceed flood regulation goals at the downstream control points. The effects of reductions in releases at one or multiple projects at a control point are a function of travel time and the rate of rise of flood waters. After flows have receded and the danger of flooding has passed, release of stored flood water is coordinated among the projects to prevent overbank conditions downriver, and to return the reservoir to the minimum flood-control pool in anticipation of the next potential flood.

The major flood control season occurs between the beginning of December and the end of January after the fall drawdown has been accomplished, although it is not uncommon to experience floods while still in the drawdown mode. During the major flood control season each reservoir is ideally at a minimum flood-control level, or “pool,” to store water during flood events for subsequent controlled release.

Floods are less likely to occur during the period February through early May. This period is referred to as the conservation storage season. Storage space in the reservoirs is filled gradually during this period for later use (irrigation, recreation, power production, water quality, etc.). Each project has a refill rule curve that provides guidance in refilling a project in a controlled manner to desired reservoir elevations for specific dates. Departures from refill rule curves may result from regulation of floods, excessive snow pack above the reservoirs, inadequate water supply, or critical power needs. Excess flood water stored above the rule curve during the conservation storage season is evacuated in accordance with downstream channel capacity. However, maintenance of minimum instream flows downstream of the facility generally takes precedence when the water supply is inadequate to maintain both minimum flows (see

Section 2.1.2.5) and the scheduled rate of filling. Deficiencies in storage may be made up at any time beyond early May when the water supply is adequate. Refill of a project can also be delayed when excessive snow pack above the reservoirs causes concern for flooding.

When authorized, Dorena and Cottage Grove dams were expected to reduce flood damages within the Coast Fork watershed by 86%. From 2001 to 2007, the Coast Fork projects provided over one million dollars in flood damage reduction (Corps 2009).

Flow rates in the Coast Fork reflect the seasonality of rainfall, with the majority of runoff occurring during the winter and spring and low flows occurring during July and August. However, headwater elevations in the Coast Fork sub-basin are fairly low elevation, thus, the Coast Fork hydrograph does not exhibit a spring snowmelt runoff. Within the study area the hydrograph has been altered from natural conditions. With dam regulation, the average monthly flows from February to April are approximately 10-20% less than what they were under natural conditions, and flows from July to October are 2 to 3 times higher (Jones 2005). Peak flows have also been reduced substantially.

The dams have substantially decreased the magnitude and frequency of extreme high flow events in the Coast Fork Willamette and Row Rivers. Additionally, the dams have decreased the magnitude of lower return period channel forming flood events (USACE 2000). The bankfull flow (the flow necessary to keep the river contained within the banks) and regulation goal at Goshen is 12,000 cfs, though flows rarely reach this magnitude. In the Coast Fork sub-basin, flows are naturally lowest in the late summer and early fall. The average daily flow of the Coast Fork Willamette near Goshen in August was less than 100 cfs prior to dam construction, which increased to about 200 cfs after dam construction. Post-dam summer flows are greater than what occurred historically because conservation storage is used for irrigation, navigation, recreation, and instream flows for aquatic life and wildlife (USACE 2000).

2.3.2 Hydropower

Federal hydroelectric power facilities are installed at eight of the thirteen USACE projects in the Willamette River basin. The electrical energy generated at these projects is marketed by the BPA throughout the Pacific Northwest and Pacific Southwest. There are two types of federal hydropower projects in the Willamette River basin: storage and reregulation. Lookout Point, Detroit, and Green Peter are storage projects and are associated with reregulation dams located downstream (Dexter, Big Cliff, and Foster, respectively). The Foster project also acts as a storage facility. The Hills Creek and Cougar storage projects do not have reregulation dams located downstream. Power facilities do not exist presently at the Fall Creek, Blue River, Cottage Grove, or Fern Ridge projects.

Power generation at the hydroelectric plants within the Willamette Project depends typically on releases for other project purposes such as flood control and environmental needs. However, some flexibility exists within the operating criteria to generate electricity at different levels throughout the day and during different seasons. Projects with hydropower facilities include exclusive storage space for power generation but the quantity of storage is relatively small, and drawdowns into power storage are limited to special power requirement periods that may develop during extended cold spells. In general, exclusive power storage is kept full to increase the hydraulic head for power generation. Generation from the storage projects is often based upon daily and weekly fluctuations in power demand ("load") and flows downstream are therefore subject to frequent fluctuations that require reregulation. Power generation at the reregulation projects is more uniform. The reregulation reservoirs are used to absorb the fluctuations in flows from their upstream storage projects and ensure that downstream flows are more uniform for protection of aquatic habitat and human life. (BA, April 2000)

A private hydropower project is under construction at Dorena Dam. Dorena Hydro, LLC, expects to bring the plant online in the summer of 2014. No additional discharges will be made for hydropower generation at Dorena. The project will generate power based on flows the Corps determines are needed to meet existing authorized purposes.

2.3.3 Navigation

Navigation is an authorized purpose for Willamette River, including the reaches above Willamette Falls. However, navigation has not become as significant of a demand on the water resources as was originally anticipated. The history of authorized navigation dates back to 1871 when Congress authorized the first plan for improving the channel between Portland and Eugene (River and Harbor Act of 1871). The plan was modified several times since, and provided for an eight foot channel between Portland and Oregon City and a 2.5 to 3.5 foot channel depth between Oregon City and Albany, which were completed in 1939. A 2.5 to 3.5 foot channel depth was completed between Albany and Corvallis in 1945. Uncompleted work on the upper navigation channel consisted of channel improvements and streamflow regulation to control depths of six feet at low water from Oregon City to the mouth of the Santiam River and five feet from that point to Albany. The USACE maintained the completed portion of the navigation channel to the vicinity of Corvallis until 1973 when commercial navigation traffic declined to a point where the USACE could no longer justify maintaining the project. The portion between Corvallis and Eugene was deauthorized by the Water Resources Development Act of 1986. In the early 1990s, the Mid-Valley Council of Governments investigated the feasibility of deepening the upper Willamette River navigation channel between Newberg and Independence to facilitate recreational and commercial boat traffic. The study found it was not cost effective to deepen the navigation channel at that time. (BA April 2000)

House Document 531 included minimum releases from the projects from June through October as well as flow objectives for downstream control points at Albany and Salem, as listed in Tables 3 and 4, respectively, to maintain navigation depth on the mainstem Willamette River.

Table 4. Minimum flow requirements at Albany and Salem (in cfs)

Month	Normal Year at Albany	Drought Year at Albany	Normal Year at Salem	Drought Year at Salem
June	---	4,000	---	5,500
July	4,500	4,000	6,000	5,500
August 1-15	5,000	4,500	6,000	6,000
August 16-31	5,000	4,500	6,500	6,000
September	5,000	5,000	7,000	6,500
October	5,000	---	7,000	---

2.3.4 Flow Augmentation

The original authorized plan for the Willamette Project is described in House Document 544, 75th Congress, third session, March 16, 1938. The plan for open-river navigation improvement above Willamette Falls stipulates a minimum flow of 5,000 cfs between Albany and the Santiam River, and 6,500 cfs downstream to Salem to provide navigation depths of six feet and five feet, respectively. It was also recognized in House Document 544 that these navigation flows would increase flows during the low-

water period and would "benefit sanitary conditions along the main stream" by diluting wastes and increase "the dissolved oxygen content of the stream with a resultant beneficial effect on fish life." House Document 531, 81st Congress, second session, March 20, 1950, also stipulates the above minimum flows to allow open-river navigation from Portland to Corvallis. HD 531 also recognized that these flows would reduce pollution concentrations in the river, and would make oxygen available for fish life. The water quality and fishery strategies for the Willamette River are currently based on the navigation flow requirements originally established at Albany and Salem.

Albany and Salem remain as summer flow augmentation control points for the Willamette system (June through October). Since 2000, the Corps has worked with other federal and state agencies to develop spring mainstem flow targets in addition to those originally authorized for June through October. The flow objectives in Table 5 combine the statutorily authorized minimum flows (House Document 531) as measured at Albany and Salem for the June through October period, which the projects were historically operated to meet, with new mainstem "fish flow" objectives for April through June.

Table 5. Mainstem Willamette Flow Objectives

Time Period	7-Day Moving Average [1] Minimum Flow at Salem (cfs)	Instantaneous Minimum Flow at Salem (cfs)	Instantaneous Minimum Flow at Albany (cfs) [2]
April 1 - 30	17,800	14,300	---
May 1 - 31	15,000	12,000	---
June 1 - 15	13,000	10,500	4,500 [2]
June 16 - 30	8,700	7,000	4,500 [2]
July 1 - 31	---	6,000 [1]	4,500 [2]
August 1 - 15	---	6,000 [1]	5,000 [2]
August 16 - 31	---	6,500 [1]	5,000 [2]
September 1 - 30	---	7,000 [1]	5,000 [2]
October 1 - 31	---	7,000	5,000

[1] An average of the mean daily flows in cubic feet per second (cfs) observed over the prior 7-day period.
[2] Congressionally authorized minimum flows (House Document 531). September flows were extended into October.

The purpose of the flow objectives presented in Table 5 is to aid juvenile and adult salmon and steelhead migration and survival, while maintaining adequate conditions in tributary areas for spawning and rearing. These flow objectives also preserve the Corps' ability to meet other authorized and necessary uses, such as maintaining acceptable water quality conditions, generating hydropower, and providing flood damage reduction. While it is not possible to achieve all flow objectives in every month of every year because of natural limitations in the availability of water and reservoir storage, the Corps' intent is to make every effort to meet or exceed the flow objectives taking into consideration flood damage reduction, human safety, and water quality.

In addition to the mainstem flow targets, the Corps worked with other federal and state agencies to develop tributary flow targets to protect spawning, incubation, and rearing of winter steelhead in the North and South Santiam rivers and of spring Chinook salmon in these rivers and in the McKenzie and Middle Fork Willamette rivers. Maximum flow recommendations during spawning are intended to avoid potential loss of redds from bed erosion and to constrain spawning activity into areas that can be provided with appropriate levels of flow throughout the subsequent incubation period. The tributary targets are depicted in Table 6. The Corps develops a Water Control Plan (WCP) each year, which outlines the approach to achieve the best possible flow conditions, recognizing established priorities and the need to balance available water and storage resources among a mix of authorized and necessary uses.

Table 6. Tributary Flow Targets

Dam	Period	Primary Use	Minimum Flow (cfs) [1]	Maximum Flow (cfs) [2]
Hills Creek	Sep 1 - Jan 31	Migration & rearing	400	
	Feb 1 - Aug 31	Rearing	400	
Fall Creek	Sep 1 - Oct 15	Chinook spawning	200	400 through Sep 30, when possible
	Oct 16 - Jan 31	Chinook incubation	50 [3]	
	Feb 1 - Mar 31	Rearing	50	
	Apr 1 - May 31	Rearing	80	
	Jun 1 - Jun 30	Rearing/adult migration	80	
	Jul 1 - Aug 31	Rearing	80	
Dexter	Sep 1 - Oct 15	Chinook spawning	1,200	3,000 through Sep 30, when possible
	Oct 16 - Jan 31	Chinook incubation	1,200 [3]	
	Feb 1 - June 30	Rearing	1,200	
	Jul 1 - Aug 31	Rearing	1,200	
Big Cliff	Sep 1 - Oct 15	Chinook spawning	1,500	3,000 through Sep 30, when possible
	Oct 16 - Jan 31	Chinook incubation	1,200 [3]	
	Feb 1 - Mar 15	Rearing/adult migration	1,000	
	Mar 16 - May 31	Steelhead spawning	1,500	3,000
	Jun 1 – Jul 15	Steelhead incubation	1,200 [3]	
	Jul 16 - Aug 31	Rearing	1,000	
Foster	Sep 1 - Oct 15	Chinook spawning	1,500	3,000 through Sep 30, when possible
	Oct 16 - Jan 31	Chinook incubation	1,100 [3]	
	Feb 1 - Mar 15	Rearing	800	
	Mar 16 - May 15	Steelhead spawning	1,500	3,000
	May 16 - Jun 30	Steelhead incubation	1,100 [3]	
	Jul 1 - Aug 31	Rearing	800	

Both Cottage Grove and Dorena Dams are used to support downstream flow augmentation during the low flow period of the year. As mentioned earlier, this augmentation was originally intended to support navigation, but subsequently supports the authorized purposes of fish and wildlife and pollution abatement. The Oregon Department of Environmental Quality (DEQ) currently issues discharge permits based on calculated 7Q10 flows at Albany and Salem on the mainstem Willamette River. The USACE established flows during abundant and adequate years which are typically at or above the 7Q10 flows (seven day low flow with a 10 year recurrence interval).

2.3.5 Irrigation

Irrigation is practiced throughout the Willamette River basin to provide water for dairy and beef cattle pasture, mint, nurseries, grass, legume seed, fruit, and other produce. Irrigation was recognized as a major purpose in the authorizing project legislation. Collectively, the total joint-use conservation storage at all thirteen projects totals approximately1.6 million acre-feet. The 1950 review report on the Willamette River basin (HD 531) authorized in the Flood Control Act of 1950 that the USACE have discretionary authority to utilize stored water for other purposes, such as recreation, water quality and for fish and wildlife habitat purposes (USACE, April 2000). The Corps works with Reclamation to market stored water from the Willamette Project for the purpose of supporting irrigation needs. Contracts are made pursuant to Federal Reclamation law; in particular §9(e) of the Act of August 4, 1939 (53 Stat. 1187), §8 of the Act of December 22, 1944 (58 Stat. 887, 891), the Flood Control Act of 1938 (52 Stat. 1222), and the Flood Control Act of 1950 (64 Stat. 170). Contracts are established between the contractor (user) and Reclamation that specify the amount of water that the user may take. Little of the reservoir storage available for irrigation in the Willamette River basin is contracted (i.e., purchased) for delivery.

There are presently no supplemental USACE releases intended specifically for irrigation use except at Detroit and Fern Ridge Reservoirs. Irrigation contracts are generally met within normal dam operations and releases. Table 7 identifies the number and quantity of stored water contracts supplied by storage in the Willamette Valley Project.

2.3.6 Municipal and Industrial Water Supply

The need for Municipal and Industrial (M&I) storage was found to be relatively low at the time that the storage capacity of the reservoirs was planned. However, the Flood Control Act of 1950 reauthorized the USACE to construct and operate the Willamette Project, as described in HD 531, which included water supply as an intended and authorized project purpose. Domestic water supply as an authorized purpose is discussed on pages 1735-1736 of HD 531, Volume 5. Paragraph 198, page 1736 states:

> "The total quantity of water required for domestic use would be small in comparison with the total storage capacity of reservoirs proposed for flood-control and other multiple-purposes uses. Ample storage in individual reservoirs, therefore, would be available at relatively low cost for domestic use when current facilities can no longer meet the demand."

To date, there are no agreements for using storage from any of the Willamette Project reservoirs for M&I water supply, but interest is significant among water suppliers in the Willamette Basin. Because of the potential for a demand in the future, USACE policy makes provisions for reallocating existing storage space and use at a later time if necessary.

Table 7. Storage volumes presently under contract for irrigation use from the Willamette Valley Project.

Reach	Reservoir Providing Water	Number of Contractors	Total Acre-Feet Contracted	Total Acres Served
Willamette River				
Downstream of Santiam River	All	48	21,633	10,159
Santiam River–Long Tom River	All except Santiam River basin reservoirs	24	14,867	9,957
Long Tom River–McKenzie River	All except Santiam River basin reservoirs and Fern Ridge	4	493	224
Middle Fork Willamette River				
Downstream of Fall Creek	Fall Creek, Dexter/Lookout Point, Hills Creek	2	911	473
Fall Creek–Dexter	Dexter/Lookout Point/Hills Creek	2	92	37
Fall Creek	Fall Creek	2	13	5
Coast Fork Willamette River				
Middle Fork – Row River	Dorena, Cottage Grove	6	581	233
Row River – Cottage Grove	Cottage Grove	1	56	45
Row River	Dorena	1	51	20
McKenzie River	Blue River, Cougar	28	1,481	793
Santiam River to Forks	Detroit/Big Cliff, Green Peter, Foster	6	527	1,264
North Santiam River	Detroit/Big Cliff	27	9,253	5,682
South Santiam River	Green Peter, Foster	14	1,096	565
	TOTALS	220	72,375	38,532

Source: BOR data, as of January 2014.

2.3.7 Recreation

Recreation use and development is authorized at all the USACE projects under federal legislation, including the Federal Water Projects Recreation Act of 1964 (Public Law 89-72), and the Flood Control Act of 1944. Under these authorities, the USACE is primarily responsible for providing recreation facilities. The USACE cooperates with the U.S. Forest Service, Oregon State Parks, Oregon Department of Fish and Wildlife, and Linn and Lane counties to build and manage a system of water-related recreation facilities. Recreation facilities are provided at all of the USACE's projects and along most of the downstream reaches.

Recreational demand in the basin is putting more pressure on maintaining reservoirs at high levels for the entire recreational season. A drawdown priority for the projects has evolved over time (Table 3). Maintenance of high pool elevations in priority recreation reservoirs is an important consideration in operation of the Willamette Project. Those projects with the highest recreation demand are last to be used for meeting flow requirements at Albany and Salem, so their pool elevations usually are high until early September. On the other hand, those projects with lower recreation demand are used for meeting summer mainstem Willamette flows, and are drawn down earlier. The three most important recreational lakes in the system, Detroit, Fern Ridge and Foster, are last to be evacuated to meet summer flow requirements. (USACE, April 2000)

Cottage Grove Lake is popular for water-skiing and fishing and ranks 73rd out of all water bodies in the state for recreational boating, according to the Oregon State Marine Board. It is also popular for lakeside camping and day use associated with waterborne recreation. The Corps operates three day-use parks and two campgrounds at Cottage Grove Lake. Pine Meadows and Primitive Campgrounds are popular destinations on summer weekends. These facilities are used to capacity during peak summer use periods. Cottage Grove Lake has boat access available to low pool. However, some facilities such as Wilson Creek Park swimming beach are sensitive to small amounts of drawdown. All of the beaches at the lake are most usable within the upper three feet of the maximum conservation pool elevation.

Dorena Lake offers a variety of recreation activities. Dorena Lake is a popular boating lake with higher percentage of sailboats and sailboards and a smaller percentage of water skiers than Cottage Grove. Dorena Lake is ranked 58th in the state for boating use. Schwarz Campground, operated by the Corps, is located immediately downstream of the dam. The Corps also operates two day use parks along Dorena Reservoir. Baker Bay Park, operated by Lane County, includes a day-use area, boat ramp, marina, and campground. The paved Row River Trail, operated by the U.S. Bureau of Land Management, follows Dorena Lake's north shore and can be used for biking, hiking, and horseback riding.

Baker Bay and Schwarz campgrounds are highly used during the summer recreation season. However, the camping opportunities are not as closely related to waterborne recreation as at Cottage Grove. Dorena is less sensitive to minor drawdown than Cottage Grove because of its steeper shoreline. Drawdowns of a few feet do no not significantly reduce the surface area available for boating.

2.4 OREGON WATER LAW

Under Oregon law, all water is publicly owned. With some exceptions, cities, farmers, factory owners, and other water users must obtain a permit or water right from the Oregon Water Resources Department (OWRD) to use water from any source— whether it is underground, or from lakes or streams. Generally speaking, landowners with water flowing past, through, or under their property do not automatically have

the right to use that water without a permit from the OWRD. For more information refer to ORS 537.110[1].

Oregon's water laws are based on the principle of prior appropriation. This means the first person to obtain a water right on a stream is the last to be shut off in times of low streamflows. In low-water years, the water right holder with the oldest date of priority can demand the water specified in their water right regardless of the needs of junior users. If there is a surplus beyond the needs of the senior right holder, the water right holder with the next oldest priority date can take as much as necessary to satisfy needs under their right and so on down the line until there is no surplus or until all rights are satisfied. The date of application for a permit to use water usually becomes the priority date of the right.

Generally, Oregon law does not provide a preference for one kind of use over another. If there is a conflict between users, the date of priority determines who may use the available water. If the rights in conflict have the same date of priority, then the law promotes preference for domestic use and livestock watering over all other uses.

In order to use stored water from the project reservoirs, the user must file an application for a secondary water right (stored water right) with OWRD (ORS 537.147).

Water rights are not automatically granted. Opportunities are provided for other water right holders and the public to protest the issuance of a permit. Water users can assert that a new permit may injure or interfere with their water use, and the public can claim that issuing a new permit may be detrimental to the public interest. This provides protection for both existing water users and public resources (OWRD 2009).

In addition to obtaining a water right to use stored water, other permits from local, state, or federal agencies may be required.

2.5 Corps of Engineers Easements and Permits

Easements and any necessary permits are required for any non-Federal entity requesting storage in a federal project. These are separate legal/regulatory instruments and are described individually below.

2.5.1 Easements

Easements are required for water pipelines and water intake structures on Corps project lands. No easement that supports a water supply agreement will be issued prior to execution of a water supply agreement by all parties (Corps of Engineers Real Estate Policy, as of 2008). Easements will contain an explicit reference to the water storage agreement and provide an explicit provision for termination of the easement for noncompliance with any of the terms and conditions of the water agreement.

An easement is not required for this project because the water will be withdrawn from the river downstream of the project, utilizing existing infrastructure not located on Corps project lands.

[1] https://www.oregonlegislature.gov/bills_laws/lawsstatutes/2013ors537.html

2.5.2 Regulatory Permits

Regulatory permits are required from the Corps for any action potentially affecting waters of the U.S., subject to federal laws and regulations including, but not limited to Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Regulatory permits are not expected to be required as water would be withdrawn from the river via the City's existing intake structure on the Coast Fork Willamette River.

2.5.3 Existing and Pending Agreements, Easements, and Permits

There are no existing or pending M&I water supply related agreements involving Cottage Grove or Dorena. There are three access road right-of-way easements, one transmission line right-of-way easement, and one agricultural easement at the Cottage Grove project. Dorena has two easements (one powerline crossing and one access to private property); a lease to Lane County for Baker Bay Public Park; and a license to Dorena Hydro, LLC for construction and operation of a private hydropower facility.

2.6 CURRENT WATER USE

Storage space in the Willamette Valley Project conservation pools was not allocated to the separate authorized purposes, i.e., flow augmentation, irrigation, municipal and industrial water supply, or recreation, when the projects were authorized. The conservation pools in each reservoir are allocated for joint-use, i.e. all the authorized purposes. From November through January, space in the conservation pool is used for flood storage, with no stored water available for other authorized purposes. Stored water is released from the conservation pool each conservation season (May through September) to support multiple purposes, including irrigation, fish and wildlife, and water quality. The reservoirs also support high levels of recreation during the summer months when the conservation pools are full or nearly full. Currently, only 688 acre-feet of the 93,457 acre-feet of storage in the Coast Fork projects are contracted for to meet one of the authorized purposes, i.e. irrigation, which equates to approximately 0.7% of the total conservation storage in the Coast Fork Willamette River.

3 PLAN FORMULATION

3.1 NEED FOR WATER

The Willamette Basin is a surface water limited system. In 1992, the OWRD revised and adopted the Willamette Basin Program[2] (the Program), described in Oregon Administrative Rule (OAR) Chapter 690, Division 502. The Program is a set of policies, objectives, and provisions that govern the future use and control of unappropriated surface water and groundwater, and directs OWRD's permitting activities. The Program strictly limits the new use of surface water during the summer months. This is largely because remaining available supplies are often insufficient for meeting existing water rights and public instream uses 80 percent of the time. The Water Resources Commission has recognized that the storage of water in the Willamette Valley Project represents a critical source of current and future water supply for meeting instream and out-of-stream needs.

The Coast Fork sub-basin, as described in the Willamette Basin Program, includes the Coast Fork Willamette River and tributaries above the confluence with the Middle Fork Willamette River south of Springfield. Today, entities requesting to divert surface water for municipal uses in the Coast Fork sub-basin, below Cottage Grove and Dorena Dams, are only allowed to do so from December 1 to April 30 of each year. Surface water diversions for municipal use, located above the dams, are not allowed any time of the year. The specific language and rules that govern uses in the Coast Fork Willamette Basin are found in OAR 690-502-0070. Although new uses of surface water for municipal uses is strictly limited in the Coast Fork sub-basin, the Willamette Basin Program allows water that is legally stored to be released or used for any beneficial purpose, including municipal uses.

3.2 WATER SUPPLY DEMAND ANALYSIS

The study area described in the sections below is limited to the Coast Fork Willamette River watershed. This area was selected because the City of Creswell is located in this watershed and it is not feasible for the City to use stored water from reservoirs outside the Coast Fork Willamette River sub-basin.

3.2.1 Water Supply Demand: Existing Water Users

Currently, irrigation is the only consumptive use of stored water from the reservoirs in the Coast Fork sub-basin. Reclamation has issued a total of eight contracts in the Coast Fork sub-basin for a total of 688 acre-feet of storage as of 2013. An additional 76 Reclamation contracts on the mainstem Willamette River for 39,993 acre-feet of storage are supported in part by releases from Dorena and Cottage Grove reservoirs.

3.2.2 Total M&I Water Demand in the Study Area

Supply sources and projected water demands for the City are described in the November 2008 report entitled "Southern Willamette Valley Municipal Water Providers" (SWMWP, 2008), the City of Creswell Water System Analysis, April 2012 (Analysis, 2012), and the City of Creswell Community Water Profile, June 2013 (Profile, 2013). The 2008 SWMWP report, which was funded by OWRD as part of its Water Supply and Conservation Initiative, described the City's 2007 population as 4,650 and its water demand

[2] http://arcweb.sos.state.or.us/pages/rules/oars_600/oar_690/690_502.html

for the four-month period of June-September as approximately 127 million gallons, equivalent to 390 acre-feet.

The City's current population is 5,030.[3] Based on recent per capita use figures, it is projected that the City's (instantaneous) water demand in the near future (2015) could exceed 2,082 gallons per minute (gpm) (about 3 million gallons per day, or 10 acre-feet per day) (Analysis, 2012 and Profile, 2013). Water use for the City of Creswell is highest during the months of June through October, and peaks in August (Profile, 2013). For planning purposes, the instantaneous (maximum) water demand was used to determine the total season demand for this letter report. This unit was selected to account for a variety of factors, including population growth, industrial growth, climate change, water laws and policies, and consumption patterns.

Table 8 City of Creswell Demand Data

Year	Daily Demand	Total Season Demand
2015	2,082 gpm (maximum)	1,123 acre-feet

The above demand value includes an estimate for a quantity of water to serve the former Fircrest facility, an agricultural processing facility formerly used as a Foster Farms chicken processing facility. The City is actively pursuing a new user of the facility, one that is also expected to be a high water user.

3.2.3 City of Creswell Water Supply

The City of Creswell currently obtains its water supply from groundwater and natural flow from the Coast Fork Willamette River. The City's groundwater supply is authorized under two certificated water rights, which, in combination authorize the use of 22 different wells and up to 3.16 cfs, or 1,418 gpm. The City's surface water supply is authorized under two certificated water rights, which in combination authorize the use of up to 5 cfs, or 2,243 gpm, from the Coast Fork Willamette River. Although the City's water supply authorizations add up to 8.16 cfs, or 3,661 gpm, supply constraints exist that require the City to seek alternatives.

Table 9 City of Creswell Water Supply Data

Source	cfs	gpm	Available (gpm)	Dependable (gpm)
Groundwater (22 wells total)	3.16	1,418	375	375
Surface	5.00	2,243	2,243	897
Total	8.16	3,661	2,618	1,272

Based on information in the City's 2004 Water System Master Plan (Master Plan) and communications with the City's Public Works Director, the City's groundwater supply is constrained. The City's "River Wells Well Field" (6 of the 22 authorized wells) has been placed into "reserve" and is not used due to the shallow nature of the wells, their proximity to surface water sources and potential for contamination, poor well construction, and low yield. The Emerald Valley Well Field (6 of the 22 authorized wells) has also

[3] http://www.ci.creswell.or.us/index.php?q=node/28

been placed in "reserve." These wells are currently not useable for potable water supply due to low yields and levels of arsenic that exceed current Environmental Protection Agency (EPA) Drinking Water Standards.

Finally, the Garden Lake Well Field (10 of the 22 authorized wells) provides a very limited source of water supply for the City. Even though this groundwater source also has high levels of naturally occurring arsenic, the wells are connected to the City's water treatment plant where surface water and groundwater can be blended to dilute arsenic concentrations below the EPA Drinking Water Standards. However, due to public concerns about the consumption of water with high arsenic levels, the City only uses the Garden Lake Well Field approximately once per week for approximately four hours. The Garden Lake Well Field wells used to pump groundwater for blending with surface water produce a total of approximately 375 gpm. Therefore, of the 1,418 gpm of groundwater authorized for use, the City's actual groundwater supply is approximately 375 gpm on a very limited basis.

The City's surface water supply of 5 cfs, or 2,243 gpm, is diverted from the Coast Fork Willamette River and treated through the City's water treatment plant, which was upgraded in 2009. The City's diversion system and treatment plant are capable of supplying the full 5 cfs of supply to meet City demand (See Claim of Beneficial Use for Water Right Transfer T-9825).

In the near future, the City may also face a water supply shortfall due to the "junior" priority date of its 3 cfs surface water right and/or due to high water use industry coming back on line. The City's surface water certificate (Certificate 85427) for 3 cfs has a 1989 priority date and is considered a junior water, with a priority date after other water rights and both a 40 cfs instream water right on the Coast Fork (Certificate 59761) and a 2000 cfs instream water right on the Willamette River, below the confluence of the Coast Fork and Middle Fork Willamette River (certificate 59549). Although it is expected that the Coast Fork instream water right would be met, the Willamette River instream water right may not be met during periods of low flow (based on historical gage records from the Middle Fork and Coast Fork) and could result in curtailment of the City's 1989 water right. Under such a circumstance, the City's water use under Certificate 85427 could be curtailed to only allow the use of water for domestic purposes (the instream water right does not have priority over domestic water uses). Domestic water use includes water use for human consumption, household purposes, and domestic animal consumption ancillary to residential use. It would not include irrigation, commercial or industrial uses of water. As a result, during periods of very low flow, the City could be subject to curtailment by OWRD's Watermaster (which did occur in the 1990s) and have very limited access to its 3 cfs water right. Under this scenario and under current conditions, the City would have a dependable water supply of approximately 1,272 gpm – 810 gpm short of the 2015 projected demand of 2,082 gpm. If a high water use industry comes back on line the shortage could be even more severe. Therefore, the City is seeking a backup water supply to provide 1.2 MGD (3.6 acre-feet per day) during the low water season. This equates to 437 acre-feet for the period June – September.

Table 10 City of Creswell Water Supply Needs in 2015

Daily (gpm)			June-September (acre-feet)		
Available	**Demand**	**Deficit**	**Available**	**Demand**	**Deficit**
1,272	2,082	810	686	1,122	437

3.3 ALTERNATIVES

When the projects were originally authorized, irrigation was thought to be the largest future user of stored water. Agriculture in the Willamette Valley has not grown at the rate foreseen in the authorizing documents. Water use and conservation in the agricultural community has also changed since the Willamette Project was authorized. The conservation storage in the entire Willamette Project totals approximately 1.6 MAF. Of this total, only 72,375 ac-ft are contracted for irrigation use. In the Coast Fork Willamette River, only 688 acre-feet of the total 93,457 acre-feet of conservation storage are contracted for irrigation.

3.3.1 Natural Flow

New surface water rights for the use of natural flow in the Coast Fork sub-basin for municipal use are not available to meet the City's future demands for several reasons. First, OWRD's administrative rules generally prohibit issuance of a new year-round municipal water right. OWRD's basin program rules "classify" (allow use of) surface water within the Coast Fork sub-basin for municipal use only from December 1 through April 30. These rules would, in most cases, prevent issuance of a new municipal use permit for use during the remainder of the year. Further, issuance of a new permit would be precluded due to a lack of available surface water. OWRD's Water Availability Analysis shows that no water is available for new natural flow water rights from the Coast Fork Willamette River from February through November of each year. Therefore, obtaining a new natural flow water right is not a viable alternative and was eliminated from further consideration.

3.3.2 Purchase Water from Another Municipal Entity

The City could develop an interconnection with, and purchase water from, another municipal water supplier. The Eugene Water and Electric Board (EWEB) is the only municipal water supplier within close proximity to the City of Creswell that has sufficient water supply and treatment infrastructure to be able to provide water to other water suppliers. This approach is expected to be cost prohibitive for the City. No specific studies, engineering designs, or agreements exist for providing water from EWEB to Creswell; however, a recent EWEB/City of Veneta interconnection and agreement can be used for demonstrative purposes. Based on the projected cost of the pipeline from EWEB to the City of Veneta, it is estimated that the pipeline from EWEB to Creswell would cost approximately $4.7 million. The approximately 10.5 miles of pipeline from EWEB to Veneta has an estimated cost of $10 million or approximately $952,400 per mile. Assuming the same cost per mile and a pipeline length of approximately five miles yields a total cost of approximately $4.7 million. Moreover, under the current EWEB/City of Veneta agreement, the current (2013) cost of the water supply is approximately $1.24 per thousand gallons or approximately $404 per acre-foot annual cost. This is a technically feasible alternative.

3.3.3 Groundwater

The City could potentially obtain a new municipal water right for the use of groundwater. This approach, however, also poses a number of problems. Some of the groundwater in the area has naturally high levels of iron, manganese, and arsenic (Master Plan, 2004; SWMWP, 2008). In addition, the issuance of new water rights for the use of groundwater has many of the same limitations as the issuance of new surface water rights, as described above. The Willamette Basin Program administrative rules presume that groundwater in unconfined alluvium within a ¼ mile of the banks of a stream or surface water source is hydraulically connected with that surface water source, and as such, is given the same classification as the surface water source. As mentioned in Section 3.1, surface water sources are strictly limited during the summer months in the Coast Fork Basin. Additionally, OWRD can determine that groundwater use

within one mile from a surface water source has the "potential for substantial interference" (PSI) with surface water. If the use of groundwater will have PSI, OWRD will apply surface water availability to determine if groundwater is available for a proposed use. As described above, surface water is not available for new natural flow rights from February through November. Due to these limitations on the use of groundwater, this is not a viable alternative and was eliminated from further consideration.

3.3.4 Conservation

The City of Creswell could institute conservation measures sufficient to eliminate its need for additional water supply beyond what can be supplied by its existing water rights. A 2010 study of conservation measures conducted for the City of Corvallis found that employing a large suite of conservation measures to obtain the maximum water savings available would yield a conservation savings of only approximately 4 percent of its average demand, and would require a budget of over $5 million. (City of Corvallis, Water Use and Water Conservation Project, 2010). Conservation measures could include limitations on outdoor water use during peak demand seasons, block rate pricing structure adjustments, and indoor and landscape water audits for both residential and commercial/industrial facilities (Profile, 2013). This is a viable alternative and was carried forward for further review.

3.3.5 Surplus Water from Federal Storage

Surplus water is defined per Corps guidance as "water stored in a Department of the Army reservoir that is not required because the authorized use for the water never developed or the need was reduced by changes that occurred since authorization or construction…" The authorizing documents for the Projects, namely HD 531, stated an expected demand of 640,000 acre-feet of storage to meet irrigation needs in the Willamette Valley river basin. Reclamation has issued contracts for just over 72,000 acre-feet of storage as of January 2014, leaving approximately 568,000 acre-feet of storage originally intended for irrigation unused.

Purchasing 437 acre-feet of conservation storage within Cottage Grove and Dorena reservoirs could meet the City's projected immediate needs. The City would enter into a surplus agreement with the Corps for use of up to 437 acre-feet of water from June – September, for a period not to exceed 5 years, with an option for one 5 year extension. Water would be released from one or both of the two reservoirs and withdrawn directly from the Coast Fork Willamette River, downstream of both dams, using the City's existing withdrawal system.

The rate of discharge to provide 437 acre-feet of water over the course of June through September is approximately 2 cfs. The current outlets on Cottage Grove and Dorena dams allow for water releases in 5 cfs increments. Discharges are determined using rating tables and required flows. Flows are verified at downstream USGS stream gages, which have approximately a 5 cfs margin of error. Due to this range, water is often released in excess of project minimums to account for gage error at the downstream USGS gages. No operational changes will occur at the projects to release additional water specifically for the surplus water supply agreement. The City will be required to provide data showing amounts of water withdrawn to verify that they have not exceeded their 437 acre-feet of stored water.

This is a viable alternative and was carried forward for further review.

3.4 ALTERNATIVES STUDIED IN DETAIL

3.4.1 Without Project Alternatives

3.4.1.1 Purchase Water from Another Entity

Under this alternative, the City would enter into an agreement with EWEB to obtain the required water from the EWEB system. In addition, the City would construct a pipeline from the EWEB water treatment plant to the City of Creswell's distribution system.

3.4.1.2 Conservation

Under the conservation alternative, the City would begin implementation of conservation measures to reduce peak season demand. These measures would be employed routinely but specifically during drought years when 3 cfs of the City's water rights would be curtailed.

3.4.2 Proposed Action – Surplus Agreement

The proposed action is a surplus agreement for 437 acre-feet of water from the Dorena and Cottage Grove reservoirs combined, resulting in approximately 2 cfs of stored water to be withdrawn from the Coast Fork Willamette River downstream of Dorena and Cottage Grove reservoirs for the months of June - September.

4 IMPACTS TO AUTHORIZED PURPOSES

This section addresses the impacts to the authorized purposes of the Willamette Valley Project dams and reservoirs from issuing a water supply agreement to the City of Creswell for 437 acre-feet of water from the conservation pools of Dorena and Cottage Grove reservoirs. The affects described below are based on the determination that the temporary use of a combined 437 acre-feet of water from Dorena and Cottage Grove reservoirs would have an unmeasurable effect on the surface elevations and outflows of the Willamette Project dams and reservoirs (See Appendix C for modeling results). Note that the model results described in Appendix C reference the use of 499 acre-feet of stored water. This volume of storage was the original focus of the report before the volume was refined. Because model results for the 499 allocation showed insignificant changes in project conditions, there was no need to rerun the model for 437 acre-feet.

4.1 FLOOD DAMAGE REDUCTION

Flood damage reduction storage space during the conservation release season is typically provided between the maximum conservation pool and full pool in the reservoirs. The surplus water would be from within the conservation pool, not the summer flood control pool; therefore there would not be an impact to the flood storage pool or the drawdown in the fall of the conservation pool to minimum flood control pool elevations at Cottage Grove or Dorena reservoirs.

Table 11 below shows the number of days in a Water Year the flows are above bankfull or flood stage, with flows noted at the control points. The modeling shows that there are no changes to these values when additional water is released June – September to satisfy the City's 2 cfs demand for municipal water.

4.2 HYDROPOWER

Hydropower generation depends on the elevation of the reservoir. Modeling results, as shown in Figure 5 below, indicate there will be no change to reservoir elevations at any of the Willamette Project reservoirs; therefore there will be no impact to hydropower generation at the eight Willamette Project hydropower projects. In addition, the private hydropower project at Dorena will utilize the Corps' determined discharges from the reservoir. Dorena Hydro LLC will not have any authority or right to request an increase or decrease of flow from the federal project. Therefore, power generation will not be measurably increased or decreased as a result of the proposed action.

Table 11 Flood Damage Reduction Summary

Flood Damage Reduction Summary

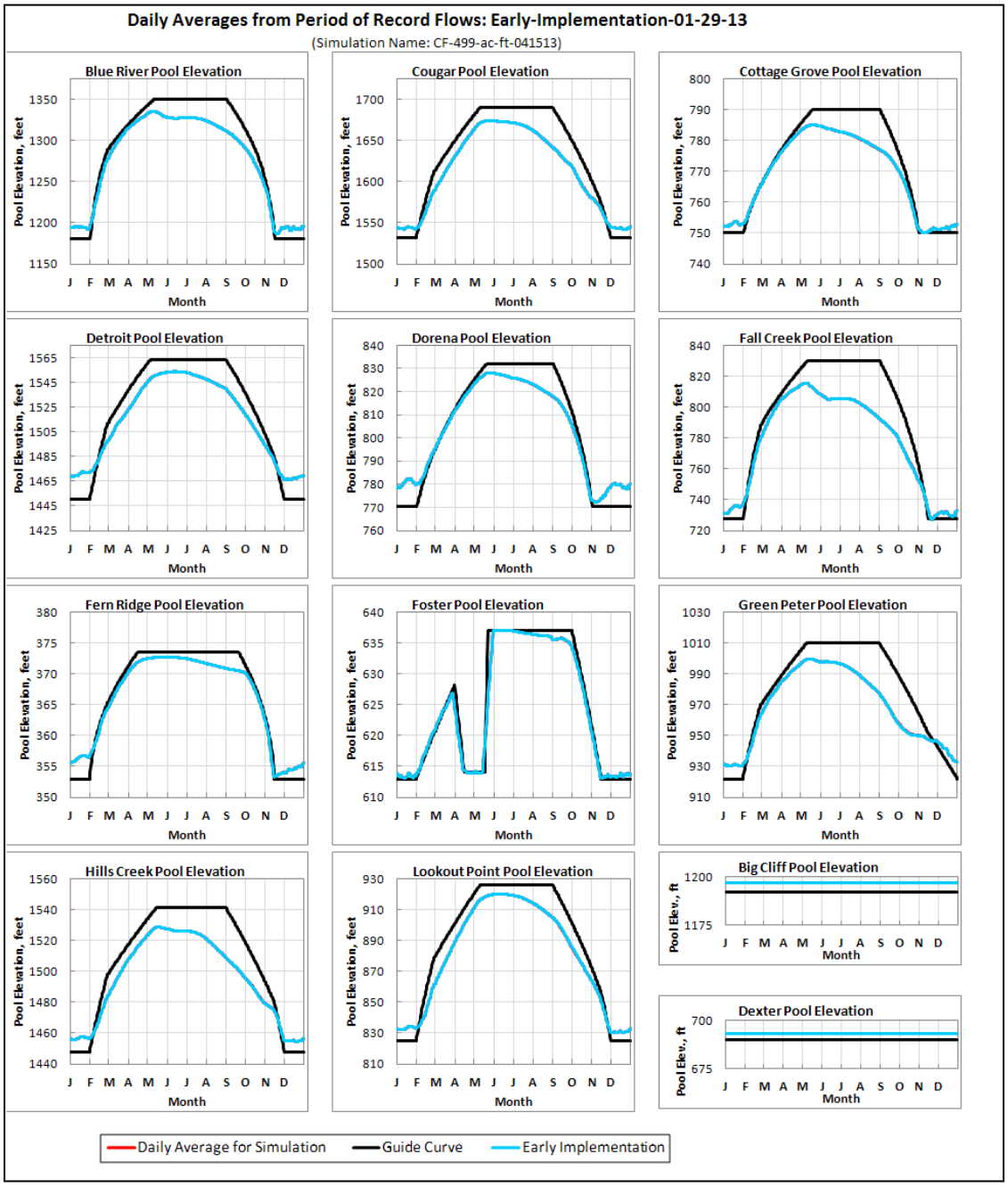
Simulation: CF-499-ac-ft-041513

Non-Exceedance Values for Number of Days in a Water Year that flows are above Bankfull or Flood Stage, with Peak Flows Noted		Non-Exceedance Values for 73 Water Years						Median Non-Exceedance Values by Water Year Type							
		Conditional formatting compares to Baseline counterpart						Early Imp. Baseline by WY Type				Simulation by WY Type			
		Early Implementation Baseline POR			Simulation POR										
Days Above Bankfull	Bankfull Flow, cfs	5%	50%	95%	5%	50%	95%	Abundant	Adequate	Insufficient	Deficit	Abundant	Adequate	Insufficient	Deficit
Willamette River near Goshen (GOSO)	12000	0	0	5	0	0	5	1	0	1	0	1	0	1	0
Middle Fork Willamette River at Jasper (JASO)	20000	0	0	6	0	0	6	0	0	0	0	0	0	0	0
Willamette River at Eugene (EUGO)	40000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
McKenzie River at Vida (VIDO)	14500	0	1	8	0	1	8	1	0	1	0	1	0	1	0
Willamette River at Harrisburg (HARO)	42000	0	4	30	0	4	30	7	4	5	0	7	4	5	0
Long Tom River at Monroe (MNRO)	4650	0	5	23	0	5	23	9	4	3	1	9	4	3	1
South Santiam River at Waterloo (WTLO)	18000	0	0	2	0	0	2	0	0	0	0	0	0	0	0
North Santiam River at Mehama (MEHO)	17000	0	0	3	0	0	3	0	0	1	0	0	0	1	0
Santiam River at Jefferson (JFFO)	35000	0	3	11	0	3	11	3	2	2	1	3	2	2	1
Willamette River at Albany (ALBO)	70000	0	2	11	0	2	11	3	1	2	0	3	1	2	0
Willamette River at Salem (SLMO)	90000	0	7	31	0	7	31	11	7	5	1	11	7	5	1
Days Above Flood Stage	Flood Flow, cfs														
Willamette River near Goshen (GOSO)	15000	0	0	2	0	0	2	0	0	0	0	0	0	0	0
Middle Fork Willamette River at Jasper (JASO)	23000	0	0	2	0	0	2	0	0	0	0	0	0	0	0
Willamette River at Eugene (EUGO)	53900	0	0	0	0	0	0	0	0	0	0	0	0	0	0
McKenzie River at Vida (VIDO)	35000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Willamette River at Harrisburg (HARO)	70500	0	0	2	0	0	2	0	0	0	0	0	0	0	0
Long Tom River at Monroe (MNRO)	6000	0	0	6	0	0	6	2	0	2	0	2	0	2	0
South Santiam River at Waterloo (WTLO)	25700	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Santiam River at Mehama (MEHO)	32400	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santiam River at Jefferson (JFFO)	49800	0	0	2	0	0	2	0	0	0	0	0	0	0	0
Willamette River at Albany (ALBO)	88000	0	0	4	0	0	4	0	0	0	0	0	0	0	0
Willamette River at Salem (SLMO)	153000	0	0	3	0	0	3	0	0	0	0	0	0	0	0
Peak Flow at Control Point, cfs															
Willamette River near Goshen (GOSO)		6250	11830	22550	6250	11830	22550	12850	11290	10050	6540	12850	11290	10050	6540
Middle Fork Willamette River at Jasper (JASO)		8260	16050	24460	8260	16050	24460	17530	15920	14910	10170	17530	15920	14910	10170
Willamette River at Eugene (EUGO)		13410	24630	38050	13410	24630	38050	26710	22770	20500	15760	26710	22770	20500	15760
McKenzie River at Vida (VIDO)		9360	14540	23720	9360	14540	23720	14810	14380	14100	12290	14810	14380	14100	12290
Willamette River at Harrisburg (HARO)		25000	50210	89590	25000	50210	89590	54230	48830	54200	38300	54230	48830	54200	38300
Long Tom River at Monroe (MNRO)		2850	5880	10210	2850	5880	10210	7050	5540	6060	4220	7050	5540	6060	4220
South Santiam River at Waterloo (WTLO)		10900	14670	25120	10900	14670	25120	15580	13950	14360	13270	15580	13950	14360	13270
North Santiam River at Mehama (MEHO)		11630	16150	26420	11630	16180	26420	16970	15780	15880	13190	16970	15780	15880	13190
Santiam River at Jefferson (JFFO)		27440	40960	77670	27440	40960	77670	46430	38860	39940	34860	46430	38860	39940	34860
Willamette River at Albany (ALBO)		36750	75670	130600	36750	75670	130600	81540	75670	72820	47750	81540	75670	72820	47750
Willamette River at Salem (SLMO)		65680	118370	204310	65680	118370	204310	125740	123970	130520	83450	125740	123970	130520	83450

Simulation value compared to Baseline:	70% and less	70% to 80%	80% to 90%	90% to 110%	110% to 120%	120% to 130%	130% and more

Non-Exceedance Value Example for Early Imp. Run, Goshen Bankfull Flows:
Flows are less than Bankfull all days of the year for 5% or less of the water years.
Flows are less than Bankfull all days of the year for 50% or less of the water years (half the time).
Almost always (95% of the time), 5 days or less in a water year, flows were above Bankfull.

Figure 5 Comparison of Daily Average Reservoir Elevations



4.3 NAVIGATION AND FLOW AUGMENTATION

Minimum flows released from the Willamette Valley Project reservoirs during the conservation season were originally developed to maintain navigation depth on the mainstem Willamette. Although a federal navigation channel is not maintained upstream of Portland, Oregon, minimum flows are still maintained for pollution abatement and fishery purposes, as listed in the Willamette BiOps issued in July 2008.

Based on the modeling work completed for this project, the proposed action is not expected to impact the ability of the Corps to meet minimum project releases or maintain minimum flows at Salem and Albany

during adequate and abundant water years (as defined in the 2008 NMFS BiOp). During Deficit years, when the demand for M&I water would be most critical, minimum flows are not always met in the current baseline without the proposed action. However, minimum flow requirements out of Dorena are met every year of the Period of Record in June through September in the ResSim analysis, which covers 73 years, including 10 Deficit water years. The baseline analysis models current operations, which include Dorena and Cottage Grove contributing proportional shares of the mainstem targets. Modeling the release of an additional 2 cfs from the Coast Fork Willamette River reservoirs did not change the number of days mainstem minimum flow targets were not met compared to the baseline.

Table 12 below shows the number of days in a water year that minimum tributary and mainstem flows are not met.

Table 12 Summary Water Year Statistics for BiOp Flow Targets

BiOp Flow Targets: Summary for Water Year Statistics

Simulation: CF-499-ac-ft-041513	

Non-Exceedance Values for the Number of Days in a Water Year that Minimum Tribuatary Flows are Not Met	Non-Exceedance Values for 73 Water Years (Conditional formatting compares to Baseline counterpart.)						Median Non-Exceedance Values by Water Year Type							
							Early Imp. Baseline by WY Type				Simulation by WY Type			
	Early Implementation Baseline POR			Simulation POR										
	5%	50%	95%	5%	50%	95%	Abundant	Adequate	Insufficient	Deficit	Abundant	Adequate	Insufficient	Deficit
Cottage Grove	0	1	42	0	1	43	1	0	1	20	1	0	1	20
Dorena	0	0	22	0	0	22	0	0	1	0	0	0	1	0
Hills Creek	0	0	11	0	0	11	0	0	0	0	0	0	0	0
Fall Creek	0	0	2	0	0	2	0	0	0	0	0	0	0	0
Dexter	0	11	82	0	11	82	9	8	22	75	9	8	22	76
Blue River	0	0	10	0	0	10	0	0	0	0	0	0	0	0
Cougar	0	0	25	0	0	25	0	0	0	4	0	0	0	4
Fern Ridge	0	7	28	0	7	28	6	9	2	23	6	9	2	23
Foster	16	61	165	16	60	165	44	66	104	139	44	66	104	140
Big Cliff	0	6	62	0	6	62	2	6	3	34	2	6	3	34
Albany	0	16	55	0	16	55	17	4	1	28	17	3	1	27
Salem	1	23	83	1	22	83	9	42	44	51	9	44	44	51

Non-Exceedance Value Example for Early Imp. Run, Cottage Grove Minimum Tributary Flows:
Minimum tributary flows were met all days of the year for 5% or less of the water years.
Half the time (50%) there was one day or less in a water year that minimum tributary flows were not met.
Almost always (95% of the time), 42 days or less in a water year, minimum tributary flows were not met.

4.4 IRRIGATION

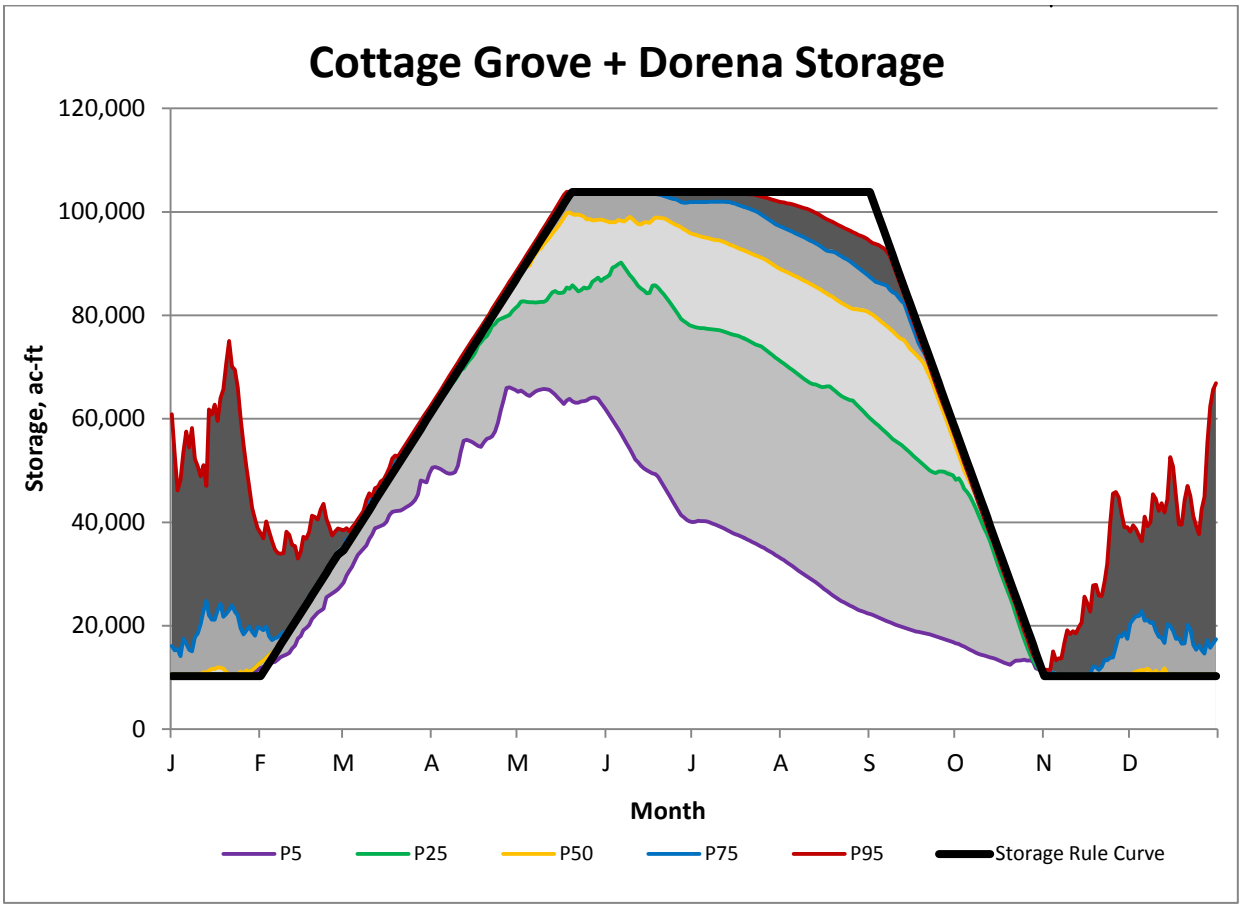
As of January 2014, Reclamation issued irrigation contracts for 72,375 acre-feet of stored water, which is less than 5% of the storage in the basin. At the current low level of use for water service contracts it is not necessary for the Corps to make special operational adjustments, such as increasing flow releases, to meet current contract requirements. Irrigation contracts are generally met with normal dam operations and releases. The exception to this is in the North Santiam and Long Tom basins. An additional 73 cfs above minimum releases is made from Detroit Reservoir on the North Santiam and an unspecified amount of water is released from Fern Ridge to meet a flow target at Monroe on the Long Tom River. As noted in Appendix C, there is no visible change to flows from the reservoirs from using an additional 499 acre-feet from the Coast Fork projects. The small increment of water requested by the City of Creswell would not affect the ability to meet existing irrigation contracts.

4.5 MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Currently, no contracts exist for M&I water supply in the Willamette Valley Project; therefore issuing an agreement for 437 acre-feet of water from the conservation pool would not affect existing operations for M&I water supply.

Current minimum flow requirements at Dorena vary from 100 to 190 cfs, while those from Cottage Grove vary from 50 to 75 cfs, depending on the time of year; therefore withdrawing 2 cfs of stored water from Dorena and Cottage Grove reservoirs combined is a small percentage of outflows. Figure 6 below shows that within the Period of Record analysis, Dorena and Cottage Grove at times dropped to low elevation levels during the conservation season, but always had conservation storage remaining during the requested period of use. The surplus agreement will state that 437 acre-feet of stored water can be supplied to Creswell with 95 percent reliability for the period of June through September, while continuing current operations within the Willamette Project.

Figure 6 Storage Availability at Cottage Grove and Dorena Reservoirs



The State of Oregon has the authority to grant a preference for human consumption uses (e.g., cooking, drinking, and sanitation) and livestock watering uses during a governor declared drought. This could result in modified operations during dry years to ensure adequate storage is maintained through September to meet the municipal demand.

4.6 Recreation

Figure 5 above shows the elevations of the reservoirs for the baseline condition and the with-project condition of releasing additional water to meet M&I purposes downstream of the reservoir. Only the baseline condition elevation is visible since there is no predicted change to reservoir elevations as a result of the City withdrawing 2 cfs of water from the river below the dams. As the proposed action would not measurably decrease the elevation of the conservation pools within the Willamette Project, and specifically Cottage Grove and Dorena reservoirs, recreation would not be affected.

5 SUMMARY OF USER COST

The cost for surplus water from Corps of Engineers' reservoirs is calculated as the highest of three costs: 1) benefits and/or revenues foregone; 2) replacement costs; and 3) updated cost for storage. This cost is for the capital investment cost only.

The methodology for determining the user cost is described in detail in Appendix A, Derivation of User Cost. Based on the cost analysis, the updated cost of storage is the highest of the three costs for the Willamette Valley Project. The updated cost of storage was calculated using the procedure outlined in the Water Supply Handbook (Corps, 1998). The cost from the midpoint of construction was updated to the beginning of FY13. For a contract issued in FY 2014, the updated cost of storage is $2,345 per acre-foot of storage (capital cost only).

The updated cost of storage above is based on system pricing rather than the price for an individual reservoir. On January 28, 1997, the Northwestern District Commander gave the approval for the Portland district to prepare a surplus water supply agreement with the City of Portland. The authority for this approval was delegated down from the Assistant Secretary of the Army for Civil Works (ASA(CW)) on January 10, 1997. The delegation of authority included approval for the system pricing methodology for future surplus water supply agreements. The memos approving system pricing for surplus reports is found in Appendix D.

The annual payment value for surplus M&I water is calculated based on a 30 year repayment period. The capital cost for 437 ac-ft of storage is $1,024,765 (437 x $2345). The annual payment for this water, as calculated in FY 2014 using a finance period of 30 years at an interest rate of 3.125% (EGM 13-01, Federal Interest Rates for Corps of Engineers Projects for Fiscal Year 2014) is $53,131. This interest rate is fixed for the five years of a surplus contract. If the contract is renewed for an additional five years, the interest rate will be updated to the current rate and payment value recalculated.

An annual Operation and Maintenance (O&M) cost is also due every year and is based on the O&M expense for the Willamette Project in the Government fiscal year most recently ended. FY13 O&M costs for the Willamette Project were $13,520,680. The requested amount of storage, 437 acre-feet, is 0.027% of the usable storage, therefore the initial O&M cost would be $3,651 ($13,520,680 * 0.027%). The O&M cost charged to the City of Creswell will be recalculated each year based on the previous year's O&M cost.

Costs for repair, rehabilitation, and replacement (RR&R) are charged to users as they occur and are based on the percentage of usable storage space contracted to the user. The agreement holder is encouraged, but not required, to establish a fund in the event future RR&R costs occur during the agreement period. The user is only required to pay for RR&R costs incurred while the contract is in place.

Table 13 lists the various costs and payments for a surplus water agreement entered into in FY14.

Table 13 Summary of Annual Payment for Surplus Water

Acre-feet of Water	437
Capital Cost of Water	$1,024,765
Repayment Period	30 years
Repayment Rate	3.125%
Annual Payment	$53,131
FY13 O&M Cost*	$3,651
Total Annual Payment*	$56,782
Annual Cost per Acre-foot of Water*	$130
Total Cost for 5 year surplus agreement*	$283,910

*O&M costs are updated annually; therefore these values will vary slightly each year.

6 OTHER CONSIDERATIONS

6.1 YIELD

Purchase of storage from a Corps reservoir requires the determination of a storage-yield relationship for the reservoir, i.e. the amount of storage needed to meet a specified withdrawal. The Corps has determined that a storage-yield relationship will not be calculated for this report because there is very low risk to the government and the City of Creswell of not meeting the requested 2 cfs demand for stored water June – September. Hydrologic and reservoir simulation modeling of the Coast Fork reservoirs demonstrates that, for the existing basin uses, there is storage available to ensure with at least 95% reliability (through the period of record) the water requested, as shown in Figure 6 above. Appendix C of this report contains additional details on the modeling completed for this project. Current minimum flow requirements at Dorena vary from 100 to 190 cfs, while those from Cottage Grove vary from 50 to 75 cfs, depending on the time of year; an additional 2 cfs of water withdrawn from the Coast Fork Willamette River downstream of Dorena and Cottage Grove reservoirs is a small percentage of the outflows. ResSim analysis of current operations indicates that minimum releases from Dorena were satisfied in all 73 years of the Period of Record, although Cottage Grove did not always have sufficient water to meet its minimum flow requirements. Within the Period of Record analysis, Dorena at times dropped to low elevation levels during the conservation season, but always had at least 1700 acre-feet of conservation storage remaining. If the demand cannot be met, the City would curtail water use to all users except that needed for direct human consumption.

The surplus agreement will state that 437 acre-feet of stored water can be supplied to Creswell with 95 percent reliability for the period of June through September, while continuing current operations of the Willamette Project. The City will be required to pay the annual fees regardless of whether or not water is available. In addition, the Corps is not liable for lack of water due to weather conditions.

Future reallocation efforts would require the development of a system yield methodology prior to implementation.

6.2 TEST OF FINANCIAL FEASIBILITY

The purpose of the test of financial feasibility is to demonstrate that water from storage in the Federal project is the most efficient water supply alternative. The capital costs of the other two alternatives (purchasing water from another entity and conservation) are $4,700,000 and $5,000,000 respectively, opposed to the surplus water capital cost of $1,024,765. Table 13 below shows the annual costs for each alternative, assuming a 30 year repayment period for calculations.

Table 14 Cost Comparison of Alternatives

Alternative	Capital Cost (annual payment)	Annual Operations and Maintenance or Fee	Total Annual Cost
Surplus Water	$53,131	$3,651	$56,782
EWEB pipeline	$233,067	$176,548	$409,615
Conservation	$271,857	-	$271,857

Therefore, using 437 acre-feet of storage is the most cost effective source of water for the City of Creswell.

6.3 ENVIRONMENTAL CONSIDERATIONS

6.3.1 National Environmental Policy Act

Under NEPA, federal agencies are required to identify significant environmental resources likely to be affected by proposed activities as well as make an assessment of the impacts to those resources and consider a full range of alternative actions. Environmental considerations are fully integrated into the decision-making process. The analysis of impacts to the environmental baseline in response to the proposed alternatives, and in consideration of pertinent laws and Executive Orders, was addressed the *Environmental Assessment – Coast Fork Willamette River, Oregon Surplus Water Letter Report*, May 2014 (EA).

The EA described the expected impacts, with respect to the overall context and intensity the proposed action would have on each of the above listed resources in the Coast Fork Willamette River watershed. Two alternatives are evaluated in detail: the No Action Alternative and the Proposed Action.

A notice of availability and a request for comments on the draft EA was posted to the Corps' website on 5 May 5, 2014. The draft EA was made available for 15 days, ending on 20 May 2014. Three comment letters were received from state agencies/groups: one from the Oregon Water Resources Department (OWRD), another from the Oregon Water Utilities Council (OWUC), and the third from the Oregon Department of Agriculture (ODA). Two private citizens requested additional information pertaining to the specific location of the City's water intake structure(s). Clarifying language was added to the Introduction, Purpose and Need, Alternatives, Affected Environment and Cumulative Effects sections of the final EA in response to these comments. No new or additional information was provided during the public comment period that suggested a need to change or modify the *Proposed Action*, as described in the draft EA. As a result, the draft EA was finalized and the *Proposed Action* remains the Corps' preferred alternative.

Based on the EA, the Corps determined the Proposed Action will not significantly affect the quality of the human environment and that an Environmental Impact Statement was not required. The Corps signed the Finding of No Significant Impact on 2 June 2014.

6.3.2 Endangered Species Act

The Corps made the determination of *no effect* on species listed as threatened or endangered under the Endangered Species Act and which could be affected by operations of the Corps dams and reservoirs. ESA-listed species within the project area include Upper Willamette River spring Chinook and winter steelhead, Oregon chub, and bull trout. No further coordination with the National Marine Fisheries Service or U.S. Fish and Wildlife Service was required.

6.3.3 Climate Change

The Corps recognizes the impact climate change may have on reservoir operations and in FY13, the Institute for Water Resources (IWR) funded the Corps Portland District to initiate a study incorporating potential climate change into Corps operations in the Willamette Basin. The objective of this pilot study was to be better prepared with operational strategies for flood seasons based on understanding possible climate change impacts. Funding was subsequently pulled but may be reinstated in the future.

6.3.4 Environmental Operating Principles

The USACE Civil Works environmental mission ensures that all Corps projects, facilities and associated lands meet environmental standards.

- Principle 1. Environmental Sustainability – There will be unmeasurable effects to the natural environment.
- Principle 2. Interdependence of life and the physical environment – Use of surplus water will have negligible impacts on the environment and the hydrology downstream of Dorena and Cottage Grove Reservoirs.
- Principle 3. Seek balance and synergy among human development activities and natural systems – Providing needed M&I water supply to the City of Creswell will not impact the natural system while providing a needed resource for human development.
- Principle 4. Continue to accept corporate responsibility and accountability – The surplus agreement complies with all applicable laws.
- Principle 5. Assess and mitigate cumulative impacts to the environment – A surplus agreement, assessed with other Corps projects, does not require any separable ecosystem mitigation.
- Principle 6. Build and share knowledge – Coordination with state and federal agencies resulted in an appropriate use of surplus water from Dorena and Cottage Grove Reservoirs.
- Principle 7. Respect the views of individuals and groups – Input from federal and state agencies and the public were adequately addressed and incorporated through stakeholder meetings.

The USACE Campaign Plan is intended to "guide policy decisions on how [the Corps] organizes, trains, and equips [the Corps] personnel; how [the Corps] plans, prioritizes, and allocates resources; and how [the Corps] responds to emerging requirements and challenges." This letter report and subsequent surplus water agreement with the City of Creswell furthers the Campaign Plan Goals 2a and b, 3b, and 4a and b.

- Goal 2a: Deliver integrated, sustainable, water resources solutions – A surplus agreement will provide water for the City of Creswell, whose alternative sources for additional supplies is severely limited.
- Goal 2b: Implement collaborative approaches to effectively solve water resource problems – The Corps is working with the OWRD to provide water to a municipality in need of immediate water.
- Goal 3b: Improve resilience and lifecycle investment in critical infrastructure – When executed, the agreement establishes repayment of the capital cost of the dam in addition to annual payments of a portion of the O&M costs. This repays the federal government a portion of the annual O&M cost without the need for additional O&M tasks specific to the water supply project.
- Goal 4a: Identify, develop, maintain, and strengthen technical competencies among the USACE workforce – The modeling effort for this project challenged the team members in furthering the development of an existing computer model. Model refinements will be carried forward into other projects using a similar model.
- Goal 4b: Communicate strategically and transparently – The Corps continues to meet with stakeholders and other federal, state and local agencies as this project moves forward. Transparency has been important to maintaining a good working relationship with the parties as well as obtaining needed information for this surplus letter report.

6.4 SUMMARY OF DAM SAFETY CONSIDERATIONS

Corps dams are classified through a risk assessment process into five Dam Safety Action Classifications (DSAC) which represent varying levels of safety risks. DSAC I – Very High Urgency, II – High Urgency, III - Moderate Urgency, IV – Low Urgency, V - Normal. As a result of the Dam Safety program efforts in recent years, the Corps has performed in-depth studies to obtain a better understanding of risks and conditions at its dams. In some cases, new observations were made of symptoms of potentially serious problems. In other cases, the Corps learned original design and construction methods do not meet current safety standards. DSAC ratings are reviewed during routine periodic assessments and during special studies, during which dams are more closely reviewed and assessed.

Based on a recent risk assessment performed for Cottage Grove Dam in 2012, the project was given a DSAC III classification, indicating that the project requires further engineering evaluations to determine if repairs are required. In the interests of public safety, Corps water supply policy does not allow the conservation pool to be raised at projects where dams are classified DSAC I, II or III. Therefore, only storage within the existing conservation pool may be considered for water supply purposes. A risk assessment at Dorena Dam conducted in 2008 resulted in a DSAC IV classification for this project.

Interim and long-range measures may impact the storage in the reservoir for water supply purposes, such that the amount of storage available for water supply could be reduced. Corps water supply storage agreements require non-Federal users to share the costs of remediation measures in proportion to the storage space that has been provided to each user. The City of Creswell was notified of the DSAC for each dam and the potential impacts to water supply, including the City's responsibility to share in the costs of any potential repairs that may occur during the life of the water supply agreement.

The Portland District Dam Safety Officer has reviewed this report and in light of the risk assessments and DSAC classifications, determined the withdrawal of 2 cfs of stored water will not increase the risks to dam safety. The memo is attached in Appendix E.

7 IMPLEMENTATION

7.1 FEDERAL AND NON-FEDERAL RESPONSIBILITIES

Federal Responsibilities

The Corps, Portland District will issue a surplus water agreement for 437 acre-feet of storage in the joint-use conservation pool for water supply to the City of Creswell, valid for five years, with the option to extend for an additional five years. The five year extension will be subject to availability and recalculation of the reimbursement. Collection of the annual OMRRR charge will be conducted in conjunction with the annual capital cost.

Non-Federal Responsibilities

The regulation of the use of water withdrawn or released from the storage space at Dorena and Cottage Grove reservoirs shall be the sole responsibility of the City of Creswell and the OWRD. The City of Creswell will have full responsibility to acquire, in accordance with state laws and regulations, and, if necessary, to establish or defend, any and all water rights needed for utilization of the water provided under this agreement. The City of Creswell will be responsible for the annual payment, which includes an annual charge for O&M based on the previous FY actual O&M expenses, and any RR&R that occurs during the period of the agreement. The City will also be required to maintain an accurate record of the water withdrawn from the Project per Article 2 of the agreement. Estimates of need and records of the quantity of water actually withdrawn must be submitted to the Corps on a weekly basis.

The City of Creswell will need to pursue a water use permit application from the state to use stored water. OWRD will then process this application.

7.2 AGENCY COORDINATION

Stakeholder meetings have been conducted regularly to continue the on-going dialogue about the Willamette Basin Review and keep interested parties updated on related activities. Federal, state, and local governmental agencies have been invited to participate, including representatives from the Corps and OWRD, Reclamation, NOAA fisheries (NMFS), ODFW, the Oregon Department of Agriculture, and the Cities of Salem, Hillsboro, Creswell, Eugene, McMinnville. The Oregon congressional delegation has also been invited to stakeholder meetings. In addition, watershed councils, water control districts and other non-governmental entities invited to participate include the Oregon Water Utilities Council, Oregon Water Resources Congress, Oregon Association of Nurseries, Oregon Farm Bureau, Santiam Water Control District, Tualatin Valley Water District, The Nature Conservancy and WaterWatch.

The final draft Report was provided for a 28 day public review on December 28, 2013. The report was posted on the Corps and OWRD websites and an email indicating its availability sent to the Willamette Stakeholders group, which includes local, state, and federal agencies, agricultural interest groups, municipalities and associations, and federal congressional representatives. Two comment letters were received through this public review. The letters and Corps responses are included in Appendix F of this report. An Agency Technical Review was completed in January 2014 in conjunction with a second District Quality Control review.

7.3 PROPOSED AGREEMENTS

The draft agreement is provided in Appendix H. ER 1105-2-100 delegates authority to approve surplus water supply agreements and letter reports to the Division for volumes under 499 acre-feet. This ER also requires that the first storage agreement on any project will be approved by the Army for Civil Works

(ASA(CW)). Since this is the first M&I water agreement in the Willamette Valley Project, the documents will be sent to the ASA(CW) for approval.

7.4 REAL ESTATE CONSIDERATIONS

A real estate plan and easement are not required as surplus water would be withdrawn at the City of Creswell's existing intake structure on the Coast Fork Willamette River, downstream of the two Corps dams and not on Corps lands.

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 FINDINGS

The City of Creswell requested up to 437 acre-feet of storage from Dorena and Cottage Grove Reservoirs, combined. These reservoirs are part of the Willamette Valley Project, a system of 11 dams and reservoirs and 2 reregulating dams in the Willamette Valley of Oregon. The Corps determined there is surplus water available to meet the City's request for 437 acre-feet of water, to be released between June and September.

8.2 RECOMMENDATIONS OF DISTRICT ENGINEER

Based on the findings of this report and pursuant to Section 6 of the Flood Control Act of 1944, it is recommended to issue the City of Creswell a surplus water agreement for 437 acre-feet of surplus water at Dorena and Cottage Grove Reservoirs, combined, to satisfy current water demands for the City of Creswell.

9 REFERENCES

Cottage Grove Historical Society. 2012. Website accessed at: *http://cottagegrovehistoricalsociety.com/*.

Dykaar, B.B. July 2005. Status and trends of Middle and Coast Forks Willamette River and their floodplain habitat using geomorphic indicators. Prepared for Willamette Partnership and U.S. Army Corps of Engineers by Ecohydrology West, Santa Cruz CA.

EC 1110-2-210, Water Supply Storage and Risk Reduction Measures for Dam Safety.

ER 1105-2-100, The Planning Guidance Notebook.

Flood Control Act of 1938 and 1941.

Flood Control Act of 1944 (Public Law 79-534)

Heritage Research Associates. 2012. Archaeological Survey of the Nature Conservancy's Willamette Confluence Preserve, Lane County, Oregon. Heritage Research Associates Report No. 369.

Hulse, D., S. Gregory and J. Baker (eds.). 2002. *Willamette River Basin Planning Atlas, Trajectories of environmental and ecological change*. 2nd Edition. Prepared by the Pacific Northwest Ecosystem Research Consortium. Oregon State University Press, Corvallis.

GSI Water Solutions, Inc., CH2M HILL, and HDR Inc. 2010. City of Corvallis, Water Use and Water Conservation Project, August 2010.

Jones, Philip. 2005. Lower Coast Fork Willamette River Watershed Assessment. Final Report, June 2005. Prepared for Coast Fork Willamette Watershed Council.

Lane Council of Governments. 2013. City of Creswell Community Water Profile, June 2013.

Lane County. 2005. Report on Lane County Coordinated Population Forecast 2025-2030

National Environmental Policy Act of 1970.

National Marine Fisheries Service (NMFS). 2008. Endangered Species Act Section 7(a)(2) Consultation Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation on the Willamette River Basin Flood Control Project. July 11, 2008. NOAA Fisheries Log Number: F/NWR/2000/02117.

Northwest Power and Conservation Council (NPCC). May 28, 2004a. Draft Willamette Subbasin Plan. Prepared for the Northwest Power and Conservation Council by the Willamette Restoration Initiative.

Oregon State Marine Board. 2008. Triennial Survey Results.

Oregon Water Resources Department. 2009. Water Rights in Oregon. An Introduction to Oregon's Water Laws. http://www.oregon.gov/owrd/pages/pubs/aquabook_laws.aspx

Oregon Water Supply and Conservation Initiative (OWSCI). November 2008. Southern Willamette Valley Municipal Water Providers Final Report.

Permanent Rights to Storage Act of 1963.

Southwood Engineering Corporation. 2012. City of Creswell Water System Analysis, April 2012.

Southwood Engineering Corporation. 2004. City of Creswell Water System Master Plan, July 2004.

U.S. Army Corps of Engineers (USACE). 1982. Willamette River projects: hydrologic and temperature effects, preliminary literature review and data analysis. Portland District, Portland OR.

USACE. 1998. Water Supply Handbook, A Handbook on Water Supply Planning and Resource Management. Prepared by T.M. Hillyer with G.A. Hofbauer. Revised IWR Report 96-PS-4. Water Resources Support Center, Institute for Water Resources, Alexandria, VA.

USACE. 2000. Biological Assessment of the Effects of the Willamette River Basin Flood Control Project on Species Listed under the Endangered Species Act. Prepared by U.S. Army Corps of Engineers, Portland, OR and R2 Resource Consultants, Seattle, WA.

USACE, Bonneville Power Administration, and U.S. Bureau of Reclamation. 2007. Supplemental Biological Assessment of the Effects of the Willamette River Basin Flood Control Project on Species Listed under the Endangered Species Act. Portland, OR.

USACE. 2009. Willamette Valley Projects Configuration/Operation Plan (COP), Final Phase I Report. Portland, OR.

USFWS. 2008. Endangered Species Act Section 7 Consultation Biological Opinion on the Continued Operation and Maintenance of the Willamette River Basin Project and Effects to Oregon Chub, Bull Trout, and Bull Trout Critical Habitat Designated Under the Endangered Species Act. July 11, 2008. File number: 8330.F0224(07).

Water Resources Development Act of 1986.

Water Supply Act of 1958.

Appendix A
DERIVATION OF USER COST

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A.1. INTRODUCTION

Users of surplus water are required to reimburse the federal government during the period of use of the water. The purpose of this appendix is to determine the methodology and price charged for surplus water from the Willamette Valley Project (Willamette Project). Per ER 1105-2-100, the cost of surplus water is determined using the methodology used to calculate the price of reallocated storage. This cost is the highest of the benefits or revenues foregone, replacement cost, or the updated cost of storage in the federal project. In addition to this charge is an estimated annual charge of operation and maintenance (O&M), repair, replacement, and rehabilitation (RR&R). Section A.1 describes the baseline condition and the basis for determining the economic benefits and revenues provided by the Willamette Project. The charge for O&M and RR&R is identified in Chapter 5 of the main report. Section A.2 shows how the per-unit charge was derived.

The Willamette Project is a system of eleven storage and two re-regulating dams and reservoirs operated as a system for the primary authorized purpose of flood damage reduction and to meet flow targets at Albany and Salem. Conservation storage is provided in the reservoirs during the non-flood season and stored water can be used to support the secondary authorized purposes of navigation, hydroelectric power, irrigation, water supply, pollution abatement (flow augmentation), fish conservation, and public recreation.

System-wide impacts were assessed because the Corps will charge a system price for the storage, not the cost associated with an individual reservoir. System pricing was approved by the Assistant Secretary of the Army for Civil Works (ASA(CW)) for surplus agreements in January 1997. Memos stating the approval of system pricing for surplus agreements are included in Appendix D of this report. Using a system price reflects the reality of operating the projects as a system and maintains operational flexibility in meeting the authorized purposes.

Modeling results of the 437 acre-feet of surplus water demand demonstrate there would be no measurable change in the elevations of the reservoirs. Therefore, loss of hydropower revenue and recreation benefits from using 437 acre-feet of surplus water is insignificant. Actual costs charged to the user (as listed in Chapter 5) are based on the use of 437 acre-feet of surplus water using the per-acre-foot unit cost calculated below. The 2050 demands used in calculations contained in this appendix are based on the 2000 Interim Report and were completed as a sensitivity analysis to illustrate the updated cost of storage is the highest of the cost methods even when impacts to hydropower and recreation are at their maximum due to use of water for M&I purposes.

A.1.1. Base Condition

The base condition incorporates continued operation and management of the hydropower and recreation resources of the Willamette Project and the downstream reaches as currently practiced, whether it is by Federal, State, or County resource management agencies.

No new federal hydropower projects are expected to be constructed at any facility within the Willamette Project. Dorena Hydro LLC is constructing a privately-owned hydropower facility at Dorena Dam. The project will have a total capacity of 8 mW (but an operational maximum of 5 mW) and is expected to be online by spring 2014.

No major recreation improvements are planned by the Corps at any facility within the Willamette Project. Small work items planned include upgrading items to meet universal accessible standards; new bicycle and hiking trails; fish and wildlife habitat work; new road surfaces; erosion control; landscaping; weed

control; new signs, fences, and gates; and other maintenance projects. These changes are anticipated to increase visitation by less than 5 percent in the foreseeable future. Lane County, Linn County, Oregon State Parks and Recreation Department (OPRD), and the U.S. Forest Service will continue to maintain their respective recreation areas associated with the Corps lakes.

Lane County anticipates some recreation improvements at Dorena, Fern Ridge and Fall Creek Reservoirs. Plans for Baker Bay Park at Dorena Lake include enlarging the marina, developing a group picnic area and constructing a 25 unit campground. For Richardson Park at Fern Ridge Lake, a group picnic area, 40 more camping spaces, and a wetland interpretative center are planned. Redevelopment of the day use area at Zumwalt Park is also planned. At Winberry Park on Fall Creek Lake, a group picnic area and a 40 unit campground are planned. Linn County may expand some campgrounds at Green Peter and Foster lakes.

Facility improvements are planned by OPRD at Champoeg State Heritage Area, Spring Valley Access, Willamette Mission State Park, Bowers Rock State Park, and Marshall Island Access, all located on the mainsteam Willamette River. Some minor improvements are also planned at Detroit Lake State Recreation Area on the North Santiam River, and at Pengra Access on the Middle Fork Willamette River.

The type of recreation activities pursued at the Willamette Project facilities is anticipated to remain similar to the existing mix of activities. It is expected that increases in the amount of recreation use will remain a function of summer weather conditions and population in the basin. Prolonged periods of hot, dry summer weather or prolonged periods of unsuitable summer weather conditions could be expected to affect recreation use of the Willamette Project reservoirs by 10 percent or so. Also, those lakes located closest to the basin's population centers can be expected to remain the most heavily used for recreation activities.

A.1.2. Valuation Methodology

Determining the benefits provided by the Willamette Project as a whole involves calculating the benefits of the individual project purposes. The subsections below describe the methodology for the calculation of those benefits, or in certain cases why the benefit was not calculated.

A.1.2.1. Hydropower

The Hydropower Analysis Center (HAC) determined the hydropower benefits and economic analysis associated with using the full (2050) projected M&I demand of 207,828 acre-feet of stored water from the Willamette Project. The full analysis is detailed in Appendix B, Hydropower Analysis.

Analysis of hydropower impacts due to use of reservoir storage to meet water supply requirements included the computation of the following values:

- power benefits foregone
- replacement cost (assumed to be the same as benefits foregone)
- revenues foregone
- credit to the Federal power marketing agency
- power generation emissions avoided

In consultation with BPA, the hydropower impact of reservoir storage reallocation for meeting all M&I requirements in the Willamette River basin through 2050 was based on the computed benefits foregone. Revenue foregone and cost of replacement power was assumed to be equal to benefits foregone and no credits will be considered because the magnitude of the impact to hydropower generation of the hydropower projects in the Willamette Project is insignificant.

A.1.2.2. Recreation

Water based recreation and water quality improvements exhibit benefits of a public or collective nature, in that once they are provided, consumers cannot readily be excluded from using them. Demands by recreationists for amply filled reservoirs are increasingly competitive with flood management, releases for instream flows for water quality, fish and wildlife, navigation, downstream recreation, crop irrigation, and other uses. Thus, recreational values of water are useful in assessing tradeoffs in reservoir management. Although research indicates there are a multitude of means to value water related public goods, such as recreation, the Corps recognizes three techniques for valuing recreation benefits.

The basis for recreation valuation associated with water and related land resource planning includes an estimate for National Economic Development (NED)[4] benefits that includes 1) estimating the value of the projected recreational use that would occur with the plan (alternative) and also that would be diminished by the plan; 2) taking into explicit account the competition from other recreational opportunities within the area of influence of the proposed plan; 3) estimating future recreational use and value, on the basis of socio-economic variables over the entire life of the project under both the with and without project conditions; 4) calculating benefits as the difference between the with-plan and without-plan value of recreational opportunities within the market of the project.

Unit day, travel cost, and contingent value are three methods to estimate recreational demand and value and have been applied to a variety of recreational goods. These techniques are described in ER1105-2-100 (Planning Guidance (P&G) Notebook) and are the basis for estimating the NED net benefits.

Both the travel cost and contingent value methods determine the value of a recreational site by attempting to approximate the price-quantity demanded relationship. This means both methods can simultaneously estimate use as well as the willingness to pay for that use. Unit Day Values apply a price to an expected visitation use of a project.

A.1.2.3. Water Quality Improvements

Estimating the economic benefits of water quality improvements is among the most frequently encountered but most difficult tasks of water valuation. Benefits may be received by both users and nonusers. Users can be offstream producers, offstream consumers, and public good beneficiaries, such as recreational water users, municipal and industrial users, and agricultural interests.

Increasing downstream flows for M&I purposes can have the added benefit of reducing concentrated pollutants (dilution). This scenario depends on distance and time from the point of discharge, temperature, rates of flow, and the quality of the receiving waters. No models were used within this report to forecast the effects of changes in discharges on downstream pollutant concentrations.

[4] The National Economic Development (NED) value is the change in the net value of the national output of goods and services, expressed in monetary units, following project implementation.

Furthermore, due to the public nature of water quality and the difficulty of assigning a value for water quality improvements or declines, no further analysis was conducted.

A.1.2.4. Navigation

Very little navigation activity exists within the Willamette River Basin. Conflict between water released for water borne transportation purposes and for competing purposes such as hydropower, recreation, and flood risk management is minimal. Therefore no further analysis was conducted or considered when determining the system price for storage.

A.1.2.5. Flood Risk Management

Use of storage will not affect flood damage reduction operations; therefore, no further discussion is required.

A.1.2.6. Irrigation

The U.S. Bureau of Reclamation administers the water service contracts for irrigators using conservation storage from the Willamette Valley Project. The cost per acre-foot of this storage is based on the original cost of the projects with no escalation of original costs to current price levels or interest, plus an administrative fee. Reclamation assesses a minimum charge, which is the greater of $2 per acre of irrigated land or $50, and once the minimum is met, a rate of $8 per acre-ft. Because the volume of water required for irrigation, and its associated reservoir storage, does not change when comparing the "with and without project conditions," no valuation for irrigation is presented within this analysis when determining the benefits and revenues foregone.

A.1.2.7. Fish and Wildlife

In many environmental evaluation problems, such as valuing improved conditions for threatened and endangered species within the Willamette River, economic value measures cannot be derived from individual market decisions. Some goods and services provided by public policy or the environment contribute to satisfying consumer preferences but are unable to be valued via market transactions. When a policy is potential rather than actual, or when nonuse (or passive use) values are involved, market transactions are difficult to identify.

Unlike *revealed preference* methods, which require some sort of natural market experiment to provide data (such as the travel cost method for recreation), citizens of the community can be questioned directly for preferences regarding proposed environmental policy (*expressed preference*). A sample of respondents are presented a description of conditions simulating a hypothetical market in which they are asked to express their willingness to pay (WTP) for existing or potential environmental conditions not observed in the market place. The most common form of questioning to ascertain individual valuations of hypothetical future events is called the Contingent Valuation Method (CVM).

The general approach is well documented in the P&G Notebook and the available NED manuals. No known studies have been found to document the tradeoffs between allocating water for fish habitat restoration purposes and municipal and industrial water storage within the Willamette Basin reservoirs. Due to the public nature of protecting endangered species, no value estimate will be derived for improved conditions for threatened and endangered species within the Willamette River, as economic value

measures cannot be derived from individual market decisions. Baseline hydraulic models included releases for fish purposes; therefore changes from the baseline for M&I purposes also included water volumes for fish flows.

A.2. DERIVATION OF USER COST

A.2.1. Benefits/Revenues Foregone

A.2.1.1. Recreation

The Willamette Project reservoirs do not contain specialized recreation activities; rather all reservoirs within the system support general recreation activities, such as water skiing, fishing, photography, picnicking, boating, and camping, among other general recreational activities that involve relatively easy access to recreation facilities. The Corps decided to conduct a sensitivity analysis on recreation benefits to determine if benefits foregone would be relatively close in cost the updated cost of storage. If the total value of recreation provided for at all the Corps reservoirs in the Willamette Valley was significantly less than the updated cost of storage, no further calculations would be needed. Recreational benefits foregone were calculated using the Unit Day Values method, using the highest unit day value as provided in the Economic Guidance Memorandum, 13-03, titled Unit Day Values for Recreation for Fiscal Year 2013 ($11.39) for the economic evaluation purposes. An estimate of total recreation days for general recreation was derived using visitation data from OMBIL and VERS database employing 2012 data for the period May 1st through August 31st, which amounted to 1,539,439 total visits per year for all 11 reservoirs. Data was obtained for all day use areas and campgrounds, regardless of which federal, state or local agency managed the recreational facility associated with the reservoirs. To calculate the maximum value of the recreational benefits provided by the Willamette Project reservoirs, $11.39 was multiplied by 1,539,439 visitors, for a total of $17,534,210 per year when all conservation pools are full and usable for recreational purposes.

For purposes of this analysis it is assumed all recreational opportunities would be foregone should water within the system of reservoirs be used exclusively for Municipal and Industrial purposes. The value for annual recreational benefits foregone (dollars per year) is therefore considered to be $17,534,210.

A.2.1.2. Hydropower

Hydropower impacts were assessed by BPA and the Corps Hydropower Analysis Center (HAC) and are summarized in Appendix B. The HAC determined that regulating the Willamette Project to supply the full 2050 projected demand for M&I stored water supply does not incur any capacity losses; therefore, there are no capacity benefits foregone. Because there is no capacity loss, the hydropower benefits foregone are equal to the energy foregone which is about $380,000 ($1.83 per acre foot).

A.2.1.3. Total Benefits/Revenues Foregone

The total for the average annual benefits/revenues foregone is the sum of the values calculated above for recreation and hydropower and is listed in Table A.1 below.

Table A-1 Total Annual Benefits/Revenues Foregone

Recreation	$17,534,210
Hydropower	$380,000
Total	$17,914,210

A.2.2. Replacement Cost

ER 1105-2-100 requires the estimate of replacement costs when water is being reallocated from either the flood control pool or from hydropower. None of the proposed surplus water supply is from flood control or hydropower, therefore, no replacement cost for equivalent protection is presented in the economic analysis.

A.2.3. Updated Cost of Construction

The updated cost of storage for M&I water supply was determined by first computing the joint-use costs at the time of construction by subtracting the specific costs from the total construction cost and multiplying the result by the ratio of storage (ac-ft) to total usable storage space (ac-ft). In this computation, usable storage did not include space set aside for sediment distribution or for hydropower head. The cost allocated to the storage on this basis was escalated to present day price levels by use of the Corps of Engineers Civil Works Construction Cost Index System (CWCCIS). This index is maintained in EM 110-2-1304 (value for the following calculations is 7.527288). Since the CWCCIS dates back only to 1967, the ENR Construction Cost Index was used to update the cost of older projects to the 1967 time frame. Costs were indexed from the midpoint of the physical construction period to the beginning of the fiscal year in which the project became operational. In this manner, interest during construction was not used in this updating procedure Table A.2 below lists the variables used in calculating the updated cost of storage for the eleven storage projects and the updated cost of construction and price per acre-foot of storage for each project.

The updated cost of construction was calculated using the following formula:

Updated Cost of Construction = Initial Construction Cost * ENR Factor * CWCCIS Index Factor

The results in Table A.2 show the updated cost of storage ranges from $761 to $5,430. The eleven storage projects are operated as a system to meet multiple operational requirements during the conservation season and flood season, including existing irrigation contracts, fish and wildlife flows, and water quality objectives. Since the projects are operated as a system, the Corps determined a single system price is the preferred cost to charge M&I users. The system price was calculated by dividing the "Indexed FY2014 Construction Costs" ($3,933,623,762) by the "Total Usable Storage" (1,677,551) in order to derive a per-acre foot cost value that is equivalent to performing a weighted average for each reservoir based on its "Total Usable Storage." (Total Usable storage is the sum of the conservation storage and summer flood control storage, i.e. the storage between the minimum conservation pool elevation and full pool elevation.).

Table A-2 Determination of Updated Cost of Storage

WILLAMETTE RIVER BASIN PROJECT - TOTAL USABLE STORAGE
COST/ACRE-FOOT ADJUSTED TO CURRENT PRICE LEVELS
Updated to FY 2014

Project	Total Storage Full Pool (Acre-feet)	Total Exempt Storage * (Acre-feet)	Total Usable Storage (Acre-feet)	Beg Const. Period	End Const. Period	Mid-point of Const.	Annual Ave. ENR Index Const. (Mid of Const.)	ENR factor to 1967 price level	Initial Const. Cost** (Joint-Use)	Updated Construction Cost to 1967 (Joint Use)	Indexed FY 2014 *** Const. Cost (Joint-Use)	Cost per acre-foot of usable storage
Blue River	89,500	3,971	85,529	May-63	Oct-68	Jan-66	1019	1.0540	$29,381,230	30,967,067	$233,098,040	$2,725
Cottage Grove	32,900	3,139	29,761	Aug-40	Sep-42	Aug-41	258	4.1628	2,276,000	9,474,512	71,317,381	2,396
Cougar	200,000	52,200	147,800	Jun-56	Nov-63	Feb-60	824	1.3034	49,262,900	64,209,168	$483,320,921	3,270
Detroit	455,100	154,400	300,700	May-47	Oct-53	Jul-50	510	2.1059	41,405,200	87,194,480	$656,337,990	2,183
Dorena	77,600	7,094	70,506	Jun-41	Nov-49	Aug-45	308	3.4870	13,306,000	46,398,195	$349,252,590	4,954
Fall Creek	123,162	9,505	113,657	May-62	Oct-65	Jan-64	936	1.1474	20,099,700	23,063,117	$173,602,733	1,527
Fern Ridge	97,300	2,802	94,498	Apr-40	Dec-41	Jan-41	258	4.1628	2,296,000	9,557,767	$71,944,071	761
Foster	60,800	31,100	29,700	Jun-61	Jun-67	May-64	936	1.1474	18,673,300	21,426,415	$161,282,801	5,430
Green Peter	428,100	159,900	268,200	Jun-61	Jun-67	May-64	936	1.1474	47,734,500	54,772,279	$412,286,734	1,537
Hills Creek	355,600	155,400	200,200	May-56	Nov-61	Jan-59	797	1.3476	39,168,300	52,781,373	$397,300,611	1,985
Lookout Point	455,800	118,800	337,000	May-47	Dec-54	Feb-51	543	1.9779	62,054,390	122,737,412	$923,879,889	2,741
Total	**2,375,862**	**698,311**	**1,677,551**						**$325,657,520**		**$3,933,623,762**	

* Dead or inactive storage + storage for hydropower head.
** Cost data obtained from original cost allocation reports for each project.
*** CWCCIS Index applied 1967 - Sept 2013.
Storage Data obtained from current (2013) rating tables.

Initial cost per acre-foot of Usable Storage **$194**
Updated (FY14) cost per acre-foot of Usable Storage **$2,345**

These values assume a system pricing methodology and are not simply an average of the individual project's per acre cost.

Using this system approach, the cost per acre-foot is $2,345 based on FY14 interest rates. The value of the full 2050 M&I demand using the updated cost of storage method was calculated using a standard amortization function using the principle amount of $487,327,753 (total acre feet of water required for M&I purposes (207,828 acre-ft) multiplied by the per ac-ft updated cost of storage ($2,345), Federal discount rate of 3.50%, and a 50 year payment period (the Corps uses 50 years as the standard time period for determining benefits of a project)). The calculation derives an annual revenue value of $20,776,590.

A.2.4. Selected Method for Determining User Cost

The price for water supply storage in the Willamette Valley Project reservoirs is established as the highest of three different economic evaluations: 1) benefits and/or revenues foregone; 2) replacement costs; and 3) updated cost for storage.

The total benefits/revenues foregone and value of the full 2050 M&I demand using the updated cost of storage are listed in Table A.3 below. Comparing the value of the demand (using updated cost of storage) to the annual benefits/revenues foregone, the updated cost for storage exceeds the other means to calculate the cost for water storage; therefore, the cost allocated to the non-Federal sponsor (i.e., the price to be charged for the capital investment for the reallocated storage) will be established by the updated cost of storage per ER 1105-2-100, Appendix E, Section E-57, page E-216, paragraph d(2).

Table A-3 Economic Criteria

Economic Criteria	Value
Total Benefits/Revenues Foregone	$17,914,210
Replacement Costs	N/A
Updated Cost of Storage	$20,776,590

Appendix B
HYDROELECTRIC POWER

B.1. INTRODUCTION

B.1.1. Purpose and Scope

This report, prepared by the Hydropower Analysis Center (HAC) for the Portland District (NWP), Corps of Engineers, presents details of the hydropower economic analysis associated with the Willamette Basin Review under which reservoir storage is to be used for the purpose of municipal and industrial (M&I) water supply. The purpose for the analysis of hydropower impacts is to support the benefit analysis to determine the price to be charged for the use of surplus water for municipal and industrial water supply and determine if any credits may be due to the hydropower users who may be impacted by use of the water for M&I purposes. This report summarizes the hydropower impact of meeting the projected municipal and industrial water supply requirements for the Willamette River basin in the year 2050.

Modeling results of the 437 acre-feet of surplus water demand demonstrate there would be no measurable change in the elevations of the reservoirs. Therefore, no loss of hydropower revenue or capacity would occur from using 437 acre-feet of surplus water. The 2050 demands used in calculations contained in this appendix are based on the 2000 Interim Report and were completed as a sensitivity analysis to illustrate the updated cost of storage is the highest of the cost methods even when impacts to hydropower and recreation are at their maximum due to use of water for M&I purposes.

B.1.2. Project Description

The Willamette River system consists of thirteen Corps projects: Detroit & Big Cliff, Green Peter & Foster; Cougar, Blue River; Hills Creek, Lookout Point & Dexter, Fall Creek; Dorena and Cottage Grove; and Fern Ridge. The projects are multi-purpose reservoirs authorized for the primary purposes of flood control, navigation, irrigation, water supply, and hydroelectric power generation. Other authorized purposes are recreation, water quality improvement, and fish and wildlife. A map of the Willamette River Basin is shown in Figure B-1. Hydropower impacts were computed only for those projects that generate hydropower.

The reservoir system is operated to maintain seasonally defined flood control storage space. Downstream river flow criteria have been established at downstream control points to achieve project benefits. The regulating discharge criteria are supplied for all stream control points (including reservoir outflow controls) as a seasonal function of a system state parameter. Runoff forecasts and these criteria are used by a system model which iteratively computes reservoir discharges and balances the remaining reservoir storage without exceeding downstream control point criteria. Consequently, the use of storage from Willamette River Basin reservoirs for increased water supply demands has impacts to the system of hydropower projects.

The relevant hydropower project economic analysis parameters are shown in Table B-1.

Figure B-1 The Willamette River System

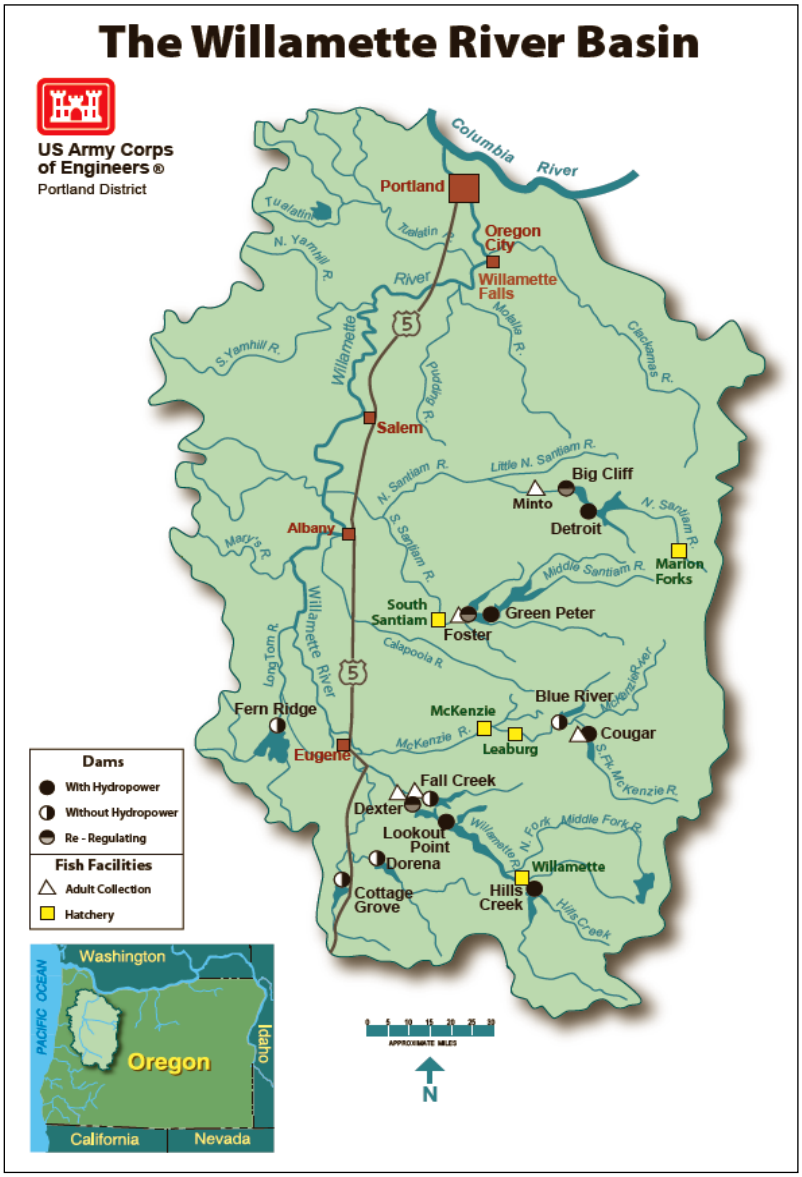

Table B-1 Pertinent Study Data Hydropower and Economic Parameters

	Power			Economic Factors		
Power Project	**Rated Capacity (MW)**	**Power-on-Line (POL)**	**Project Age (years) As of (15-Apr-13)**	**Remaining Economic Life of 50-years**	**Economic Analysis Period (years)**	**Federal Interest Rate**
Big Cliff	18	12-Jun-54	59	-9	50	3.75%
Cougar	25	24-Mar-64	49	1	50	3.75%
Detroit	100	26-Jun-53	60	-10	50	3.75%
Dexter	15	19-May-55	58	-8	50	3.75%
Foster	20	22-Aug-68	45	5	50	3.75%
Green Peter	80	9-Jun-67	46	4	50	3.75%
Hills Creek	30	2-May-62	51	-1	50	3.75%
Lookout Point	120	16-Feb-55	58	-8	50	3.75%

B.1.3. Alternatives Considered

The U.S. Army Corps of Engineers, Portland District (NWP) requested the Hydropower Analysis Center (HAC) evaluate the following alternative use of reservoir storage:

Base Case – Early Implementation – This Base Case is described in Appendix C.

Meets All M&I (2050) – Water Supply Diversions indentified by the sponsor as projected requirements in the year 2050; described in Appendix C.

The difference in hydropower generation between these two alternatives represents the impact of full development of M&I water supply requirements in the Willamette Basin served by the USACE system of reservoirs over this period.

B.1.4. Assumptions

The following were assumed as part of this analysis:

- Evaluate energy benefits foregone based upon M&I water supply withdrawal requirement in 2050.
- Water supply withdrawals are considered a consumptive use.
- Water supply withdrawal rates and return rates are specified seasonally and listed in the hydrologic analyses in Appendix C.
- The most likely, least costly type of thermal generation plant to replace the Willamette River Basin generation is a combined-cycle (highly efficient) natural gas-fired combustion turbine generating station.
- Interest rate used is the FY13 federal interest rate of 3.75%.
- Period of analysis for this study is 50 years.
- Prices used in determining the energy and capacity unit-values are based on October 2013 price levels, which are assumed to apply over the entire period of analysis.

- Note, totals presented in tables below may not sum due to rounding.

B.2. HYDROPOWER ANALYSIS

The price for the reservoir storage used for M&I water supply must be determined, as well as the economic and environmental impact on hydropower. Procedures for computing the cost of storage reallocation addressed in this study are outlined in ER 1105-2-100, *Planning Guidance Notebook* (22 April 2000), Appendix E, paragraph E-57, d(2).

Analysis of hydropower impacts involved computation of the following values:

- power benefits foregone
- power revenues foregone
- replacement cost of power
- credit to the Federal power marketing agency
- power generation emissions avoided

The following paragraphs briefly describe each of these values. The hydropower impact analysis will be limited to calculation of power benefits foregone and emissions avoided, for reasons explained below in Section B.2.1.

B.2.1. Power Benefits Foregone

Hydropower benefits are normally based on the cost of the most likely alternative thermal source of power. The power benefits foregone can be divided into two components, energy value and capacity value. In the case of water supply withdrawals, there is usually a loss of energy benefits, which are based on the loss in generation as a result of water being diverted from the reservoir for water supply rather than passing through the hydropower plant. The energy value is equal to the incremental cost, primarily fuel, of the alternate source that replaces the lost hydropower generation.

Increases in demand for stored water could result in lower reservoir elevations later in the conservation season. This would result in a lower head in the reservoir, decreasing the dependable capacity for power generation and thus causing a loss in capacity benefits. The capacity value represents the capital cost, and fixed operation and maintenance costs, of the alternate energy source.

B.2.2. Revenue Foregone

The second power-related cost is the revenue foregone. Marketing of power is not performed by the Corps, but rather by the Federal power marketing agencies (PMA). The revenue foregone is the value of the lost hydropower based on the PMA's current energy rates, ER 1105-2-100, *Planning Guidance Notebook* (22 April 2000), Appendix E, paragraph E-57, d(2)(b).

B.2.3. Cost of Replacement Power

Cost of replacement power is a National Economic Development (NED) cost similar to power benefits foregone, and is therefore a redundant value in the case of hydropower. NED power benefits foregone are based on the cost of the most likely alternative, which is the cost of replacement power, ER 1105-2-100, *Planning Guidance Notebook* (22 April 2000), Appendix E, paragraph E-57, d(2)(c).

B.2.4. Credit to Power Marketing Agency

Project costs originally allocated to hydropower are being repaid through power revenues which are based on rates designed by the Federal power marketing agency (PMA) to recover allocated costs. ER 1105-2-100 (22 April 2002), *Planning Guidance Notebook*, Appendix E-57d(3) states that: "If hydropower revenues are being reduced as a result of the reallocation, the power marketing agency will be credited for the amount of revenues to the Treasury foregone as a result of the reallocation assuming uniform annual repayment."

B.2.5. Emissions Avoided

One of the benefits of hydropower generation is that it is a relatively clean resource that results in few air emissions. A reduction in hydropower generation may require increased generation from thermal plants, resulting in increased emissions.

B.2.6. Scope of Analysis

The generation of the Federal Columbia River Power System (FCRPS) is about 8,721 aMW. USACE Northwestern Division Projects within the FCRPS generate about 6,026 aMW, while the Portland District's Willamette Basin Projects generate about 188 aMW. This study determines that the hydropower impact of meeting the M&I Water Supply requirements in 2050 is about 1 aMW annually, which is about 0.5% of the generation of the Willamette Basin Projects and 0.01% of the FCRPS generation. Impacts of this magnitude are within the commonly accepted error of estimate for modeling of the power system, and therefore are considered negligible. In addition, the impacts will accrue to this level gradually over the period from the present until 2050.

In consultation with BPA Staff, the hydropower impact of using reservoir storage to meet M&I requirements in the Willamette River Basin through 2050 will be based on the computed power benefits foregone. Revenue foregone and cost of replacement power will be assumed to be equal to benefits foregone and no credits will be considered because the magnitude of the impact to hydropower generation of the Willamette River Basin projects is insignificant. In addition, the emissions avoided will be computed.

B.3. POWER BENEFITS FOREGONE

Power benefits foregone include both energy and capacity benefits foregone, which are computed by applying unit values to the potential loss in generation and loss in capacity at the eight hydropower projects in the Willamette River Basin. The On-Peak and Flat energy price (unit value) is the unit cost of producing replacement energy in the regional power system based on the forward market price forecast in the Mid-C (mid-Columbia), the largest and most liquid market hub for electricity in the Pacific Northwest. This energy unit value is applied to the loss in generation to determine the energy benefit foregone.

The capacity unit value is the cost of equivalent thermal capacity which would replace the lost capacity, and is used to determine the capacity benefit foregone. This capacity unit cost is based on the most likely, least costly, type of thermal generation plant that would replace the Willamette River Basin hydropower generation. This replacement thermal generating resource has been determined in the 6th Northwest Conservation and Electric Power Plan prepared by the Northwest Power and Conservation Council to be a combined-cycle (highly efficient) natural gas-fired combustion turbine generation station.

B.3.1. Energy Benefits

Calculation of the hydropower energy benefits involves the following steps:

- Run the ResSim model to obtain daily power plant discharges for each alternative.
- Summarize and reformat ResSim output for input to HYDSIM.
- Run the HYDSIM model to obtain average monthly power and generation for each alternative.
- Determine the annualized energy price for the period of analysis based on BPA and EIA forecasts.
- Apply the annualized energy price to the average generation for each alternative.
- Sum the annualized energy value for each alternative to obtain annual energy benefit.

Three computer models are used in the development of an estimate for energy benefits foregone. The ResSim and HYDSIM models are used in estimating the energy loss, and the AURORA model is used in determining the energy price forecast. A description of these three models is provided below, and in subsequent sections the calculation of energy loss and energy price is presented.

ResSim is a sequential streamflow routing computer model that was used to simulate the operation of the Willamette River Basin system on a daily time-step according to existing guidelines for reservoir and system operation. The simulations used in the analysis were based on a period of record of 73 years, from 1935 through 2008. Analyses of the ResSim model results are presented in the Hydraulics and Hydrology Appendix C.

HYDSIM simulates power production for the month to month operation of the Columbia River Basin hydropower system. The model is jointly maintained by BPA and BC Hydro. It is used to determine the hydro system generation and resulting project outflows, end of month storage contents, etc., under varying inputs of inflows, power loads, operating procedures and constraints, and physical plant data.

The HYDSIM model is a deterministic model that uses rule curves and flow or storage constraints to achieve operating objectives, especially for power, flood control, fish flows and spill, and recreation. It simulates one period at a time without looking ahead. It uses 14 periods in a year with April and August split into two periods, since these months have significant natural flow differences between their first and

second halves. The Willamette Basin portion of HYDSIM was used by BPA to post-process the ResSim modeling to capture hydropower impacts. Daily inflow and outflow (including outflow by outlet) from ResSim were averaged into the 14 periods and used as input to HYDSIM. The model was run in a continuous mode with project initial storage contents for each operating year starting where the previous year ended. Monthly average megawatts (aMW) were computed from the average powerhouse flows and end of month elevations for the Period of Record.

The HYDSIM model includes both storage and run-of-river projects.

AURORA is an electric energy market model owned and licensed by EPIS Inc. used to forecast market clearing prices for electric power. The hourly market-clearing price is based upon a fixed set of resources dispatched in least-cost order to meet demand while subject to emissions limits. The hourly price is set equal to the variable cost of the marginal resource needed to meet the last unit of demand. A long-term resource optimization feature within the AURORA model allows generating resources to be added or retired based on economic profitability. Market-clearing price and the resource portfolio are interdependent, meaning market-clearing price affects resource revenues and will affect which resources are added or retired. AURORA sets the market-clearing price using assumptions of demand levels (load) and supply costs. The demand forecast implicitly includes the effect of price elasticity over time. The supply side is defined by the cost and operating characteristics of individual electric generating plants, including resource capacity, heat rate, and fuel price. AURORA recognizes the effect that transmission capacity and prices have on the system's ability to move generation output between areas. Input data to AURORA includes the following: an electricity demand model, coal market model, natural gas market model, new/future generating capacity database, as well as sulphur dioxide (SO2) and nitrous oxide (NOx) emissions allowance model.

B.3.1.1. Energy Loss

Monthly average megawatts (aMW) were computed from the average powerhouse flows and end of month elevation for the Period-of-Record. Annual average generation for each project is the weighted average of the period generation (weighting factor is the hours in each period). Annual average generation results from the HYDSIM modeling for the Early Implementation Baseline (Appendix C) and the alternative Meet All M&I (2050) are shown in Table B-2, and the detailed monthly tables are included as an attachment to this appendix. Subtotals are provided for the power projects and the flat projects, as well as total annual average generation under each alternative.

Table B-2 Average Annual Generation by Project for each Alternative (aMW)

	Base Case-Early Implementation	**Meet All M&I**
Detroit*	40.1	38.8
Big Cliff	10.8	10.7
Cougar	16.0	16.5
Green Peter*	29.6	29.6
Foster	13.6	13.5
Hills Creek	18.6	18.7
Lookout Point*	40.2	40.0
Dexter	9.5	9.6
Subtotals		
*Power Projects	109.9	108.4
Flat Projects	68.5	69.0
TOTAL	178.4	177.4

Annual average generation under the Base Case-Early Implementation alternative is 178.4 aMW. Under the Meet All M&I alternative, annual average generation is 177.4 aMW, yielding a generation loss of 1 aMW, or about 0.5 percent of total generation.

The three peaking power projects in the Willamette Valley are Detroit, Green Peter, and Lookout Point. These projects have units designed to be run fully loaded to meet peak loads, but they do not generate continuously. These peak load periods are referred to as heavy load hours (HLH). These "power" projects all have re-regulation projects downstream so that outflows can be reregulated to a more normative flow. The base flow projects in the Willamette Valley operate more continuously (i.e., "flat") and generate power in both peak load and non-peak load periods, or in market terms both during heavy load hours (HLH) and light load hours (LLH). Heavy and light load hours were estimated by actual historical generation from the past five years. Flat prices were computed as a weighted average of HLH and LLH, a combination of 72 hours of HLH and 96 hours of LLH per 168 hour week.

B.3.1.2. Energy Price

In order to determine the energy benefit foregone, an amortized monthly energy price for the 50-year period of analysis is needed. The energy price for the period of analysis is based on a combination of BPA's monthly 10-year energy price forecast and the U.S. Energy Information Administration (EIA) 30-year annual energy price outlook, seasonally adjusted to account for monthly variation in both the HLH and flat energy price.

The value of energy has a seasonal trend based on demand and generating resource availability throughout the year. Energy prices are highest when seasonal temperatures are lowest, increasing the electrical power demand for indoor heating, and when river flow is lowest at the end of the regional annual dry period, which decreases hydropower generation. Energy prices are lowest as seasonal temperatures begin to warm, reducing demand for heating simultaneous to when snow melt runoff is highest and there is an excess of hydropower. Seasonal shaping factors were developed to capture the variation in monthly energy price and transform an annual forecast.

The EIA annual electrical energy price projection was transformed into a monthly projection by developing monthly shaping factors from the BPA monthly price projection, which characterize the ratio of monthly to annual average price over the forecast period. In addition, price factors reflecting the ratio of the HLH monthly price to the flat monthly price were determined. A long-term electrical energy price forecast for the period of analysis was created by the BPA 10-year forecast for the period 2012-2022 as the base forecast and extending it with the seasonally adjusted EIA forecast for the years 2023-2040. The forecast was extended from 2040 to 2062 to complete the 50-year period of analysis by repeating the last annual cycle of the monthly price, as displayed in Figure B-2.

Finally, the HLH and flat energy price for each month of the forecast are amortized to obtain the long-term monthly energy prices for the 50-year period of analysis (Table B-3). The present values of the monthly energy prices are amortized to produce an annualized monthly price. The product of the annualized monthly energy price and energy loss due to water withdrawals represents the annual energy benefits foregone for that alternative.

Figure B-2 Long-Term Energy Price Projections

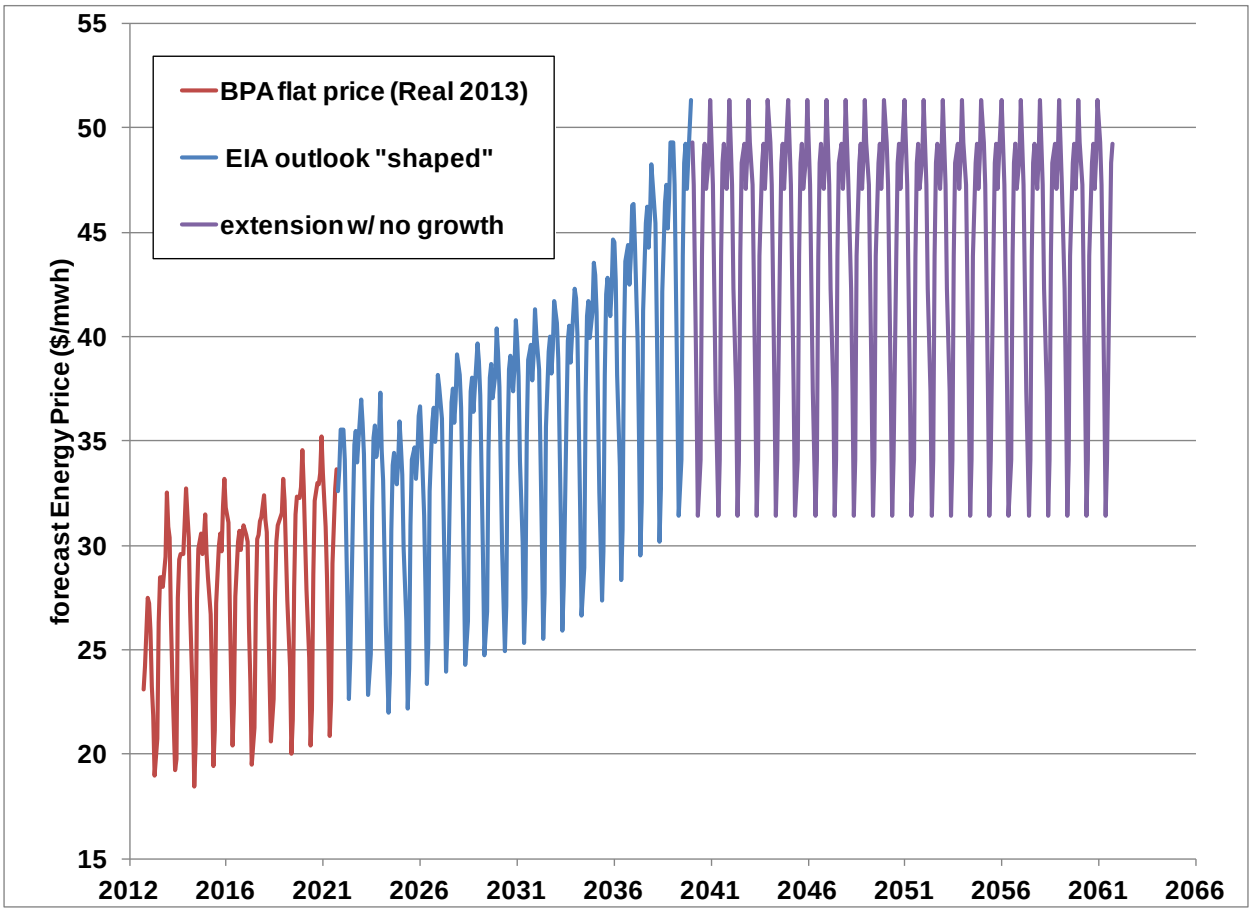

Table B-3 Long-Term Monthly Energy Prices (2013 dollars)

month	HLH Levelized Price (Real)	flat Levelized Price (Real)
Jan	$42.92	$40.11
Feb	$40.70	$38.47
Mar	$36.44	$34.41
Apr	$33.03	$30.41
May	$29.38	$25.56
Jun	$31.08	$27.74
Jul	$37.70	$35.70
Aug	$41.74	$39.30
Sep	$42.57	$40.02
Oct	$39.74	$37.94
Nov	$40.51	$39.15
Dec	$43.20	$41.41

B.3.1.3. Energy Benefits Foregone

The long-term energy prices described in the previous section were applied to the annual average generation (aMW) to obtain the average annual value of generation for the Willamette Valley Project for each of the two alternatives. The expected annual energy value generated is $59,709,000 in the Base Case-Early Implementation alternative, and $59,329,000 for the Meet All M&I alternative, as shown in Table B-4 and Table B-5.

The calculation results displayed in the following tables are based on average annual power production at each project under current operating regimes and forecasted megawatt-hours generated by power peaking project (power projects) and base load power (flat) projects. The power plants at the large storage projects (Detroit, Green Peter, Lookout Point) are used primarily to generate during peaking hours (HLH), while the power plants at the downstream re-regulating dams (Big Cliff, Foster, Dexter) generate power continuously throughout the day. The flat price applies to the generation at the re-regulating projects as well as the other power plants in the basin.

Energy benefits foregone is the value of the hydropower generation loss that occurs under an alternative as compared to the base condition. The annual average value of the lost hydropower energy (net-benefit) is approximately $380,000.

Table B-4 Value of Generation – Base Case-Early Implementation (x $1,000)

Period	OCT 1-31	NOV 1-30	DEC 1-31	JAN 1-31	FEB 1-28	MAR 1-31	APR 1-15	APR 16-30	MAY 1-31	JUN 1-30	JUL 1-31	AUG 1-15	AUG 16-31	SEP 1-30
subtotals														
Power Project (aMW)	105.1	171.4	168.7	162.4	93.0	90.8	105.9	100.0	117.7	90.6	59.4	61.8	63.4	92.8
Power Project ($)	$3,108	$4,904	$4,989	$4,801	$2,485	$2,683	$1,515	$1,431	$3,480	$2,592	$1,756	$884	$968	$2,655
Flat (aMW)	70.5	87.9	84.4	84.2	52.2	56.0	69.3	69.5	83.0	71.8	49.5	53.3	53.5	58.5
Flat ($)	$1,990	$2,479	$2,600	$2,512	$1,349	$1,433	$759	$761	$1,579	$1,435	$1,315	$754	$808	$1,684
Total $	$59,709													

Table B-5 Value of Generation – Meet All M&I-2050 (x $1,000)

Period	OCT 1-31	NOV 1-30	DEC 1-31	JAN 1-31	FEB 1-28	MAR 1-31	APR 1-15	APR 16-30	MAY 1-31	JUN 1-30	JUL 1-31	AUG 1-15	AUG 16-31	SEP 1-30
subtotals														
Power Project (aMW)	86.2	163.0	168.0	160.6	87.3	90.1	105.8	99.8	118.0	95.0	67.2	71.9	78.4	86.2
Power Project ($)	$2,548	$4,664	$4,967	$4,750	$2,332	$2,664	$1,513	$1,428	$3,488	$2,719	$1,988	$1,029	$1,197	$2,466
Flat (aMW)	60.6	85.2	84.1	84.2	51.5	55.9	69.2	69.3	83.2	76.6	56.4	59.7	59.3	60.2
Flat ($)	$1,712	$2,401	$2,592	$2,512	$1,331	$1,430	$758	$759	$1,582	$1,531	$1,497	$845	$895	$1,733
Total $	$59,329													

B.3.2. Capacity Benefits

Capacity benefits foregone are defined as the product of the loss in dependable capacity and a capacity unit value. The capacity unit value represents the capital cost of constructing replacement thermal capacity. The evaluation of capacity benefits assumes the following:

- Plant capacity is not considered lost until monthly average generation drops below 6 aMW at the three power projects.
- The value of capacity is based on the capital replacement cost of the marginal replacement resource, which is a highly efficient combined cycle combustion turbine generating station.

B.3.2.1. Capacity Loss

Three power projects in the Willamette Valley (Detroit, Green Peter, and Lookout Point) can be scheduled to provide energy to meet morning and evening peak loads (HLH). They also provide standby capacity that can be called up to provide more or less energy depending on the needs of the loads that BPA serves. A capacity loss is incurred when there is insufficient energy to meet system load (generation drops below 6 aMW). Generation loss of this magnitude is not anticipated under the Meet All M&I alternative, therefore no capacity loss occurs.

B.3.2.2. Capacity Value

The value of the loss of capacity is based on the capital replacement cost of the marginal replacement resource, which is either a single cycle or a combined cycle combustion turbine. The estimate of these capital costs is estimated by the Northwest Power and Conservation Council, and results in a monthly capacity value of about $6,605/MW. If the peaking plant's generation drops below 6 aMW during a month, the cost of the foregone capacity would be the product of $6,605 and the project's capacity.

B.3.2.3. Capacity Benefits Foregone

Capacity loss is not anticipated under the Meet All M&I alternative, therefore, there are no capacity benefits foregone.

B.3.3. Benefits Foregone

Hydropower benefits foregone are the sum of the energy benefits foregone and the capacity benefits foregone, which is estimated in this analysis to be $380,000.

B.4. EMISSIONS OF REPLACEMENT POWER

Hydropower is a relatively clean electric power generating resource that results in few air emissions. Replacing any or all of the Willamette Valley Projects' hydropower generation may require increased generation from thermal plants. Generating resources are typically brought on line or taken off line in order of their operating costs in wholesale power markets. Resources that have low operating costs are favored, and include hydroelectric, nuclear, and wind resources. Higher plant operating cost resources include thermal plants using fossil fuels such as coal, oil, and natural gas. Lowest cost resources are used first and highest cost resources are used last. The amounts of and types of resources that are actually used vary depending on the amount of energy demand in the system. Marginal resources vary by the time of the day and day of the week, as energy needs rise and fall.

In 2008, the Pacific Northwest Power and Conservation Council produced a report titled, "Marginal Carbon Dioxide Rates of the Northwest Power System." The Council's report concludes that gas-fired power plants with relatively high operating costs are on the margin during heavy load hours, while coal is typically the resource on the margin during light load hours on nights and weekends. The report estimates that the marginal production rate of carbon dioxide (CO_2) from these resources is approximately 900 pounds of CO_2 per megawatt hour of generation. Thus, the reduction of regional hydroelectric generation associated with a given operation will increase the amount of energy produced with thermal power plants and increase the amount of CO_2 produced by 900 pounds per MWh.

Meeting all the identified municipal and industrial water supply demand by 2050 using stored water from the Willamette Valley Project would result in a regional increase in CO2 emissions of 3,402.6 metric tons annually (Table B-6 below) because of the need to replace the lost hydropower energy with energy from a coal powered plant.

Table B-6 CO2 Emissions Due to Lost Hydropower Generation

	Annual Average Generation					
	ALTERNATIVE	Base Line	Meet All M&I	difference		
		(aMW)	(aMW)	(aMW)		
	PROJECT					
	Detroit	40.1	38.8	1.2		
	Big Cliff	10.8	10.7	0.1		
	Cougar	16.0	16.5	-0.5		
	Green Peter	29.6	29.6	0.0		
	Foster	13.6	13.5	0.0		
	Hills Creek	18.6	18.7	0.0		
	Lookout Pt	40.2	40.0	0.2		
	Dexter	9.5	9.6	0.0		
	Total (aMW)	178.4	177.4	1.0		
			x	8,760	hrs	
				8,334.9	mwh	
	Emissions Computation		x	900	lbs CO_2/mwh	
				7,501,413.7	lbs CO_2	
			/	2204.6	lbs/metric tonne	
				3,402.6	metric tonnes CO_2	

ATTACHMENTS

Table B-7 Willamette Basin Review - Base Case-Early Implementation, aMW

Period	OCT 1-31	NOV 1-30	DEC 1-31	JAN 1-31	FEB 1-28	MAR 1-31	APR 1-15	APR 16-30	MAY 1-31	JUN 1-30	JUL 1-31	AUG 1-15	AUG 16-31	SEP 1-30	Annual Average
PROJECT															
Detroit**	43.3	71.1	63.9	64.2	44.9	38.0	39.8	31.4	30.6	23.6	18.0	17.2	18.0	30.6	40.1
Big Cliff	11.5	15.7	13.8	13.7	9.6	8.9	10.2	10.3	12.5	10.8	7.3	6.0	6.1	9.6	10.8
Cougar	17.4	19.3	17.6	17.6	11.5	12.3	14.7	15.4	19.6	17.8	14.5	16.5	16.5	12.2	16.0
Green Peter**	19.3	41.5	59.0	50.0	20.1	25.3	32.5	31.7	33.7	20.7	13.8	15.0	15.3	24.0	29.6
Foster	11.6	16.5	19.6	18.0	12.1	14.9	19.1	16.3	15.2	12.2	7.1	6.9	7.0	10.9	13.6
Hills Creek	19.2	22.9	21.4	22.3	12.2	13.2	17.6	19.2	25.0	21.3	14.2	17.0	16.7	16.3	18.6
Lookout Point**	42.5	58.8	45.8	48.1	28.0	27.5	33.6	37.0	53.4	46.3	27.6	29.5	30.1	38.2	40.2
Dexter	10.8	13.5	12.0	12.5	7.0	6.7	7.8	8.3	10.7	9.7	6.5	7.0	7.2	9.5	9.5
subtotals															
Power Projects	105.1	171.4	168.7	162.4	93.0	90.8	105.9	100.0	117.7	90.6	59.4	61.8	63.4	92.8	109.9
Flat	70.5	87.9	84.4	84.2	52.2	56.0	69.3	69.5	83.0	71.8	49.5	53.3	53.5	58.5	68.5
Total	175.6	259.3	253.2	246.5	145.2	146.7	175.2	169.5	200.7	162.4	108.9	115.0	117.0	151.2	178.4

**Power Projects

Table B-8 Willamette Basin Review – Meet All M&I (2050), aMW

	Period	OCT 1-31	NOV 1-30	DEC 1-31	JAN 1-31	FEB 1-28	MAR 1-31	APR 1-15	APR 16-30	MAY 1-31	JUN 1-30	JUL 1-31	AUG 1-15	AUG 16-31	SEP 1-30		Annual Average	
	PROJECT																	
	Detroit**	32.6	67.0	63.5	62.4	38.9	37.2	39.8	31.2	30.7	25.2	21.1	21.5	24.4	29.2		38.8	
	Big Cliff	9.5	14.9	13.6	13.6	8.8	8.8	10.2	10.2	12.5	11.3	8.2	7.9	7.8	9.6		10.7	
	Cougar	14.6	18.6	17.6	17.7	11.5	12.3	14.7	15.5	19.7	20.1	18.0	18.2	17.5	14.7		16.5	
	Green Peter**	18.7	40.8	58.7	50.0	20.4	25.4	32.5	31.7	33.8	21.5	14.4	15.8	19.5	21.0		29.6	
	Foster	11.5	16.3	19.5	17.9	12.1	14.8	19.0	16.2	15.2	12.5	7.1	7.0	8.5	9.9		13.5	
	Hills Creek	15.8	22.7	21.4	22.4	12.2	13.2	17.6	19.3	25.2	22.5	15.5	18.3	16.9	16.6		18.7	
	Lookout Pt**	34.9	55.2	45.8	48.2	28.0	27.5	33.6	37.0	53.5	48.4	31.8	34.6	34.5	36.0		40.0	
	Dexter	9.2	12.7	12.0	12.5	7.0	6.7	7.8	8.3	10.7	10.2	7.5	8.4	8.5	9.4		9.6	
	subtotals																	
	Power Projects	86.2	163.0	168.0	160.6	87.3	90.1	105.8	99.8	118.0	95.0	67.2	71.9	78.4	86.2		108.4	
	Flat	60.6	85.2	84.1	84.2	51.5	55.9	69.2	69.3	83.2	76.6	56.4	59.7	59.3	60.2		69.0	
	Total	146.8	248.2	252.1	244.8	138.8	145.9	175.0	169.2	201.2	171.6	123.6	131.6	137.7	146.3		177.4	

**Power Projects

Appendix C
HYDROLOGY AND HYDRAULICS

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C.1. HYDROLOGY AND HYDRAULICS

C.1.1. Background

The Willamette River Basin was modeled using the Hydrologic Engineering Center (HEC) Reservoir System Simulation Program (ResSim) to assess the individual project and system effects of using 499 ac-ft of stored water from Cottage Grove and/or Dorena reservoirs for municipal and industrial (M&I) water supply for the City of Creswell. (This volume of storage was the original focus of the report before the demand was refined. Because model results for the 499 allocation showed insignificant changes in project conditions, there was no need to rerun the model for 437 acre-feet.) These two reservoirs are important within the Willamette Valley Project (Willamette Project), used for both flood damage reduction operations and to supply water that helps meet minimum flow targets for the Willamette River at Albany and Salem.

ResSim was also used to analyze the system-wide impacts of using stored water from the eleven storage projects in the Willamette Project to meet projected M&I needs in 2050. The results from this 2050 analysis were used in the cost analysis to determine the price structure for using 499 ac-ft of storage from the Willamette Valley Project.

The ResSim model used for this study was adapted from the model used for an intense modeling effort under the Willamette Configuration and Operation Planning (COP) project, a major part of the Willamette Biological Opinions (BiOps) implementation. The baseline ResSim model used for the COP studies is detailed in the "Model Documentation Report of the Willamette Basin HEC-ResSim Model" (available upon request from the Corps). The Model Documentation Report identifies all of the physical parameter inputs for the thirteen reservoirs in the basin, the routing reach specifications, the inflow time series used, and the operation sets (the rules used in the ResSim model to regulate the thirteen projects) of the baseline model of the Willamette Basin.

The baseline model refers to the simulation, with its associated operation sets (or rule sets) for each individual project, which mimics the way the Willamette Valley Project is operated today. This includes physical capacity information for all project outlets, special operations at each project during high inflow events, project rule curves, the minimum flow targets for tributaries and the mainstem, and outflow rates of change (ramping rates) identified in the Willamette BiOps for listed fish, and the current Interim Risk Reduction Measures (IRRMs) at specific projects in the basin.

Interim Risk Reduction Measures (IRRMs) are in place at many of the projects in response to spillway Tainter gate deficiencies. The IRRMs primarily impact project operations during high inflow events, except at Lookout Point, where the maximum conservation pool has been lowered to 915 feet until spillway gates are repaired. The IRRMs are considered to be short-term operational changes until the spillway gates are repaired and were, therefore, not included in the model for this study as it is assumed the IRRMs will be lifted during the time period that water supply is needed.

The operations to meet the minimum flows from the BiOps, along with ramping rates, are referred to as Early Implementation operations which are detailed below. The project inflows and the local stream flows into the system are also described below; however, the Model Documentation Report should be referred to for most of the details associated with the baseline model.

C.1.2. ResSim Model Description

ResSim is used to model reservoir systems whose operations are defined by a variety of goals and constraints. The model uses a rule-based description of the operational goals and constraints that reservoir

operators must consider when making release decisions. The dam is the root of an outlet hierarchy or "tree" which allows the user to describe the different outlets of the reservoir in as much detail as necessary. ResSim is *not* an optimization tool and can only be used to simulate rule-based reservoir operations input by the modeler. The model does not run in a forecast mode, it makes decisions based on modeled system status and inflows. Additional information on ResSim is available on the US Army Corps of Engineers Hydrologic Engineering Center (HEC) website: (http://www.hec.usace.army.mil/).

All projects in ResSim are configured with their physical constraints and capabilities. Geographic information, such as river mile location and elevation above sea level can also be specified, but the program does not include a true geospatial component. Each reservoir also has an operation set associated with it. The operation set is first broken into zones, based on pool elevation as a function of date, and then a set of instructions within that zone describes how the reservoir is operated. These instructions are called rules, and are prioritized within each zone. The model calculates each reservoir's flow release at each time step to meet the highest priority rule possible based on the physical capability for that project. The program progresses through each time step calculation until the simulation is complete.

C.1.3. Inflows and Local Flows

The Corps' Portland District Hydrologic and River Engineering Section (EC-HY) developed a 73-year data set of Willamette project inflows and local flows on a daily time step. This Period of Record (POR) dataset contains historical data from October 1935 through 2009. The data for 2009 was still being finalized at the beginning of the COP ResSim modeling effort, so the baseline analysis mentioned in the Background section used flow inputs for October 1935 through December 2008. A large number of model variables from the baseline were selected to be used for comparison with any additional analyses, and these variables were processed to obtain statistical parameters and counts of occurrences. Any ResSim models compared to the baseline data should use the same period of analysis (October 1935 through December 2008) even when additional years of inflow data are available. The phrase Period of Record, or POR, in this report will always refer to the window of 1 October 1935 through 31 December 2008, which is just over 73 years of daily data.

The Period of Record flows were entered into the model as unregulated daily average inflows at the projects and local flows at the control point locations. (Control points are locations used for reservoir regulation decisions). The development of this flow data set is fully documented in Section 8.3 of the report titled "Hydrology Report Willamette FIS Update (Phase One)"[5] This report is available from the Corps upon request.

Several large flood events within this POR are available in hourly data also, but hourly data is not available for the lower flow periods of the year. Since Willamette Basin system performance must be evaluated in all types of flow regimes, the continuous daily average data is well suited for the type of results required for a water supply analysis. This continuous POR reservoir and local inflows includes wide variability in project inflows, representing high flow and the low flow water years.

The ResSim model, using the POR flows, is being used to test current operations against a diversity of historical flows and therefore does not recreate historical operations and flow release impacts. There are multiple reasons for this, including that the POR covers pre-dam periods, the dams began their early

[5] Hydrology Report, Willamette FIS Update (Phase 1), Lane County, Oregon, and Cities of Cottage Grove, Creswell, Goshen, Eugene, and Springfield; U.S. Army Corps of Engineers, Portland District; May 6, 2013.

implementation operations around 2007, and the model does not include various restrictions on flow or pool levels required for any maintenance or construction operations that have occurred over the years.

C.1.4. Water Year Classification

Minimum flow targets at Albany and Salem vary depending on the amount of stored water in the Willamette Project. Appendix B of the "Willamette Project Supplemental Biological Assessment"[6] designates four water year classifications that are used to determine the mainstem Willamette minimum flow targets for April through October. The four classifications are Abundant, Adequate, Insufficient, and Deficit.

The year classification is based on the storage volume of the federal projects in the Willamette Basin for each day of May 10 through 20 of any year. The storage volume is determined by summing the conservation storage in all the reservoirs (not counting the reregulating dams of Big Cliff and Dexter). The peak system storage volume that occurs from May 10 - 20 of each year is then used to classify the water year type. If this volume is less than 0.9 million acre-feet (MAF), the year is designated as Deficit. If the storage volume is between 0.9 and 1.19 MAF, the year is designated as Insufficient. Storage volumes from 1.20 to 1.48 MAF are designated as Adequate, and all years with storage volumes greater than 1.48 MAF are designated as Abundant. The maximum conservation storage is 1.59 MAF.

Several rules in the model depend on the year classification. The Insufficient and Deficit water years have reduced minimum flow targets at Salem, as listed in the Willamette BiOps. The 73 years in the POR were classified using this system in order to have a variable minimum flow target in a downstream rule for Salem and to determine when some of the diversions used in the model (where water is removed from the system) are reduced in the lower water years. Refer to Reasonable and Prudent Alternative 3.4 in the NMFS BiOp.

C.1.5. Study Methodology

The methodology used for this water supply study was a three step process:

Step 1: Run the Early Implementation Baseline. Data from this baseline was used to establish flow and elevation statistics that were used for comparisons for other system operations as well as costs.

Step 2: Add a single diversion on the Coast Fork to represent the water needs addressed in this study (499 acre-feet for the City of Creswell). Supply the stored water from Dorena and Cottage Grove reservoirs by specifying greater outflows from these projects to meet the diversion. Run the simulation described in Step 2 and compare results to the Early Implementation Baseline results to assess impacts to the system and the individual projects.

Step 3: Input the projected M&I needs for 2050 (as specified in the Willamette Basin Review Interim Report) as additional diversions and use water from storage projects to meet the modeled demand. Specify stored water releases from hydropower projects whenever possible to obtain the worst case scenario for hydropower impacts. Use the modeled results in the system wide cost analysis and compare system behavior with the baseline (See Appendix B of Surplus Letter Report).

[6] Supplemental Biological Assessment of the Effects of the Willamette River Basin Flood Control Project on Species Listed Under the Endangered Species Act; U.S. Army Corps of Engineers, Portland District, Bonneville Power Administration, Bureau of Reclamation; May 2007.

C.1.5.1. Step 1. Set Up the Early Implementation Baseline

The baseline model from the Willamette COP project (IRRM Baseline) was used as the starting point for this water supply study. The Early Implementation Baseline, which is the model for the water supply study, was created by modifying project operations in the IRRM Baseline as described below.

- Detroit – removed IRRM specific spill in high event winter inflows.
- Big Cliff – changed the pool elevation from 1193 ft. (IRRM elevation) to 1197 ft.
- Green Peter – removed the IRRM specific spill in high event winter inflows.
- Foster – added a variable minimum outflow rule that is a two-way lookup table that interpolates low releases more smoothly than the IRRM Baseline, and helps Green Peter to also operate more smoothly with fewer days of zero outflow.
- Cougar - removed IRRM specific spill in high event winter inflows.
- Blue River - removed IRRM specific spill in high event winter inflows.
- Hills Creek - removed IRRM specific spill in high event winter inflows.
- Lookout Point - removed IRRM specific spill in high event winter inflows and raised the maximum conservation pool elevation from 915 ft. to 926 ft.
- Dexter – changed the pool elevation from 691 ft. to 693 ft.
- Fall Creek - removed IRRM specific spill in high event winter inflows.
- Cottage Grove – fixed an error in the Special Curves release specification.
- Dorena – fixed an error in the Special Curves release specification.
- Fern Ridge – fixed an error in the Special Curves Induced Surcharge-Falling Pool Options from 6 hours to 24 hours.

Once these changes were made to the model, the Early Implementation Baseline was run. The results from this simulation were then used for comparison against the other simulations for the water supply study. Table C-1 below lists the details of the Early Implementation Baseline simulation.

Table C-1 Early Implementation Baseline ResSim Simulation Details.

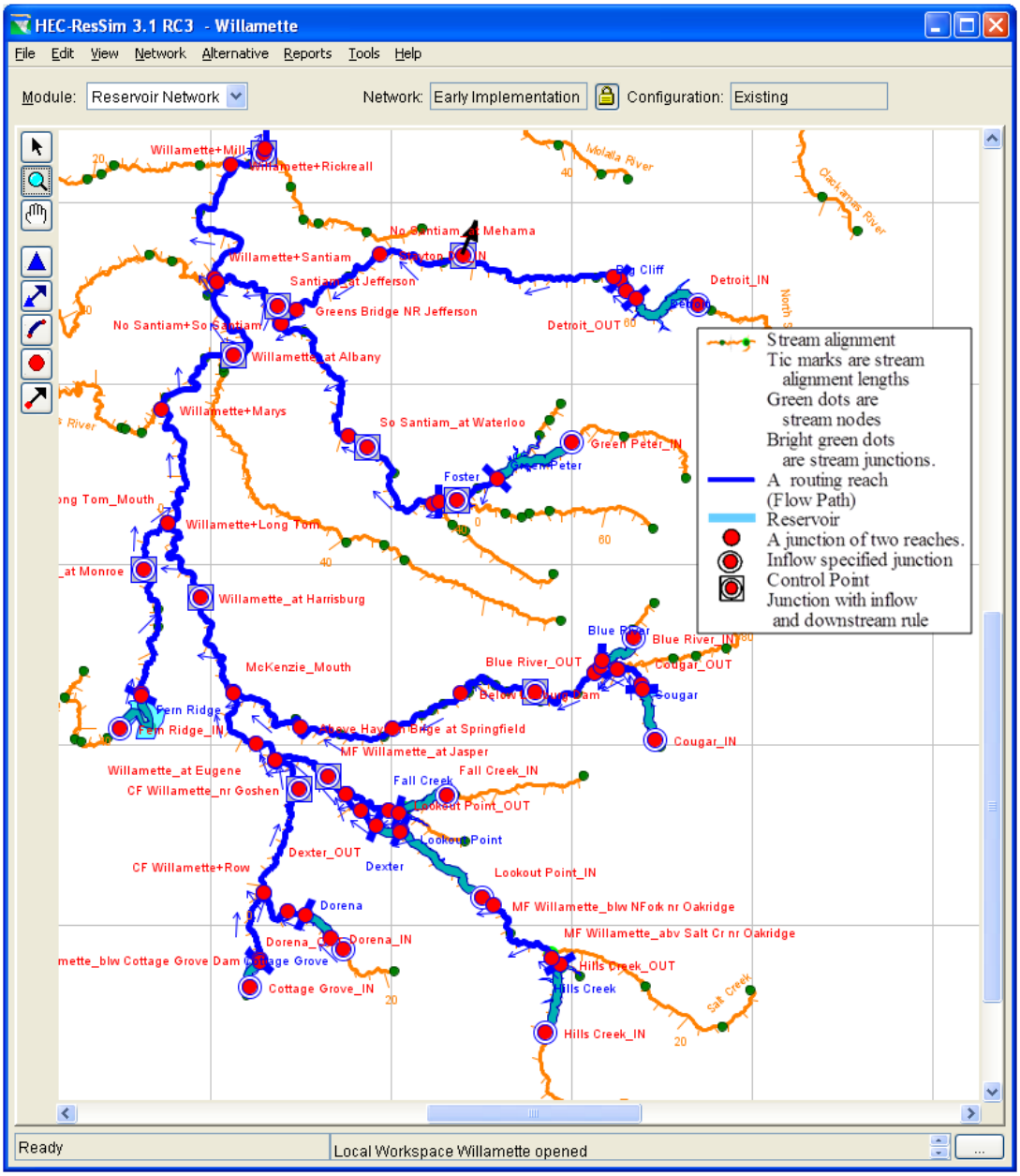
ResSim Version	HEC-ResSim 3.1 RC3 Build 101	Watershed	Willamette3
Network	Early Implementation Network		
Configuration	Existing	Alternative	Early Imp
Inflow File Name	Daily Series – 13Apr2011.dss		
Rule Curve File	Willamette_Rule_Curves.dss		
External Variables File	year_classifications.dss		
Simulation Name	Early-Implementation-01-29-13		
Simulation Start Simulation Lookback	04 Oct 1935 at 2400 01 Oct 1935 at 2400	Simulation Ending	31 Dec 2008 at 2400

Project	Operation Set Name	Lookback Elevation	Lookback Flows (cfs)
Detroit	New Early Imp	Rule Curve	Power Plant 1573.0, Spillway and ROs 0.0
Big Cliff	Early Imp	1193.0 ft	Power Plant 1573.0, Spillway 0.0
Green Peter	Early Implementation rule set	Rule Curve	Power Plant 1500.0, Spillway and RO 0.0
Foster	Early Implementation and Fish Weir	Rule Curve	Power Plant 1500.0, Spillway 0.0
Cougar	Early Implementation	Rule Curve	Power Plant 400.0, Spillway and RO 0.0
Blue River	New Early Imp	Rule Curve	RO 50.0,Spillway 0.0
Hills Creek	Early Imp	Rule Curve	Power Plant 1200.0, Spillway and ROs 0.0
Lookout Point	LOP Early Imp	Rule Curve	Power Plant 1200.0, Spillway and ROs 0.0
Dexter	Early Imp	693.0 ft	Power Plant 1200.0, Spillway 0.0
Fall Creek	Early Imp	Rule Curve	RO 200.0, Spillway 0.0
Cottage Grove	Early Imp	Rule Curve	RO 50.0, Spillway 0.0
Dorena	Early Imp	Rule Curve	RO 100.0, Spillway 0.0
Fern Ridge	New Early Imp	Rule Curve	RO 30.0, Spillway and Sluice Gate 0.0

Notes: Lookback flows and elevations refer to the initial conditions at the start of the simulation.

A ResSim screen shot of the modeled watershed used for the Early Implementation Baseline is shown in Figure C-1 below. Note that only one diversion is included, at Mehama along the North Santiam River. The diversion is indicated by a heavy-lined arrow pointing away from the river. This diversion was part of the IRRM Baseline, which diverts 73 cfs from the North Santiam for irrigation use from the first of April to the end of October.

Figure C-1 Screen Shot of the Modeled Watershed used for the Early Implementation Baseline



C.1.5.2. Step 2. Assess Impact of the Stored Water Request on Current Configuration

The ResSim analysis for the use of stored water added a single diversion (withdrawal of water from the system) at Goshen, which is downstream of both Cottage Grove and Dorena, to the Early Implementation Baseline. The water diverted from the system for M&I use is to be supplied from stored water within the Coast Fork sub-basin reservoirs. In order to use stored water for these diversions, the model must include rules that tell the reservoirs to let that water out, in addition to what the project would have already computed as a release. The operation sets of those reservoirs supplying water must be modified to let out flow of the same magnitude and for the same period of time as the water that is diverted from the system. This is accomplished by increasing the project minimum release value by the same amount that is diverted

downstream. For another very simplified example, ignoring all routing, timing, and so on, if a project minimum release is 400 cfs, and downstream diversions require 100 cfs from that reservoir, the project will now release 500 cfs as a minimum. This rule does not affect any computed flows higher than the new minimum release specification. Table C-2 below lists the particulars of this simulation. The 499 acre-feet storage request is assumed to be evenly distributed from June through September, which amounts to just over 2 cfs of flow diverted at Goshen. This is shown in Table C-3 below. Both Cottage Grove and Dorena dams can supply water at the location desired. For modeling purposes, the contribution from each project was divided proportionally based on the amount of conservation storage available in each project. The flow contributions at Cottage Grove and Dorena, shown in Table C-4, are added to the minimum project flows during June through September.

Table C-2 Use of 499 ac-ft of Stored Water ResSim Simulation Details.

ResSim Version	HEC-ResSim 3.1 RC3 Build 101	**Watershed**	Willamette3
Network	Early Implementation Network		
Configuration	Existing	**Alternative**	499CF
Inflow File Name	Daily Series – 13Apr2011.dss		
Rule Curve File	Willamette_Rule_Curves.dss		
External Variables File	year_classifications.dss		
Simulation Name	CF-499-ac-ft-041513		
Simulation Start **Simulation Lookback**	04 Oct 1935 at 2400 01 Oct 1935 at 2400	**Simulation Ending**	31 Dec 2008 at 2400
Project	**Operation Set Name**	**Lookback Elevation**	**Lookback Flows (cfs)**
Detroit	New Early Imp	Rule Curve	Power Plant 1573.0, Spillway and ROs 0.0
Big Cliff	Early Imp	1193.0 ft	Power Plant 1573.0, Spillway 0.0
Green Peter	Early Implementation rule set	Rule Curve	Power Plant 1500.0, Spillway and RO 0.0
Foster	Early Implementation and Fish Weir	Rule Curve	Power Plant 1500.0, Spillway 0.0
Cougar	Early Implementation	Rule Curve	Power Plant 400.0, Spillway and RO 0.0
Blue River	New Early Imp	Rule Curve	RO 50.0,Spillway 0.0
Hills Creek	Early Imp	Rule Curve	Power Plant 1200.0, Spillway and ROs 0.0
Lookout Point	LOP Early Imp	Rule Curve	Power Plant 1200.0, Spillway and ROs 0.0
Dexter	Early Imp	693.0 ft	Power Plant 1200.0, Spillway 0.0
Fall Creek	Early Imp	Rule Curve	RO 200.0, Spillway 0.0
Cottage Grove	COT 499ac-ft Request	Rule Curve	RO 50.0, Spillway 0.0
Dorena	DOR 499ac-ft Request	Rule Curve	RO 100.0, Spillway 0.0
Fern Ridge	New Early Imp	Rule Curve	RO 30.0, Spillway and Sluice Gate 0.0

Notes: Lookback flows and elevations refer to the initial conditions at the start of the simulation.

Table C-3 Stored Water Usage Each Month.

Municipal Projected Need	**June (ac-ft)**	**July (ac-ft)**	**August (ac-ft)**	**September (ac-ft)**	**Equivalent Flow Every day of Month**	**Volume (ac-ft)**
Goshen	123	126.5	126.5	123	2.06 cfs	499

Table C-4 Flow Contributions from Reservoirs Upstream of Creswell.

Projects Supplying Demand	Conservation Storage (acre -feet)	Relative Storage Proportion	Stored Flow Released (cfs)
Cottage Grove (COT)	28,661	0.307	0.63
Dorena (DOR)	64,745	0.693	1.43

Notes:

1. Relative Storage Proportion is the individual project storage/total storage of all projects used to meet demand.
2. Stored Flow Released is equal to the equivalent flow times the storage proportion. Stored flow released June – Sept.
3. No reduction is assumed for municipal needs during Deficit years.

C.1.5.3. Step 3. Assess Impact on Hydropower Revenue and Recreation Benefits of Using Stored Water for the Projected 2050 M&I Demand

The ResSim analysis for the use of water from all Willamette Project storage reservoirs to meet 2050 projected M&I demand added multiple diversions to the model to simulate the out-of-stream use of the stored water. Municipal diversions were added separately from industrial diversions, applied at control points downstream of reservoirs and on the mainstem. Model rules were written that require the reservoirs to release water to meet the demand, in addition to what the project would have already computed as a release. These rules do not affect any computed flows higher than the new minimum release specification.

The 2050 irrigation demands were not modeled for this report because the focus here is on determining impacts associated with the future M&I demand. Future stored water demands will have impacts associated with reduced hydropower and recreation opportunities due to lower reservoir levels, for example. Future studies may assess the impact of greater irrigation demand, with or without greater M&I demand, as needed for any future analyses. The cost analysis for the Surplus Letter Report assessed the worst case hydropower losses related to M&I demand.

Table C-5 lists estimated future M&I demand, as described in the 2000 Interim Report referenced earlier. That report presented the demand at various locations in terms of a volume of water needed June through September. In the table below, this volume is converted to an equivalent flow during the same period. July and August volumes are slightly higher than June and September volumes, but that is because those months are one day longer.

The future M&I demands were modeled as diversion flows applied at the locations given in Table C-6 Almost all diversions were specified at associated control points. The exceptions were: Salem municipal, which physically occurs at Stayton, and Wilsonville and Oregon City area demands, which were applied at Salem. The model has null routing reaches below Salem, with no additional inflows downstream of that point. The Wilsonville and Oregon City demands are taken out at Salem, since their demand must be satisfied by upstream reservoirs.

Diverting Wilsonville and Oregon City area demands at the Salem control point is a conservative assumption for the worst case hydropower cost analysis. When a control point has both a downstream control rule and a diversion associated with it, ResSim will first remove the diverted flow from the point and then increase project outflows to satisfy a specified minimum at the control point. As a very simplified example, ignoring timing, routing, losses, etc, if the regulated flow entering a control point is 500 cfs, the local inflow at that point is 200 cfs, and a diversion at that point is 50 cfs, the flow at that point is computed as 500 + 200 - 50, or 650 cfs. If that point has a minimum 800 cfs downstream rule associated with it, say at Project A upstream, then the program has Project A release an additional 150 cfs to meet the minimum. The control point at Salem is a mainstem flow target location for the BiOp. With Wilsonville and Oregon City demand being taken out at Salem, their combined ~ 240 cfs is removed before project releases are adjusted

to meet minimum target rules. This conservative assumption is desired since it is a worst case hydropower loss that is being computed, and because one or both cities could theoretically build long pipelines to remove water far upstream of their geographic locations.

Table C-5 Estimate Future Demands in 2050 for Municipal and Industrial Needs.

Municipal Projected Need	**June (ac-ft)**	**July (ac-ft)**	**August (ac-ft)**	**September (ac-ft)**	**Equivalent Flow Every day of Month**	**Volume (ac-ft)**
Goshen	219	226	226	219	3.68 cfs	891
Jasper	86	89	89	86	1.45 cfs	350
Vida	6259	6468	6468	6259	105.19 cfs	25,454
Harrisburg	89	92	92	89	1.50 cfs	363
Monroe	59	61	61	59	0.99 cfs	241
Albany	3445	3560	3560	3445	57.90 cfs	14,012
Waterloo	447	462	462	447	7.51 cfs	1817
Mehama	5600	5787	5787	5600	94.11 cfs	22,773
Jefferson	49	50	50	49	0.82 cfs	198
Salem	2122	2193	2193	2122	240.47 cfs	8,631
Wilsonville	8288	8565	8565	8288	139.28 cfs	33,706
Oregon City	6021	6221	6221	6021	101.19 cfs	24,484
Total						132,920
Industrial Projected Need	**June (ac-ft)**	**July (ac-ft)**	**August (ac-ft)**	**September (ac-ft)**	**Equivalent Flow Every day of Month**	**Volume (ac-ft)**
Harrisburg	6447	6662	6662	6447	108.35 cfs	26,218
Albany	5526	5710	5710	5526	92.87 cfs	22,472
Salem	4789	4949	4949	4789	80.48 cfs	19,476
Oregon City	1658	1713	1713	1658	27.86 cfs	6,742
Total						74,908

Table C-6 Location in Model Where Diversions Occur for Projected Needs.

Municipal Projected Need at:	**Diversion Location:**
Goshen	Goshen Control Point
Jasper	Jasper Control Point
Vida	Vida Control Point
Harrisburg	Harrisburg Control Point
Monroe	Monroe Control Point
Albany	Albany Control Point
Waterloo	Waterloo Control Point
Mehama	Mehama Control Point
Jefferson	Jefferson Control Point
Salem	Stayton Junction (where physical intake was built for Salem)
Wilsonville	Salem Control Point (Model inputs end at Salem d/s location)
Oregon City	Salem Control Point (Model inputs end at Salem d/s location)
Industrial Projected Need at:	**Diversion Location:**
Harrisburg	Harrisburg Control Point
Albany	Albany Control Point
Salem	Salem Control Point
Oregon City	Salem Control Point (Model inputs end at Salem d/s location)

The water that is diverted from the system for M&I use is to be supplied from stored water within the basin reservoirs. In order to use stored water for these diversions, the model must include rules that tell the reservoirs to let that water demand out, in addition to what the project would have already computed as a release. The operation sets of those reservoirs supplying water must be modified to let out flow of the same magnitude and for the same period of time as the water that is diverted from the system. This is accomplished by increasing the project minimum release value by the same amount that is diverted downstream. This rule does not affect any computed flows higher than the new minimum release specification.

A worst case hydropower modeling scenario was developed to determine lost hydropower revenue (See Appendix B of this report). This means that wherever possible, the specified releases of stored water will occur at hydropower projects. At some locations this will not be possible, such as at Monroe, which can only be supplied by the reservoir at Fern Ridge, on the Long Tom River. Additionally, a larger reservoir should supply a larger share of the stored water released for the diversions.

For a very simplified example of these assumptions, assume Point P has a diversion of 75 cfs and there are two reservoirs, A and B, upstream of P that can supply the stored water. If Reservoir A has 100 KAF of storage and Reservoir B has 50 KAF of storage, then proportional releases of stored water from A should be twice the quantity of the stored water released from B, or 50 cfs and 25 cfs, respectively, for this very simple example. When accounting for hydropower, if both reservoirs have hydropower projects, the share of flows is still 50 cfs and 25 cfs, for A and B respectively. If there is not a hydropower project at either dam, then the share is also 50 cfs from A and 25 cfs from B. However, if only one of the two dams has hydropower production, then all 75 cfs is assumed to be supplied by dam releases from the one with hydropower, and the other project will not be drawn on to release stored water for the diversion.

Tables C-7 and C-8 lists the flow contribution from each upstream hydropower project to the future M&I demand for each location. The relative storage contribution (storage at maximum conservation pool minus the dead storage) of each project is shown. It is assumed that municipal demands are not reduced in Deficit water years, which is a conservative estimate for the worst case scenario used for the cost analysis. It is assumed that industrial demands are reduced in Deficit water years to 77% of their estimated demand, similar to the reduction in BiOp flow targets. This percentage is based on an average percentage reduction of the Salem minimum flows for fish during Deficit water years.

The flow contributions for each project are summed to give a total for each project. These are the flows specified in ResSim to be released to meet the diversions. The sum of each project's flow contribution is added to the minimum flow already specified in the model, so more stored water is released to meet the demands. For example, the sum of all flow contributions to meet M&I demands from Cougar is 198.94 cfs in most years, and 186.47 in Deficit water years. The normal minimum flow out of Cougar is 400 cfs all year, so the rules at Cougar are modified to increase the minimum outflows in June through the end of September to be 598.94 cfs in most years, 586.47 cfs in Deficit years.

The diversion flow contributions required from Hills Creek (HCR) were added to the 400 cfs normal minimum at HCR, but they were also added to the flow contributions at Lookout Point (LOP) because LOP is downstream of HCR. Similarly, the flow contributions at Green Peter (GPR) were added to the flow contributions at Foster, since Foster is downstream of GPR.

Some of the future demand cannot be met by reservoirs with hydropower. The demand for stored water at Goshen can only be satisfied from Cottage Grove or Dorena releases, neither of which has hydropower. Demand for stored water at Monroe can only be met by Fern Ridge, which is not a hydropower project.

Although Big Cliff and Dexter produce hydropower, they are reregulating projects whose pool levels fluctuate only a small amount. During an average 24-hour period, the projects pass all the water they receive. These two projects are not modeled with rules in ResSim, but instead just pass the daily inflow. Their outflows still contribute to hydropower production, but they do not have a storage content to contribute a share of stored water used to meet demand.

These revised set of operations were used for a new simulation referred to as the Worst-Case Hydropower Analysis. The results from this new simulation were then used by Bonneville Power Administration (BPA) and the Corps to determine the impacts to hydropower revenue. Table C-9 below lists the particulars of this simulation.

Table C-7 Stored Flow Contributions from Upstream Projects for Future Municipal Demands.

Municipal Flow Projected Need	Hydropower Projects that can be used to meet need* (Storage above inactive when full, in acre feet.)	Relative Storage Proportion = Project Storage / Total Storage of all Projects used to meet demand	Stored Flow Release In Most Water Yrs, June-Sept. (cfs)	Stored Flow Release In Deficit Water Yrs, June-September (For Worst Case Hydropower, no reduction to Muni.)
Albany, 57.90 cfs	HCR: 194,600 ac-ft	0.297	17.18	17.18
	LOP: 324,200 ac-ft	0.495	28.63	28.63
	CGR: 136,800 ac-ft	0.209	12.08	12.08
Goshen*, 3.68	COT: 28,661 ac-ft	0.307	1.13	1.13
	DOR: 64,745 ac-ft	0.693	2.55	2.55
Harrisburg, 1.50 cfs	HCR: 194,600 ac-ft	0.297	0.44	0.44
	LOP: 324,200 ac-ft	0.495	0.74	0.74
	CGR: 136,800 ac-ft	0.209	0.31	0.31
Jasper, 1.45 cfs	HCR: 194,600 ac-ft	0.375	0.54	0.54
	LOP: 324,200 ac-ft	0.625	0.90	0.90
Jefferson, 0.82 cfs	DET: 281,600 ac-ft	0.506	0.42	0.42
	GPR: 249,900 ac-ft	0.449	0.37	0.37
	FOS: 24,800 ac-ft	0.045	0.04	0.04
Mehama, 94.11 cfs	DET: 281,600 ac0ft	1.000	94.11	94.11
Monroe*, 0.99 cfs	FRN: 94,498 ac-ft	1.000	0.99	0.99
Salem, 35.66 cfs	DET: 281,600 ac-ft	1.000	35.66	35.66
Vida, 105.19 cfs	CGR: 136,800 ac-ft	1.000	105.19	105.19
Waterloo, 7.51 cfs	GPR:249,900 ac-ft	0.910	6.83	6.83
	FOS: 24,800 ac-ft	0.090	0.68	0.68
Wilsonville plus	HCR: 194,600 ac-ft	0.161	38.61	38.61
Oregon City, 240.47 cfs	LOP: 324,200 ac-ft	0.268	64.33	64.33
	CGR: 136,800 ac-ft	0.113	27.14	27.14
	GPR:249,900 ac-ft	0.206	49.59	49.59
	FOS: 24,800 ac-ft	0.020	4.92	4.92
	DET: 281,600 ac-ft	0.232	55.88	55.88

*Some projected needs can only be met with non-hydropower projects.

Table C-8 Stored Flow Contributions from Upstream Projects, for Future Industrial Demands.

Industrial Flow Projected Need	Hydropower Projects that can be used to meet need (Storage above inactive when full, in acre feet.)	Relative Storage Proportion = Project Storage / Total Storage of all Projects used	Stored Flow Release In Most Water Yrs, June-Sept. (cfs)	Stored Flow Release In Deficit Water Yrs, Jun – Sept.
Albany, 92.87 cfs	HCR: 194,600 ac-ft	0.297	27.57	21.23
	LOP: 324,200 ac-ft	0.495	45.92	35.36
	CGR: 136,800 ac-ft	0.209	19.38	14.92
Harrisburg, 108.35 cfs	HCR: 194,600 ac-ft	0.297	32.16	24.75
	LOP: 324,200 ac-ft	0.495	53.58	41.25
	CGR: 136,800 ac-ft	0.209	22.61	17.41
Salem, 108.35 cfs	HCR: 194,600 ac-ft	0.161	17.40	13.40
(Includes Wilsonville and	LOP: 324,200 ac-ft	0.268	28.98	22.32
Oregon City Industrial)	CGR: 136,800 ac-ft	0.113	12.23	9.42
	GPR:249,900 ac-ft	0.206	22.34	17.20
	FOS: 24,800 ac-ft	0.020	2.22	1.71
	DET: 281,600 ac-ft	0.232	25.18	19.39

Table C-9 Worst-Case Hydropower Analysis Particulars for ResSim Simulation.

ResSim Version	HEC-ResSim 3.1 RC3 Build 101	Watershed	Willamette3
Network	Diversions in Early Imp Network		
Configuration	Existing	Alternative	HydroM-I
Inflow File Name	Daily Series – 13Apr2011.dss		
Rule Curve File	Willamette_Rule_Curves.dss		
External Variables File	year_classifications.dss		
Simulation Name	Meet-M-I-Hydro-042513		
Simulation Start Simulation Lookback	04 Oct 1935 at 2400 01 Oct 1935 at 2400	Simulation Ending	31 Dec 2008 at 2400

Project	Operation Set Name	Lookback Elevation	Lookback Flows (cfs)
Detroit	DET Hydro meet M and I	Rule Curve	Power Plant 1573.0, Spillway and ROs 0.0
Big Cliff	Early Imp	1193.0 ft	Power Plant 1573.0, Spillway 0.0
Green Peter	GPR Hydro meet M and I	Rule Curve	Power Plant 1500.0, Spillway and RO 0.0
Foster	FOS hydro meet M and I	Rule Curve	Power Plant 1500.0, Spillway 0.0
Cougar	CGR Hydro meet M and I	Rule Curve	Power Plant 400.0, Spillway and RO 0.0
Blue River	New Early Imp	Rule Curve	RO 50.0,Spillway 0.0
Hills Creek	HCR All Hydro Storage	Rule Curve	Power Plant 1200.0, Spillway and ROs 0.0
Lookout Point	LOP Hydro meet M and I	Rule Curve	Power Plant 1200.0, Spillway and ROs 0.0
Dexter	Early Imp	693.0 ft	Power Plant 1200.0, Spillway 0.0
Fall Creek	Early Imp	Rule Curve	RO 200.0, Spillway 0.0
Cottage Grove	COT meet M and I	Rule Curve	RO 50.0, Spillway 0.0
Dorena	DOR meet M and I	Rule Curve	RO 100.0, Spillway 0.0
Fern Ridge	FRN meet M and I	Rule Curve	RO 30.0, Spillway and Sluice Gate 0.0

C.1.6. Study Results

This section documents results of two study sets: the use of 499 ac-ft of stored water from Cottage Grove and Dorena (CF-499-ac-ft-041513), and the use of stored water to meet the 2050 projected M&I demand (Meet-M-I-Hydro-042513, i.e. Worst Case Hydropower Analysis). These results are presented in a

summary form in terms of comparisons between each of these model runs and the Early Implementation Baseline. The comparisons are made by post-processing the ResSim output using templates created for the COP analyses and documented in the Model Documentation Report referenced earlier.

The overall changes to the system can be summarized by showing the average pool elevation throughout the year at each project. The daily average pool elevation for the simulations are obtained by finding the average 1 January elevation for all 73 modeled years, the average 2 January elevation for all 73 modeled years, and so on, until a daily average pool elevation plot is obtained and plotted against the project rule curve for reference.

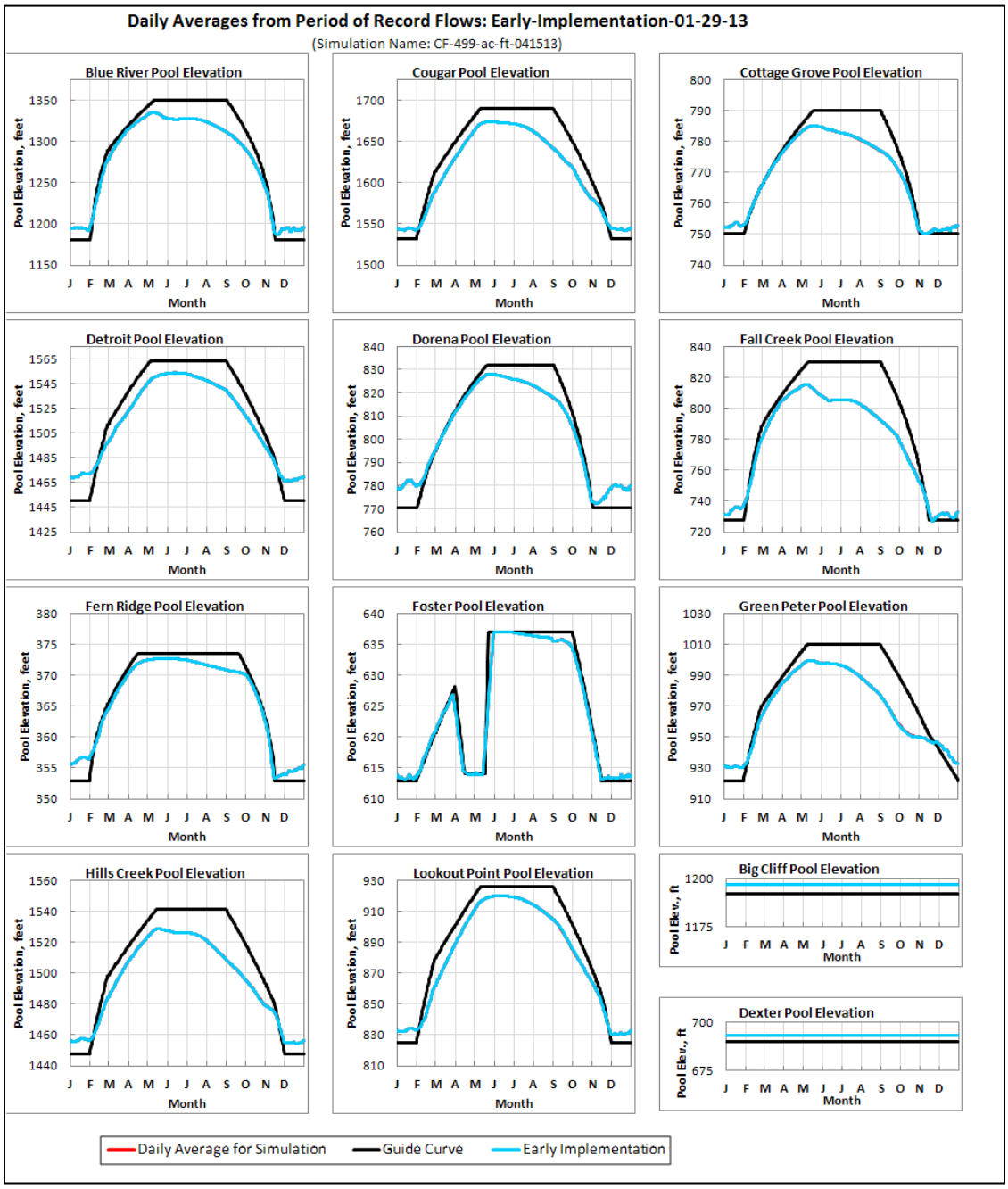
C.1.6.1. 499 ac-ft Analysis Results (From Step 2)

This analysis uses the Early Implementation Baseline operation sets, except for at Cottage Grove and Dorena, where additional flow is released to cover the diversion at Goshen. As shown in Table C-3, the total additional release from these projects is ~ 2 cfs more than current operations. This amount is so small that on average, no changes are visible in project pool elevations for the whole system (Figure C-2). Figure C-2 and Table C-10 show minimal changes to the outflows and pool elevations for both reservoirs, compared to the current operations.

Figure C-3 shows two graphs of non-exceedance values for Dorena reservoir with the 499 ac-ft analysis case compared to the Early Implementation Baseline results. These non-exceedance values show the various percentages for every day of the year at which storage values at Dorena are not exceeded. For example, all Dorena reservoir storage values for day “D” for all 73 years of the POR are pulled from the results and sorted from low to high. The storage value at the midpoint of these 73 sorted numbers for day “D” is the 50% non-exceedance storage, meaning that half the time this storage value is NOT exceeded on this particular day – half the storage values on day “D” are less than or equal to this value, half are greater than this value. The 5% non-exceedance value on day “D” means 5% of these sorted values are equal to or less than this, and all the rest are greater. The non-exceedance values are calculated for every day of the year for both analysis cases.

The upper graph of Figure C-3 shows that the 5% storage values at Dorena are never as low as the minimum conservation zone for the entire conservation season, for both the Early Implementation Baseline and the 499 ac-ft case. The minimum conservation zone is the elevation of the lower black horizontal line on the rule curve. The lower graph in the figure is a close-up of the 5% curves for September through October with -40 acre foot error bars added to the 499 ac-ft analysis case. The error bars on the 5% non-exceedance curve are also never as low as the minimum conservation zone. The magnitude of the error bars, 40 ac-ft, was determined by adding the additional releases for Creswell to Dorena’s minimum outflow, accounting for a gage accuracy of 10 percent (the gage could read 10 percent low, so 10 percent additional flow could be needed), for a possible maximum additional outflow of 19.206 cfs, which is 38 ac-ft of storage a day. This means that Dorena alone has enough stored water to meet the 499 ac-ft of additional outflow for June through September at least 95% of the time.

Figure C-2 Comparison of Daily Average Reservoir Elevations.



Note: Each graph shows the average pool elevation of a project in the 499 ac-ft Analysis (red, although not visible because it is identical to the blue and plots underneath it) to the average pool elevation of a project in the Early Implementation Baseline (in blue). The black lines are the project Rule Curves. Red is not visible as there was not enough change to see the difference between the baseline and simulation.

Table C-10 Post-Processed ResSim Model Results for Cottage Grove Reservoir in the 499 ac-ft Analysis.

Cottage Grove Project Summary																Simulation: CF-499-ac-ft-041513			
Non-Exceedance values for average flows through project outlets, average reservoir elevations, and number of days in a period that minimum tributary flows not met.				Non-Exceedance Values for 73 Water Years (Conditional formatting compares to Baseline counterpart.)						Median Non-Exceedance Values by Water Year Type							
				Early Implementation Baseline POR			Simulation POR			Early Imp. Baseline by WY Type				Simulation by WY Type			
Average Outflow, cfs				5%	50%	95%	5%	50%	95%	Abundant	Adequate	Insufficient	Deficit	Abundant	Adequate	Insufficient	Deficit
October				30	250	370	30	260	370	260	260	140	240	260	260	140	240
November				40	270	670	40	270	670	310	240	230	160	310	240	230	160
December				90	440	1140	90	440	1140	490	330	620	330	490	330	620	330
January				120	550	1120	120	550	1120	650	590	550	360	650	590	550	360
February				100	390	800	100	390	800	530	370	240	130	530	370	240	130
March				90	300	710	90	300	710	410	300	140	120	410	300	140	120
April				110	190	440	110	190	440	230	180	170	140	230	180	170	140
May				80	160	340	80	160	340	140	150	180	160	140	150	180	160
June				80	110	220	80	110	220	110	100	110	100	110	100	110	100
July				50	50	80	50	50	80	50	50	50	50	50	50	50	50
August				50	50	90	50	50	90	60	60	50	50	60	60	50	50
September				40	120	210	40	110	210	160	80	90	50	160	70	90	50
Water Year Statistics				160	250	400	160	250	400	300	250	200	170	300	250	200	170
Average Regulating Outlet Flow, cfs																	
October				30	250	370	30	260	370	260	260	140	240	260	260	140	240
November				40	270	670	40	270	670	310	240	230	160	310	240	230	160
December				90	440	1140	90	440	1140	490	330	620	330	490	330	620	330
January				120	550	1120	120	550	1120	650	590	550	360	650	590	550	360
February				100	390	800	100	390	800	530	370	240	130	530	370	240	130
March				90	300	710	90	300	710	410	300	140	120	410	300	140	120
April				110	190	440	110	190	440	230	180	170	140	230	180	170	140
May				80	160	340	80	160	340	140	150	180	160	140	150	180	160
June				80	110	220	80	110	220	110	100	110	100	110	100	110	100
July				50	50	80	50	50	80	50	50	50	50	50	50	50	50
August				50	50	90	50	50	90	60	60	50	50	60	60	50	50
September				40	120	210	40	110	210	160	80	90	50	160	70	90	50
Water Year Statistics				160	250	400	160	250	400	300	250	200	170	300	250	200	170
Average Spillway Flow, cfs																	
October				0	0	0	0	0	0	0	0	0	0	0	0	0	0
November				0	0	0	0	0	0	0	0	0	0	0	0	0	0
December				0	0	0	0	0	0	0	0	0	0	0	0	0	0
January				0	0	0	0	0	0	0	0	0	0	0	0	0	0
February				0	0	0	0	0	0	0	0	0	0	0	0	0	0
March				0	0	0	0	0	0	0	0	0	0	0	0	0	0
April				0	0	0	0	0	0	0	0	0	0	0	0	0	0
May				0	0	0	0	0	0	0	0	0	0	0	0	0	0
June				0	0	0	0	0	0	0	0	0	0	0	0	0	0
July				0	0	0	0	0	0	0	0	0	0	0	0	0	0
August				0	0	0	0	0	0	0	0	0	0	0	0	0	0
September				0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Statistics				0	0	0	0	0	0	0	0	0	0	0	0	0	0
Days Tributary Flows Not Met																	
01 October - 31 December	50		Instream	0	0	35	0	0	35	0	0	1	0	0	0	1	0
01 - 31 January	50		Instream	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 February - 30 June	75		Instream	0	0	1	0	0	1	0	0	1	0	0	0	0	0
01 July - 30 September	50		Instream	0	0	10	0	0	12	0	0	0	0	0	0	0	0
Water Year Statistics				0	1	42	0	1	43	1	0	1	20	1	0	1	20
Average Reservoir Elevation, ft																	
October	Rule Curve, ft.:		765	750	764	764	750	764	764	764	764	760	764	764	764	760	764
November	Rule Curve, ft.:		750	750	750	754	750	750	754	750	750	750	750	750	750	750	750
December	Rule Curve, ft.:		750	750	750	760	750	750	760	750	750	752	750	750	750	752	750
January	Rule Curve, ft.:		750	750	750	761	750	750	761	751	751	750	750	751	751	750	750
February	Rule Curve, ft.:		759	758	759	761	758	759	761	759	759	760	759	759	759	760	759
March	Rule Curve, ft.:		772	768	772	772	768	772	772	772	772	772	770	772	772	772	770
April	Rule Curve, ft.:		781	773	781	782	773	781	782	782	781	780	774	782	781	780	774
May	Rule Curve, ft.:		789	774	787	789	774	787	789	789	784	783	777	789	784	783	777
June	Rule Curve, ft.:		790	769	787	790	769	787	790	789	783	781	771	789	783	781	771
July	Rule Curve, ft.:		790	762	786	790	762	786	790	788	780	781	767	788	780	781	767
August	Rule Curve, ft.:		790	757	784	788	757	783	788	786	778	778	762	786	777	778	762
September	Rule Curve, ft.:		783	751	780	783	751	779	783	781	772	772	759	781	772	772	759
Water Year Statistics				761	771	773	761	771	773	772	769	768	763	772	769	768	763

Simulation value compared to Baseline:	70% and less	70% to 80%	80% to 90%	90% to 110%	110% to 120%	120% to 130%	130% and more

Non-Exceedance Value Example for Early Imp. Run, Average Reservoir Outflow for October:
Total project outflow is 30 cfs or less in October 5% of the time.
Total project outflow is 250 cfs or less in October 50% of the time.
Total project outflow is 370 cfs or less in October 95% of the time.

Note: The additional flow release from Cottage Grove to supply the water being diverted for the City of Creswell's request is so small that there are almost no changes from the current operations. The Cottage Grove outflows and pool elevations for current operations are in the Early Implementation columns, and 499 ac-ft analysis outflows and pool elevations are in the Simulation columns in the table.

Table C-11 Post-Processed ResSim Model Results for Dorena Reservoir in the 499 ac-ft Analysis.

Dorena Project Summary — Simulation: CF-499-ac-ft-041513

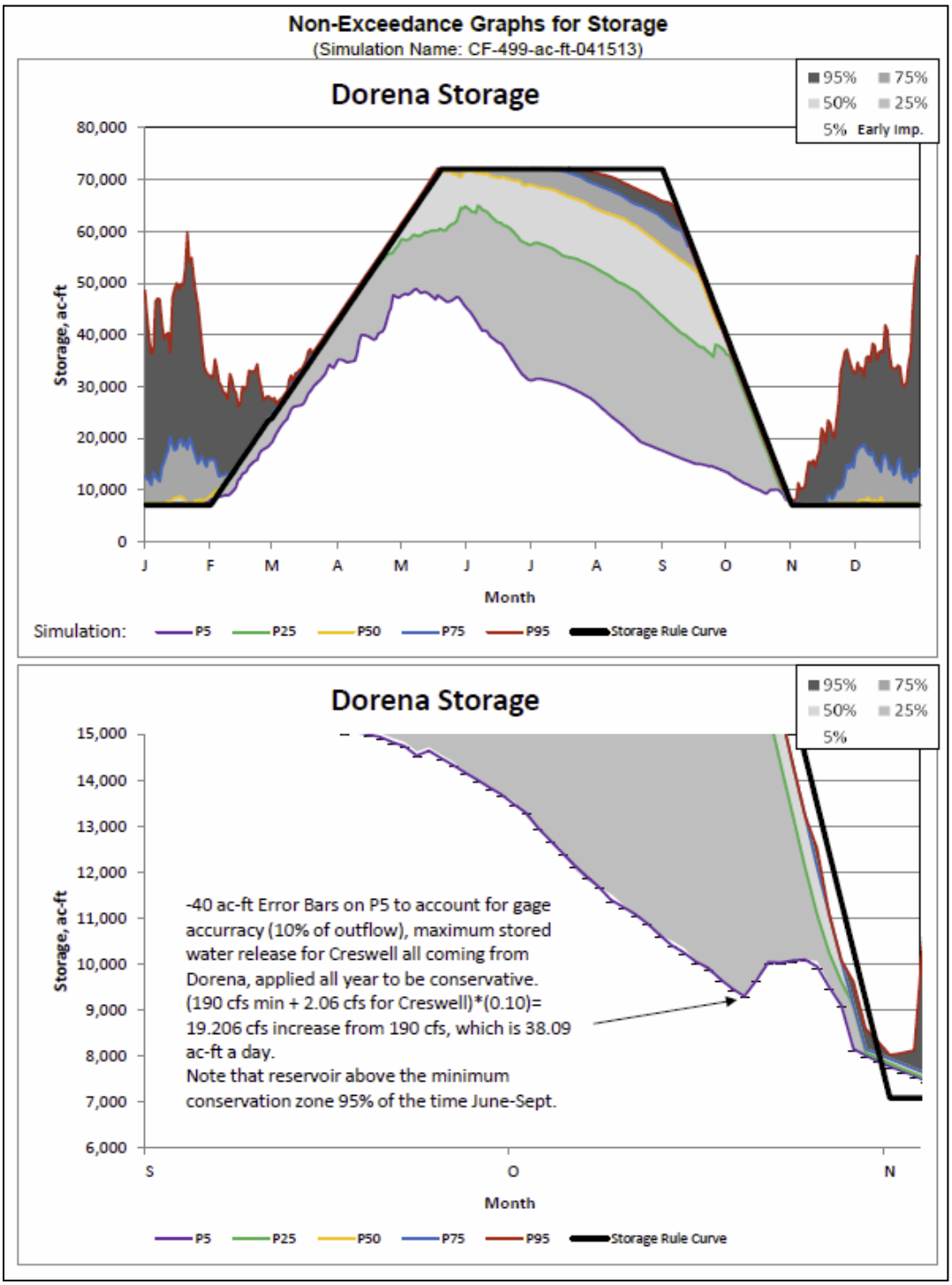
Non-Exceedance Values for Average Flows and Days Minimum Tributary Flows not Met.	Non-Exceedance Values for 73 Water Years (Conditional formatting compares to Baseline counterpart)						Median Non-Exceedance Values by Water Year Type							
	Early Implementation Baseline POR			Simulation POR			Early Imp. Baseline by WY Type				Simulation by WY Type			
Average Outflow	5%	50%	95%	5%	50%	95%	Abundant	Adequate	Insufficient	Deficit	Abundant	Adequate	Insufficient	Deficit
October	190	610	990	190	610	990	620	630	550	590	620	630	550	590
November	100	760	1950	100	760	1950	990	650	560	500	990	650	560	500
December	280	1290	3110	280	1290	3110	1440	1090	1830	860	1440	1090	1830	860
January	290	1510	2990	290	1510	2990	1860	1560	1530	900	1860	1560	1530	900
February	240	1090	2170	240	1090	2170	1310	1150	1040	330	1310	1150	1040	330
March	250	910	1850	250	910	1850	1130	810	510	280	1130	810	510	280
April	320	670	1420	320	670	1420	880	650	380	430	880	650	380	430
May	250	450	1160	250	450	1160	610	340	400	400	610	340	400	400
June	220	310	740	220	310	740	310	360	320	270	310	360	320	280
July	100	110	190	100	120	190	100	130	120	170	110	130	120	170
August	100	140	200	100	140	200	130	170	160	170	130	170	170	170
September	110	330	500	110	330	500	410	210	200	190	410	210	200	190
Water Year Statistics	420	720	1090	420	720	1090	810	690	630	440	810	690	630	440
Average Regulating Outlet Flow														
October	190	610	990	190	610	990	620	630	550	590	620	630	550	590
November	100	760	1950	100	760	1950	990	650	560	500	990	650	560	500
December	280	1290	3110	280	1290	3110	1440	1090	1830	860	1440	1090	1830	860
January	290	1510	2920	290	1510	2920	1860	1560	1530	900	1860	1560	1530	900
February	240	1090	2170	240	1090	2170	1310	1150	1040	330	1310	1150	1040	330
March	250	910	1850	250	910	1850	1130	810	510	280	1130	810	510	280
April	320	670	1420	320	670	1420	880	650	380	430	880	650	380	430
May	250	450	1160	250	450	1160	610	340	400	400	610	340	400	400
June	220	310	740	220	310	740	310	360	320	270	310	360	320	280
July	100	110	190	100	120	190	100	130	120	170	110	130	120	170
August	100	140	200	100	140	200	130	170	160	170	130	170	170	170
September	110	330	500	110	330	500	410	210	200	190	410	210	200	190
Water Year Statistics	420	720	1090	420	720	1090	810	690	630	440	810	690	630	440
Average Spillway Flow														
October	0	0	0	0	0	0	0	0	0	0	0	0	0	0
November	0	0	0	0	0	0	0	0	0	0	0	0	0	0
December	0	0	0	0	0	0	0	0	0	0	0	0	0	0
January	0	0	0	0	0	0	0	0	0	0	0	0	0	0
February	0	0	0	0	0	0	0	0	0	0	0	0	0	0
March	0	0	0	0	0	0	0	0	0	0	0	0	0	0
April	0	0	0	0	0	0	0	0	0	0	0	0	0	0
May	0	0	0	0	0	0	0	0	0	0	0	0	0	0
June	0	0	0	0	0	0	0	0	0	0	0	0	0	0
July	0	0	0	0	0	0	0	0	0	0	0	0	0	0
August	0	0	0	0	0	0	0	0	0	0	0	0	0	0
September	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Statistics	0	0	10	0	0	10	0	0	0	0	0	0	0	0
Days Tributary Flows Not Met														
Period / **Target** / **Purpose**														
01 October - 31 December / 100 / Instream	0	0	22	0	0	22	0	0	0	0	0	0	0	0
01 - 31 January / 100 / Instream	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 February - 30 June / 190 / Instream	0	0	1	0	0	1	0	0	1	0	0	0	0	0
01 July - 30 September / 100 / Instream	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Statistics	0	0	22	0	0	22	0	0	1	0	0	0	1	0
Average Reservoir Elevation / **Rule Curve**														
October / 794	777	793	793	777	793	793	793	793	791	792	793	793	791	792
November / 771	771	772	784	771	772	784	773	772	773	771	773	772	773	771
December / 771	771	776	804	771	776	804	776	775	777	773	776	775	777	773
January / 771	771	777	799	771	777	799	780	778	776	772	780	778	776	772
February / 784	781	786	795	781	786	795	786	785	785	783	786	785	785	783
March / 804	799	804	806	799	804	806	805	804	804	802	805	804	804	802
April / 819	811	819	820	811	819	820	819	819	819	816	819	819	819	816
May / 830	817	829	830	817	829	830	830	825	826	821	830	825	826	821
June / 832	810	831	832	810	831	832	832	826	830	815	832	826	830	815
July / 832	802	829	832	801	829	832	831	824	825	815	831	824	825	815
August / 832	792	826	830	792	826	830	828	821	818	810	828	821	818	810
September / 822	785	819	821	785	819	821	820	814	809	806	820	814	809	806
Water Year Statistics	792	805	809	792	805	809	806	803	802	796	806	803	802	796

Simulation value compared to Baseline:	70% and less	70% to 80%	80% to 90%	90% to 110%	110% to 120%	120% to 130%	130% and more

Non-Exceedance Value Example for Early Imp. Run, Average Reservoir Outflow for October:
Total project outflow is 190 cfs or less in October 5% of the time.
Total project outflow is 610 cfs or less in October 50% of the time.
Total project outflow is 990 cfs or less in October 95% of the time.

Note: The additional flow release from Dorena to supply the water being diverted for the City of Creswell's request is so small that there are almost no changes from the current operations. The Dorena outflows and pool elevations for current operations are in the Early Implementation columns, and 499 ac-ft analysis outflows and pool elevations are in the Simulation columns in the table.

Figure C-3 Storage Availability at Dorena Reservoir.



Note: Graphs show the non-exceedance levels for 5%, 25%, 50%, 75%, and 95% for the Early Implementation Baseline analysis (in gray scale areas) and the 499 ac-ft analysis, color lines. The 5% non-exceedance level in the upper graph is never as low as the minimum conservation zone in the conservation season for either run. The 5% non-exceedance level in the lower graph is a close-up of September and October, with 40 ac-ft error bars about the 499 ac-ft analysis 5% non-exceedance (purple line), also never going as low as the minimum conservation zone during this period.

C.1.6.2. Projected 2050 M&I Demand Analysis Results (From Step 3)

The worst case hydropower analysis has the 2050 M&I demands as diversions in the model, with specified releases at hydropower projects (when possible) to cover the amount diverted. Changes to average reservoir elevations are shown in Figure C-4, with the largest effects at Cougar, Detroit, Hills Creek, and Lookout Point. Changes at other projects, on average, are less noticeable in these graphs.

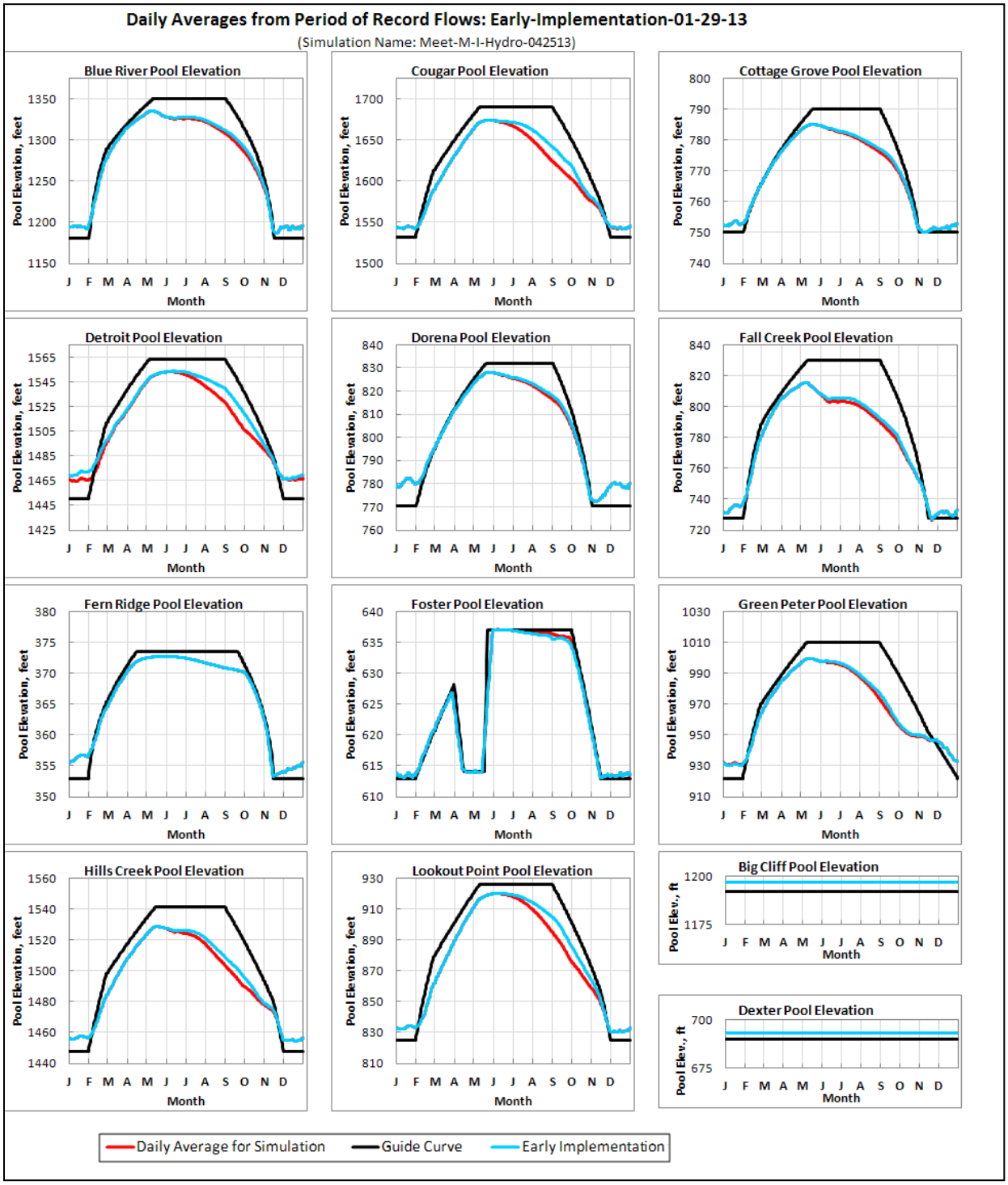
The non-exceedance graphs for the four projects with the most change are shown in Figures C-5-C-8. In these figures, the gray-scale areas represent the various percentile non-exceedances of the pool elevations associated with the Early Implementation Baseline, and the colored lines represent the same percentile non-exceedances for the Worst Case Hydropower Analysis. As an example, the June 1 value of the purple line at Detroit is at approximately 1510 ft. This P5 value means that the pool elevation of Detroit is 1510 or less at Detroit five percent of the time. The June 1 green line (P25) at Detroit is at about elevation 1550 ft, meaning that the Detroit pool elevation is 1550 ft or less on June 1 for 25 percent of the time.

The four non-exceedance graphs for Detroit, Cougar, Hills Creek, and Lookout Point indicate that the winter pool elevations and the refill period are not affected by the diversions for M&I or the increased minimum project releases, but that the months June through October are likely to have lower pool elevations than in the Early Implementation Baseline. Lower elevations mean that more water is being released from the projects at the beginning of this period. The values in Table C-12, for Detroit, show the average flow at Detroit is greater than the Early Implementation Baseline in June through September, but less than the Early Implementation Baseline in the fall and winter months. Results at Cougar, Hills Creek, and Lookout Point are similar. Table C-13 indicates there are more days of BiOp flow minimums not met in the worst case hydropower analysis than in the Early Implementation Baseline.

The Worst Case Hydropower Analysis is used for developing the system wide price of stored water used for M&I. The results presented here are meant to show the broad generalizations that can be summarized by the figures and tables.

The hydropower analysis was performed using the simulation results from the ResSim runs. In this process, the daily values for all project flows through the turbines and total reservoir outflows were binned into the same fourteen periods used by BPA in their Hydsim program, which uses monthly averages (1 period for each month except April and August which are each divided into 2 periods, hence 12 months plus 2 extra periods equals 14). The 73 years of fourteen period average values for flows were provided to BPA to process through Hydsim, which computed the power that was generated for each period of every year. The power results were processed by the Corps to determine impacts to hydropower. The revenue difference between power produced from Early Implementation Baseline and using specific projects to meet future M&I demand (Worst Case Hydropower) were determined using this approach.

Figure C-4 Comparison of Daily Average Reservoir Elevations of the Worst Case Hydropower Analysis to the Early Implementation Analysis.



Note: Each graph shows the average pool elevation of a project in the Worst Case Hydropower Analysis (red, although not visible because it is identical to the blue and plots underneath it) to the average pool elevation of a project in the Early Implementation Baseline (in blue). The black lines are the project Rule Curves.

Figure C-5 Comparison of Average Elevation at DET between the Early Implementation Baseline (gray scale areas) to the Worst Case Hydropower Analysis (colored lines).

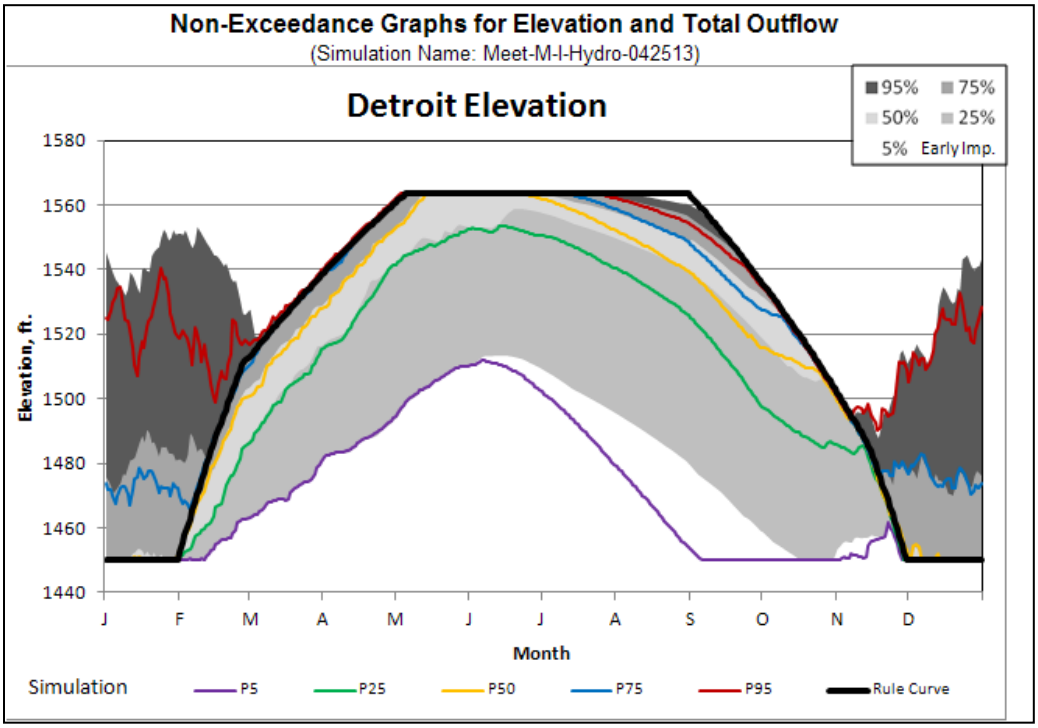


Figure C-6 Comparison of Average Elevation at CGR between the Early Implementation Baseline (gray scale areas) to the Worst Case Hydropower Analysis (colored lines).

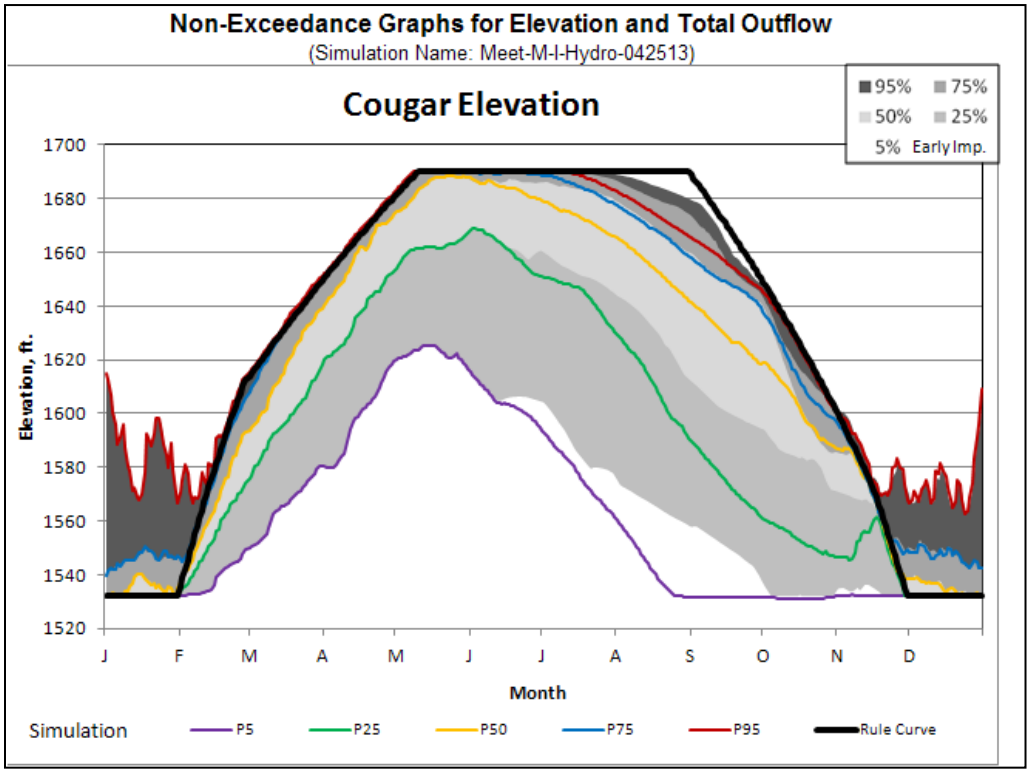


Figure C-7 Comparison of Average Elevation at HCR between the Early Implementation Baseline (gray scale areas) to the Worst Case Hydropower Analysis (colored lines).

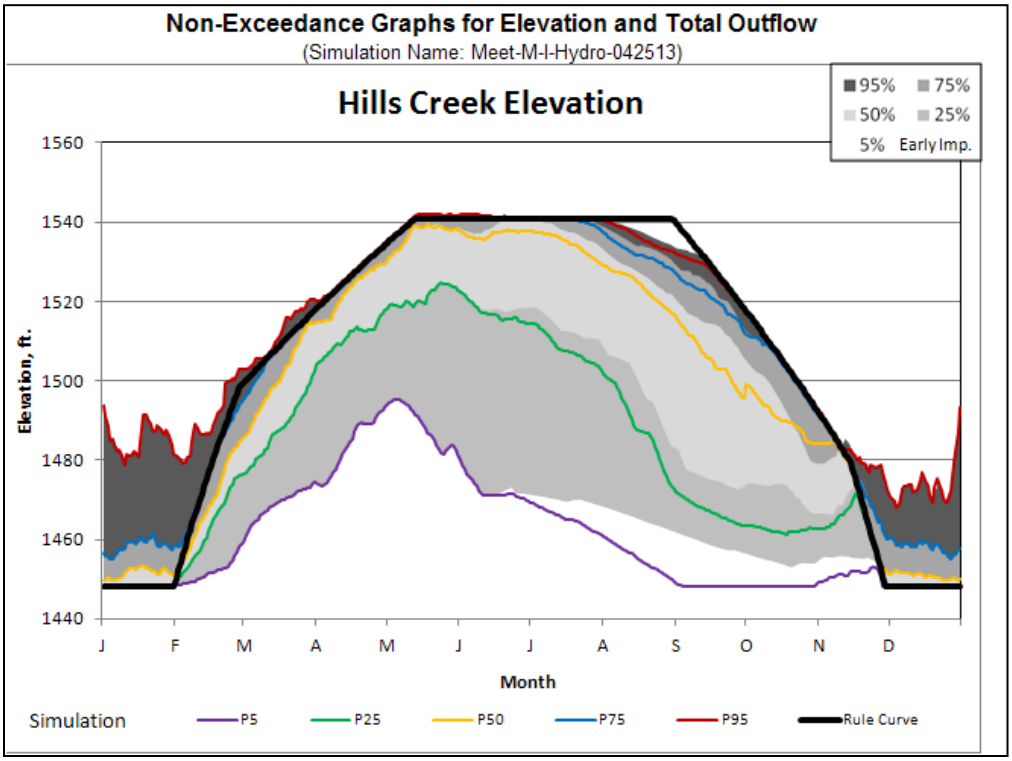


Figure C-8 Comparison of Average Elevation at LOP between the Early Implementation Baseline (gray scale areas) to the Worst Case Hydropower Analysis (colored lines).

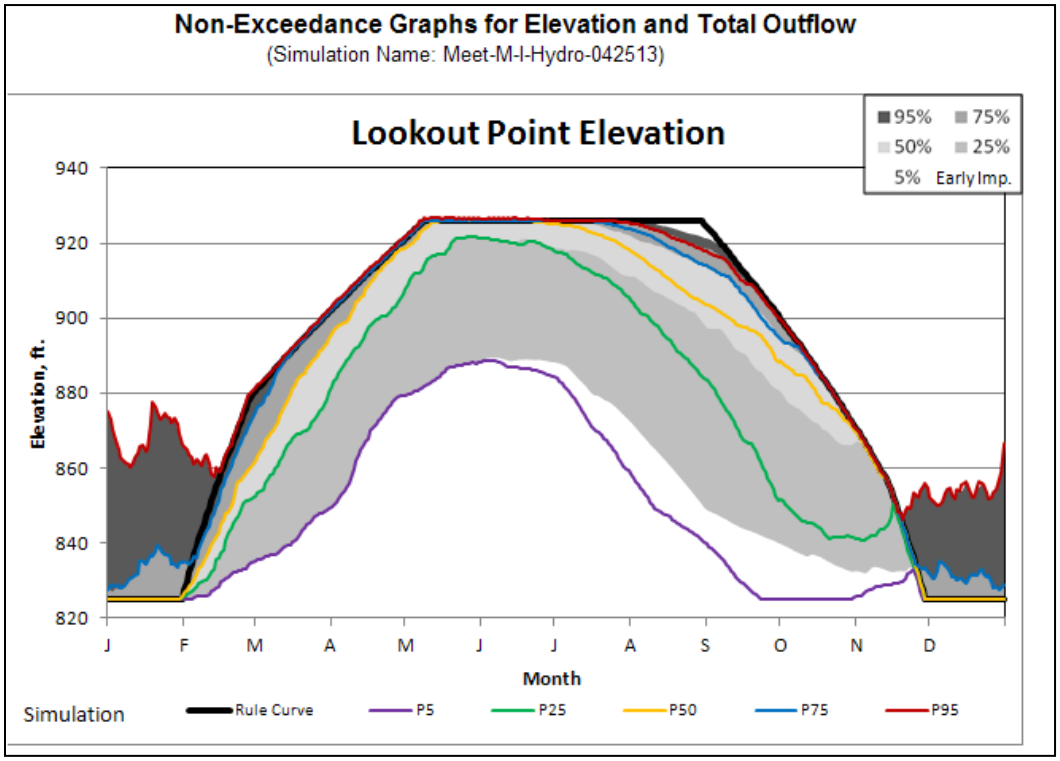


Table C-12 Post-Processed ResSim Model Results for Detroit Reservoir, Worst Case Hydropower Analysis.

Detroit Project Summary							Simulation: Meet-M-I-Hydro-042513							
Exceedance Values for Average Flows and Number of Days Tributary Flows Not Met.	Exceedance Values for 73 Water Years Conditional formatting compares to Baseline counterpart						Exceedance Values by Water Year Type							
							Early Imp. Baseline by WY Type				Simulation by WY Type			
	Early Implementation Baseline POR			Simulation POR										
Average Outflow	5%	50%	95%	5%	50%	95%	Abundant	Adequate	Insufficient	Deficit	Abundant	Adequate	Insufficient	Deficit
October	900	2110	3360	650	1460	2700	2180	1880	1820	1740	1690	1270	1270	1270
November	1920	3430	4930	1690	3370	4960	3710	3280	3090	2850	3570	3030	3120	2670
December	1370	3350	5200	1370	3350	5610	3540	2610	3550	2750	3640	2610	3550	2720
January	1240	3420	5270	1270	3290	6300	3540	3530	3090	2270	3480	3530	3020	2270
February	980	1660	5610	980	1550	5040	1910	1510	2060	1000	1860	1240	2100	1000
March	1260	1270	3190	1260	1280	3200	1610	1270	1270	1260	1610	1260	1260	1260
April	1500	1570	2850	1500	1570	2850	1850	1570	1570	1500	1810	1570	1540	1500
May	1500	2180	4210	1500	2090	4210	2720	1570	1570	1500	2720	1570	1530	1500
June	1200	1640	3750	1480	1660	3750	2090	1490	1270	1200	2090	1490	1480	1480
July	1090	1160	1600	1380	1380	1690	1180	1160	1160	1090	1380	1380	1380	1380
August	1000	1070	1090	1250	1280	1300	1070	1070	1070	1000	1280	1280	1280	1280
September	1150	1570	2160	760	1780	1870	1610	1570	1570	1500	1780	1780	1780	1420
Water Year Statistics	1570	2150	3060	1600	2160	3050	2340	2080	1900	1690	2360	2130	1880	1700
Average Upper Regulating Outlet Flow														
October	0	120	460	0	280	410	120	170	380	20	260	370	190	240
November	0	20	360	0	30	510	10	20	30	0	20	40	50	10
December	0	20	540	0	30	1580	30	20	20	10	30	30	40	10
January	0	20	200	0	30	1320	20	20	20	10	30	20	10	10
February	0	0	400	0	0	1450	0	0	0	0	0	0	0	0
March	0	0	430	0	0	420	0	0	0	0	0	0	0	0
April	0	0	0	0	0	0	0	0	0	0	0	0	0	0
May	0	0	0	0	0	0	0	0	0	0	0	0	0	0
June	0	0	0	0	0	0	0	0	0	0	0	0	0	0
July	0	0	0	0	0	0	0	0	0	0	0	0	0	0
August	0	0	0	0	0	0	0	0	0	0	0	0	0	0
September	0	390	430	0	460	480	260	410	410	390	460	460	460	0
Water Year Statistics	10	70	140	20	90	310	70	70	70	30	90	100	80	30
Average Turbine Flow														
October	880	2010	3080	650	1130	2530	2170	1520	1430	1320	1370	870	1170	890
November	1890	3350	4740	1680	3120	4600	3610	3280	3090	2700	3510	3030	3120	2630
December	1370	3230	4590	1370	3340	4640	3510	2570	3510	2730	3410	2570	3510	2700
January	1240	3180	4690	1270	3060	4770	3460	3490	3070	2260	3460	3500	3010	2260
February	980	1660	4410	980	1540	3680	1860	1510	2060	1000	1800	1230	2100	1000
March	1260	1270	2770	1260	1280	2790	1610	1270	1270	1260	1610	1260	1260	1260
April	1120	1500	1820	1090	1500	1790	1420	1520	1570	1500	1440	1550	1540	1500
May	580	1140	2290	580	1140	2290	1110	760	1560	1500	1110	800	1530	1500
June	480	820	1700	560	830	1700	770	670	740	1200	780	620	860	1480
July	560	590	1160	660	690	1380	570	560	560	1090	670	690	960	1380
August	610	610	1070	730	880	1280	610	610	620	1000	740	1080	1150	1280
September	940	1150	2110	760	1320	1510	1170	1170	1150	1110	1290	1320	1320	1320
Water Year Statistics	1290	1750	2320	1320	1740	2140	1850	1710	1640	1620	1750	1690	1650	1670
Average Spillway Flow														
October	0	0	0	0	0	0	0	0	0	0	0	0	0	0
November	0	0	0	0	0	0	0	0	0	0	0	0	0	0
December	0	0	190	0	0	180	0	0	0	0	0	0	0	0
January	0	0	820	0	0	430	0	0	0	0	0	0	0	0
February	0	0	940	0	0	330	0	0	0	0	0	0	0	0
March	0	0	0	0	0	0	0	0	0	0	0	0	0	0
April	0	270	1020	0	260	1020	600	70	0	0	470	70	0	0
May	0	1360	2070	0	1320	2070	1700	990	0	0	1690	990	0	0
June	0	1020	1990	0	1050	1990	1310	940	540	0	1310	980	630	0
July	0	610	850	0	720	890	620	610	600	0	720	720	420	0
August	0	470	470	0	390	560	470	470	460	0	560	200	0	0
September	0	130	260	0	0	280	190	80	20	0	110	0	0	0
Water Year Statistics	0	350	600	0	340	530	420	280	140	0	410	260	130	0

Simulation value compared to Baseline:	70% and less	70% to 80%	80% to 90%	90% to 110%	110% to 120%	120% to 130%	130% and more

Exceedance Value Example for Early Imp. Run, Average Reservoir Outflow for October:
Total project outflow is 900 cfs or less in October 5% of the time.
Total project outflow is 2110 cfs or less in October 50% of the time.
Total project outflow is 3360 cfs or less in October 95% of the time.

Notes: Comparison of average outlet flows of the Worst Case Hydropower Analysis to the Early Implementation Baseline in terms of flow value non-exceedance values. Note that June, July, and August turbine flow values are higher than in the baseline, coincident with the project elevations being lower (pool levels are lower because more water is released), but that September and October values of turbine flows are lower than in the baseline (more years with not enough water to release).

Table C-13 Post-Processed ResSim Model Results for BiOp Minimum Flows, Worst Case Hydropower Analysis.

BiOp Flow Targets: Summary for Water Year Statistics

Simulation: Meet-M-I-Hydro-042513

Non-Exceedance Values for the Number of Days in a Water Year that Minimum Tribuatary Flows are Not Met	Non-Exceedance Values for 73 Water Years (Conditional formatting compares to Baseline counterpart.)						Median Non-Exceedance Values by Water Year Type							
							Early Imp. Baseline by WY Type				Simulation by WY Type			
	Early Implementation Baseline POR			Simulation POR										
	5%	50%	95%	5%	50%	95%	Abundant	Adequate	Insufficient	Deficit	Abundant	Adequate	Insufficient	Deficit
Cottage Grove	0	1	42	0	1	44	1	0	1	20	1	0	1	21
Dorena	0	0	22	0	0	25	0	0	1	0	0	0	1	0
Hills Creek	0	0	11	0	0	37	0	0	0	0	0	0	0	26
Fall Creek	0	0	2	0	0	2	0	0	0	0	0	0	0	0
Dexter	0	11	82	0	4	41	9	8	22	75	3	3	4	31
Blue River	0	0	10	0	0	10	0	0	0	0	0	0	0	0
Cougar	0	0	25	0	0	56	0	0	0	4	0	0	29	39
Fern Ridge	0	7	28	0	8	30	6	9	2	23	6	9	2	25
Foster	16	61	165	19	68	165	44	66	104	139	50	72	104	142
Big Cliff	0	6	62	2	20	76	2	6	3	34	16	18	18	62
Albany	0	16	55	0	13	63	17	4	1	28	14	10	0	37
Salem	1	23	83	1	28	109	9	42	44	51	9	57	58	83

Simulation value compared to Baseline:	70% and less	70% to 80%	80% to 90%	90% to 110%	110% to 120%	120% to 130%	130% and more

Non-Exceedance Value Example for Early Imp. Run, Cottage Grove Minimum Tributary Flows:
Minimum tributary flows were met all days of the year for 5% or less of the water years.
Half the time (50%) there was one day or less in a water year that minimum tributary flows were not met.
Almost always (95% of the time), 42 days or less in a water year, minimum tributary flows were not met.

Notes: Comparison of the Worst Case Hydropower Analysis run (columns with light numbers or shades of red or green instead of white fill in cells with "Simulation" in column headings) to the Early Implementation Baseline (columns with "Baseline" in heading). Values are non-exceedance for the number of days that minimum flows are NOT met, so a smaller number is better.

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Appendix D
SYSTEM PRICING APPROVAL DOCUMENTATION

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WILLAMETTE BASIN SURPLUS WATER SYSTEM PRICING DOCUMENTATION

Correspondence Timeline (Memorandums 1-7)

1. 29 Oct 1996, Willamette Basin Surplus Water Letter Report (Letter Report)
2. 22 Nov 1996, Transmittal of Letter Report from NWD to HQUSACE
3. 02 Jan 1997, Transmittal from HQUSACE to ASA(CW)
4. 09 Jan 1997, HQUSACE Comments on Letter Report
5. 10 Jan1997, ASA(CW) Approval of Agreement to HQUSACE
6. 14 Jan 1997, HQUSACE Letter Report Approval to NWD
7. 28 Jan 1997, NWD Authorization to NWP

DEPARTMENT OF THE ARMY
PORTLAND DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2946
PORTLAND, OREGON 97208-2946

REPLY TO
ATTENTION OF:

CENPP-PE-HR (1110-2-1455a) 29 OCT 1996

MEMORANDUM FOR COMMANDER NORTH PACIFIC DIVISION ATTN CENPD-ET-P

SUBJECT: Willamette Basin Surplus Water Letter Report

1. The City of Portland Parks and Recreation Department would like to purchase 213 acre-feet of surplus water from storage in the Willamette Basin. The City would like to use the water in lieu of treated, municipal water from the Bull Run Watershed to water five waterfront parks annually from 1 May to 31 October.

2. The Oregon Water Resources Department indicated that instream (natural) flows are not available to the City for this purpose. The Oregon Water Resources Department will issue the City a permit to withdraw stored water contingent upon obtaining an agreement from the Portland District. Since the water will not be used to irrigate commercial crops this request fits under the category of municipal and industrial use.

3. Five copies of the draft letter report and surplus water agreement are enclosed for your concurrence and forwarding to USACE for approval. The letter report establishes a unit charge per acre-foot of surplus water for the Willamette Basin projects. This methodology will be applied to future requests for surplus water agreements in the Basin. The economic analysis in the letter report concentrates on determining the highest cost for the surplus water and ensuring that the user reimburses the Federal Government that amount. Since this is not a permanent reallocation of storage, there is no need to compare the benefits of this action to the costs of a permanent shift from another authorized purpose. The water is surplus to authorized purposes and as such, the storage can be sold to the user provided the cost of the storage is reimbursed.

4. Pricing the surplus water based on the updated costs of all eleven storage projects is the best method because the Willamette Basin Projects are operated as a system to meet specific flow requirements at Albany and Salem, Oregon. In most cases, it is difficult to identify which upstream project is contributing a specific part of that flow at Albany and Salem. Even in cases where the point of diversion may be directly downstream from one of the projects, that consumptive use may likely affect releases from elsewhere in the system in the form of increased releases to

meet the target flows at Albany and Salem. The overall basin price reflects a fair price to all potential users while at the same time creating a methodology that provides the most operational flexibility and ease of administration to the Portland District.

5. Portland Parks and Recreation's water permit application with the State of Oregon will expire January 1997. To avoid further delays created by Portland Parks and Recreation reapplying for a state permit, we request completion of this action by 15 January 1997.

6. Any questions should be directed to Mr. Michael Posovich, Reservoir Regulation and Water Quality Section, CENPP-PE-HR, at (503) 326-6468.

FOR THE COMMANDER:

Encls
1-5 as

HOWARD B. JONES, P.E.
Chief, Planning and Engineering Division

S: 22 November 1996
6 November 1996

CENPD-ET-P

MEMORANDUM FOR

CENPD-ET-O
CENPD-ET-PR
CENPD-ET-R
CENPD-OC

Subject: Letter Report, Surplus Water Requests for Willamette River Basin, Oregon

Please review subject report and provide comments to this office NLT 22 November. Frank McDonald, ext 3872, is the point of contact for this action.

ET-P

Encl

THOMAS L. DAVIS
Chief, Planning Division

McDonald/kb
6Nov96/3872
pe-ec:\npp\surplus.wil

CENPP-PE-HR 29 October 1996

LETTER REPORT
SURPLUS WATER REQUESTS
for the
WILLAMETTE RIVER BASIN, OREGON

1. PURPOSE

This report describes a request for surplus water from the City of Portland, Oregon, Bureau of Parks and Recreation referred to as the City throughout this report. This is the first such request processed in the Willamette River Basin and therefore, must be approved by the Office of the Assistant Secretary of the Army for Civil Works [OASA (CW)]. This report will serve to establish a unit charge per acre-foot of municipal and industrial (M & I) water that will be applied to future surplus water agreements in the Willamette Basin. Approval authority for these future surplus water agreements will be in accordance with Table 4-5 found on page 4-59 of Engineering Regulation (ER) 1105-2-100.

Surplus water is classified as water stored in a Department of the Army reservoir which is not required because the authorized need for the water never developed or the need is reduced by changes which have occurred since authorization or construction. The authority to sell surplus water for M & I purposes was granted to the Corps of Engineers by Section 6 of the Flood Control Act of 1944 (Public Law 78-534), as amended. Under this authority, the Secretary of the Army is authorized to make agreements to sell surplus water to states, municipalities, private concerns, or individuals, at such prices and on such terms as deemed reasonable.

The City would like to purchase surplus water from the U.S. Army Corps of Engineers, Portland District in order to "irrigate" five parks located on the Willamette River. The term "irrigate" is used throughout this report to describe the act of watering grass and other non-commercial plants. It is not used to describe the act of watering a commercial crop for resale as this would fall under the purview of the U.S. Bureau of Reclamation (USBR). The City initially requested 52 acre-feet of water to "irrigate" one park in downtown Portland in a letter dated 21 July 1991 (Attachment 1). The City has recently updated their request to include four additional parks in a letter dated 7 July 1995 (Attachment 2) for a total of 213 acre-feet of water. Table 1 provides a summary of the park locations and amount of water needed to "irrigate" each.

The City will pump water from the Willamette River via shallow wells at each park during the summer irrigation season from 1 May to 31 October. The City prefers to conserve its limited supply of treated drinking water during this period of low precipitation by using water directly from the Willamette River. The Oregon Water Resources Department (OWRD) has determined that these wells would be hydraulically connected to the mainstem Willamette River and therefore, constitute instream flow. The OWRD has also indicated that

instream (natural) flows are not available to the City for their use, but has indicated they will issue the City a permit to withdraw stored water contingent on obtaining a surplus water agreement from the Corps (Attachment 3).

Table #1 - Water Request from Portland Parks and Recreation

Park	*Location (address/river mile)*	*"Irrigation" Area (acres)*	*Water Amount (acre-feet)*
Waterfront Park	SW Front Ave/ RM 12-13	33.6	67.2
Willamette Park	SW Macadam & Nebraska Sts./RM 16.5	30.4	60.8
Cathedral Park	N Edison & Pittsburgh Sts./RM 6	17.5	35.0
Sellwood Park	SE 7th & Miller Sts./RM 16.5	16.4	32.8
Sellwood Riverfront Park	SE Spokane & Oaks Park Way/RM 16	8.8	17.6
	Total	106.7	213.4

2. BACKGROUND

The Willamette Basin Reservoirs are a system of thirteen projects operated together to provide many benefits to the region and the Nation (see Figure 1). The Willamette River Basin lies in northwest Oregon and is the largest basin solely in Oregon. The basin has a drainage area of 11,200 square miles and supports over 75 percent of the state's population, its larger cities, and many major industries. It also contains some of Oregon's most productive agricultural land and supports nationally and regionally significant fish and wildlife species. There are a number of streams in the basin designated as State scenic waterways and Federal wild and scenic rivers. Water related recreational opportunities in the basin are numerous.

The authorization for the projects in the Willamette Basin was provided by several Congressional acts (see Table 2). The Flood Control Act (FCA) of 1938 (PL 75-761) approved plans described in House Document (HD) 544 and resulted in the construction of seven projects. The FCA of 1950 (PL 81-516) authorized plans contained in HD 531 and resulted in the construction of five more projects. Finally, the FCA of 1960 (PL 86-645), which authorized plans contained in Senate Document 104, resulted in one more project in the Willamette Basin. House Document 531 presented long-range flood protection plans for the Columbia River Basin after the disastrous flood of 1948. The document presented an overall water resources development plan for the Willamette Basin which included projects constructed as part of previous legislation and reads:

Figure #1 - Willamette Basin Projects

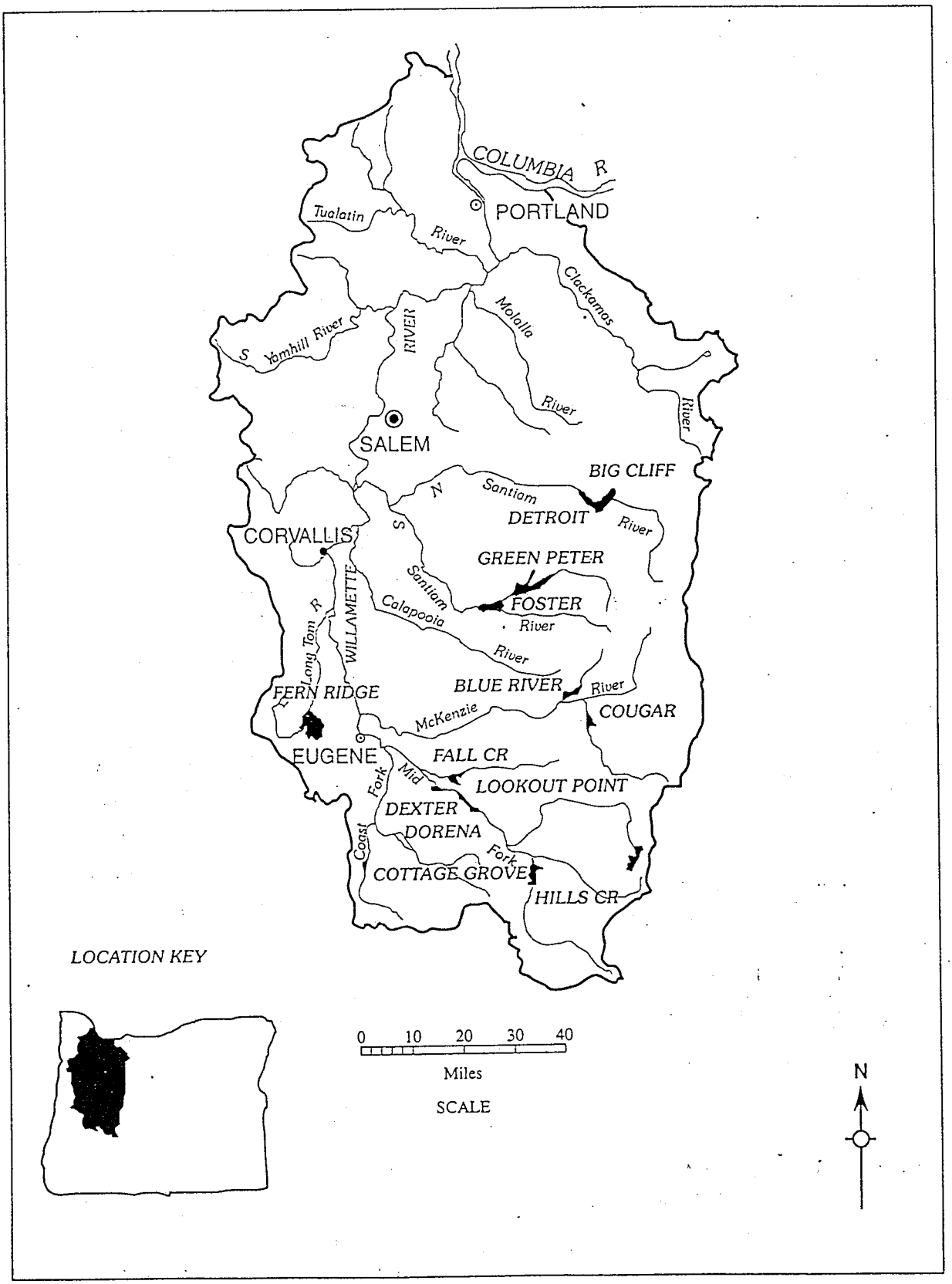


Table #2 - Congressional Authorizations of Corps Projects in the Willamette Basin

Willamette Basin Project	***Congressional Authorization Date (Flood Control Act)***	***Congressional Report Pursuant to Authorization (House Document)***
Hills Creek	1950	531
Lookout Point (includes Dexter Re-regulating Dam)	1938	544
Fall Creek	1950	531
Cottage Grove	1938	544
Dorena	1938	544
Cougar	1950	531
Blue River	1950	531
Fern Ridge	1938	544
Green Peter	1950	531
Foster	1960	Senate Doc. 104
Detroit (included Big Cliff Re-regulating Dam)	1938	544

"The primary accomplishment [purposes] of the proposed projects would be the provision of flood control and major drainage. Secondary accomplishments would be the generation of hydroelectric power; improvement of main stem Willamette for navigation; increase of water supplies for irrigation and domestic use; increase of low flows which would result in abatement of pollution and improved fish conditions for fish life; and improved recreational conditions at reservoirs and downstream."

Of the thirteen Willamette Basin Projects, two are re-regulation projects and do not provide any conservation storage capability. Pertinent data on the remaining eleven projects are found in Table 3.

The Willamette Basin Projects are operated as a system. The annual weather patterns in the Pacific Northwest and the runoff characteristics of the Willamette Basin allow the system to be operated to balance a range of purposes as described in HD 531. The well-defined limits of the flood season and effective planned use of storage space after the flood season allows for the impoundment of spring runoff. Subsequently, conservation related releases are made during the low water conditions typically found in the summer and early fall seasons. HD 531 established minimum regulated flows for navigation of 5,000 ft^3/sec at Albany and 6,500 ft^3/sec at Salem.

Table #3 - Pertinent Data on Corps Projects in the Willamette Basin[1]

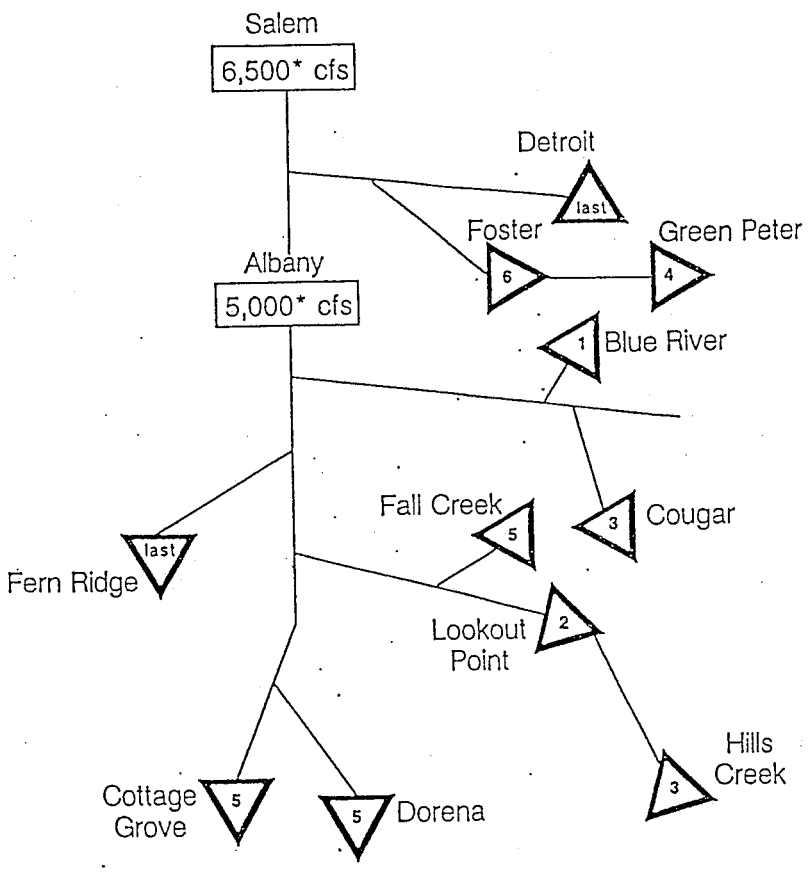
PROJECT	DRNG AREA (sq mi)	HYDRO POWER	MIN FLOOD CONTROL POOL		MAX CONSERVATION POOL		FULL POOL		JOINT USE
			ELEV. (ft, NGVD)	STORAGE (acre-feet)	ELEV. (ft, NGVD)	STORAGE (acre-feet)	ELEV. (ft, NGVD)	STORAGE (acre-feet)	STORAGE[2] (acre-feet)
Hills Creek	389	Yes	1448.0	155,370	1541.0	350,010	1543.0	355,570	197,640
Lookout Point	991	Yes	825.0	118,760	926.0	442,990	929.0	455,840	324,230
Fall Creek	184	No	728.0	9,620	830.0	117,830	834.0	125,080	108,210
Cottage Grove	104	No	750.0	3,140	790.0	31,780	791.0	32,930	28,640
Dorena	265	No	770.5	7,090	832.0	72,050	835.0	77,600	64,960
Cougar	208	Yes	1532.0	63,900	1690.0	207,760	1669.0	219,080	143,860
Blue River	88	No	1180.0	3,970	1350.0	82,820	1357.0	89,520	78,850
Fern Ridge	252	No	353.0	7,170	373.5	101,070	375.1	116,790	93,900
Green Peter	277	Yes	922.0	159,860	1010.0	409,830	1015.0	428,110	249,970
Foster	494	Yes	613.0	31,070	637.0	55,870	641.0	60,780	24,800
Detroit	438	Yes	1450.0	154,380	1563.5	436,010	1569.0	455,100	281,630
TOTALS				714,330		2,308,020		2,416,400	1,596,690

[1]Willamette River Basin Reservoir System Operation, U.S. Army Corps of Engineers, Portland District, May 1989, p. 9.
[2]Joint Use Storage equals Maximum Conservation Storage minus Dead or Inactive Storage minus Specific Use Storage

These flows, however, are subject to interagency management based on water year conditions in the Willamette Basin.[1] Although a navigation channel is no longer maintained upstream of Portland, minimum flows are maintained for pollution abatement and fishery purposes. In recent years, the State of Oregon, Department of Environmental Quality has issued discharge permits based on slightly reduced minimum flows of 4,500 ft^3/sec at Albany and 6,000 ft^3/sec at Salem.

During May of each year the Corps holds an annual meeting to present and discuss a Willamette Basin water release plan for the June through October time period. The objective of this meeting is to develop a collaborative plan that balances the multiple uses of the system. Operational constraints, competing project purposes and downstream physical, environmental, and social needs are discussed with State and Federal water resources and fishery agencies. Additional comments and guidance are also received from local government offices and private interests. A generalized order of reservoir drawdown is shown at Figure 2.

Figure #2 - Willamette River Basin Generalized Order of Reservoir Drawdown (After 1985)



Note:
*Have been subject to interagency management based on water year conditions.

[1] Willamette River Basin Reservoir System Operation, U.S. Army Corps of Engineers, Portland District, May 1989, p. 17.

3. SURPLUS WATER AVAILABILITY

The USBR holds two state permits for approximately 1.6 million acre-feet of water from conservation storage in the Willamette Basin projects. USBR sells this water for agricultural crop irrigation in the Willamette Basin and is in the process of converting the state permits for this use to permanent water rights. As of June 1996, the USBR had issued 226 water service contracts totaling 57,226 acre-feet of stored water or about 3.6 percent of the total available. Clearly, the need for irrigation water has not developed to the extent originally projected in the Willamette Basin. Because of this, surplus water stored for conservation uses from spring to fall each year is available for other authorized project purposes.

4. ECONOMIC ANALYSIS

The City is seeking a surplus water agreement with the Corps for several reasons. At present, the parks are "irrigated" using treated, municipal water from the Bull Run Watershed on the western slopes of nearby Mount Hood. During the summer months when precipitation in the Willamette Basin is low, the City conserves its municipal water supply whenever possible. Increased population growth in the region has made this a higher priority in recent years, particularly during below average precipitation years. During recent droughts the City has rationed water. Using stored water directly from the mainstem Willamette for watering parks meets the City's goals under its Bull Run Water Conservation Program. The location of the parks directly adjacent to the Willamette River makes the use of groundwater unfeasible, since the City would have to put in extremely deep wells to avoid a hydraulic connection to the River. For these reasons, the City seeks to enter into a surplus water agreement to purchase stored water from the Federal Government.

4.1 Derivation of User Cost

As outlined in ER 1105-2-100, the cost of surplus storage is determined using the same procedures utilized to calculate the cost of reallocated (permanent) storage. The cost shall be the highest of benefits or revenues foregone, the replacement cost, or the updated cost of storage. To this annual cost will be added an estimated annual cost for operation, maintenance, repair, replacement and rehabilitation (O,M,R,R & R). Because of the availability of surplus water in the Willamette projects and the small amounts of water requested, the updated cost of storage is the highest cost method.

Since the Willamette Basin projects are operated as a system, the user cost derivation is based on the updated cost of all eleven storage projects in the basin. Using all eleven storage projects is appropriate for surplus water agreements because the requests are generally for small amounts and the agreements are temporary, not to exceed five years in length. Considering all eleven projects as a system provides the Corps the most flexibility when formulating the annual Willamette Basin release plan. Even though the surplus water may be withdrawn directly downstream of a specific project, it may be necessary to coordinate releases elsewhere in the system to meet minimum flow requirements at Albany and Salem.

By calculating user costs based on all eleven storage projects, operational flexibility is maintained and an equitable price that can be easily administered is established for all potential surplus water users in the Willamette Basin.

For the updated cost of storage method, the capital costs at the time of construction are calculated and costs allocated to specific purposes are subtracted. These resulting costs (joint use) are then escalated to current price levels. This amount is then multiplied by the ratio of requested surplus storage to total usable storage (in acre-feet).

$$(\text{Total Construction Cost} - \text{Specific Costs}) \times \frac{\text{Surplus Storage Requested}}{\text{Total Usable Storage}} \text{ [acre - feet]}$$

Added to this updated cost of surplus storage is an appropriate share of the joint use O,M,R,R & R costs for the fiscal year prior to the year of the agreement. Repayment of all these costs, including interest at the current Federal rate, is made using a thirty year amortization period. Surplus water agreements are limited to a 5-year period and if renewed, all costs would be updated at the time of renewal and a new, current interest rate applied. Table 4 shows the derivation of these costs (figures rounded to the nearest dollar).

Using the updated cost of storage method, the cost of surplus water to be purchased is $1,410 per acre-foot (January 1996 price level). The amortized 30-year repayment amount at the FY 1996 water supply interest rate of 6.75 percent is $103.76 per acre-foot. An additional cost of $5.66 per acre-foot is added to include FY 1995 O,M,R,R & R costs. Therefore, the City will be charged $109 per acre-foot of surplus water annually for the 5-year agreement period (cost rounded to nearest dollar). For future requests, this price will be updated by November of each year when the new water supply interest rate and previous fiscal year O,M,R,R & R costs are available.

4.2 Effects on Project Purposes

4.2.1 Flood Control. The water requested from surplus storage will be used during the conservation season of reservoir operations in the Willamette Basin. Flood control storage space during the conservation season is typically provided between the maximum conservation pool and full pool in the reservoirs. The water to be released from surplus storage for the City would not affect this flood control storage, or the drawdown in the fall of the conservation pool to minimum flood control pool elevations.

4.2.2 Navigation/ Flow Augmentation. Minimum flows released from the Willamette Basin projects during the conservation season were originally developed to maintain navigation depth on the mainstem. Although a navigation channel is no longer maintained, these minimum flows still serve very important pollution abatement and fishery purposes. The amount of surplus water to be released to the City is very small. The additional flow created by 213 acre-feet over the six month period of water use is approximately 0.6 ft^3/sec. This will not measurably alter the minimum releases from the Willamette Basin projects. This small amount will also not decrease the surface water elevations or water velocities of the Willamette River.

Table #4 - Derivation of Willamette Basin User Costs

Willamette Basin Project	Usable Storage[1] (Acre-Feet)	Indexed Capital Costs, Jan 1996 Price Level[2]	Updated Capital Cost per Acre-Foot[3]	Cost w/ 30-yr Repay.[4]	Joint Use O&M Costs, FY95[5]	Joint Use Major Replacement Costs, FY95[5]	O,M,R,R&R Cost per Acre-Foot[6]	Total Cost w/ 30-yr Repay.[4]
Blue River	85,550	$140,940,053	$1,647	$121	$201,904	$0	$2	$124
Cottage Grove	29,790	37,035,045	$1,243	$91	$571,239	$0	$19	$111
Cougar	155,220	299,472,393	$1,929	$142	$991,012	$0	$6	$148
Detroit	318,200	407,064,320	$1,279	$94	$990,168	$31,656	$3	$97
Dorena	70,510	162,159,156	$2,300	$169	$369,683	$0	$5	$175
Fall Creek	115,000	107,349,807	$933	$69	$448,315	$0	$4	$73
Fern Ridge	103,134	44,743,165	$434	$32	$835,687	$0	$8	$40
Foster	29,600	100,117,386	$3,382	$249	$66,702	$0	$2	$251
Green Peter	270,000	245,477,782	$909	$67	$1,549,257	$17,701	$6	$73
Hills Creek	200,000	246,956,005	$1,235	$91	$315,950	$20,018	$2	$93
Lookout Point	358,900	655,989,422	$1,828	$135	$3,158,752	$263,279	$10	$144
WILLAMETTE BASIN	**1,735,904**	**$2,447,304,534**	**$1,410**	**$104**	**$9,498,669**	**$332,654**	**$6**	**$109**

[1]Dead or inactive storage plus storage for hydropower subtracted from full pool storage
[2]ENR Construction Cost Index applied from date of construction to 1967; CWCCIS Index applied 1967 - 1996
[3]Indexed Capital Costs divided by Usable Storage
[4]FY 1996 Federal water supply interest rate applicable to surplus water contracts: 6.75%
[5]Costs obtained from Portland District Finance and Accounting Section
[6]Joint use O&M plus Major Replacement Costs divided by Usable Storage

4.2.3 Power Generation. Although six of the eleven storage projects in the Willamette Basin generate power, as stated above, the small amount of surplus water will not measurably alter releases from the Willamette Basin projects. Current releases will easily accommodate the City's request without affecting minimum flows at Albany and Salem. Therefore, power generation will not be measurably increased or decreased at any of the projects.

4.2.4 Irrigation. As previously stated, the USBR has issued water service contracts for only 57,226 acre-feet of stored water which is less than 4 percent of the total available. The small increment of water requested by the City will not affect the USBR's ability to issue additional contracts for irrigation in the Willamette Basin.

4.2.5 Recreation. The small amount of surplus water requested by the City will not measurably decrease the elevation of the conservation pools at the Willamette Basin projects. With no decrease in the conservation pools, recreation will not be affected.

5. ENVIRONMENTAL CONSIDERATIONS

Based on guidance in ER 200-2-2, Procedures for Implementing NEPA, the proposed water supply action qualifies as a Categorical Exclusion under paragraph 9a., Activities at Completed Corps Projects. The action is an authorized project purpose which has been generally addressed in the EIS for Operation and Maintenance of the Willamette Reservoir System, May 1980. The amount of water requested by the City of Portland (213 acre-feet) is a very small percentage of individual reservoir or total basin reservoir storage (less than 0.01 percent of total useable storage). Release of this quantity would have no perceptible effect on reservoir elevations, downstream flows, resident or anadromous fish, wetlands, vegetation, or other uses such as recreation.

In addition to NEPA requirements, this and all future water supply requests will be reviewed for compliance with all other pertinent environmental laws, executive orders and regulations. This would include, but not be limited to the following:

Clean Water Act
Endangered Species Act
Cultural Resources Acts
Wild and Scenic Rivers Act
Executive Order 11990, Protection of Wetlands
ER 1105-2-50 Planning, Environmental Resources

In addition to ensuring that future requests comply with the above environmental requirements, the cumulative effect of subsequent surplus water requests must also be considered. According to guidance found in ER 1105-2-100, when the lesser of 4,000 acre-feet or 10 percent of available storage reallocated per project is reached, the request must again be approved by the OASA (CW) for the next increment. Since the eleven Willamette projects are operated as a system, the Portland District will use 44,000 acre-feet as the point

where cumulative effects will be considered in more detail. This amount is less than 3 percent of the available storage in the basin. It must also be stressed that if future requests create more than a 4,000 acre-foot demand directly from a single project, then the OASA (CW) must approve additional requests. The cumulative effect cut-off point (from a Basin and single project perspective), in conjunction with the environmental requirements checklist, will ensure that the environmental effects of these temporary, surplus water agreements are adequately addressed.

6. COORDINATION

A copy of this draft surplus water letter report was provided to the USBR and the OWRD. Their comments are enclosed (Attachments 4 and 5).

7. SUMMARY

Surplus water in the Willamette Basin is clearly available based on the small amount of water currently used for irrigation purposes. The Portland Parks and Recreation request meets the requirements under the Corps' authority to enter into surplus water agreements. The small amount of water requested (213 acre-feet) will not significantly affect project purposes, but it does further the City's efforts to conserve its pristine source of municipal water in the Bull Run Watershed. The unit price per acre-foot established in this report reflects how the Willamette Basin projects are operated as a system and the same methodology will be used for future requests based on the approval authority described in ER 1105-2-100. This action gives the Federal Government the opportunity to provide the City an alternative source of water in order to water plants and grass in their waterfront parks and conserve a limited municipal water supply, while at the same time returning revenues to the U.S. Treasury.

8. RECOMMENDATION

Based on the findings in this letter report, and under the authority of Section 6 of the Flood Control Act of 1944, I recommend that 213 acre-feet of surplus water in the Willamette Basin be made available for the City of Portland Parks and Recreation to use to water five parks according to the terms and conditions contained in the signed Surplus Water Agreement with the City. The methodology used to compute the unit price for this individual request will be used for future surplus water requests until the 44,000 acre-foot increment is reached for the entire Willamette Basin. This surplus water request will satisfy the needs of the City and contribute to the conservation of its municipal water supply.

29 OCT 96
Date

Chris L. Cottrell
Major, Corps of Engineers
Acting Commander

CITY OF PORTLAND
BUREAU OF PARKS AND RECREATION
OPERATIONS
6437 S.E. DIVISION AVE.
PORTLAND, OREGON 97206
(503) 248-4397

MIKE LINDBERG, Commissioner
CHARLES JORDAN, Director

July 21, 1991

TO: Col. Charles Hines
Corps of Engineers
Regional Office
PO Box 2946
Portland, Or. 97208-2946

FROM: John Brandt JB
Portland Park Bureau
6437 SE Division St
Portland, Or. 97206

SUBJECT: Permit to use stored water from the Willamette River at Waterfront Park

The Portland Park Bureau wishes to make application to use stored water from the main stem of the Willamette River adjacent to Gov. Tom McCall Waterfront Park in downtown Portland. The purpose of the diverted water would be to irrigate 26 acres of turf in the park.

Currently the area is being irrigated from the City of Portland water system at great expense. The amount of water used last year was 2 acre-feet per acre of park.

We would propose using two 8" shallow wells to draw the water from the Willamette, it then would be pumped through our existing in-ground irrigation system.

If you require any additional information , please call me at 720-7263.

PORTLAND PARKS AND RECREATION

PARK OPERATIONS

6437 SE DIVISION STREET, PORTLAND, OREGON 97206

TELEPHONE (503) 823-1600 FACSIMILE (503) 823-2246

CHARLIE HALES, COMMISSIONER CHARLES JORDAN, DIRECTOR

RECEIVED
JUL 13 1995
REG & ENV RES BR

DATE : JULY 7, 1995

TO: COL. TIMOTHY L. WOODS
U. S. ARMY CORPS OF ENGINEERS
REGIONAL OFFICE
P. O. BOX 2946
PORTLAND, OR. 97208 - 2946

FROM: DAVID GRAY / IRRIGATION SERVICES
PORTLAND PARKS AND RECREATION
6437 S.E. DIVISION ST.
PORTLAND, OR. 97206

SUBJECT: PERMIT TO USE STORED WATER FOR IRRIGATION OF MUNICIPAL PARKS.

Portland Parks and Recreation wishes to make application for an additional one hundred sixty acre feet of stored water to irrigate four municipal parks in the vicinity of the Willamette River. This application is in addition to the fifty two acre feet of stored water we applied for in our letter to your office, dated December 14, 1994. We have enclosed site maps for these four parks with this letter showing their locations, as well as the locations of the shallow wells that we intend to use for appropriation of the water. We would like to thank you and your staff for all of your efforts in assisting Portland Parks and Recreation with our Bull Run Water Conservation Program.
As always, should you require any additional information, please call us at (503) 823- 1606 or (503) 823- 8638

Attachment 2

Oregon

WATER
RESOURCES
DEPARTMENT

July 15, 1996

David Gray
Portland Parks and Recreation
6437 SE Division St.
Portland, Oregon 97206

Re: G-14131

Dear Mr. Gray:

This is to confirm that under OAR 690-310-270 (2) you have been granted an extension of time concerning your application. Unless you secure a contract with the Army Corps of Engineers, no action will be taken on G-14131 until January 15, 1997. If you have any questions please call Bill Fujii at 1 (800) 624-3199 ext. 254.

Sincerely,

Dwight French,
Manager
Water Rights Section

CC: file
Lori Norton
Mike Posovich, ACOE

Commerce Building
158 12th Street NE
Salem, OR 97310-0210
(503) 378-3739
FAX (503) 378-8130

Attachment 3

United States Department of the Interior

BUREAU OF RECLAMATION
Pacific Northwest Region
1150 North Curtis Road
Boise, Idaho 83706-1234

IN REPLY REFER TO:

SEP 30 1996

PN-3323
WTR-4.00

Mr. Mike Posovich
Reservoir Regulation and Water Quality Section
U.S. Army Corps of Engineers
Portland District
PO Box 2946
Portland OR 97208-2946

Subject: Review of Draft Surplus Water Letter Report, Willamette Basin Project (Reply to Your Letter Dated September 17, 1996)

Dear Mr. Posovich:

This is in response to your request for our review of a draft of the Surplus Water Letter Report relating to the Portland Parks and Recreation Department's request to purchase 213 acre-feet of surplus water from storage in the Willamette Basin for municipal use at five waterfront parks. The draft report would serve to establish a unit charge per acre-foot of municipal and industrial water that would be applied to future surplus water agreements in the Willamette Basin.

This office has reviewed the draft report and finds it consistent with Bureau of Reclamation policies and procedures.

Thank you for providing Reclamation with the opportunity to review and comment on the draft report. If you have any questions, please call Mr. Larry Parsons of this office at (208) 378-5346.

Sincerely,

Ryan M. Patterson

Ryan M. Patterson
Program Manager
Lands and Repayment

Attachment 4

Oregon

WATER
RESOURCES
DEPARTMENT

October 15, 1996

Mike Posovich
Reservoir Regulation and Water Quality Section
Department of the Army
Portland District, Corps of Engineers
PO Box 2946
Portland, Oregon 97208-2946

Re: Draft Surplus Water Letter Report

Dear Mr. Posovich:

I apologize for the delay in responding to Mr. Jones' September 17, 1996 letter. The Department has the following comments, which I will organize in two sections. Water Right application G-14131 and general comments.

Application G-14131

From a water rights processing prospective, the report indicates the Army Corps of Engineers (COE) will be capable of entering an agreement with the Portland Parks and Recreation Department. This agreement will allow the Water Resources Department to issue a positive Proposed Final Order concerning application G-14131. This Proposed Final Order would be conditioned to require a contract from the Bureau of Reclamation's (BOR) permit (Permits S-1625 and R-5363) since the COE does hold the right for this storage. We are assuming that the BOR recognizes this agreement as legal and binding.

General Comments

The Department offers the following general comments. We realize that the COE and the BOR have different definitions of irrigation than the WRD. In general the Department supports any action which will allow more flexibility to allow the use of stored water. The Department assumes that the ~~BOR's~~ COE's current allocation study will be more detailed and address the questions which would be raised in the allocation of this stored water in the broader context of Municipal and Industrial uses.

Commerce Building
158 12th Street NE
Salem, OR 97310-0210
(503) 378-3739
FAX (503) 378-8130

Attachment 5

Memorandum 1

If you have any questions please feel free to call me at 1 (800) 624-3199 ext. 254.

Sincerely,

Bill

Bill Fujii, Planner 2

CC: David Gray, Portland Parks and Recreation Dept
Roberta Jortner, Portland Water Bureau
Dwight French
Doug Parrow
Tom Paul

DRAFT

AS OF: 23 Oct 96

SURPLUS WATER AGREEMENT
BETWEEN THE UNITED STATES OF AMERICA
AND
THE CITY OF PORTLAND, OREGON, PARKS AND RECREATION DEPARTMENT
FOR
SURPLUS OF WATER FROM CORPS OF ENGINEERS PROJECTS IN THE
WILLAMETTE RIVER BASIN

THIS AGREEMENT, entered into this _____day of _____, 19__, by and between the UNITED STATES OF AMERICA (hereinafter called the "Government") represented by the District Engineer executing this agreement, and the **CITY OF PORTLAND, OREGON, by and through its PARKS AND RECREATION DEPARTMENT**, (hereinafter called the "User");

WITNESSETH THAT:

WHEREAS, pursuant to the Flood Control Act (FCA) of 1938 (Public Law 75-761), the FCA of 1950 (Public Law 81-516) and the FCA of 1960 (Public Law 86-645), the Government has constructed and is operating thirteen multi-purpose projects (hereinafter called the "Project"); on the Willamette River, Oregon, and,

WHEREAS, Section 6 of the Flood Control Act of 1944 (Public Law 78-534), as amended, provides that the Secretary of the Army is authorized to enter into agreements with states, municipalities, private concerns, or individuals, at such prices and on such terms as he may deem reasonable, for domestic and industrial uses for surplus water that may be available at any reservoir under his control provided that no agreements for such water shall adversely affect the existing lawful uses of such water; and,

WHEREAS, the User desires to enter into an agreement with the Government for the privilege of withdrawing surplus water from the Project;

NOW, THEREFORE, the parties do mutually agree as follows:

ARTICLE 1 - Water Supply and Withdrawals.

a. The Government will reserve **213 acre feet** of storage space in the Project in order to meet the water demands of the User. From this storage space the User shall have the privileges of withdrawing water **from 1 May to 31 October** at a rate not to exceed **36 acre-feet per month** during the term of this agreement as specified in Article 5 hereof.

b. The User shall have the right to construct, operate and maintain installations and facilities, or to enter into agreements with third parties therefore, for the purpose of withdrawing water from the Projects, subject to the approval of the District Engineer as to

design and location of such installation and facilities. All costs associated with such installations and facilities or any modifications thereof or any future construction in connection therewith, shall be without expense to the Government.

c. The Government reserves the right to control and use all storage in the Project in accordance with the authorized Project purposes. The Government further reserves the right to take such measures as may be necessary in the operation of the Project to preserve life and/or property, including the right not to make downstream releases during such periods of time as are deemed necessary, in its sole discretion, to inspect, maintain, or repair the Project.

d. The User recognizes that this agreement provides storage space for raw water only. The Government makes no representation with respect to the quality or availability of water and assumes no responsibility therefor, or treatment of the water. The water level of the Project will be maintained at elevations which the Government deems will best serve the authorized purposes of the Project, and this agreement shall not be construed as giving the User any rights to have the water level maintained at any elevation. The User further recognizes that it is acquiring no permanent right to the use of storage in the Project.

ARTICLE 2 - Metering. For the purpose of maintaining an accurate record of the water withdrawn from the Project, the User agrees to furnish and install, or cause to be installed, meters or measuring devices satisfactory to the District Engineer, without cost to the Government. As required, the User agrees to furnish to the District Engineer advance estimates of need and records of the quantity of water actually withdrawn. Such devices shall be available for inspection by Government representatives at all reasonable times.

ARTICLE 3 - Regulation of the Use of Water. The regulation of the use of and water rights needed for the water withdrawn or released from storage space shall be the sole responsibility of the User and under the sole authority of the User in accord with Federal, State, and local laws and shall not be considered a part of this agreement. The Government shall not be responsible for the use of water by the User, nor will it become a party to any controversies involving the water use, except as such controversies may effect the operations of the Project.

ARTICLE 4 - Consideration and Payment.

(a) In consideration of the right to withdraw **213 acre-feet** per calendar year for **five (5) years** from the Project for municipal and industrial water supply purposes, the User shall pay the Government **$23,310.00 per year, the first of** which shall be due and payable within thirty (30) days of the effective date of the agreement as set forth in Article 5 herein. **Future payments thereafter will be due and payable on the anniversary date the first payment is due.**

(b) The repayment amount shown in Article 4(a) is based **upon joint use and specific water supply construction costs updated to October 1996 price levels using appropriate indices and the Fiscal Year 1996 water supply interest rate of 6.75 percent as computed by the Secretary of the Treasury in accordance with Section 932 of the Water Resources Development Act of 1986 (Public Law 99-662).**

(c) If the User shall fail to make any payment under this agreement within thirty (30) days of the date due, interest thereon shall accrue at the rate as determined by the Department of Treasury's Treasury Fiscal Requirements Manual (1 TFRM 6-8000, "Cash Management") and shall compound annually from the date due until paid. This provision shall not be construed as waiving any other rights the Government may have in the event of default by the User, including but not limited to the right to terminate this agreement for default.

ARTICLE 5 - Agreements. This agreement represents the entire agreement between the parties and is not dependent upon nor bears any relation to the terms of any other prior agreements between the Government and the User.

ARTICLE 6 - Duration of Agreement. This agreement shall become effective as of the date of the approval by the **Secretary of the Army or his duly authorized representative**, and shall continue in full force and effect under the conditions set forth herein, for a period of not to exceed five (5) years from the said date of approval. Upon expiration, this agreement may be extended by mutual agreement for additional periods of not to exceed five (5) years each. All such agreement extensions shall be subject to recalculation of reimbursement.

ARTICLE 7 - Termination of Agreement.

a. Either party may terminate this agreement and the privilege of withdrawing water upon **ninety (90)** days written notice. In the event of termination under this paragraph, the Government will make pro rata refund for any balance of the agreement term for which payment has been made and the User will pay all charges which have accrued through the date of the termination.

b. The Government may terminate this agreement and the privilege of withdrawing water upon ninety (90) days written notice, if the User shall default in performance of any obligation of the agreement. Upon such a termination, User shall continue to be liable to the Government for any monies owned and for any costs incurred by the Government as a result of the default.

c. In the event of any termination pursuant to this Article or Article 5, User shall, upon request of the District Engineer, promptly remove, at the User's own expense, any facilities constructed on Project land for water withdrawal and restore premises around the removed facilities to a condition satisfactory to the District Engineer.

ARTICLE 8 - Rights-of-Way. Occupancy and use of Project lands shall be in accordance with any permits, rights-of-way, or easement granted to the User by the Government.

ARTICLE 9 - Release of Claims. The User shall hold and save the Government, including its officers, agents, and employees, harmless from liability of any nature or kind for of on account of any claim for damages which may be filed or asserted as a result of the withdrawal or release of water from the Project made or ordered by the User, or as a result of the construction, operation or maintenance of any facilities or appurtenances owned and operated by the User except for damage due to the fault or negligence of the Government or its contractors.

ARTICLE 10 - Transfer or Assignment. The User shall not transfer or assign this agreement nor any rights acquired thereunder, nor suballot said water or storage space or any part thereof, nor grant any interest, privilege or license whatsoever in connection with this assignment, without the approval of the Secretary of the Army or his duly authorized representative provided that, unless contrary to public interest this restriction shall not be construed to apply to any water which may be withdrawn or obtained from the water supply storage space by the User and furnished to any third party or parties or to the rates charged therefor.

ARTICLE 11 - Officials Not to Benefit. No member of or delegate to Congress, or Resident Commissioner, shall be admitted to any share of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

ARTICLE 12 - Covenant Against Contingent Fees. The User warrants that no person or selling agency has been employed or retained to solicit or secure this agreement upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the User for the purpose of securing business. For breach or violation of this warranty, the Government shall have the right to annul this agreement without liability, or in its discretion, to add to the agreement price or consideration the full amount of such commission, percentage, brokerage, or contingent fee.

ARTICLE 13 - Environmental Quality. During any construction , operation, and maintenance by the User of any facilities, specific actions will be taken to control environmental pollution which could result from such activity and to comply with applicable Federal, State and local laws and regulations concerning environmental pollution. Particular attention should be given to (1) reduction of air pollution by control of burning, minimization of dust, containment of chemical vapors, and control of engine exhaust gases, and of smoke from temporary heaters; (2) reduction of water pollution by control of sanitary facilities, storage of fuels and other contaminants, and control of turbidity and siltation from erosion; (3) minimization of noise levels; (4) onsite and offsite disposal of water and spoil; and (5) prevention of landscape defacement and damage.

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ARTICLE 14 - Federal and State Laws.

a. The User shall utilize the water withdrawn from the Project in a manner consistent with Federal, State, and local laws.

b. The User furnishes, as part of the agreement, an assurance (see Exhibit B) that the User will comply with Title VI of the Civil Rights Act of 1964 (78 Stat. 252; 42 U.S.C. 2000d, et seq) and Department of Defense Directive 5500.11 issued pursuant thereto and published in Part 300 of Title 32, Code of Federal Regulations.

c. Any discharges of water or pollutants into a navigable stream or tributary thereof resulting from the User's facilities and operations undertaken under this agreement shall be performed only in accordance with applicable Federal, State and local laws and regulations.

ARTICLE 15 - Approval of Agreement. This agreement shall be subject to the written approval of the Secretary of the Army or his duly authorized representative and shall not be binding until so approved.

IN WITNESS WHEREOF, the parties have executed this agreement as of the day and year first above written.

APPROVED: THE UNITED STATES OF AMERICA

_____ By _____
1/ (District Engineer)

[Insert name of User]

DATE:_____ By _____
(Title)

1/ Fill-in Title of appropriate approving Government official if other than the District Engineer.

(Necessary approvals and countersignatures required by State and local law with respect to execution on behalf of the User must be ascertained by the District Engineer and his Counsel and added to the signature block.)

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EXHIBIT A

WILLAMETTE BASIN STORAGE PROJECTS, OREGON

I - PERTINENT RESERVOIR DATA[1]

PROJECT	DRNG AREA (sq mi)	HYDRO POWER	MIN FLOOD CONTROL POOL		MAX CONSERVATION POOL		FULL POOL		JOINT USE STORAGE[2] (acre-feet)
			ELEV. (ft, NGVD)	STORAGE (acre-feet)	ELEV. (ft, NGVD)	STORAGE (acre-feet)	ELEV. (ft, NGVD)	STORAGE (acre-feet)	
Hills Creek	389	Yes	1448.0	155,370	1541.0	350,010	1543.0	355,570	197,640
Lookout Point	991	Yes	825.0	118,760	926.0	442,990	929.0	455,840	324,230
Fall Creek	184	No	728.0	9,620	830.0	117,830	834.0	125,080	108,210
Cottage Grove	104	No	750.0	3,140	790.0	31,780	791.0	32,930	28,640
Dorena	265	No	770.5	7,090	832.0	72,050	835.0	77,600	64,960
Cougar	208	Yes	1532.0	63,900	1690.0	207,760	1669.0	219,080	143,860
Blue River	88	No	1180.0	3,970	1350.0	82,820	1357.0	89,520	78,850
Fern Ridge	252	No	353.0	7,170	373.5	101,070	375.1	116,790	93,900
Green Peter	277	Yes	922.0	159,860	1010.0	409,830	1015.0	428,110	249,970
Foster	494	Yes	613.0	31,070	637.0	55,870	641.0	60,780	24,800
Detroit	438	Yes	1450.0	154,380	1563.5	436,010	1569.0	455,100	281,630
TOTALS				714,330		2,308,020		2,416,400	1,596,690

[1]Willamette River Basin Reservoir System Operation, U.S. Army Corps of Engineers, Portland District, May 1989, p. 9.
[2]Joint Use Storage equals Maximum Conservation Storage - Dead or Inactive Storage - Specific Use Storage

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EXHIBIT A (cont'd)

WILLAMETTE BASIN STORAGE PROJECTS, OREGON

II - UPDATED COST OF JOINT USE STORAGE
WILLAMETTE BASIN PROJECT

Usable Storage[1] (Acre-Feet)	Indexed Capital Costs, Jan 1996 Price Level[2]	Updated Capital Cost per Acre-Foot[3]	Cost w/ 30-yr Repay[4]	Joint Use O&M Costs, FY95[5]	Joint Use Major Replace. Costs, FY95[5]	O,M,R,R&R Cost per Acre-Foot[6]	Total Cost w/ 30-yr Repay[4]
1,735,904	$2,447,304,534	$1,409.82	$103.76	$9,498,669	$332,654	$5.66	$109.43

[1]Dead or inactive storage plus storage for hydropower subtracted from full pool storage
[2]ENR Construction Cost Index applied from date of construction to 1967; CWCCIS Index applied 1967 - 1996
[3]Indexed Capital Costs divided by Usable Storage
[4]FY 1996 Federal water supply interest rate applicable to surplus water contracts: 6.75%
[5]Costs obtained from Portland District Finance and Accounting Section
[6]Joint use O&M plus Major Replacement Costs divided by Usable Storage

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EXHIBIT A (cont'd)

WILLAMETTE BASIN STORAGE PROJECTS, OREGON

III - COST OF SURPLUS WATER
WILLAMETTE RIVER BASIN, OREGON

Useable Storage (Exhibit A-I)	**1,735,904 acre-feet**
Updated Joint-Use Costs (Exhibit A-II)	**$2,447,304,534**
Surplus Water Cost per acre-foot of Useable Storage ($2,447,304,534/1,735,904 ac-ft)	**$1,409.82 /acre-foot**

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EXHIBIT A (cont'd)

WILLAMETTE BASIN STORAGE PROJECTS, OREGON

IV - TOTAL COST TO THE USER
FOR WATER SUPPLY STORAGE

Interest and Amortization (for 213 acre-feet of storage)

$1,410/ac-ft x 213 ac-ft x 0.0736 (financing factor based on 30 years, 29 with interest at 6.75%)	$22,104

Operation and Maintenance

Proportion of joint-use actual O,M,R,R&R expenditure for FY 1995 (213/1,735,904[1] x $9,831,323)	$1,206

TOTAL ANNUAL COST[2] (paid once a year for the 5-year duration of this agreement)	**$23,310**

[1] Proportion based on 213 acre-feet of the 1,735,904 acre-feet of useable storage
[2] Annual payment due and payable on the date specified in Article 4a

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EXHIBIT B

ASSURANCE OF COMPLIANCE

ASSURANCE OF COMPLIANCE WITH THE DEPARTMENT OF DEFENSE DIRECTIVE

UNDER TITLE VI OF THE CIVIL RIGHTS ACT OF 1964, AS AMENDED;

THE AGE DISCRIMINATION ACT OF 1975;

AND THE REHABILITATION ACT OF 1973, AS AMENDED

The party executing this assurance, being the applicant recipient of Federal financial assistance under the instrument to which this assurance is attached: HEREBY AGREES THAT, as a part of its obligations under the aforesaid instrument, it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), as amended (42 U.S.C. 2000d), and all requirements imposed by or pursuant to the Directive of the Department of Defense (32 CFR Part 300), issued as Department of Defense Directive 5500.11 (December 28, 1964), pursuant to that title: The Age Discrimination Act of 1975 (42 U.S.C. 5102): the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), to the end that in accordance with the aforementioned Title, Directive and Acts, no person in the United States shall on the ground of race, color, age, sex, religion, handicap or national origin be excluded from participation in, be denied the benefits of, or be otherwise subjected to discriminations under any program or activity for which the Applicant -Recipient receives Federal financial assistance from the Department of the Army and HEREBY GIVES ASSURANCE THAT it will immediately take any measure necessary to effectuate this agreement.

If any personal property or real property, or interest therein, or structure thereon is provided or improved with the aid of Federal Financial assistance extended to the applicant-recipient by the Department of the Army, or if such assistance is in the form of personal or real property, or interest therein or structure thereon, then this assurance shall obligate the applicant-recipient or in the case of any transfer of such property, any transferee, for the period during which the property is used for another purpose involving the provision of similar services or benefits, or for the period during which retains ownership or possession or property whichever is longer. In all other cases, this assurance shall obligate the applicant-recipient for the period during which the federal financial assistance is extended to it by the Department of the Army. The Department of the Army representatives will be allowed to visit the recipient's facilities. They will inspect the facilities to ensure that there are no barriers to impede the handicap's accessibility in either programs or activities.

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THIS ASSURANCE is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property, discounts or other federal financial assistance extended after the date hereof to the applicant-recipient by the Department of the Army, including installment payments after such date on account of arrangements for Federal financial assistance which were approved before such date. The applicant-recipient recognizes and agrees that such Federal financial assistance will be extended in reliance on the representations and agreements made is this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the applicant-recipient, its successors, transferees, and the assignees, and the person or persons whose signatures appear below are authorized to sign this assurance on behalf of the applicant.

Date_____

_____
(Applicant-Recipient)

By_____

Title_____

_____

_____
(Applicant-Recipient's Mailing Address)

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EXHIBIT C

CERTIFICATION REGARDING LOBBYING

SURPLUS WATER AGREEMENT
WILLAMETTE RIVER BASIN, OREGON
CITY OF PORTLAND, PARKS AND RECREATION DEPARTMENT

---

1. The undersigned certifies, to the best of their knowledge and belief, that:

a. No Federal appropriated funds have paid or will be paid, by or on the behalf of the undersigned, to any person for influencing or attempting to influence on officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal Contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence any officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the water supply agreement for the Willamette Basin Projects, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities", in accordance with its instructions **(a copy is attached to this agreement for information only).** This form is available to users by requesting it telephonically at (202) 761-0116, or by writing to HQUSACE (CECW-A), 20 Massachusetts Avenue, NW, Washington, D.C., 20314-1000.

c. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a

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prerequisite for making or entering into this transaction imposed by Section 1352 Title 31 U.S.C. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each failure.

City of Portland, Parks and Recreation Department

By _____
(Name)
Director, Parks and Recreation Department

Address:

DISCLOSURE OF LOBBYING ACTIVITIES

Approved by OMB 0348-0046

Complete this form to disclose lobbying activities pursuant to 31 U.S.C. 1352
(See reverse for public burden disclosure.)

1. Type of Federal Action:
- ☐ a. contract
- b. grant
- c. cooperative agreement
- d. loan
- e. loan guarantee
- f. loan insurance

2. Status of Federal Action:
- ☐ a. bid/offer/application
- b. initial award
- c. post-award

3. Report Type:
- ☐ a. initial filing
- b. material change

For Material Change Only:
year _____ quarter _____
date of last report _____

4. Name and Address of Reporting Entity:
☐ Prime ☐ Subawardee
Tier _____, *if known:*

Congressional District, *if known:*

5. If Reporting Entity in No. 4 is Subawardee, Enter Name and Address of Prime:

Congressional District, *if known:*

6. Federal Department/Agency:

7. Federal Program Name/Description:

CFDA Number, *if applicable:* _____

8. Federal Action Number, *if known:*

9. Award Amount, *if known:*
$

10. a. Name and Address of Lobbying Entity (*if individual, last name, first name, MI*):

b. Individuals Performing Services (*including address if different from No. 10a*) (*last name, first name, MI*):

(*attach Continuation Sheet(s) SF-LLL-A, if necessary*)

11. Amount of Payment (*check all that apply*):
$ _____ ☐ actual ☐ planned

12. Form of Payment (*check all that apply*):
- ☐ a. cash
- ☐ b. in-kind; specify: nature _____
  value _____

13. Type of Payment (*check all that apply*):
- ☐ a. retainer
- ☐ b. one-time fee
- ☐ c. commission
- ☐ d. contingent fee
- ☐ e. deferred
- ☐ f. other; specify: _____

14. Brief Description of Services Performed or to be Performed and Date(s) of Service, including officer(s), employee(s), or Member(s) contacted, for Payment Indicated in Item 11:

(*attach Continuation Sheet(s) SF-LLL-A, if necessary*)

15. Continuation Sheet(s) SF-LLL-A attached: ☐ Yes ☐ No

16. Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when this transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Signature: _____
Print Name: _____
Title: _____
Telephone No.: _____ Date: _____

Federal Use Only:

Authorized for Local Reproduction
Standard Form - LLL

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COPY

INSTRUCTIONS FOR COMPLETION OF SF-LLL, DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subawardee or prime Federal recipient, at the initiation or receipt of a covered Federal action, or a material change to a previous filing, pursuant to title 31 U.S.C. section 1352. The filing of a form is required for each payment or agreement to make payment to any lobbying entity for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a covered Federal action. Use the SF-LLL-A Continuation Sheet for additional information if the space on the form is inadequate. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered Federal action for which lobbying activity is and/or has been secured to influence the outcome of a covered Federal action.

2. Identify the status of the covered Federal action.

3. Identify the appropriate classification of this report. If this is a followup report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last previously submitted report by this reporting entity for this covered Federal action.

4. Enter the full name, address, city, state and zip code of the reporting entity. Include Congressional District, if known. Check the appropriate classification of the reporting entity that designates if it is, or expects to be, a prime or subaward recipient. Identify the tier of the subawardee, e.g., the first subawardee of the prime is the 1st tier. Subawards include but are not limited to subcontracts, subgrants and contract awards under grants.

5. If the organization filing the report in item 4 checks "Subawardee", then enter the full name, address, city, state and zip code of the prime Federal recipient. Include Congressional District, if known.

6. Enter the name of the Federal agency making the award or loan commitment. Include at least one organizational level below agency name, if known. For example, Department of Transportation, United States Coast Guard.

7. Enter the Federal program name or description for the covered Federal action (item 1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans, and loan commitments.

8. Enter the most appropriate Federal identifying number available for the Federal action identified in item 1 (e.g., Request for Proposal (RFP) number; Invitation for Bid (IFB) number; grant announcement number; the contract, grant, or loan award number; the application/proposal control number assigned by the Federal agency). Include prefixes, e.g., "RFP-DE-90-001."

9. For a covered Federal action where there has been an award or loan commitment by the Federal agency, enter the Federal amount of the award/loan commitment for the prime entity identified in item 4 or 5.

10. (a) Enter the full name, address, city, state and zip code of the lobbying entity engaged by the reporting entity identified in item 4 to influence the covered Federal action.

    (b) Enter the full names of the individual(s) performing services, and include full address if different from 10 (a). Enter Last Name, First Name, and Middle Initial (MI).

11. Enter the amount of compensation paid or reasonably expected to be paid by the reporting entity (item 4) to the lobbying entity (item 10). Indicate whether the payment has been made (actual) or will be made (planned). Check all boxes that apply. If this is a material change report, enter the cumulative amount of payment made or planned to be made.

12. Check the appropriate box(es). Check all boxes that apply. If payment is made through an in-kind contribution, specify the nature and value of the in-kind payment.

13. Check the appropriate box(es). Check all boxes that apply. If other, specify nature.

14. Provide a specific and detailed description of the services that the lobbyist has performed, or will be expected to perform, and the date(s) of any services rendered. Include all preparatory and related activity, not just time spent in actual contact with Federal officials. Identify the Federal official(s) or employee(s) contacted or the officer(s), employee(s), or Member(s) of Congress that were contacted.

15. Check whether or not a SF-LLL-A Continuation Sheet(s) is attached.

16. The certifying official shall sign and date the form, print his/her name, title, and telephone number.

COPY

Public reporting burden for this collection of information is estimated to average 30 mintues per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0046), Washington, D.C. 20503.

CENPD-ET-P (CENPP-PE-HR/29 Oct 96) (1105) 1st End
Mr. McDonald/kb/503-326-3872
SUBJECT: Willamette Basin Surplus Water Letter Report

CDR, North Pacific Division, Corps of Engineers, PO Box 2870, Portland, OR 97208-2870 NOV 22 1996

FOR CDR, HQUSACE (CECW-P), 20 MASS AVE NW, WASH, DC 20314-1000

1. The attached Surplus Water Supply report and draft contract are forwarded for your review and transmittal to ASA(CW) for approval.

2. We have reviewed the report and concur with the district's findings.

FOR THE COMMANDER:

JOHN E. VELEHRADSKY, P.E.
Director, Engineering and
Technical Services

Encl
nc

DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

CECW-AR (1110-2-1150a) 02 JAN 1997

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (CIVIL WORKS)

SUBJECT: Willamette Basin Draft Surplus Water Supply Agreement with the City of Portland, Oregon

1. Purpose: To provide the subject draft agreement for your approval.

2. Recommendation: That you approve the draft agreement enclosed at Tab A as well as a delegation of authority to approve the final agreement to the major subordinate command (MSC).

3. Discussion:

a. The City of Portland, Oregon, Parks and Recreation Department wants to purchase 213 acre-feet of surplus water annually from storage in the Willamette River basin system. The purpose is to irrigate five waterfront parks in the city during the dry season of summer. Instream (natural) water is not available to the city for this purpose and they must have an agreement with the U. S. Army Corps of Engineers before the State of Oregon will issue the city a permit to withdraw water from the Willamette River. The Willamette system projects include about 1.6 million acre-feet of agricultural water supply storage. Of this total, only about 57,000 acre-feet are under contract and the remainder is clearly surplus. Because the city will be using the water to irrigate parkland rather than commercial crops, a surplus water contract is considered appropriate. The 213 acre-feet of water is considered negligible in light of the total amount of surplus water available in the system.

b. The surplus water report, enclosed at Tab B, utilizes a unique method of determining the reimbursement. Because the Willamette basin projects are operated as a system, and must provide certain instream flows at specific points, identifying a specific reservoir as a source for the water sought by the City of Portland is not practical. For this reason, the report treats the surplus as coming from the system as a whole and uses a weighted average of the updated cost of construction of all eleven projects in determining the cost to the user. We believe that this is an acceptable extension of the method required in Corps guidance for surplus water contracts and should be applied to any future surplus water contracts in the Willamette basin, although it should not automatically be extended to water supply storage reallocations and contracts under the Water Supply Act of 1958.

CECW-AR
SUBJECT: Willamette Basin Draft Surplus Water Supply Agreement with the City of Portland, Oregon

c. Our review of the surplus water supply report revealed only minor concerns, including:

(1) The report states, in the first paragraph, that it will "establish a unit charge per acre-foot of municipal and industrial (M&I) water that will be applied to future surplus water agreements in the Willamette basin." This is not correct. If this agreement is approved by the Assistant Secretary of the Army (Civil Works), it will establish a method for determining the unit charge, but not the unit charge itself, for any future surplus agreements. Because the unit costs are calculated using updated costs of storage, the unit costs of any surplus water contracts will depend on the date at which they are being proposed.

(2) On page 8 of the report, the annual repayment amount should be calculated using the fiscal year 1997 (FY 97) interest rate of 7.125 percent and the most current (FY 96) actual operation, maintenance, repair, rehabilitation, and replacement (OMRR&R) expenditures.

(3) Paragraph 5, "Environmental Considerations," of the letter report states, "In addition to NEPA requirements, this and all future water supply requests will be reviewed for compliance with all other pertinent environmental laws..." and cites several environmental laws and executive orders with which compliance is required. The phrase "will be reviewed" implies that the current letter report for the water supply request has not already been reviewed in light of the cited laws. Prior to finalizing the agreement, the district should certify both compliance with all laws and executive orders and that coordination with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service has been completed and agreement has been reached that the surplus water supply request will not have an adverse impact on any threatened or endangered species that might be in the study area.

d. Our review of the agreement reveals the need for only minor changes including:

(1) The user cost as calculated in exhibit A of the draft agreement should reflect the current (FY 97) interest rate as well as the most current (FY 96) actual OMRR&R expenditures. This will affect the total annual cost to the user.

(2) Article 4, paragraph (a), on page 2 of the draft agreement must be revised to reflect the total annual cost to the user resulting from paragraph d.(1), above.

(3) Article 4, paragraph (b), on page 3 of the draft agreement must be revised to reflect the FY 97 interest rate of 7.125 percent.

e. Please be aware that the City of Portland's current state permit for withdrawing water from the system expires on January 15, 1997. In light of this situation and in view of the minor

Memorandum 3

CECW-AR
SUBJECT: Willamette Basin Draft Surplus Water Supply Agreement with the City of Portland, Oregon

changes we believe needed, we are requesting a delegation of authority to approve the final agreement to the MSC. A short turnaround time is also requested.

f. If you have any questions, please call the review manager, Henri Langlois, at 703-428-6484.

FOR THE DIRECTOR OF CIVIL WORKS:

DAVID B. SANFORD, JR.
Chief, Policy Division
Directorate of Civil Works

2 Encls
as

CF:
CECW-A
CECW-PE
CECW-MA(2)
CECW-AR, Comeback copy-js

CECW-PE 9 January 1997

HQUSACE COMMENTS
WILLAMETTE BASIN SURPLUS WATER LETTER REPORT
AND
DRAFT WATER SUPPLY AGREEMENT WITH CITY OF PORTLAND, OREGON

The following comments must be appropriately addressed before the water supply agreement is finalized and executed with the city of Portland, Oregon:

a. Letter Report:

(1) The report states, in the first paragraph that it will "establish a unit charge per acre-foot of municipal and industrial (M&I) water that will be applied to future surplus water agreements in the Willamette basin." This is not correct. This agreement establishes a method for determing the unit charge, but not the unit charge itself, for any future surplus agreements. Because the unit costs are calculated using updated costs of storage, the unit costs of any surplus water contracts will depend on the date at which they are being proposed;

(2) On page 8 of the report, the annual repayment amount should be calculated using the fiscal year 1997 (FY 97) interest rate of 7.125 percent and the most current (FY 96) actual operation, maintenance, repair, rehabilitation, and replacement (OMRR&R) expenditures; and

(3) Paragraph 5, "Environmental Considerations," of the letter report states, "In addition to NEPA requirements, this and all future water supply requests will be reviewed for compliance with all other pertinent environmental laws..." and cites several environmental laws and executive orders with which compliance is required. The phrase "will be reviewed" implies that the current letter report for the water supply request has not already been reviewed in light of the cited laws. Prior to finalizing the agreement, the district should certify both compliance with all laws and executive orders and that coordination with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service has been completed and agreement has been reached that the surplus water supply request will not have an adverse impact on any threatened or endangered species that might be in the study area.

b. Draft Surplus Water Supply Agreement:

(1) The user cost as calculated in exhibit A of the draft agreement should reflect the current (FY 97) interest rate as well as the most current (FY 96) actual OMRR&R expenditures. This will affect the total annual cost to the user;

(2) Article 4, paragraph (a), on page 2 of the draft agreement must be revised to reflect the total annual cost to the user resulting from compliance with comment b.(1), above; and

(3) Article 4, paragraph (b), on page 3 of the draft agreement must be revised to reflect the FY 97 interest rate of 7.125 percent.

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
CIVIL WORKS
108 ARMY PENTAGON
WASHINGTON DC 20310-0108

REPLY TO
ATTENTION OF

10 JAN 1997

MEMORANDUM FOR THE DIRECTOR OF CIVIL WORKS

SUBJECT: Willamette Basin Surplus Water Supply Agreement with the City of Portland

This responds to the memorandum of January 2, 1997, subject as above, concerning the subject draft agreement. The draft agreement is approved, subject to the changes noted in the January 2, 1997, memorandum. In accordance with your recommendation, the Division Engineer is authorized to execute the agreement for the Army.

H. Martin Lancaster
Assistant Secretary of the Army
(Civil Works)

Memorandum 5

Encl 7

CECW-PE (CENPP-PE-HR/29 Oct 96) (335-2-5c) 2nd End
Mr. Daniels/jd/202-761-1981
Subject: Willamette Basin Surplus Water Letter Report

14 JAN 1997

HQ, US Army Corps of Engineers, Washington, DC 20314-1000

FOR Commander, North Pacific Division, ATTN: CENPD-ET-P

The subject report and draft surplus water supply agreement are approved subject to the incorporation of revisions required in response to the enclosed comments. Authority to execute the water supply agreement is delegated to the Division Engineer. A copy of the executed agreement should be provided to HQUSACE (CECW-PE) for information.

FOR THE DIRECTOR OF CIVIL WORKS:

G. EDWARD DICKEY
Chief, Planning Division
Directorate of Civil Works

7 Encls
wd encls 1-5
Added 2 encls
6. Comments
7. Cy ASA(CW) Memo
Jan 10, 97

CF:
CENPP-PE-HR

CENPD-ET-P (CENPP-PE-HR/29 Oct 96) (1105) 3rd End
Mr. McDonald/kb/503-326-3872
Subject: Willamette Basin Surplus Water Letter Report

CDR, North Pacific Division, Corps of Engineers, PO Box 2870,
Portland, OR 97208-2870

28 JAN 1997

FOR Commander, Portland District (CENPP-PE)

You are authorized to prepare subject surplus water supply agreement for the Division Engineer's signature in accordance with the ASA(CW) memo (encl 7). Future agreements within the Willamette Basin should be processed in accordance with ER 1105-2-100, Table 4-5.

FOR THE COMMANDER:

"SIGNED"

ET

ET

7 Encls
1-5 wd
6-7 nc

JOHN E. VELEHRADSKY, P.E.
Director, Engineering and
Technical Services ET-PF

McDonald/kb
28Jan97/3872
pe-ec:\npp\willwat.wpd

MFR (28 Jan 97): Forwards Water Supply agreement approval to NPP for action. ASA(CW) approval delegated signature authority for this contract to Div Engr.

Appendix E
Pertinent Correspondence

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Oregon
John A. Kitzhaber, MD, Governor

Water Resources Department
North Mall Office Building
725 Summer Street NE, Suite A
Salem, OR 97301-1271
503-986-0900
FAX 503-986-0904

Colonel Jose L. Aguilar
U.S. Army Corps of Engineers, Portland District
P.O. Box 2946
Portland, OR 97208-2946

June 4, 2014

Re: Coast Fork Willamette River Surplus Water Letter Report (June 2014)

Dear Colonel Aguilar,

The Oregon Water Resources Department would like to express support for recent efforts by the U.S. Army Corps of Engineers to examine the use of stored water for meeting municipal and industrial water uses in the Coast Fork Willamette River sub-basin. The water stored in the Willamette Basin Project reservoirs is a critical supply of water for meeting the long-term water needs for a variety of instream and out-of-stream uses in Oregon's most populated river basin. The approval of the "Coast Fork Willamette River Surplus Letter Report," accompanying agreement, and associated water rights would be the first time a municipal or industrial water user could temporarily gain access to stored water from the Project reservoirs. Historically, stored water has been available to irrigation uses only, administered by the U.S. Bureau of Reclamation's water contracting program.

As the non-federal sponsor, the Department appreciates the Portland District's communication and involvement of various stakeholders and state agencies throughout the planning and study process. These efforts have been very informative, helping the state and others understand the modeling analysis and review steps needed to undertake such a review.

The Department is well positioned to continue this working relationship with the Corps and basin interests in the coming years. The Willamette Basin Review–Reservoir Study, a joint state and federal effort, will take a broader look at the current and potential uses of stored water from the Project reservoirs, examining options for permanently allocating water to meet a full range of beneficial uses in the entire Willamette Basin. The State of Oregon has secured its full cost-share obligation to carry out this incredibly important study.

Again, I would like to express our appreciation and support for the Corps' recent efforts to provide stored water for meeting the needs of water users in the Coast Fork Willamette River sub-basin.

Sincerely,

Thomas J. Paul, Deputy Director
Oregon Water Resources Department

Copy (by email): Kevin Brice, USACE
Eric Stricklin, USACE
Phil Ward, OWRD
Alyssa Mucken, OWRD
Niki Iverson, OWUC

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, PORTLAND DISTRICT
PO BOX 2946
PORTLAND OR 97208-2946

REPLY TO
ATTENTION OF

Reservoir Regulation & Water Quality Section

26 NOV 2013

Mr. Jamon Kerit
Interim City Administrator, City of Creswell
13 S. 1st Street
P.O. Box 276
Creswell, Or. 97426

RE: Willamette Valley Project-Cottage Grove

Dear Mr. Kerit:

You have requested the use of surplus water in Cottage Grove and Dorena Reservoirs for municipal and industrial water supply purposes. Storage for such use may be available, subject to preparation and approval of a report and compliance with applicable Federal and state laws and regulations. Before proceeding, however, we must inform you of the status of the dam at Cottage Grove; along with the potential impacts on water supply storage.

While the U.S. Army Corps of Engineers (Corps) recognizes the numerous public benefits of providing storage in its reservoirs for water supply purposes, the Corps also recognizes its responsibility to provide storage in a safe, secure and reliable environment. The Corps is committed to the safety of its dams.

The Corps continually evaluates its dams and determines if remediation may be necessary to meet and maintain current Corps safety standards. Corps dams are classified through a risk assessment process into five Dam Safety Actions Classifications (DSAC) which represent varying levels of safety risks. In the interest of public safety, Corps water supply policy does not allow the conservation pool to be raised at projects where dams are classified DSAC I, II, III. Therefore, only storage within the existing conservation pool may be considered for water supply purposes.

The dam at Cottage Grove has been classified DSAC III-Moderate Urgency. As a result, the Corps may implement interim or long-range measures to remediate the conditions which lead to the DSAC. These measures may impact the storage in the reservoir for water supply purposes, such that the amount of storage available for water supply could be reduced. Corps water supply storage agreements require non-Federal users to share the costs of remediation in proportion to the storage space that has been provided to each user.

Printed on Recycled Paper

We will continue to work with you in your efforts to meet your present and future water needs. To this end, we continually review our projects for effectiveness, efficiency and safety. Copies of this letter have been provided to Ms. Alyssa Mucken, Oregon Water Resources Department and Eric Stricklin, the Corps' project manager for the Willamette Basin Review Feasibility Study. If you have questions about any matters addressed in this letter, please contact Ms. Laurie Nicholas at (503) 808-4887 or Laurie.Nicholas@usace.army.mil.

Sincerely,

Bruce J. Duffe

Bruce J. Duffe
Chief, Hydraulics and Hydrology
U.S. Army Corps of Engineers
Portland District

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, PORTLAND DISTRICT
PO BOX 2946
PORTLAND OR 97208-2946

REPLY TO
ATTENTION OF

Reservoir Regulation & Water Quality Section

26 NOV 2013

Mr. Jamon Kerit
Interim City Administrator, City of Creswell
13 S. 1st Street
P.O. Box 276
Creswell, Or. 97426

RE: Willamette Valley Project-Dorena Dam

Dear Mr. Kerit:

You have requested the use of surplus water in Cottage Grove and Dorena Reservoirs for municipal and industrial water supply purposes. Storage for such use may be available, subject to preparation and approval of a report and compliance with applicable Federal and state laws and regulations. Before proceeding, however, we must inform you of the status of the dam at Dorena; along with the potential impacts on water supply storage.

While the U.S. Army Corps of Engineers (Corps) recognizes the numerous public benefits of providing storage in its reservoirs for water supply purposes, the Corps also recognizes its responsibility to provide storage in a safe, secure and reliable environment. The Corps is committed to the safety of its dams.

The Corps continually evaluates its dams and determines if remediation may be necessary to meet and maintain current Corps safety standards. Corps dams are classified through a risk assessment process into five Dam Safety Actions Classifications (DSAC) which represent varying levels of safety risks.

The dam at Dorena has been classified DSAC IV- Low Urgency, but it does not meet all Corps safety standards. As a result, the Corps will conduct elevated monitoring and evaluation of the dam. In the event the DSAC is elevated to a higher level of risk, the Corps may implement interim or long-range measures to remediate the conditions which led to the new DSAC. These measures may impact the storage in the reservoir for water supply purposes, such that the amount of storage available for water supply could be reduced. Remediation is cost shared with water supply users in proportion to the storage space that has been provided to each user.

Printed on Recycled Paper

We will continue to work with you in your efforts to meet your present and future water needs. To this end, we continually review our projects for effectiveness, efficiency and safety. Copies of this letter have been provided to Ms. Alyssa Mucken, Oregon Water Resources Department and Eric Stricklin, the Corps' project manager for the Willamette Basin Review Feasibility Study. If you have questions about any matters addressed in this letter, please contact Ms. Laurie Nicholas at (503) 808-4887 or Laurie.Nicholas@usace.army.mil.

Sincerely,

Bruce J. Duffe

Bruce J. Duffe
Chief, Hydraulics and Hydrology
U.S. Army Corps of Engineers
Portland District

City of Creswell
13 S. 1st Street PO Box 276 Creswell, Or. 97426
Ph (541) 895-2531 Fax (541) 895-3647

July 30, 2013

Colonel John W. Eisenhauer
U. S. Army Corps of Engineers, Portland District
P.O. Box 2946
Portland, OR 97208-2946

RE: Willamette Basin Project - Small Scale Reallocation Study

Dear Colonel Eisenhauer:

Since the late 1980's, the municipal water providers in the Willamette Basin have been seeking access to the water stored in the Willamette Basin projects. Today, this stored water represents a key primary and supplemental supply source for municipal water providers.

For several years, the City of Creswell has been in communication with the Oregon Water Resources Department and the Oregon Water Utilities Council regarding a potential Army Corps of Engineers-led small scale reallocation study. We understand such a study could make available up to 499 acre-feet of stored water for municipal use.

On December 13, 2010, the City of Creswell City Council voted to participate in the small scale reallocation study. Consistent with that action, the City requests that the Army Corps of Engineers initiate and complete the small scale reallocation study. It is our understanding that the City will incur no financial obligations and is not making any commitments regarding future contracts for use of the stored water.

We look forward to working with you and your staff on this important project.

Sincerely,

Jamon Kent, Interim City Administrator

TTY call: 1-800-735-2900 Spanish TTY Call: 1-800-735-3896 Creswell is an Equal Opportunity Employer & Provider
Facilities are ADA Accessible and Creswell complies with section 504 of the Rehabilitation act of 1973

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, PORTLAND DISTRICT
PO BOX 2946
PORTLAND OR 97208-2946

REPLY TO
ATTENTION OF

CENWP-EC-HC

13 DEC 2013

MEMORANDUM FOR RECORD

SUBJECT: Dorena Dam and Cottage Grove Dam Risk Assessments.

1. References:
   a. Coast Fork Willamette River, Oregon, Surplus Water Letter Report, draft November 2013.
   b. Cottage Grove Lake Project Periodic Assessment Report No. 1, September 2012.
   c. Dorena Dam Screening Portfolio Risk Assessment (SPRA), December 2008.

2. The City of Creswell is seeking additional water supply for municipal and industrial uses. The City is considering entering into an agreement for use of 437 acre-feet (2 cfs) of surplus water from Dorena and Cottage Grove reservoirs, combined, from June – September.

3. The Portland District Dam Safety Officer has reviewed the referenced report and in light of the results of the risk assessments performed at these projects, determined discharging an additional 2 cfs through the dam during the conservation season will not increase the risks to dam safety.

4. Questions or comments regarding the surplus water project should be directed to Laurie Nicholas, Chief, Reservoir Regulation and Water Quality Section, at (503) 808-4887.

LANCE A. HELWIG, P.E.
Chief, Engineering and Construction
Division

Printed on Recycled Paper

Appendix F
PUBLIC COMMENTS AND RESPONSE TO COMMENTS

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January14, 2014

District Engineer
U.S. Army Corps of Engineer District, Portland
Attn: CENWP-PM-P/Eric Stricklin
P.O. Box 2946
Portland, Oregon 97208-2946

Dear Mr. Stricklin;

Thank you for the opportunity to review and comment on the Draft Surplus Water Report prepared for the City of Creswell's request to gain access to stored water in the Willamette Project for municipal purposes. The Oregon Water Utilities Council (OWUC) has worked closely with the City of Creswell, our water utility members, GSI Water Solutions, and Geosyntec to review the report and draft comments for submittal. Our comments are attached.

The water stored in the Willamette Project will be the key component to meeting the future needs for irrigation, drinking water supply, industrial uses, and environmental restoration. The Willamette project provides the primary factor for economic development in Oregon's most populated river basin.

OWUC has appreciated the opportunity to work with the USACE staff on the Draft Water Surplus Report. Local USACE staff have made tremendous progress on this effort and have worked successfully with stakeholders throughout the study. Determining the approximate cost of water for municipalities for a future contracting program and in the continued Willamette Basin Review Study is critical for our infrastructure planning and investment strategies.

Thank you for your consideration of our comments and please don't hesitate to contact me at 503-615-6770 or niki.iverson@hillsboro-oregon.gov.

Sincerely,

Niki Iverson
Project Manager, Oregon Water Utilities Council
City of Hillsboro

Technical Memorandum

To: Niki Iverson, OWUC Project Manager

CC: Brad Taylor, OWUC Chair

From: Adam Sussman
Kimberly Grigsby

Date: January 13, 2014

Re: Policy and Water Rights Review of Coast Fork Willamette River, Surplus Water Letter Report

---

We have reviewed the Coast Fork Willamette River Final Draft Surplus Water Letter Report (Letter Report) dated December 18, 2013 , which was developed by the U.S Army Corps of Engineers (Corps). Overall, the Letter Report is well-written and provides valuable information about the costs associated with the use of stored water for municipal and industrial (M&I) purposes. We are providing the following questions, comments and suggested edits in an effort to clarify a few topics in the final document, and to raise a couple of high-level issues that should be considered when the Corps initiates the reallocation process. Our comments are arranged by section in the Letter Report.

Chapter 2 Project Background

In the last paragraph of section 2.1 (Projects Authorization), please identify the water right certificates that authorize the storage of water in Willamette Valley Project (72755 and 72756).

In section 2.5.3 (Obtaining New Water Rights) please indicate that the federal storage water rights would need to "transferred" to change the character of use before a new water right for M&I purposes could be issued. Describe the transfer process at a high level.

Chapter 3 Plan Formulation

In the first paragraph of section 3.1, the Letter Report should be clear that OWRD's Willamette Basin Program provides limitations only on *new* water rights to use surface water during the summer months. The rules cited do not affect the use of *existing* water rights in the basin.

Similarly, the last sentence in the second paragraph should be changed to state that "Although *new uses* of surface water for municipal use is strictly limited…"

To avoid confusion, the first paragraph in section 3.1 should indicate that water is unavailable at 80 percent exceedance on most tributaries, but not the mainstem Willamette River.

In section 3.4.2 (Proposed Action – Surplus Agreement), the Letter Report converts the 437 acre-feet of stored water for which the report determines that the City of Creswell has a demand into a rate of approximately 2 cfs. This conversion appears to be based on an assumption that Creswell would use the stored water at a constant rate over the four-month period of June through September. For purposes of a future reallocation, however, it is important that the Corps understand that this is likely not how municipalities would use stored water. Instead, it is expected that municipalities would more likely use the stored water over shorter periods at higher rates. For example, the water would be used to meet peak demands or as a redundant supply when another water source is not available.

Chapter 4 Impacts to Authorized Purposes

The last paragraph in section 4.1.7 (Municipal and Industrial Water Supply) is unclear. It appears to imply that flow targets in the Biological Opinion would not be met in drought years due to state water policy.

Chapter 5 Summary of Derivation of User Cost

The Letter Report describes how the annual payment of $53,131 was calculated, based on a 30-year repayment schedule. We believe it is worth clarifying that at the end of the 30-year period, the municipal water provider would thereafter only be required to pay annual O&M and any RR&R costs.

We understand that the amount of capital costs paid under a surplus water agreement would be applied towards the 30-year payment under a contract issued after a reallocation. It would be helpful for the Letter Report to clarify this point.

The Letter Report uses an interest rate of 3.125 percent. We understand that this rate would be "locked in" for the 5-year agreement period, and adjusted every five years. It would be helpful to clarify this issue in the Letter Report.

It appears that the annual cost of $53,131 does not include the O&M cost of $4,322. This should be clarified. Also, it would be helpful to include the total annual cost of $57,453 in this section.

It is not clear how RR&R costs would be assessed on an interim water surplus contract. This should be clarified, including whether dam safety considerations play into future RR&R costs.

The Letter Report is specific to the City of Creswell, but it would be helpful if it also indicated that another municipality could potentially obtain access to the stored water (such as through a transfer of the surplus water agreement). The Letter Report should also indicate whether the repayment costs would be the same for another entity (although they may also need to pay the cost of additional NEPA analysis).

Chapter 6 Other Considerations

In section 6.2 (Test of Financial Feasibility), the Letter Report refers to a surplus water Project First Cost of $915,879. The meaning and source of this cost are not explained.

Chapter 7 Implementation

In section 7.1 (Federal and Non-Federal Responsibilities), we would suggest the following edits to the second and fourth paragraphs to improve clarity:

"Reclamation and the Corps will need to submit a water right transfer application to OWRD to change the character of use from irrigation to M&I for a 437 acre-foot portion of the federal government's storage water right."

"OWRD will need to process the transfer application for Reclamation and the Corps and the City of Creswell's secondary water right application to use the stored water."

Appendix A Derivation of User Cost

In section A.2.3 (Updated Cost of Storage), the Federal discount rate was applied over a 50-year project life, but the repayment period considered was 30 years. Why are these time periods different? How does this difference impact the cost of stored water? Should this be explained further?

Also it is not clear how the $100 per acre foot average annual value for the updated cost of storage was used. Please clarify.

A clearer description of the calculations in this section would be helpful, such as providing the formula for calculating the updated cost of storage value of $20,776,590.

Further, we understand the 3.5 percent Federal discount rate to be variable. Would this impact the cost of water under a surplus water contract?

This section of the Letter Report references the M&I demand of 207,828 acre-feet. It may be useful to indicate that this demand is from the OWRD and Corps Willamette River Basin Reservoir Study Interim Report (January 2000), which was reviewed by GSI in 2013 as part of the local cost share. Should the M&I demand memo be included in an appendix?

The title for section A.2.4, "User Cost," is confusing since it implies an individual user of the stored water. A clearer title would be "Stored Water Cost" or "Selected Method for Determining Cost."

Additional Comments

Please indicate whether there is a deadline for Creswell to contract for this stored water.

Should the Return Flow memo be referenced and included in an appendix?

In the future, the 207,828 acre-feet figure for M&I demand may need to be updated.

Memorandum

Date:	14 January 2014
To:	Niki Iverson, OWUC Project Manager
Copies to:	Brad Taylor, OWUC Chair
From:	Rob Annear, and Brian Apple, Geosyntec Consultants
Subject:	Coast Fork Willamette River, Oregon – Surplus Water Letter Report Review, Appendix C, Hydrology and Hydraulics

---

INTRODUCTION

The United States Army Corps of Engineers (USACE) has developed a Reservoir System Simulation Program (ResSim) model of the Willamette River Basin in order to assess the effects of using 499 ac-ft. of stored water in the Cottage Grove and Dorena reservoirs for the City of Creswell's Municipal and Industrial (M&I) water supply. A review was conducted of Appendix C (Hydrology and Hydraulics) of the Surplus Water Letter Report. The Appendix provides useful information on the hydrology and hydraulic analyses undertaken to understand the impact of utilizing the 499 ac-ft. of stored water for Cottage Grove. We are providing the following comments and suggested edits in an effort to clarify some aspects of the appendix for issuing the final document. The comments are divided into specific comments for sections within the appendix; general comments which apply throughout the appendix; and high-level comments regarding any potential future reallocation studies.

SPECIFIC COMMENTS

1. Section 1.3 Inflows and Local Flows:
    a. The fourth paragraph starts with: "The ResSim model does not reproduce the regulated flows that really occurred; instead, the model…," can you rephrase this to state that, "The ResSim model, using the period of record (POR) flows, is being used to test current operations against a diversity of historical flows and therefore not trying to recreate historical operations and flow release impacts."
2. Section 1.4 Water Year Classification

a. Please add an introduction sentence or two to explain that each year in the POR needs to be classified and why.
b. This section states the water year classification is based on the storage volume targets (is this a "target" or is this what water is available?) of the federal projects in the Willamette Basin for each day from May 10th through 20th of any year. However, the same paragraph then states the "peak composite system storage" that occurs from May 10th through 20th of any year is used to classify the water year. It appears that storage volume targets and peak composite system storage is not the same thing. Please clarify whether the peak composite system storage or the storage volume targets are used for the water year classification.
c. This section states Insufficient and Deficit water years have reduced minimum flow targets at Salem. Please reference the Biological Opinion (BiOp) which serves as the basis for these reduced targets and clarify if the reduction in diversions is also specified in the BiOp.

3. Section 1.5 Study Methodology
   a. Please provide an explanation and definition of what is the Product Delivery Team (PDT) and how it is involved in this analysis. The Product Delivery Team was not mentioned in the Surplus Letter Report and was only used in this appendix.
   b. Under the bullet item labeled 'Step 3' of this section, please clarify if the projected 2050 M&I needs are across the entire basin or for Creswell only. In addition, please provide an explanation of what the specification of "stored water releases from hydropower projects whenever possible" means. Also, please reference that the model results from "Step 3" are referred to as the "Worst-Case Hydropower Analysis" as noted later in the appendix.
   c. Subsection C.1.5.1 Step 1. Set Up the Early Implementation Baseline
      i. In this section it states "The baseline model from the Willamette COP project was used as the starting point for the water supply study" on page 4 and then the next sentence refers to an IRRM Baseline "network" and then it's called the Early Implementation (EI) Network. It appears that the baseline model from the Willamette COP was used and then modified to remove the IRRM operations and make a few other adjustments to get to the Early Implementation Baseline. Please clarify if that was the methodology used.
      ii. The word "network," is a modeling term that is specific to HEC-ResSim. A screen shot of the reservoir network for the EI Baseline is provided but the word "network" is not defined. Please define "network" or avoid

interchanging the use of "network" with the description of the model simulations.

iii. This section includes a list of the changes made to the IRRM Baseline (to create the EI Baseline). There is also a statement elsewhere in the appendix that indicates that the IRRMs were removed. Please provide the rationale for these changes.

iv. The sentence (page 6) defining where the only diversion is located should be changed to "Note that this network has only one current diversion included, which is at Mehama [along the North Santiam River]." Furthermore, the last sentence in this paragraph should state "…irrigation needs are met with the minimum [flow] releases specified at [individual] projects." This comment applies to the following subsection as well.

d. Subsection C.1.5.2 Step 2. Assess Impact of the Stored Water Request on Current Configuration

   i. Please clarify the analysis is for the use of stored surplus water, not just stored water, and restate the M&I diversion amount is specific (i.e. 499 acre-ft. for the City of Creswell).

e. Subsection C.1.5.3 Step 3.Assess Impact of Using Stored Water for the Projected 2050 M&I Demand.

   i. A statement discussing how the M&I demands were identified or developed and that they were implemented across the basin should be included at the beginning of this subsection.

   ii. In this subsection it states the "Interim Report" had been referenced earlier when it had not (third paragraph).

   iii. There is a reference to "control points," please include a definition (page 8).

   iv. A reference to the "BiOp" should be cited (page 9).

   v. The last two sentences of the first paragraph (Page 10) appear to be repetitive with the last two sentences in the first paragraph of Subsection C.1.5.2. It may be possible to delete these two sentences.

   vi. The river along which the reservoir at Fern Ridge is located should be noted.

   vii. In the discussion of the summing of flow contributions for each project (5th paragraph, page 10), a cross-reference to a table listing these contributions would be beneficial.

viii. In the 6th paragraph, please define the acronyms “HCR”, ”LOP”, and “GPR” during their first use or refer to a table where these acronyms are spelled out.

ix. Please define the acronym “BPA” at first use in the appendix.

x. The figure for the projected 2050 water demands was removed from the 90% draft (was included in the 60% draft). This figure provides useful information regarding the location of future diversions and should be reconsidered for inclusion.

4. Section 1.6 Study Results
    a. In the first sentence please clarify that the 2050 projected M&I demand simulation is the “Worst-Case Hydropower Analysis” simulation.
    b. The last two sentences in the first paragraph appear to be repetitive with the rest of the text in the same paragraph and therefore it may be possible to delete these last two sentences.
    c. In this section (2nd paragraph, page 12) consider modifying the sentence to read “by finding the average 1 January elevation for all [73] modeled year[s], the…”
    d. Please label the ‘minimum conservation zone’ in the results figures for clear interpretation.
    e. Subsection 1.6.2 Projected 2050 M&I Demand Analysis Results (From Step 3)
        i. Please change references in the text from “baseline” to “Early Implementation Baseline” or “EIB” (after defining acronym) to remain consistent.
        ii. Please consider changing the second sentence in this section from “The average effect on reservoir elevations is shown in …” to “The average reservoir pool elevations are shown in…”
        iii. In the last paragraph of this subsection, the phrase “hydropower analysis” should be changed to “hydropower cost analysis” for clarification.
        iv. In the last paragraph of this subsection, there are several references to “fourteen periods used by BPA” and “The 73 years of fourteen period average values for flows are…” What is the meaning of ‘fourteen period?’ Is this supposed to be a “14-day period?”

GENERAL COMMENTS

1. Please provide complete reference citations for the following reports referenced in the Appendix:
    a. Model Documentation Report of the Willamette Basin HEC-ResSim Model

   b. *Appendix Section 8.3 of the report: Hydrology Report Willamette FIS Update (Phase One)*
   c. *Appendix B of the report: Willamette Project Biological Assessment*
2. Please provide consistent references to the HEC ResSim model. Referred to as 'HEC ResSim', 'ResSim program', 'ResSim model', 'program', and 'model' throughout the report.
3. Please provide consistent references to specific model scenarios like the "Worst-Case Hydropower Analysis."
4. In discussion of the reservoir system, please provide consistency in reference to the "Willamette River Basin System" (some instances refer to it as "Willamette Basin System").
5. Please provide consistency when referencing 'The Early Implementation Network' and 'Early Implementation Baseline' in Appendix C.
6. Names or titles such as "Deficit" and "Insufficient" should be consistently labeled with capitalization (or not).
7. Please consider abbreviating Municipal and Industrial (M&I) demands should be consistently.

RECOMMENDATIONS FOR FUTURE REALLOCATION

Below is short list of recommendations to consider for any future reallocation studies that may be undertaken.

- Consider reviewing and updating the Municipal and Industrial (M&I) demands as recommended in a memorandum provided by the Oregon Water Utilities Council.
- Consider incorporating into the HEC-ResSim model estimates for return flow recommended in a memorandum provided by the Oregon Water Utilities Council.
- The agricultural demands should be updated to reflect more accurate understanding of future demands.
- Provide a more detailed analysis into the certainty of water supplies in subbasins of Willamette Basin in different water year scenarios. The method presented in the Surplus Water Letter Report for classifying the water years is different than used by municipal water supply agencies.

*** * * * ***

Stricklin, Eric T NWP

From: Jeff Stone [jstone@oan.org]
Sent: Tuesday, January 14, 2014 3:50 PM
To: Willamette Basin Review
Subject: [EXTERNAL] Attn: Eric Stricklin / Re: Public Comment re DRAFT Coast Fork Willamette River Surplus Water Letter Report / Issued under Public Notice Dated Dec. 18, 2013

Dear Mr. Stricklin

With this email, I offer the following comments on behalf of the Oregon Association of Nurseries regarding the DRAFT Coast Fork Willamette River Surplus Water Letter Report (the "Draft Letter"):

1. The Draft Letter finds that the release of 437 acre-feet of water requested by the City of Creswell will not affect existing irrigation contracts or the ability to issue new irrigation contracts up to 95,000 acre-feet. Such a finding under Section 4.1.6 in particular implies that that 95,000 acre-feet limitation is presented as a hard cap. Such statements are incorrect and should be further qualified to confirm that the NMFS Willamette BiOps provides a process for irrigation contracts to be awarded in the aggregate in excess of 95,000 acre-feet.

2. Section 2.5.1. The first sentence of Section 2.5.1 states, "Under Oregon law, all water is publicly owned." This is an oversimplification of Oregon law. The statement is true up and to the point that water is not subject to authorized rights of diversion and withdrawal for application to beneficial use. Once diverted from a surface body or withdrawn as groundwater, the corpus of the water no longer is titled in the public, but rather is tilted in the water user. Likewise, to the extent that stored water has been committed under a contract with the Bureau of Reclamation, the contracting party has a legal interest in the contracted water, meaning that the public ownership has been diminished with respect to that water. We would recommend that this statement be deleted or corrected to avoid any confusion.

3. Section 2.5.2. The second sentence of the second full paragraph states, "In Oregon, the prior appropriation doctrine has been law since February 24, 1909, when passage of the first unified water code introduced state control over the right to use water." This statement is incorrect. The doctrine of prior appropriation was utilized at common law in courts throughout Oregon prior to 1909. During this time, water interests were also recognized under principles of riparian water law. This statement should be corrected to confirm that the common law doctrine of prior appropriation was codified in state statute on February 24, 1909 to achieve a statewide uniform body of laws governing the administration of surface water.

If you have any questions or would like additional information to clarify our remarks, please let me know.

Sincerely

Jeff Stone

Oregon Association of Nurseries

JEFF STONE / Executive Director, Oregon Association of Nurseries <http://www.oan.org/>
email: jstone@oan.org <mailto:jstone@oan.org> office: 503-682-5089 cell: 971-235-3868
29751 SW Town Center Loop West, Wilsonville, Oregon 97070

RESPONSES TO COMMENTS RECEIVED UNDER PUBLIC NOTICE OF DRAFT COAST FORK WILLAMETTE RIVER SURPLUS WATER LETTER REPORT ISSUED 18 DECEMBER 2013

OREGON ASSOCIATION OF NURSERIES
Comments submitted 14 January 2014

- Oregon Association of Nurseries provided a comment concerning the 95,000 acre-feet limit stated in the National Marine Fisheries Service 2008 Biological Opinion. Based on review of the statement in the document, the reference to this amount was removed to ensure to Letter Report focused on current and existing uses of stored water.
- In addition, the OAN requested corrections to Sections 2.5.1 and 2.5.2. OAN is correct in stating that these two sections are simplified descriptions of Oregon water law. The Letter Report is intended to provide high level background information on Oregon water law.

RESPONSE TO COMMENTS SUBMITTED BY OREGON WATER UTILITIES COUNCIL
Comments submitted 14 January 2014

Chapter 2

- Added certificate numbers as requested.
- Section 2.5.3 was not changed as this section is a general overview of Oregon law. Section 7.1 provides a description of what will need to occur for the change of use.

Chapter 3

- Comments 1-3 were addressed as requested.
- Comment on demands are noted. GSI provided demand data as part of the cost share agreement with the study sponsor, Oregon Water Resources Department. The Corps converted the demand to constant acre-foot and cfs values for the season of use. This was needed for modeling purposes to determine potential impacts.

Chapter 4

- Section 4.1.7 was modified based on OWRD comments; reference to flow targets was removed.

Chapter 5

- The time period of 30 years was used only to calculate the annual payment. A surplus agreement is temporary, good for five years with an option to extend an additional five years. After the agreement expires, no additional payment is due, and there is no longer a right to storage or water.
- While there is precedent to applying surplus agreement payments to a future agreement resulting from a reallocation, this report documents the immediate need for water supply; therefore discussion of future reallocation agreements is not included.
- The report was clarified to state the current interest rate of 3.125 is only fixed for five years. If the surplus agreement is extended, a new annual payment will be calculated based on the new interest rate.
- Costs more clearly laid out in written and table format.
- The City of Creswell was notified in writing of dam safety consideration and potential impacts to their financial responsibility. Letter included in report appendix.

- A surplus letter report is specific to a request for surplus water at specific location and by a specific entity. If Creswell is unable to utilize the surplus water, the Corps will evaluate other requests, but additional review may be necessary.

Chapter 6

- Project First Cost changed to Capital Cost to ensure consistent use of terms between alternatives.

Chapter 7

- Suggested edits were similar to OWRD edits; OWRD edits incorporated.

Appendix A

- The 50-year project life refers to the physical planning life of the dam; report clarified.
- The $100 per acre-foot unit was not used elsewhere; therefore it was not helpful in clarifying future costs and hence deleted.
- Calculations clarified and the equation for updated cost of construction was added.
- The federal interest rate of 3.5% was used to calculate the updated cost of storage. This cost would be recalculated each fiscal year and for each agreement for storage. Appendix A establishes the methodology for determining the cost of storage and the current storage price. The price will vary as the interest rate changes.
- The M&I demands used in Appendix A, B, and C were from the 2000 Willamette Basin Review Interim Report. GSI reviewed these values and determined that they are reasonable estimations of 2050 demand data for the purposes of this report. GSI recommended further evaluation of M&I demands for a full-scale reallocation project. (Memorandum dated September 30, 2013)
- Section A.2.4 title changed to Selected Method for Determining User Cost

Additional Comments

- The City of Creswell will have 6 months from the date of ASA(CW) approval of the storage agreement. After 6 months, the Corps and ASA(CW) will re-evaluate the agreement and report for policy compliance.
- Return flows information was not incorporated into the modeling effort for the Surplus Report. Should a future reallocation project go forward, return flows will be incorporate in the model.
- The Corps concurs that the M&I demand value of 207,828 would need to be updated for a large scale reallocation project.

Specific Comments

- Suggested edits to Sections 1.3 and 1.4 were incorporated.

Section 1.5

- Reference to PDT was removed since it was not necessary.
- The 2050 M&I demands are for the entire basin; clarified in document.
- Section C.1.5.1 was edited to ensure consistency of terms.
- See Section C.1.1 for explanation of IRRMs.
- Clarifications added regarding diversion of water at Mehama and releases made to satisfy that demand.
- The analysis does not differentiate between stored surplus water and stored water.
- M&I demands for the City of Creswell were provided by GSI. 2050 demands came from the 2000 Interim Report. Reference to this report was added.
- Defined control points in the text.
- BiOp was previously used and referenced.

- Repetitive sentences deleted.
- Long Tom River added to statement of Fern Ridge.
- Flow contributions are listed in Tables C.1.7 and C.1.8.
- Acronyms spelled out.
- Figure C.1.1 shows control points and Table C.1.6 lists the control points where demands are removed from the model.

Section 1.6

- Suggested edits a-c incorporated.
- Minimum conservation zone was described in the text above the figures.
- Changed text to ensure consistent use of the term "Early Implementation Baseline".
- Changed text in comment e.ii to address the stated concern.
- OWRD submitted similar changes as requested in e.iii and those edits incorporated.
- Clarified the fourteen periods include one for each month except April and August which are divided into two periods each.

General Comments

- Comment 1: The model documentation report is still undergoing agency review. A copy of the report was provided for review. Citations for the other two reports were added as footnotes into the document.

- Comments 2-7 addressed requested.

- Recommendations for future reallocation are noted. This report is only for use of surplus water supply by the City of Creswell.

Appendix G
ENVIRONMENTAL ASSESSMENT
AND
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US Army Corps of Engineers ®
Portland District
BUILDING STRONG.

FINAL ENVIRONMENTAL ASSESSMENT

COAST FORK WILLAMETTE RIVER, OREGON SURPLUS WATER LETTER REPORT

Cottage Grove reservoir

The environmental review, consultation, and other actions required in accordance with applicable Federal laws for this project is being, or has been, carried-out by the U.S. Army Corps of Engineers, Portland District, under its assumption of responsibility pursuant to 33 C.F.R. Part 230.

27 May 2014

Executive Summary

This draft Environmental Assessment (EA) has been prepared by the U.S. Army Corps of Engineers, Portland District (Corps) and is available for public review in compliance with the applicable laws and regulations, including the National Environmental Policy Act (NEPA). The purpose of this draft EA is to consider the environmental impacts of annually supplying the City of Creswell (City), Oregon with 437 acre-feet of surplus water stored in Corps reservoirs in the Coast Fork Willamette River to meet its municipal and industrial water needs. The City would withdraw water from the Coast Fork Willamette River between June and September for the purpose of meeting increased water needs during the summer season.

Currently, the City obtains water from groundwater wells and natural flows in the Coast Fork Willamette River. Approximately 61 percent of the City's total water rights are sourced from natural flows in the Coast Fork Willamette River (2,243 gallons per minute [gpm]) and the remaining 39 percent (1,418 gpm) is supplied via groundwater. In total, the City's existing water rights provide 3,661 gpm for domestic purposes (see Table 1). However, while the City has water rights to meet current needs, the volume of water regularly available between groundwater and surface water sources is substantially less than the City's needs. Furthermore, the use of natural flow surface water in the Coast Fork Willamette River subbasin is not allowed for municipal and industrial uses between 1 May and 30 November, per the Oregon Administrative Rules (Chapter 690 Division 502).

The Coast Fork Willamette River, is partially fed through the release of stored water from the Corps' Dorena and Cottage Grove reservoirs. The Corps is legally entitled to store and release water for uses authorized by state and federal laws. In effect, the proposed action would result in a difference of 2 cfs less water in the river downstream from the City during the summer months. There would be *no* operational change in how the dams are managed or operated because the precision of the spillway gates does not allow for the release of exactly 1.8 cfs additional water.

The Corps has determined that surplus water is available for municipal and industrial water use, and a surplus water agreement between the City and the Corps would provide the City with a cost-effective source of water to meet their immediate needs. The agreement would be valid for 5 years, with a one-time-only option to extend the agreement for an additional 5 years (for a total of 10 years). The City would be authorized to withdraw stored water released from the dams using existing infrastructure and no construction or ground-disturbing activities would occur. The total cost charged to the City for the use of stored surplus water would amount to $56,782 annually (almost $130 per acre-foot for), amounting to a total cost for surplus water of $283,910 over 5 years.

At the end of the public comment period, the Corps will consider all comments received or post marked by the expiration date of this public notice and make a determination of significance of impacts resulting from the proposed action.

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Appendix A: City of Creswell's request letter
Appendix B: Summary of Comments and Responses on Draft EA

ABBREVIATIONS AND ACRONYMS

BiOp	Biological Opinion
°C	degrees Celsius
Cfs	cubic feet per second
City	City of Creswell, Oregon
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
DEQ	Oregon Department of Environmental Quality
DLCD	Oregon Department of Lands and Conservation Development
DO	dissolved oxygen
EA	Environmental Assessment
ER	Engineering Regulation
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
EWEB	Eugene Water and Electric Board
Gpm	gallons per minute
Gpd	gallons per day
HUC	Hydrologic Unit Code
M&I	Municipal and Industrial (water)
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service, a division of the National Oceanic and Atmospheric Administration
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
OAR	Oregon Administrative Rule
ODFW	Oregon Department of Fish and Wildlife
ORS	Oregon Revised Statutes
OWRD	Oregon Water Resources Department
pH	potential hydrogen
Reclamation	U.S. Bureau of Reclamation
RM	river mile
USC	U.S. Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

1. INTRODUCTION

The U.S. Army Corps of Engineers (Corps), Portland District is proposing to supply the City of Creswell (City), Oregon with surplus water for municipal and industrial (M&I) use from Corps reservoirs in the Coast Fork Willamette sub-basin. This Environmental Assessment (EA) evaluates the environmental impacts of this proposal. This document has been prepared by the U.S. Army Corps of Engineers, Portland District (Corps) in compliance with the National Environmental Policy Act (NEPA).

In a letter dated 30 July 2013, the City requested the use of 437 acre-feet of stored water annually from the Coast Fork Willamette River to support its growing M&I water supply needs (see Appendix A). In response to this request, the Corps completed a letter report to determine if there is a sufficient quantity of stored water in the Coast Fork Willamette River sub-basin, specifically in the Corps-owned and operated Dorena and Cottage Grove reservoirs, to support the City's request. The results of study were summarized in the April 2014 *Coast Fork Willamette River, Oregon Surplus Water Letter Report* (Corps 2014). As described in the report, the Corps determined there are sufficient quantities of surplus water in the reservoirs, and further, that the most efficient means to meet the City's immediate needs is to use stored water from the Dorena and Cottage Grove conservation pools[1].

Following the analysis of environmental effects, and in full consideration of any issues or comments identified by the public, State and Federal agencies and Tribes, the Corps will determine whether or not to issue a Surplus Water Agreement with the City. Should the Corps decide to enter into an agreement with the City, the City would be responsible for ensuring compliance with all other state and federal regulations for use of the stored water.

1.1. Authority and Funding

The Corps is authorized to sell surplus water for M&I purposes, as granted to the U.S. Army Corps of Engineers by Section 6 of the Flood Control Act of 1944 (Public Law 78-534), as amended. Under this authority, the Secretary of the Army is authorized to make agreements to sell surplus water to states, municipalities, private concerns, or individuals, at such prices and on such terms as deemed reasonable. Engineering Regulation (ER) 1105-2-100, paragraph E-57(b)(2) classifies surplus water as:

> *1) water stored in a Department of the Army reservoir which is not required because the authorized need for the water never developed or the need is reduced by changes which have occurred since authorization or construction or 2) water that would be more beneficially used as municipal and industrial water than for the authorized purpose and which, when withdrawn, would not significantly affect authorized purposes over some specified time period.*

The Corps' authorization, construction, and management of the Dorena and Cottage Grove reservoirs is governed in part by the Flood Control Acts of 1938 [Public Law 75-761], 1950 [Public Law 81-5196], and 1960 [Public Law 86-645]. These Acts established and authorized a basin-wide flood control and multi-purpose water development and management plan for the

[1] It should be noted that the term "surplus water", as used throughout this EA, is synonymous with water which is legally stored in the Corps' Willamette Valley Project reservoirs.

Columbia River Basin, which encompasses the Willamette Basin (inclusive of the Coast Fork Willamette River). The Flood Control Act of 1938 specifically authorized the construction of the Cottage Grove and Dorena dams, among others.

The Flood Control Acts of 1950 and 1960 reauthorized earlier dams and expanded the authorization to construct additional dams to complete what is now referred to as the Willamette Valley Project, a collective system of 13 dams and reservoirs throughout the Willamette Basin. The Willamette Valley Project, as described in House Document 531, dated October 1, 1948, was authorized for the primary purpose of controlling floods and drainage issues in the Willamette Valley during the flood season; after the flood season, the dams were authorized to release water for secondary purposes, including the storage and release of water to support navigation, hydropower generation, irrigation, water supply, recreation, and fish and wildlife habitat throughout the basin. The Water Resource Development Act of 1990 added environmental protection as a primary purpose at all Corps water resource projects.

Authority for the Corps to provide storage space in Federally owned reservoirs for M&I water supply originated in the Water Supply Act of 1958 (Title III of Public Law 85-500), as amended. The City's request for surplus water for M&I needs and the Corps' authority to enter into an agreement for surplus water sourced from water stored in Corps-owned and operated reservoirs for M&I use is consistent with these acts and plans.

1.2. Project History and Background

When the Willamette Valley Project was originally authorized, storage space in the conservation pools was not specifically allocated to each of the authorized purposes, i.e. irrigation, municipal and industrial, recreation, fish and wildlife. Instead, the conservation pools in each reservoir are allocated for joint-use for all the authorized purposes.

The Corps and the Oregon Water Resources Department (OWRD) initiated a feasibility study in May 1996 to analyze current water uses in the basin to project water needs for select authorized purposes. In March 1999, steelhead and spring Chinook salmon in the upper Willamette Basin were listed as threatened under the Endangered Species Act (ESA). It was anticipated that recommendations in the resulting biological opinion (BiOp) would include the use of stored water in the Willamette Valley Project reservoirs to meet minimum flow requirements in the mainstem and tributaries. The Corps and OWRD agreed to suspend the feasibility study pending resolution of the ESA consultation and issuance of a BiOp.

The *Endangered Species Act Section 7(a)(2) Consultation Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Willamette River Basin Flood Control Project* (NMFS BiOp) and *Endangered Species Act Section 7 Consultation Biological Opinion on the Continued Operation and Maintenance of the Willamette River Basin Project and Effects to Oregon Chub, Bull Trout, and Bull Trout Critical Habitat Designated Under the Endangered Species Act* (USFWS BiOp), cumulatively referred to as Willamette BiOps, were issued in July 2008 and included flow requirements for fish (NMFS 2008, USFWS 2008). In addition, the BiOps included a requirement to further study the most beneficial flow requirements for ESA-listed salmonids.

Despite the on-going investigations into flow requirements for ESA-listed salmonids throughout the Willamette Basin, the Corps and OWRD re-initiated the 1996 feasibility study with a substantially reduced scope to complete the analysis of surplus water and, if appropriate, issue a surplus water supply agreement with the City of Creswell. The Corps summarized the results of the reduced study in a surplus water letter report (Corps 2014).

1.3. Action Area

The extent of analysis in this EA includes the City of Creswell in Lane County, Oregon, and the Coast Fork Willamette River watershed in the southern-most portion of the Willamette River valley (see Figure 1). The U.S. Geological Survey (USGS) uses a hierarchical system of hydrologic unit codes (HUC) to categorize and delineate regions, sub-regions, basins, sub-basins, watersheds and sub-watersheds, each with a unique identifier from 2-12 digits. The 4th HUC (watershed) for the Coast Fork Willamette River is 17090002.

The Coast Fork sub-basin is approximately 669 square miles and includes the Coast Fork Willamette River and the Row River and numerous tributaries above the confluence with the Middle Fork Willamette River south of Eugene and Springfield, Oregon. The Coast Fork Willamette River is one of two major rivers which converge to form the Willamette River in Eugene, Oregon. The Coast Fork Willamette River begins in the Coast Range in south western Lane County and flows north toward the City of Cottage Grove. The river is dammed at river mile (RM) 29.7 to form the Cottage Grove Reservoir. The Row River begins in the Cascade Mountains in southeastern Lane County and flows north where it is dammed at RM 7.7 to form Dorena reservoir, approximately 6 miles east of Cottage Grove, Oregon. The City of Creswell is downstream of Cottage Grove and lies at RM 13 on the Coast Fork Willamette River, upstream of its confluence with the Willamette River in Eugene, Oregon.

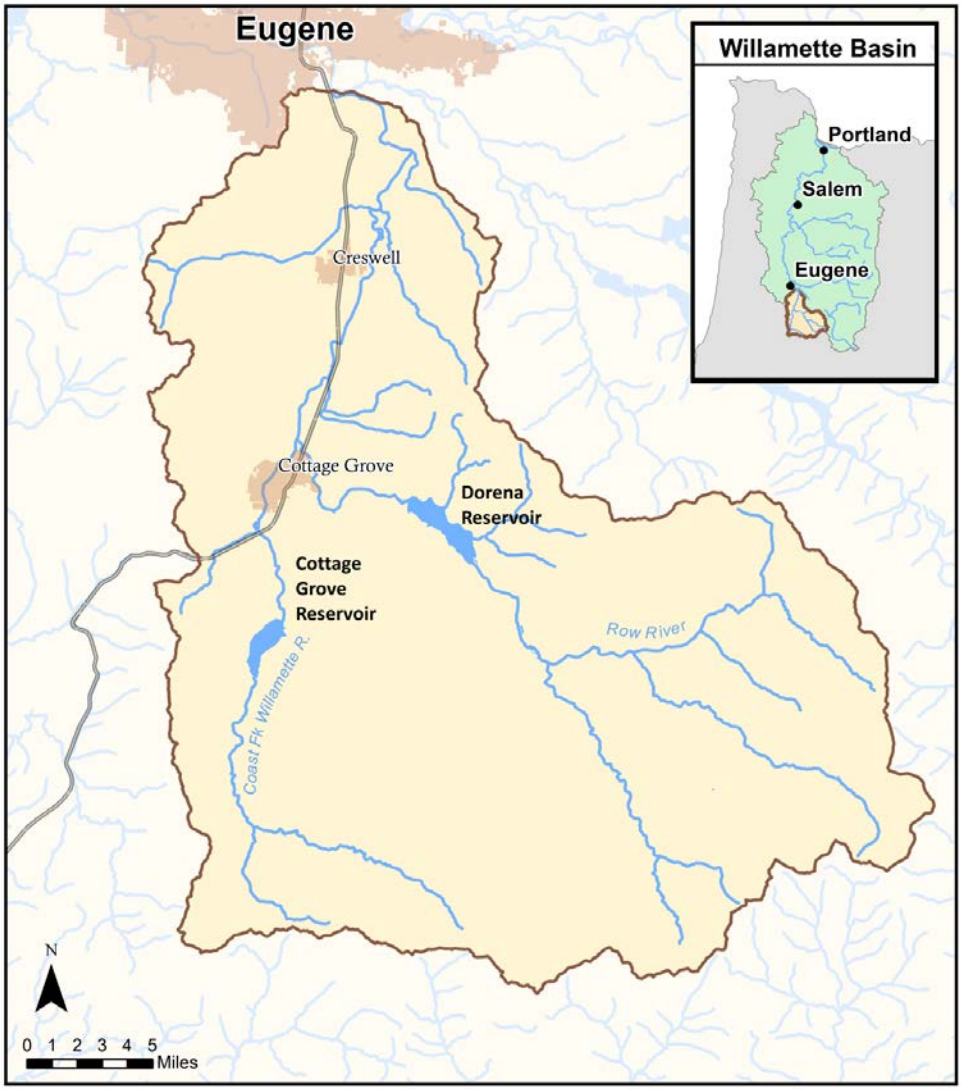

Figure 1: Coast Fork Willamette River Watershed, Hydrologic Unit Code: 17090002

According to the U.S. Census Bureau's 2010 census, the Cities of Cottage Grove and Creswell have populations of approximately 9,686 and 5,031 persons, respectively. The City of Creswell's current population of approximately 5,000 is projected to be 9,758 in 2025 and 11,727 in the year 2032 (Lane County Coordinated Population Forecast, June 2009).

2. Purpose and Need

The purpose of the proposed action, described in greater detail below, is to supply an additional 437 acre-feet of surplus water to the City of Creswell from the Dorena and Cottage Grove reservoirs to meet the City's increasing M&I needs. The City needs alternate sources of water to augment their existing water supply and meet expected future demands.

Currently, the City obtains water from groundwater wells and natural flows in the Coast Fork Willamette River. Approximately 61 percent of the City's total water rights are sourced from natural flows in the Coast Fork Willamette River (2,243 gallons per minute [gpm]) and the remaining 39 percent (1,418 gpm) is supplied via groundwater. In total, the City's existing water rights provide 3,661 gpm for domestic purposes (see Table 1). However, while the City has water rights to meet current needs, the volume of water regularly available between groundwater and surface water sources is substantially less than the City's needs. Furthermore, the use of natural flow surface water in the Coast Fork Willamette River subbasin is not allowed for municipal and industrial uses between 1 May and 30 November, per the Oregon Administrative Rules (OAR) 690-502.

The use of some groundwater wells is regularly restricted due to the shallow nature of the wells, their proximity to surface water sources, the potential for contamination, poor well construction, and low yield. In addition, some well fields are not usable for potable water due to public health concerns regarding the consumption of water with high levels of arsenic contamination. As a result, only 375 gpm (or 26 percent) of the total groundwater authorized for use is regularly available. Similarly, while surface water rights provide for 2,243 gpm, only 897 gpm (or 40 percent) are regularly available on an annual basis due to reduced flows during low-water years. As a result, the volume of water which is regularly available between groundwater and surface water is only 1,272 gpm (or 35 percent) on an annual basis.

Table 1: City of Creswell Water Supply

Source	Water Right (gpm)	Available (gpm)	Dependable (gpm)
Groundwater (22 wells)	1,418	375	375
Surface water: Coast Fork Willamette River	2,243	2,243	897
Total	3,661	2,618	1,272

The City conducted an analysis of the water system in April 2012 and projected an increased demand over the next 20 years (Southwood 2012). Based on population growth estimates, the City has projected that it will need 3,850 gpm by 2032 due to the expected increase in domestic water use. In the nearer future, however, the City projected an immediate need for 2,082 gpm in 2015. Between the water immediately available (1,272 gpm) and the projected need for 2015 (2,082 gpm), there is a shortage of 810 gpm. The City has identified that it requires an additional 810 gpm of water during the summer months when water use is most limited to meet current and future demand.

The additional 810 gpm equates to approximately 3.6 acre-feet of water per day (see Table 2 for the conversion of units). There are 122 days between June and September, resulting in a

total needed volume of approximately 437 acre-feet of water (3.6 acre-feet * 122 days = 437 acre-feet). This equates to releasing an additional 1.81 cfs per day (hereafter approximated to be 2 cfs) from the Dorena and Cottage Grove reservoirs between June and September to meet current and future M&I needs.

Table 2: Conversion of Units and Volume Needed

Gallons per Minute (gpm)	***Gallons per Day (gpd)***
$1\ gpm = 1{,}440\ gpd$ $Where\ 810 * 1{,}440 = \mathbf{1,166,400\ gdp}$	
Gallons per Day (gpd)	***Acre-feet per day (acre-feet)***
$1\ gdp = 0.0000031\ acre\ feet$ $Where\ 1{,}166{,}400 * 0.0000031\ = \mathbf{3.6\ acre\ feet}$	
Acre-feet per day (acre-feet)	***Cubic Feet per Second (cfs)***
$1\ acre - foot = 0.5\ cfs$ $Where\ 3.6 * 0.5\ = \mathbf{1.8\ cfs}$	

In addition to the lower volumes of water that are regularly available, the City could experience a shortfall in surface water supplies due to the "junior" status of water rights.[2] Oregon's water laws are based on the principle of prior appropriation, wherein the oldest water right on a stream has priority in low-water years regardless of the needs of junior water rights. The City has a 1989 water right for 3 cfs (1346.5gpm) annually from the Coast Fork Willamette River which could be curtailed if older, downstream water rights (totaling 2,040 cfs) are not met during periods of low flow. If this were to occur, the City could experience a substantial reduction in the amount of water that is available for domestic purposes.

These combined reductions in water availability create a deficit in the overall water supply which necessitates the City seeking additional water rights. The Oregon Revised Statute (ORS) §537.110 states that all waters in the State of Oregon are in public ownership and new appropriations for water rights are granted by the OWRD. Surface waters are limited throughout the Willamette Basin during the summer months when surface flows are insufficient to meet existing water rights and in-stream uses. The OWRD's analysis of water availability shows that no water is available for new natural flow water rights from the Coast Fork Willamette River from February through November of each year (Water Availability Report System). For this reason, the OWRD Water Resources Commission has determined the Willamette Valley Project reservoirs are the preferred source of water to meet the needs of growing communities and industries in the Willamette Basin (OAR 690-502).[3]

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[2] The City's water rights could be curtailed during low flow periods to provide water for domestic purposes and to meet senior water rights. Domestic water use includes water use for human consumption, household purposes, and domestic animal consumption ancillary to residential use but does not include irrigation, commercial or industrial uses. As a result, the City could be subject to curtailment and have limited access to its water rights during low-water years.

[3] Specific language and rules governing the Coast Fork watershed are found in OAR 690-502-0070.

In order to supply 437 acre-feet of surplus water from the Dorena and Cottage Grove reservoirs to the City for M&I use, the City would enter into an agreement with the Corps, per the Flood Control Act of 1944.

3. PROPOSED ACTION AND ALTERNATIVES

As required under NEPA, the Corps identified all reasonable alternatives to supply the City with additional water and evaluated the effects of implementing those alternatives. However, the Corps dismissed alternatives that were either not feasible or those which did not meet the purpose and need described above in Chapter 2.

3.1. No Action Alternative

The No Action Alternative would not change the City's access to water for M&I use nor would it provide access to stored water in the Coast Fork watershed. Under the No Action Alternative, the City would maintain their existing water rights from groundwater wells and surface flows from the Coast Fork Willamette River. However, the Corps would not provide surplus water from the Dorena and Cottage Grove reservoirs to support growing needs for municipal and industrial water use. As a result, the City would not be authorized to withdraw stored water to support M&I needs.

The Coast Fork watershed would remain a water-limited system under the No Action Alternative, and use of groundwater and surface water would be restricted during periods of low flow, particularly during the summer when overall water resources are limited.

3.2. Proposed Action - Purchase Surplus Water from Corps

Under this alternative, the City would withdraw 437 acre-feet of surplus water from the Coast Fork Willamette River, which is partially fed through the release of stored water from the Corps' Dorena and Cottage Grove reservoirs. The City would withdraw water between June and September for the purpose of meeting increased water needs during the summer season.

A surplus water agreement between the City and the Corps would provide the City with a cost-effective source of water to meet their immediate needs. The agreement would be valid for 5 years, with a one-time-only option to extend the agreement for an additional 5 years. Consequently, the scope of this analysis is limited to a period of 10 years, after which the City would need to re-evaluate its continued need and the availability of water supply sources for M&I purposes. The City would withdraw stored water from the river downstream of the dams using the City's existing infrastructure at the water treatment plant near Cloverdale Road (Section 13, Township 19 South and Range 3 West). No construction or ground-disturbing activities are necessary or would occur to facilitate the withdrawal of surplus water. The total cost charged to the City for the use of stored surplus water would amount to $56,782 annually (almost $130 per acre-foot). Over the 5-year agreement period between the Corps the City, the total cost for surplus water amounts to $283,910.

It should be noted that the Corps would *not* release additional stored water from the reservoirs, but rather, the City would withdraw the requested 437 acre-feet from the Coast Fork Willamette River between June and September. In effect, there would be 2 cfs less water in the river downstream from the City during the summer months. There would be *no* operational change in how the dams are managed or operated because the precision of the regulating outlets does not allow for the release of approximately 2 cfs.

As noted above, in order to withdraw stored water from the Coast Fork Willamette River, the City would be responsible for ensuring compliance with all state and federal laws and regulations, notably ORS § 537.130, 140, 142, 145 through 240, § 537.400(1), and § 540.520.

3.3. Alternatives Considered but Dismissed from Further Evaluation

3.3.1. New Surface Water Right

One alternative that was considered to meet the City's increased need was to obtain a new surface water right for natural flow in the Coast Fork Willamette River. However, a new surface water right is not available due to a lack of legally available surface water. The OWRD's water availability analysis showed that surface waters from the Coast Fork Willamette River are not available between February and November, and the OWRD's administrative rules prohibit the issuance of water rights for municipal uses where surface waters are limited (as in the case with the Coast Fork Willamette River). Further, the use of surface water for municipal use in the Coast Fork watershed is only authorized between 1 December and 30 April, preventing OWRD from issuing new permits for year-round M&I use.

Therefore, obtaining a new natural flow water right is not a viable alternative to meet the City's needs and this alternative was eliminated from further consideration and evaluation.

3.3.2. New Groundwater Right

Another alternative meeting the purpose and need is for the City to obtain a new groundwater right. However, some local groundwater sources have naturally high levels of iron, manganese, and arsenic (Southwood 2004; SWMWP, 2008), which pose public health concerns. In addition, the issuance of new water rights for the use of groundwater has many of the same limitations as the issuance of new surface water rights, as described above. The OWRD's administrative rules presume that groundwater within a ¼ mile of a stream or surface water source is hydraulically connected with that surface water, and as such, groundwater is given the same classification (and use restrictions) as the surface water source. Additionally, the OWRD has determined that groundwater withdrawals within one mile of a surface water source can interfere with the availability of surface waters. As a result, OWRD typically applies the surface water restrictions to groundwater. In the Coast Fork watershed, surface water (and therefore groundwater) is not available for new uses between February and November.

For these reasons, a new groundwater right is not available and therefore is not a viable alternative to meet the City's need for additional water. As such, this alternative was eliminated from further consideration and evaluation.

3.3.3. Purchase Water from Another Municipal Entity

Another alternative to meet the City's need for additional water supply would be the purchase of water from another municipal water supplier. The Eugene Water and Electric Board (EWEB) is the only municipal water supplier within close proximity to the City of Creswell that has sufficient water supply and treatment infrastructure to provide water to other users. However, this alternative is expected to be cost prohibitive for the City.

For example, the projected cost of the pipeline from EWEB to the City of Veneta (approximately 10.5 miles west of Eugene) is estimated to cost almost $10 million, with construction of the pipeline costing an estimated $952,400 per mile. In addition to the construction costs associated with establishing a pipeline between the cities, the current (2013) cost of purchasing water is approximately $1.24 per thousand gallons, or approximately $404 per

acre-foot annually. Assuming the same cost per mile between Eugene and the City of Creswell (5 miles), constructing a pipeline between the cities could cost upwards of $4.7 million, in addition to the added costs of purchasing the water which would total approximately $177,000 annually.

Due to the prohibitively expensive costs associated with purchasing water from another municipality, this alternative is economically infeasible and was therefore dismissed from further consideration and evaluation.

3.3.4. Water Conservation

The City of Creswell could institute conservation measures sufficient to eliminate its need for additional water supply beyond what can be supplied by its existing water rights. As a point of comparison, a 2010 study of conservation measures conducted for the City of Corvallis found that implementing a suite of conservation measures to maximize water savings would yield a conservation savings of approximately 4 percent of the average demand and would require a budget of over $5 million (GSI Water Solutions 2010). Even if the City of Creswell were to implement conservation measures and reap a 5 percent savings during the summer months, they would still have insufficient water supply to meet the City's needs. Five percent of 2,082 gpm is 104 gpm, which equates to a conservative demand of 1,978 gpm. Given the volume of reliable water supply is 1,272 gpm, the City would still be over 700 gpm short of meeting the current needs.

For this reason, and because this alternative would be prohibitively expensive, implementing water conservation measures alone would not meet the purpose and need of the City, and this alternative was dismissed from further evaluation.

3.4. Comparison of Alternatives

The following section described how the alternatives were compared to ensure they met three primary criteria. For starters, the alternative proposed as the Preferred Alternative needed to meet the City's need for additional water supply to support M&I uses. In addition, the action needed to be compliant with all local, state, and federal policies and laws. And because costs can be limiting factors for small (and even large) municipalities, the economic viability of all the alternatives were compared to identify which alternatives were within reason of the City's financial resources. Table 3 shows a matrix of which alternatives met the criteria, and those which did not.

Table 3: Comparison of alternatives

Alternatives Under Consideration and Those Dismissed from Further Consideration	*Meets the City's purpose and need*	*Compliant with Local and State policy*	*Economically feasible*
No Action Alternative	No	Yes	Yes
Purchase Surplus Water from Corps	Yes	Yes	Yes
New Surface Water Right	Yes	No	Yes
New Groundwater Right	Yes	No	Yes

Purchase from Another Entity	Yes	Yes	No
Water Conservation	No	Yes	No

After comparing the alternatives against the City's need for additional water supply, compliance with local, state and federal policies and plans, and economic viability, only one alternative met all three criteria: the use of surplus water from the Corps' Dorena and Cottage Grove Reservoirs. For this reason, the Corps proposes this alternative as the Proposed Action.

4. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The sections below describe the human and natural resources that could be affected as a result of supplying surplus water to the City from the Dorena and Cottage Grove reservoirs. It should be noted that the Corps' analysis of surplus water availability, the relationship between conservation storage and yield, dam safety considerations, and all potential impacts to the management, operations and maintenance of the Dorena and Cottage Grove dams and reservoirs, as well as the Willamette Valley Project is summarized in the *Coast Fork Willamette River, Oregon Surplus Water Letter Report* (Corps 2014).

The Corps' construction of the Dorena and Cottage Grove dams in the 1940s initiated fundamental changes to the Coast Fork Willamette River watershed, including the elimination of fish passage between the lower river and upstream tributaries and spawning habitats, altered stream flows affecting downstream water quality, and the quantity and quality of in-stream and riparian habitats. Subsequent channelization to the Coast Fork Willamette River occurred in the 1950s, during which levees were constructed to safeguard against flooding, and culverts were installed to drain fields for agriculture, both of which disconnected the river from its natural floodplain. In spite of these changes, the resource descriptions provided below serve as the baseline condition (current condition, not pre-dam condition) against which the potential effects of the project alternatives are evaluated.

Furthermore, Section 102(B) of NEPA, as amended, instructs federal agencies to evaluate the relevant resources pertinent to the decision-making process. For this reason, only those resources which could influence selection of the proposed action or which may be affected by the proposed action were evaluated. Other resources, including geography, topography, geology, soils, etc. were considered but not carried forward for detailed analysis because the resources would not be impacted through the implementation of the proposed action. The following resources are evaluated for potential effects:

1. Water Resources, including the Willamette Valley Project, and Hydrology and Hydraulics
2. Riparian Habitats and Vegetation
3. Wetlands and Aquatic Habitats
4. Water Quality
5. Fish and Wildlife, including Threatened and Endangered Species
6. Air Quality and Noise Pollution
7. Cultural Resources
8. Recreation
9. Socio-Economic
10. Hydropower
11. Irrigation
12. Navigation
13. Municipal and Industrial Water Supply and Demand
14. Climate Change

This chapter also describes the expected impacts, with respect to the overall context and intensity the proposed action would have on each of the above listed resources in the Coast Fork Willamette River watershed. Two alternatives are evaluated in detail: the No Action Alternative and the Proposed Action.

This chapter evaluates two categories of effects: (1) direct effects, which occur at the same time and in the same place as the action; and (2) indirect effects, which occur later or at a location

away from the action. Cumulative effects, which are additive and include those effects which occur in the past, present, and reasonably foreseeable future, are discussed in Chapter 0.

4.1. Water Resources

4.1.1. Willamette Valley Project

The dams and reservoirs of the Willamette Valley Project (WVP) are located on five major tributaries: the Willamette River (inclusive of the Coast Fork Willamette River and Hills Creek); the McKenzie River; the North Santiam River; the South Santiam River; and the Long Tom River. The WVP is operated as a system to meet mainstem Willamette River flow targets at Albany and Salem. The Corps has a high degree of operational flexibility among the 13 projects in determining how to meet the authorized purposes at each project and for the system as a whole. Even though water may be withdrawn directly downstream of a specific project, it is necessary to coordinate releases across the WVP to meet minimum flow requirements at Albany and Salem. Annual weather patterns in the Pacific Northwest and runoff characteristics of the Willamette Basin allow the system to be operated to balance the range of authorized purposes and downstream use.

The well-defined limits of the flood season (November through January) and the planned use of stored water after the flood season allows for the impoundment of spring runoff beginning in February. Between November and January, the reservoirs are used strictly for flood storage, and no stored water is available for other purposes. Once the reservoirs are filled to their maximum pool elevations at end of April, stored water is then retained through the summer months (May through September) for recreational purposes and released to maintain minimum flows for downstream purposes (fish and wildlife, irrigation, and water quality, etc.). Following Labor Day, water is released from the reservoirs to lower the reservoir to the minimum pool to accommodate storage for the winter flood season.

Storage space in the WVP reservoirs was not allocated to each of the authorized purposes when the projects were first authorized. Together, the Dorena and Cottage Grove reservoirs provide 93,457 acre-feet of storage space. Of this, only 688 acre-feet is currently contracted for irrigation purposes, equating to approximately 0.7% of the total conservation storage space in the Coast Fork Willamette River reservoirs.

4.1.1.1. Environmental Consequences

The WVP is operated as a system to regulate downstream flows at Albany and Salem. If the rate or timing of water released from one dam is changed, one or more dams in the system must also be adjusted to accommodate these changes and still maintain downstream minimum and maximum flows. Because there would be no operational changes to the Dorena and/or Cottage Grove dams during the winter flood season or the summer conservation season, the WVP would experience no direct or indirect changes under either the No Action Alternative or the Proposed Action.

4.1.2. Hydrology and Hydraulics

The hydrology of the Coast Fork Willamette River is an important component of protecting water quality and aesthetic value, as well as providing recreation opportunities, fish and wildlife habitat, and M&I use of surface and ground waters. The climate of the Coast Fork Willamette subbasin is a temperate marine west-coast type, characterized by wet winters and dry summers. More than half of the annual precipitation normally falls in the five-month

period of November through March, with July and August as the driest months. The total Coast Fork Willamette watershed is 669 square miles, with Dorena tributary basins at 265 square miles and Cottage Grove tributary basins at 104 square miles; the combined drainage area of the two projects is just over half the total area of Coast Fork watershed.

The Corps' dams and reservoirs in the Coast Fork watershed regulate peak flows for flood control and store water for seasonal discharge to support authorized downstream purposes. According to a watershed assessment conducted by the Coast Fork Willamette Watershed Council (CFWWC), there was a 37 percent reduction in peak flows after the dams became operational in the late 1940s and early 1950s (CFWWC 2005). Stored water is released from the reservoirs between May and September to support downstream uses, including irrigation, navigation, flows for fish and wildlife, and water quality maintenance.

The USGS stream gage (#14157500) near Goshen, Oregon (downstream from Creswell) monitors flows on the Coast Fork Willamette River for the entire watershed and serves as the control point for regulation of the Dorena and Cottage Grove dams. The mean annual peak flow, reported by the Goshen gage, is approximately 13,110 cfs, with peak flows approaching 33,400 cfs. Minimum flows are used at both dams whenever possible during flood events to keep flows at Goshen at no more than 12,100 cfs. The maximum evacuation rates (outflows) at Cottage Grove and Dorena are 3000 cfs and 5000 cfs, respectively, and high flows at Goshen are predominantly from local inflows (streams and tributaries downstream of both Cottage Grove and Dorena dams). Mean summer low flows in the Coast Fork Willamette River are 414 cfs (CFWWC 2005), where minimum outflows from Cottage Grove vary from 75 cfs between February and June to 50 cfs the remainder of the year. Minimum outflows from Dorena are 190 cfs between February and June and 100 cfs all other times.

The accuracy of the surface water discharges is dependent upon the accuracy of the streamflow gage regulating flows. In the case of the Goshen gage, it is estimated that flows are accurate to within 5-10 percent. As a result, a 5-10 percent error during the summer minimum flows (414 cfs) corresponds to approximately 20-40 cfs. The requested 2 cfs is well within the error margins of the gages measuring flows at Goshen. Furthermore, the dams' outlets can only make course adjustments in discharge; the requested 2 cfs is too small of a difference to initiate a change in operations of the dams. As a result, the discharge of water from the Dorena and Cottage Grove dams to meet minimum flows is sufficient to compensate for immeasurable variations in outlet releases.

During the Corps' surplus letter report study, 73 years of hydrologic and hydraulic data were modeled to identify if and when downstream flow targets were met versus the proportion of years when targets were not met. The results of this modeling showed that minimum downstream flow targets at Albany and Salem were met 95 percent of the years between June and September, and flow targets were not met only during deficit water years.[4] Dorena is able to capture and store all of its inflow during the spring conservation period to meet its summer pool elevation. Consequently, Dorena can meet its proportion of downstream flow targets.

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[4] The Corps classifies water years as Deficit, Insufficient, Adequate, or Abundant depending on the volume of water stored within the WVP during the spring conservation season. The classification is based on the total storage volume across the WVP for each day between May 10th and May 20th, where the maximum storage volume available is 1.59 million acre-feet. If the volume is less than 0.9 million acre-feet, the year is designated as a Deficit water year. Insufficient water years have between 0.9 and 1.19 million acre-feet of stored water between May 10th and 20th; Adequate water years have between 1.20 and 1.48 million acre-feet; and Abundant years have more than 1.48 million acre-feet.

Cottage Grove is unable to fill its reservoir during deficit years and all incoming flows are passed downstream to meet (as much as possible) its proportion of the minimum downstream flow targets. When Cottage Grove cannot meet its flow targets, releases at Dorena Dam compensates (when possible) to meet downstream flow targets.

4.1.2.1. Environmental Consequences

Under the No Action Alternative, no stored water would be withdrawn from the river and as a result, there would be no direct or indirect changes to the hydrology or hydraulics of the Coast Fork Willamette River or its watershed. Flows would remain consistent with current peak and minimum flows, which are regulated in part by releases from the Corps' Dorena and Cottage Grove dams.

Under the Proposed Action, the City would withdraw an additional 2 cfs from the Coast Fork Willamette River, and in effect, there would be 2 cfs less water in the river downstream from the City. For the purpose of evaluating the most extreme impacts to in-stream flow downstream from the dams, it is assumed that no water is returned to the system after the City's use (assume 100 percent consumption). However, as described above, this amount of water is within the error margins of the stream gage at Goshen. As a result, the volume and the rate at which this volume of stored water is withdrawn is immeasurable, even at low flows. Moreover, the Corps' hydraulic modeling results showed that the City's withdrawal of 2 cfs of water from the Coast Fork Willamette River did not change the number of days when minimum flow targets were not met. As a result of these factors, implementing the Proposed Action would result in no direct or indirect effects to the hydrology or hydraulics of the Coast Fork Willamette River or its watershed.

4.2. Riparian Habitats and Vegetation

Riparian plant species common throughout the watershed include Oregon ash, big-leaf and vine maples, various species of willows, dogwood, and an assortment of sedges, rushes, and grasses (CFWWC 2005). Some evergreen trees, in particular Douglas fir and western hemlock, can be found above ordinary high water. Riparian zones and a diverse assemblage of vegetation provides a multitude of benefits to fish and wildlife, including the contribution of large wood which creates cover and escape refugia from predators. Leaf litter and other allochthonous inputs support primary production, which in turn supports a prey base and the overall food chain.[5] Riparian vegetation can also improve water quality by reducing erosion and stabilizing streambanks, and canopy cover over or adjacent to the stream or river can moderate temperatures, providing thermal refugia for species adapted to cold-water systems.

Following construction of the dams and regulation of the Coast Fork Willamette River, there have been substantial changes to the vegetative structure of riparian zones across the watershed. Channelization has disconnected the river from the floodplain, and adjacent land uses (logging, agriculture, urbanization, etc.) have decreased the extent of the riparian zone supporting wetlands and aquatic habitats. The removal of trees and vegetation along the streambank has led to increased temperatures, increased erosion and sediment inputs, and substantially reduced the input of large wood and other materials important for maintaining ecological functions. Invasive species have also degraded the quality of riparian habitats, where non-native species outcompete with natives and reduce the overall biodiversity of flora

[5] Allochthonous sources of nutrients come from outside the aquatic system (such as plant and soil material) and are a critical source of nutrient recycling throughout the ecosystem.

and fauna. Together, these impacts have substantially reduced the overall habitat quality and quantity along the river's riparian zones.

4.2.1. Environmental Consequences

There would be no changes to riparian areas or vegetation along the Coast Fork Willamette River or its watershed if the No Action Alternative were implemented. No stored water would be withdrawn and as a result, there would be no changes in the flow downstream from the City's water supply infrastructure. As described above, flows would remain consistent with the current peaks and minimums, to which the resources are adapted to normal seasonal variation. The structure and function of these areas would not change in response to the No Action Alternative.

Under the Proposed Action, the City would withdraw an additional 2 cfs from the Coast Fork Willamette River during the summer, low flow months. The direct effect of this action would immeasurably reduce downstream flows by 2 cfs, a difference that is detectable by downstream gages but within the gage error, as noted above. As noted above, the mean summer low flows in the Coast Fork are 414 cfs, and 2 cfs is less than approximately 0.5 percent of this amount. This loss of water from the downstream flow would have negligible impacts on the structure or function of riparian areas and any streamside vegetation, as they are adapted to fluctuating stages of the river given normal seasonal variation.

4.3. Wetlands and Aquatic Habitats

Wetlands provide several important ecological functions that benefit fish and wildlife, water quality, and groundwater wells. In addition to providing shelter and foraging habitat, wetlands also provide habitat for species that are specifically adapted to seasonally or permanently saturated soils. Wetlands also buffer the effects of storms by attenuating the effects of flooding and filtering storm runoff to allow sediments (and pollution) to settle out from the runoff.

According to the CFWWC's watershed assessment, there are three main types of wetlands found throughout the watershed: lacustrine, riverine, and palustrine (2005). Lacustrine wetlands include lakes, reservoirs and ponds, and riverine wetlands are contained within the stream channel. The palustrine wetlands found throughout the watershed include wet prairies and marshes; vernal pools; emergent, forested, and scrub-shrub wetlands. There is a mosaic of seasonal and permanent wetlands, and the depth to which water saturates the soil varies from sub-surface to standing water depending on its source: precipitation, groundwater discharge, overland flow and/or season flooding.

Grazing and invasive plant species have substantially changed the composition of vegetation from native wetlands, especially where non-native plants are adapted to disturbed soils. In addition, altered hydrologic regimes from dam and levee construction, disconnection from the floodplain, and armoring of streambanks has had detrimental impacts on the distribution and abundance of wetlands across the region. Historically, it is estimated that wetlands covered approximately 49.7 square miles, or approximately 36 percent of the area (CFWWC 2005). No local wetland inventories have been conducted for the watershed, but the National Wetlands Inventory (NWI) integrates digital data and other resources to collate regional information and develop a preliminary inventory of wetland type and distribution across a landscape.[6] In the Coast Fork watershed, the NWI registers a total of over 350 forested, scrub-shrub, and

[6] http://www.fws.gov/wetlands/NWI/index.html

emergent wetlands covering approximately 2,100 acres (3.3 square miles) (CFWWC 2005). Most of these wetlands are in lower portions of the watershed, near the mainstem and the major tributaries.

4.3.1. Environmental Consequences

Similar to the discussion for riparian areas, there would be no changes to wetland or aquatic habitats along the Coast Fork Willamette River or its watershed if the No Action Alternative were implemented. Because no stored water would be withdrawn, there would be no changes in the flow downstream from the City's water supply infrastructure. Any wetlands and aquatic habitats associated with the river are similarly adapted to seasonal flow variations, and these seasonal fluctuations would not change from the current conditions. As a result, there would be no direct or indirect effects to the structure and function of these areas in response to the No Action Alternative.

The direct effects from implementing the Proposed Action would also be wholly discountable to wetlands and aquatic habitats. Because the requested amount of water is within 1 percent of mean monthly flows during the summer months, wetland areas and aquatic habitats could experience a slight decrease in flows downstream from the City, but this decrease is within the range of what is normally experienced by these habitats.

4.4. Water Quality

The Oregon Department of Environmental Quality (DEQ) is required to regularly assess water quality and report to the U.S. Environmental Protection Agency (EPA) on the condition of the State's waters. As required in CWA Section 303(d), DEQ identifies those waters which do not meet water quality standards for beneficial uses.[7] Where data is available, DEQ also identifies specific water quality limitations and impairments for the state's waters. The summary report is commonly referred to as the 303(d) list and is used to identify where regulations are needed to improve water quality to better meet state and national standards.

Fish and other aquatic species experience some degree of stress or may die when dissolved oxygen (DO) levels fall below 8 to 10 milligrams per liter (mg/l) (CFWWC 2005). As temperatures increase, DO concentrations decrease, creating environments that are stressful and at times lethal for fish and aquatic organisms. Fish adapted to cold-water systems (cutthroat and bull trout, for example) are sensitive to even minor increases in temperatures, especially when spawning. Measurements of potential hydrogen (pH) reflect the relative acidity and alkalinity, which can be influenced by human activities, the amount of primary production (photosynthesis), and local geologic conditions. Most aquatic organisms can tolerate a range of pH from 6.5 to 8.5; beyond these levels, an area can be too acidic or too alkaline. In addition, high levels of dissolved and suspended sediments and turbidity can be detrimental to fish and aquatic organisms by impairing visibility and smothering local habitats.

Increased concentrations of nutrients (phosphorous and nitrogen) and pesticides can limit plant growth and at high levels be toxic to plants and animals. High levels of nutrients can also trigger algae blooms, which can lead to lower DO concentrations. Fecal coliform concentrations and heavy metals (arsenic, mercury, etc.) can directly affect human health and some species of

[7] Beneficial uses include domestic and industrial water supply; irrigation and livestock watering; fishing, boating, and water contact recreation; fish and aquatic life, wildlife, and hunting; aesthetic qualities; and hydropower, commercial navigation, and transportation.

fish and aquatic wildlife. The bioaccumulation of mercury in fish is widely recognized as an environmental problem, increasing health risks to humans. Fish consumption advisories have been issued by the Oregon Health Authority for the Willamette River, including the Dorena and Cottage Grove reservoirs, advising consumers of the possible health risks associated with consuming fish from the Willamette Basin (Jones 2005). Dorena Reservoir has also had algae advisories for the past few years, affecting water based recreation on the reservoir.

The Coast Fork Willamette River is on the 303(d)-list as being water quality limited for alkalinity, aquatic weeds (algae), DO, iron, manganese, mercury, pH (only during the summer), phosphorous, and temperature. Furthermore, total maximum daily loads (TMDLs) have been established per DEQ to address year-round water quality concerns in the river, but which specifically address aquatic weeds, DO, mercury, pH, phosphorus, and temperature. A TMDL was established in 2006 to address mercury contamination, but this parameter remains a concern in the Cottage Grove and Dorena reservoirs. Dorena reservoir is also on the 303(d) list for aquatic weeds. The Row River is listed for alkalinity, biological criteria, and temperature, though the latter is the only one with an approved TMDL.

As discussed, both Cottage Grove and Dorena Dams are used to support downstream flow augmentation during the low flow period of the year. This augmentation was originally intended to support navigation but subsequently is used support the authorized purposes of fish and wildlife and pollution abatement to improve water quality conditions.

4.4.1. Environmental Consequences

If no water is withdrawn from the Coast Fork Willamette River under the No Action Alternative, water quality conditions would not further degrade. As described earlier, natural flows would remain consistent with the current peaks and minimums. Furthermore, existing regulations which limit source pollution and educational programs implemented to reduce non-point source pollution are expected to continue into the future. As a result of these actions, water quality trends are not expected to change under the No Action Alternative.

Under the Proposed Action, there are no direct or indirect effects to water quality expected because the change in flow in the Coast Fork Willamette River would be approximately 0.5 percent of the mean summer low flow of 414 cfs. This amount is immeasurable and less than the accuracy of the USGS stream gages. The change in flow would be within normal seasonal variations. Temperatures, DO concentrations, nutrients and bacteria will not measurably increase or decrease in response to the withdrawal of surplus water. As a result, there will be no change to water quality as a result of implementing the Proposed Action.

4.5. Fish and Wildlife

The Coast Fork Willamette River watershed supports a rich diversity of mammals, birds, reptiles, amphibians and invertebrates closely associated with the multitude of habitat types found throughout the watershed. It is estimated there are approximately 18 species of native amphibians, 15 reptile species, 154 bird species, and 69 mammal species present in the Willamette Basin (Hulse *et al*., 2002). Construction of the WVP and anthropogenic use of the Willamette Basin has fundamentally changed natural vegetation communities, which in turn has created opportunities for some wildlife species and fragmenting and/or degraded habitat for others. Increased development of the floodplain from agricultural and urban development has restricted wildlife distribution and use of habitats to the remaining natural areas, such as those adjacent to rivers and major tributaries and the WVP reservoirs.

With more than 2,400 acres, the Dorena dam and reservoir provide habitat for a wide variety of fish and wildlife common to the region. Both the Dorena and Cottage Grove reservoirs are designated stops along the Big River Loop of the Willamette Valley Birding Trail, where a suite of native bird species can be observed, including osprey, purple martin, willow flycatchers, yellow-breasted chats. There are multiple bald eagle nesting territories near the Dorena and Cottage Grove reservoirs, and eagles frequently forage in the reservoirs in the winters months and early spring during nest initiation (Corps 2000).

Non-native species are common throughout the watershed, and many species often out-compete native species for habitat or prey resources, these species include nutria, bullfrogs, eastern gray squirrels, house sparrows, European starlings. Other non-native species support recreational hunting, namely wild turkeys and ring-necked pheasants; and native big game mammals, upland game birds and waterfowl.

Aside from federally-listed ESA species (discussed below), there are a number of state and federal species of concern, including mammals, birds, amphibians, reptiles, invertebrates and plants. Table 4 lists species of concern in the Coast Fork Willamette River watershed.

Table 4: Species of concern (not ESA-listed) in Coast Fork Willamette River watershed

Guild	Species	
Mammals	California wolverine [1]	*Gulo gulo luteus*
	Townsend's (Pacific western) big-eared bat	*Corynorynus townsendii*
	Long-legged myotis	*Myotis volans*
	Long-eared myotis	*Myotis evotis*
	Fringed myotis	*Myotis thysanodes*
	Red tree vole	*Arborimus longicaudus*
Birds	Yellow-billed Cuckoo [2]	*Coccyzus americanus*
	Harlequin duck	*Histrionicus histrionicus*
	Olive-sided flycatcher	*Contopus cooperi*
	Purple martin	*Progne subis*
	Oregon vesper sparrow	*Pooecetes gramineus affinis*
	Yellow-breasted chat	*Icteria virens*
	Lewis's woodpecker	*Melanerpes lewis*
	Northern goshawk	*Accipiter gentiles*
	Western burrowing owl [3]	*Athene cunicularia hypugaea*
	Acorn woodpecker	*Melanerpes formicivorus*
Reptiles	Northwestern pond turtle	*Clemmys marmorata marmorata*
Amphibians	Foothill yellow-legged frog	*Rana boylii*
	Red-legged frog	*Rana aurora aurora*
Plants/Trees	Whitebark pine	*Pinus albicaulis*
	Wayside aster	*Aster vialis*
	White-topped aster	*Aster curtus*
	Shaggy horkelia	*Horkelia congesta* ssp. *Congesta*
	Howell's montia	*Montia howellii*
	Tall bugbane	*Cimicifuga elata*

[1] Current breeding status for wolverine in the Willamette Basin is uncertain.
[2] The USFWS proposed to list the cuckoo as threatened under the ESA on 3 October 2013.
[3] Burrowing owls are considered extirpated from the Willamette Basin.

Sources: Corps 2000; NPCC 2004(a) and (b); Oregon Natural Heritage Information Center (ORNHIC) 2004.

The Corps also works with the Oregon Department of Fish and Wildlife (ODFW) to support resident game and non-game fisheries in the Coast Fork Willamette River. A number of native and non-native fish species are present in the Coast sub-basin, including spring Chinook salmon, rainbow trout, cutthroat trout, bull trout, mountain whitefish, large-scale sucker, sculpins, longnose dace, leopard dace, Northern pike minnow, Oregon chub, peamouth chub, redside shiner, speckled dace, three-spine stickleback, sand roller, Pacific lamprey, Western brook lamprey, river lamprey, common carp, largemouth bass, and smallmouth bass (Hulse et al 2002, CFWWC 2005).

The Corps' dams divide the sub-basin into upper and lower portions, thereby reducing the transport and delivery of large wood and substrate to downstream reaches. Changes in the abundance and distribution of gravels and large wood (particularly in large jams) have reduced suitable spawning areas and limited areas for adult cutthroat trout and juvenile rearing habitat for spring Chinook salmon. Relative to the lower Coast Fork sub-basin, the upper sub-basin above the dams have aquatic habitat that is closer to the historical baseline, with the highest proportion of functioning riparian areas, the largest amounts of large wood in the river and tributary channels, and the highest quality spawning areas (NPCC 2004a).

4.5.1. Threatened and Endangered Species

The Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 *et seq*.), as amended, provides for the conservation and recovery of endangered and threatened species and the ecosystems upon which they depend. The U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) share joint jurisdiction for the administration of ESA-listed species. Under Section 7 of the ESA, federal agencies are required to evaluate the effects of actions they fund, permit, or authorize and consult with the USFWS and/or NMFS to ensure Federal actions will not jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat. Critical habitat is defined as specific geographic locations critical to the existence of a threatened or endangered species.

4.5.1.1. National Marine Fisheries Service (NMFS) Species[8]

Among the species under NMFS jurisdiction in the Willamette Basin, there are no ESA-listed anadromous fish species currently spawning in the action area. Both the Dorena and Cottage Grove dams block upstream passage and therefore limit distribution in and above the reservoirs. However, spring Chinook salmon may be present in the Coast Fork Willamette River for rearing and migration purposes. Nevertheless, because habitat quality is poor, spawning is restricted to adjacent watersheds to the east (the Middle Fork Willamette River watershed). Both summer and winter steelhead spawn and rear in the Coast Fork watershed, but these populations are not considered native to the watershed.

Historically, only winter steelhead were native to the Willamette Valley; Willamette Falls created a seasonal barrier that was only passable during the winter months when flows were high. Since that time, the ODFW stocked the Coast Fork Willamette River with winter and summer steelhead from the Marion Forks hatchery through its Salmon and Trout

[8] NMFS species list: http://www.nmfs.noaa.gov/gis/data/critical.htm#nw
Critical habitat list: http://www.nmfs.noaa.gov/pr/species/criticalhabitat.htm

Enhancement Program to supplement salmonid runs and enhance recreational fishing opportunities. Currently, NMFS does not provide any protection under the ESA to steelhead populations upstream of the Calapooia River (near Albany, Oregon). For this reason, while winter or summer steelhead may be present in the action area, they are not afforded the same protections as the distinct population segments that are ESA-listed as threatened and endangered in the lower portions of the Willamette Basin.[9] As a result, Table 5 lists the ESA-listed species which were evaluated for potential effects resulting from implementing the proposed action.

Table 5: NMFS ESA-listed Species

Species	Status	Critical Habitat	Federal Register (FR) Citation
Chinook salmon (*Oncorhynchus tshawytscha)*	Threatened	Designated, none in action area	FR 64 14308 FR 2005-09-02

In 1999, NMFS listed the Lower Columbia River spring Chinook (which includes Upper Willamette River populations) as *threatened* with extinction under the ESA. Critical habitat for Chinook was formally designated in 2005, but none was identified in the Coast Fork Willamette River watershed, including the Row River, Mosby Creek and the Upper and Lower Coast Fork Willamette Rivers. While these watersheds are eligible for designation based on the necessary and required habit characteristics for spawning, migration and/or rearing, NMFS determined that the economic benefits of excluding these areas outweighed the benefits of designation.

In the lower Coast Fork watershed, the productivity, capacity, and diversity of cutthroat trout, bull trout, and spring Chinook salmon populations are limited by habitat connectivity and modifications; lack of large woody debris; poor water quality; and the partial or complete barrier to upstream fish passage (NPCC 2004a). In response to these changes, the minimum in-stream flows described in the NMFS 2008 BiOp are comparable with flows recommended for upstream passage, spawning, incubation, and rearing of salmonids (NMFS 2008a; Corps 1982 and 2000). The release of warm water from Cottage Grove and Dorena reservoirs appreciably reduces the quality of habitat for salmonid production (Corps 2000). Compared to historical conditions, water temperatures below the dams are generally cooler in the summer and warmer in the fall and winter, which affects the upstream distribution of spring Chinook salmon adults, alters the timing of spawning, and affects egg incubation (NPCC 2004a). Temperatures in excess of 26°C have been measured downstream of the dams, and warm water species are much more abundant than salmonids, indicating an unfavorable temperature regime for native species (Thompson et al. 1966, Corps 2000).

4.5.1.2. U.S. Fish and Wildlife Service (USFWS) Species[10]

Among the ESA-listed and candidate species under USFWS jurisdiction in the action area, there are several species that were not evaluated in this assessment because their habitat is not present in the action area and therefore it is highly unlikely that individuals of the species

[9] A distinct population segment is defined as a population of a particular species that is discrete from other populations of the same species, and which is also important to the long-term viability of the species as a whole.

[10] USFWS species list: http://www.fws.gov/oregonfwo/Species/Lists/Documents/County/LANE%20COUNTY.pdf

would be present in the action area. In addition, species for which implementation of the proposed action would have negligible and/or discountable effects to either individuals or their habitats were not evaluated. These species include: gray wolf (*Canis lupus*), Canada lynx (*Lynx Canadensis*), fisher (*Martes pennanti*), marbled murrelet (*Brachyramphus marmoratus*), Northern spotted owl (*Strix occidentalis caurina*), streaked horned lark (*Eremophila alpestris strigata*), Oregon spotted frog (*Rana pretiosa*), Fender's blue butterfly (*Icaricia icarioides fenderi*), and the Oregon silverspot butterfly (*Speyeria zerene hippolyta*).

Similarly, there are three ESA-listed plant species that were not evaluated in this assessment because the potential effects from implementing the proposed action would be negligible and discountable to any populations present in the action area. These include Bradshaw's lomatium *(Lomatium bradshawii),* Willamette daisy *(Erigeron decumbens* var. *decumbens)* and Kincaid's lupine *(Lupinus sulphureus* var. *kincaidii).*

Table 6 lists the remaining ESA-listed species which were evaluated for potential effects resulting from implementing the proposed action.

Table 6: USFWS ESA-listed Species

Species	Status	Critical	Federal Register (FR) Citation
Oregon chub (*Oregonichthys crameri*)	Threatened*	Designated	
Bull trout (*Salvelinus confluentus*)	Threatened	Proposed	FR 63 31647

*On February 4, 2013, the USFWS announced a proposal to remove the Oregon chub, and its critical habitat, from the list of Endangered and Threatened Species.[11]

Oregon chub are endemic to the Willamette River, with historical populations in the Coast Fork Willamette River downstream from both Dorena and Cottage Grove dams. Oregon chub were listed as *endangered* under the ESA in 1993 and are under the jurisdiction of the USFWS. The USFWS changed the classification from endangered to threatened on April 23, 2010 and on February 4, 2013, USFWS proposed to remove the Oregon chub, and its critical habitat, from the endangered and threatened species list. Current populations are limited to naturally-occurring and reintroduced populations in the Santiam, Middle Fork, and Coast Fork Willamette Rivers. Surveys conducted in the mid-2000's found small populations (approximately 100 individuals) of chub in three locations in the Coast Fork watershed near the cities of Eugene, Creswell and Cottage Grove. Oregon chub have also lost habitat as backwater and off-channel areas have disappeared as a result of changes in the frequency and magnitude of seasonal flows (NPCC 2004a). Furthermore, the overall loss of channel complexity, reduced extent and lateral connection of the floodplain, the presence of non-native predators, further degrades quality habitats for native fish.

The Columbia River population of bull trout (including the Willamette River basin) was listed as *threatened* under the ESA in 1998. The Willamette River Recovery Unit encompasses an area of approximately 19,312 square miles and includes the Upper Willamette River area (including the Coast Fork watershed) and the Clackamas River. Currently, bull trout are only found in the upper portion of the Willamette basin, in the McKenzie and Middle Fork Willamette River basins and historically were found in the Santiam and Clackamas Rivers. There are no populations of bull trout in the Coast Fork Willamette River watershed, and there is no designated critical habitat in the Coast Fork watershed.

[11] https://www.fws.gov/oregonfwo/Species/Data/OregonChub/

4.5.2. Environmental Consequences

Under the No Action Alternative, there would be no direct or indirect effects to the area's fish or wildlife, including threatened and endangered species and their habitats. There would be no changes associated with flows in the Coast Fork Willamette River, and therefore there would be no changes to habitats associated with the river as a result of this action. The habitats which support the area's fish and wildlife, while degraded, would remain intact and functioning in their current state. While habitats are expected to be further restricted and degrade over time due to current land use practices and existing stressors, the No Action Alternative would neither induce nor prevent these natural changes from happening. There are minimum flow requirements for fish and wildlife, per the NMFS and USFWS 2008 BiOps, and these flows would not change as a result of the No Action Alternative.

Similarly, the Proposed Action would have no direct or indirect effects to fish and wildlife in the Coast Fork watershed, including threatened and endangered species and their habitats. The overall quality and quantity of water downstream from the City would not alter or change the physical, chemical, or biological conditions of the river or the watershed, resulting in no impacts to fish and wildlife habitat. The City's withdrawal and use of 2 cfs for M&I purposes would have immeasurable impacts on existing conditions in the watershed. Like the No Action Alternative, any water withdrawn from the rivers would still be subjected to the minimum flow requirements associated with the NMFS and USFWS 2008 BiOps, and as a result, implementing the proposed action would not result in adverse impacts to the watershed's fish and wildlife.

4.6. Air Quality and Noise Pollution

Lane County is not monitored by the Oregon DEQ for air quality. Instead, a local air protection agency, the Lane Regional Air Protection Agency (LRAPA) monitors air quality for Lane County using standards developed by the EPA. While the City of Creswell is not specifically monitored for air quality, it is geographically close to the Eugene/Springfield metropolitan area. For this reason, air quality in Creswell is assumed to be consistent with that in the Eugene/Springfield metropolitan area. The area in the Eugene/Springfield urban growth boundary is designated by the EPA and Oregon DEQ regulations as a non-attainment area for Particulate Matter 10 and is classified as *moderate* for air quality (LRAPA 2010). Air quality in the area is within federal air quality standards found on the DEQ website at http://www.deq.state.or.us/aqi/index.aspx.

The LRAPA and the EPA's Air Quality Index (AQI) data shows that air quality has generally improved over the past twenty years. The AQI uses local monitoring data to assess possible health impacts associated with poor air quality. Data from 2010 showed that particulates, ozone and carbon monoxide levels were at record lows since the 1970's and 1980's, and motor vehicle exhaust has decreased by up to 50% following educational programs implemented in the early 2000s to reduce emissions and improve fuel efficiency (LRAPA 2010). As a result, air quality for Lane County is (on average) good and is considered to have little or no risk to human health.

Sources of noise in the Coast Fork Willamette River watershed are limited to traffic along major arterials, which are not considered impactful. Sensitive sites for noise and air quality are schools and hospitals.

4.6.1. Environmental Consequences

Under the No Action Alternative, there will be no effect on air quality or noise pollution and current trends are expected continue. Currently, the primary air quality and noise concerns are the result of everyday practices and processes commonplace in rural and larger

metropolitan areas: traffic, industry, wood or other incidental burning, forestry, or agricultural activities (LRAPA 2010). Under the No Action Alternative, current living practices in the area are expected to mimic current conditions and the practices and processes representing the primary air quality and noise pollution concerns would not change and as a result, there would be no changes to air quality, noise pollution or subsequent risks to human health.

If the Proposed Action were implemented, current regulatory mechanisms would continue to limit air and noise pollution and changes to air quality would not be measurable against the existing background concentrations. As a result, there would be no direct or indirect changes to air quality or noise thresholds resulting from the City's withdrawal of 2 cfs from the Coast Fork Willamette River and any consequential changes to land use practices.

4.7. Cultural Resources

At the time of Euro-American contact, the Upper Willamette Valley was populated by Native American peoples who spoke languages belonging to the Kalapuyan language family. At least 13 distinct "bands" or "tribes" were present that roughly correspond with the major tributary subbasins of the Willamette River. The Winefelly band occupied the lower Coast and Middle Forks area (Heritage Research Associates [HRA] 2012).

The Kalapuyan bands used a variety of fish, wildlife, and vegetable resources in riverine, lowland and upland habitats. Because Willamette Falls restricted anadromous fish access to the Upper Willamette River Basin to Chinook and steelhead, the Kalapuyan bands were not as reliant on salmon as other Northwestern native populations. Kalapuyan settlement and subsistence patterns were closely tied to two primary seasonal patterns (wet winters and dry summers) each year. The rainy seasons were spent at permanent winter villages that consisted of multifamily winter dwellings composed of bark or plank houses excavated into the ground and subsistence activities included hunting, fishing and use of stored vegetable resources. Dry seasons were spent in temporary camps near concentrations of specific resources such as camas shoots and bulbs, which were collected in large quantities and roasted in large subterranean rock ovens and dried for winter use or trade. Hunting and fishing occurred year-round, and vegetable resources were reliant on seasonal availability. The practice of burning prairies improved the habitat for camas and other vegetable resources and also provided forage for game animals (HRA 2012).

Archaeological research has been conducted at several sites in the Upper Willamette Valley during the past decades. Artifacts such as large fluted and stemmed projectile points, as well as other stone tools have been found in multiple locations by both amateur and professional archaeologists, but have not been dated. The oldest known sites along the Long Tom River have been radiocarbon dated to between 9660 and 9130 years before present (BP) (HRA 2012). Other Early Archaic Period materials such as roasted camas bulbs and charcoal have been dated to 7750-6525 BP; Middle Archaic Period (6000-2000 BP) artifacts include broad-necked projectile points, milling stone technology and features such as camas ovens, pit houses, and burial sites, and the Late Archaic Period (2000-200 BP) is evidenced by the introduction of small, narrow-necked projectile points, which are believed to reflect a change from atlatl and dart technology to bow and arrow use. By about 5000 BP, there was an increase in plant processing using rock ovens. The intensification of processing and storage of food resources has been interpreted as a possible catalyst that led to a substantial increase in population, greater social complexity, and increased sedentism (O'Neill et al. 2004).

Historic settlement in the study area, as indicated by numerous donation land claims, began in the 1840s. In 1847, Richard Robinson became the Coast Fork subbasin's southernmost settler

when he staked his claim just north of present day Cottage Grove (CFWWC 2005). Further settlement in the Coast Fork valley was spurred by emigration along the nearby Oregon Trail and Applegate Trail. For much of the late 1800s and early 1900s, the subbasin's floodplain area was used for a variety of agricultural purposes including fruit and nut orchards, hay production, hops, alfalfa, vegetable crops, as well as livestock grazing. Gold was discovered in the Bohemia Mountains above Cottage Grove in 1858 resulting in a substantial increase in settlement in Cottage Grove (Cottage Grove Historical Society 2012). In 1872, the Southern Pacific Railroad line connecting Southern Oregon to Portland was completed, spurring population growth for the region.

4.7.1. Environmental Consequences

Under the No Action Alternative, there would be no potential for direct or indirect effects to cultural or historic resources, and for this reason, the No Action Alternative would result in a *no potential to cause effects* on properties on or eligible to the National Register of Historic Places (NRHP).

Similarly under the Proposed Action, there would be no potential for direct or indirect effects to cultural or historic resources. The City's withdrawal of stored water from the Coast Fork Willamette River would utilize existing infrastructure and no new construction or ground disturbing activities would occur as a direct result of the action. For this reason, the Proposed Action would result in a *no potential to cause effects* on properties on or eligible to the National Register of Historic Places (NRHP).

4.8. Recreation

The Dorena and Cottage Grove reservoirs support a high level of recreation during the summer months when the conservation pools are full or nearly full. Cottage Grove Lake is popular for water-skiing and fishing and ranks 73rd out of all water bodies in the state for recreational boating, according to the Oregon State Marine Board. It is also popular for lakeside camping and day use associated with waterborne recreation. The Corps operates three day-use parks and two campgrounds at Cottage Grove Lake: Pine Meadows and Primitive Campgrounds are popular destinations on summer weekends. Cottage Grove Lake has boat access available to low pool and the Corps' facilities are used to capacity during the summer months. All of the beaches at the lake are most usable within the upper three feet of the maximum conservation pool elevation. However, some facilities, such as Wilson Creek Park swimming beach, are sensitive to small amounts of drawdown and use may decline at lower reservoir elevations.

Dorena Lake offers a similar variety of recreation activities and ranks 58th in the state for boating use. Dorena Lake is a popular boating lake with higher percentage of sailboats and sailboards and a smaller percentage of water skiers than Cottage Grove. Schwarz Campground, operated by the Corps, is located immediately downstream of the dam. The Corps also operates two day use parks along Dorena Reservoir. Baker Bay Park, operated by Lane County, includes a day-use area, boat ramp, marina, and campground. The paved Row River Trail, operated by the U.S. Bureau of Land Management, follows Dorena Lake's north shore and can be used for biking, hiking, and horseback riding. Baker Bay and Schwarz campgrounds are highly used during the summer recreation season. However, the camping opportunities are not as closely related to waterborne recreation as at Cottage Grove. Dorena is less sensitive to minor drawdowns of the reservoir than Cottage Grove because of its steeper shoreline and drawdowns of a few feet do not substantially reduce the surface area available for boating and recreation.

4.8.1. Environmental Consequences

Recreational opportunities in the Coast Fork Willamette River watershed (inclusive of the Dorena and Cottage Grove reservoirs) would not change as a result of implementing the No Action Alternative. There would be no changes from existing conditions of the pool elevations at either reservoir. Additionally, there would be no changes to the downstream flows and consequently no impacts to recreational opportunities (camping, boating, kayaking, swimming, etc.) that currently exist on the river downstream from the projects or at the reservoirs and lakeside campgrounds.

The Corps determined there would be no discernible changes to the pool elevations of the Dorena or Cottage Grove reservoirs, no changes to the rate and/or volume of drawdown, and no measurable changes to the downstream flow if the Proposed Action were implemented (Corps 2014). The withdrawal of 2 cfs from the Coast Fork Willamette River during the summer months is a discountable volume of water relative to the average summer flows (414 cfs). For these reasons, the Proposed Action would have no direct effects to recreational opportunities within the watershed, or across the entire WVP.

4.9. Socio-Economics

Several different social parameters are key drivers to economic and environmental effects related to water availability and related infrastructure in the City of Creswell. Population size depends primarily on employment opportunities and resource management initiatives affecting city residents. Population changes in response to changing economic opportunities depend on several factors, including alternative employment opportunities, age structure, quality of life/attachment to the area, and family characteristics, all of which will depend on adequate water supply.

According to the U.S. Census Bureau, the City has a total area of 1.72 square miles, of which 1.7 square miles is land and .02 square miles is water. There were 5,031 people in 1,906 households residing in the City, creating a population density of 1,190 inhabitants per square mile. As of the 2010 Census data, 2,441 residents in the City were part of the labor force, wherein 95% (2,318 people) were employed outside city limits, leaving only 123 residents living, as well as working, within city limits. Of the employees within city limits (792 people, 669 coming from outside the city), the majority of the jobs were in Retail Trade (19.2%), Health Care and Social Assistance (16.2%), and Lodging and Food Service Industry (13.8%), with over 80% of the labor force within the city making less than $3,333 per month.

Home ownership in the City is relatively high; approximately 71% of the households owned a home, in comparison to 62.5% for the rest of the state of Oregon. Housing in multi-unit structures between 2008 and 2012 was only 12.5% for the city, as opposed to 23.2% for the rest of the state. Although the median household income for city residents ($40,731) was less than the rest of the state ($50,036), the percentage of people below the poverty rate within the city was 11.6% vs. 15.5% for the state of Oregon.

4.9.1. Environmental Consequences

The City would not be able to meet current and future demands if the No Action Alternative were implemented. If the City does not withdraw an additional 2 cfs of water from the Coast Fork Willamette River for M&I purposes, future planning and growth would be restricted by the amount of water available to support residents, businesses and industry. Assuming future population growth follows recent trends, the City could experience an influx of upwards of 5,000 residents and the population could double by 2025. In these circumstances, the No

Action Alternative would not be able to support this expansion, thereby having detrimental impacts to economic growth.

The current regulatory framework ensures future development or changes in land use are compliant with the applicable laws and implemented conservation measures intended to minimize direct and indirect impacts to socio-economic resources. Land use and planning actions for the City are provided by the Lane Council of Governments (LCOG), an independent public agency established to coordinate public services across Lane County which facilitates the inclusion of both local and regional perspectives into comprehensive plans. If the Proposed Action were implemented, the City would have the resources (water supply) to support current need and meet future demand as it aligns with comprehensive land use plans. The Proposed Action would provide greater flexibility to the City in meeting future planning efforts during the summer months, when water is most limited. Regional job growth is expected to follow existing patterns, resulting in increased retail, health care, lodging and food services.

4.10. Hydropower

Cottage Grove does not have a hydropower plant for power generation. A private hydropower project is under construction at Dorena Dam: Dorena Hydro, LLC. This company expects to bring the plant online in the spring of 2014. However, it should be noted that hydropower generation at Dorena will only utilize the Corps' determined discharges from the reservoir to support power generation and no additional discharges from Dorena will be made to support power generation. Dorena Hydro LLC does not have authority or right to request an increase or decrease in flows from the federal project. Rather, the Corps will continue to release flows to meet authorized downstream purposes and flow targets at Albany and Salem.

4.10.1. Environmental Consequences

As discussed in Section 4.1.1.1, the WVP is operated as a system for downstream flood control. Power generation is an authorized purpose for those dams with hydropower infrastructure (Hills Creek, Lookout Point, Cougar, Green Peter, Foster, Detroit, Big Cliff, and Dexter dams). Because there would be no operational changes to the Dorena and/or Cottage Grove dams during the winter flood season or the summer conservation season, the WVP would experience no direct or indirect changes under either the No Action Alternative or the Proposed Action. Similarly, no changes to non-federal hydropower facilities are expected to occur from either the No Action or the Proposed Action. The volume of water in the river downstream from the City would not measurably change, and therefore any hydropower projects downstream from the City would not be impacted measurably. As a result, there would be no effect to hydropower generation across the Willamette Basin under both the No Action Alternative and the Proposed Action.

4.11. Irrigation

When the reservoirs were authorized and constructed, it was expected that widespread agriculture would expand throughout the Willamette Valley and the need for irrigation water would necessarily increase. Water-rights certificates issued by the OWRD to the U.S. Bureau of Reclamation (Reclamation) authorize storage in the Willamette Valley Project reservoirs for irrigation and supplemental irrigation. However, the extensive need for irrigation never developed throughout the valley as expected and only 72,000 acre-feet is currently contracted for agricultural uses throughout the Willamette Valley.

The Corps works with Reclamation to market stored water from the WVP, inclusive of the Dorena and Cottage Grove reservoirs, for the purpose of supporting irrigation needs. Reclamation currently administers 8 irrigation contracts for stored water in the Coast Fork Willamette River watershed, totaling 688 acre-feet. Table 7 identifies the number and quantity of stored water contracts supplied in part or entirely from the Coast Fork reservoirs. Dorena and Cottage Grove reservoirs are also used to supply 36,993 acre-feet to 76 mainstem Willamette River irrigation contracts (which are beyond the scope of this assessment).

Table 7: Stored water currently contracted for irrigation using Dorena or Cottage Grove reservoirs

Reservoir Providing Water	Number of Contractors	Total Acre-feet Contracted	Total Acres Served
Dorena and Cottage Grove, combined	6	581	233
Dorena, only	1	51	20
Cottage Grove, only	1	56	45
Sub-total on the Coast Fork	**8**	**688**	**298**

4.11.1. Environmental Consequences

Existing water rights for irrigation would not change under the No Action Alternative, and all irrigation contracts would continue to be met by existing flows. The current and forecasted need for stored water to support irrigation is low. Furthermore, it is not necessary for the Corps to alter dam operations (such as increasing flows) for the purpose of accommodating contract requirements.

As discussed in the above resources, the withdrawal of 2 cfs of stored water from the river would have immeasurable impacts to downstream flows. As a result, all existing irrigation contracts would continue to be supported by the existing flows if the Proposed Action were implemented and the City entered into an agreement with the Corps to withdraw an additional 2 cfs from the Coast Fork Willamette River for M&I purposes. In addition, the Corps' *Surplus Letter Report* determined the City's request for 437 acre-feet of stored water could be supported by surplus water (Corps 2014). As noted in Section 1.1, the Corps defines surplus water as stored water which is not needed to meet other authorized purposes, and which would be beneficially used for M&I purposes and which would not substantially affect other authorized purposes.

4.12. Navigation

House Document 531 outlined flow objectives for downstream control points at Albany and Salem, as well as minimum releases from the WVP between June and October to meet these objectives. The Congressionally authorized flow objectives during the summer (conservation) season were originally developed to maintain a specified navigation depth on the mainstem Willamette River. While the federal navigation channel is not maintained upstream of Portland, Oregon, the flows originally authorized for the Corps' navigation mission satisfy minimum flow requirements for fish and wildlife and water quality objectives, as listed in the NMFS and USFWS 2008 BiOps.

As described in Section 4.1.1.1 above, minimum releases from Dorena Dam are 190 cfs between February and June, and 100 cfs between July and November. The minimum releases from Cottage Grove are 75 cfs between February and June, and 50 cfs between July and November.

4.12.1. Environmental Consequences

There would be no changes to minimum flows in the Coast Fork Willamette River, and therefore no effects to downstream navigation under the No Action Alternative or the Proposed Action. The Corps would still meet downstream flow targets at Albany and Salem under both alternatives during moderate flow years.

There is no need to alter operations at the Dorena or Cottage Grove dams to accommodate the City's withdrawal of 437 acre-feet between June and September. The volume of water requested by the City is inconsequential to the average flow during the summer low-flow period and because the hydrology of the Coast Fork Willamette River would not change under the Proposed Action, as described in Section 4.1.2.1, there would be no impacts to navigation if the Proposed Action were implemented.

4.13. Municipal and Industrial Water Supply and Demand

The City of Creswell is the only entity using natural flows from the Coast Fork Willamette River to support municipal water supply needs. To date, there are no agreements for using stored water from any of the WVP reservoirs for M&I water supply, but there is strong interest among water suppliers and users in the Willamette Basin.

Supply sources and projected water demands for the City's municipal and industrial uses are described in the City's 2004 Water System Master Plan, the 2008 Southern Willamette Valley Municipal Water Providers report, the City's 2012 Water System Analysis, and the City's 2013 Community Water Profile (Southwood 2004, SWMWP 2008, Southwood 2012, and LCOG 2013 respectively). The 2008 SWMWP report, which was funded by OWRD as part of its Water Supply and Conservation Initiative, described the City's 2007 population as 4,650 and its water demand for the four-month period of June-September as approximately 127 million gallons, equivalent to 390 acre-feet.

As described earlier, Lane County projected the City's current population of approximately 5,000 to increase to 9,758 in 2025 and 11,727 in the year 2032 (Lane County 2009). Based on recent per capita use figures, the City's (instantaneous) water demand in the near future (2015) could exceed 2,082 gallons per minute (gpm), which equates to approximately 3 million gallons per day or 9.3 acre-feet per day (Analysis 2012 and Profile 2013). Between June and September, 10 acre-feet per day equates to almost 1,134 acre-feet.

4.13.1. Environmental Consequences

The OWRD's administrative rules generally prohibit issuance of a new year-round municipal water right from natural surface and groundwater flows. Furthermore, these rules "classify" (allow use of) surface water within the Coast Fork watershed for municipal use only from December 1 through April 30 of each year. As a result, all new M&I water supply demand(s) are required to seek an alternate or supplemental source of water and the OWRD has determined a preference for the use of stored water in WVP reservoirs to meet new water supply demands.

Under the No Action Alternative, the demand for M&I water would continue to increase. In this scenario, if the City were not authorized to withdraw additional water from the Coast Fork Willamette River, it could not meet existing M&I water supply needs. The State of Oregon has the authority to grant a preference for human consumption (cooking, drinking, sanitation, etc.) and livestock watering during Governor-declared droughts. This authority could result in modified operations during dry years to ensure adequate storage is maintained through

summer, low flow season to meet the municipal demand. As a result, existing water supply sources would be continually stressed, which could have detrimental impacts on future population growth and socio-economic conditions in the region.

Providing 437 acre-feet of stored water specifically for the City's M&I water supply needs as part of the Proposed Action would meet the City's demand for M&I water without measurably impacting natural flows in the Coast Fork Willamette River. As noted above, there would be no changes to the availability of water to meet existing water rights and downstream uses.

4.14. Climate Change

Climate is governed by incoming solar radiation and the associated greenhouse effects which influence short-term, seasonal, and long-term weather patterns. Greenhouse gases include (in the order of importance to the greenhouse effect): water vapor, carbon dioxide, methane, nitrous oxide and ozone. Anthropogenic activities, such as the burning of fossil fuels and the clearing of forests, adds additional greenhouse gases to the atmosphere and create a natural sink for carbon dioxide, intensifying natural greenhouse effects, and ultimately causing changes to global, regional, and local climates.

Executive Order 13514 and subsequent guidance from the Council on Environmental Quality (CEQ 2011a and 2011b) led to development of Corps policy and planning documents: the *Climate Change Adaptation Policy Statement* and the *Climate Change Adaptation Plan and Report* (Corps 2011, 2012, and 2013, respectively). The policy states, "mainstreaming climate change adaptation means that it will be considered at every step in the project lifecycle for all [Corps] projects, both existing and planned . . . to reduce vulnerabilities and to enhance the resilience of our water resource infrastructure." In its *2013 Climate Change Adaptation Plan*, the Corps identified four categories of climate change effects which have the potential to impact its national mission and operations (Corps 2013). These four categories include:

1. increasing air temperatures,
2. changing precipitation,
3. increases in extreme events, and
4. sea level change and associated tides, waves, and surges

4.14.1. Environmental Consequences

Climate change is widely recognized as a critical issue with potentially wide-ranging effects on water resources, fish and wildlife species and their habitats, and other natural resources. It has also been suggested that the effects of climate change will exacerbate temperatures; the timing and magnitude of stream flow; habitat loss, isolation and degradation; invasive species; and drought. According to the U.S. Global Change Research Program (USGRP), the average regional air temperatures have increased by an average of 1.5°F over the last century (up to 4°F in some areas), with warming trends expected to continue into the next century (2009). Precipitation trends during the next century are less certain than those for temperature, but increased precipitation is likely to occur during October through March and less during summer, with more winter precipitation falling as rain rather than snow (ISAB 2007, USGCRP 2009).

The effects of climate change in the Action Area could lead to a change in the timing of precipitation, the extent of snowpack, and rain-on-snow events, all of which culminate in changes to the timing and magnitude of stream flows and water temperatures during the spring and summer months (ISAB 2007, USGCRP 2009). These changes will not be spatially

homogeneous across the Willamette Basin, but could influence stream flows during the summer low-flow period. Low-lying areas, which contribute little to total stream flow, are likely to be more affected by changing hydrologic conditions at higher elevations. Regardless, because the scope of this assessment is limited to the Coast Fork watershed for a maximum period of 5 years (per the City's agreement with the Corps), the potential direct and indirect effects of climate change under both the No Action Alternative and Proposed Action would be immeasurable.

5. CUMULATIVE EFFECTS

This section analyzes the potential cumulative impacts that may occur following implementation of the Proposed Action when considered with other past, present, and reasonably foreseeable actions. Cumulative effects are defined as, "the impact on the environment which results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 C.F.R. § 1508.7). Cumulative impacts can result from individually minor actions, but which can collectively have a measurable impact over a period of time in a specific geographic area.

The geographic boundaries and cumulative effects vary for each resource, but the boundary for this analysis has been limited to the Coast Fork Willamette River watershed, the Action Area as described in Section 1.3. Analogous to the resources evaluated in Chapter 4, only those resources which could reflect a measurable, cumulative impact in the Coast Fork Willamette River watershed were evaluated in this analysis. Resources excluded from analysis include: geography and geology, topography, soils, and sediment quality. Furthermore, this analysis uses the same measurable threshold(s) to assess the social and environmental impacts for both the No Action Alternative and the Proposed Action. In general, effects of a particular action or group of actions would be considered to have a measurable cumulative impact if one of the following conditions are met:

- Effects of several actions occur in a common location;
- Effects are not localized and contribute to effects of an action in a different location;
- Effects on a particular resource are similar in nature or affect the same specific resource element; and
- Effects are long-term or permanent.[12]

It should be noted that this EA used a framework for assessing cumulative effects, and relied upon assumptions and uncertainties because specific data on the environmental effects of other past, present, and reasonably foreseeable actions is often incomplete or unavailable. As a result, the potential impacts on resources are expressed in qualitative terms or as a relative change from current conditions.

5.1. Past Actions

The Council on Environmental Quality (CEQ) issued a memorandum on June 24, 2005 regarding analysis of past actions. This memorandum states, "…agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions." Thus, this section characterizes the existing conditions of the affected resources and discusses how the direct and indirect effects from implementing the Proposed Action may contribute to impacts from present and reasonably foreseeable future actions.

The existing conditions in the Coast Fork Willamette River watershed include the past construction and current operation and maintenance of the Dorena and Cottage Grove dams

[12] By definition, short-term impacts tend to dissipate over time and cease to contribute to the cumulative effects as the effects subside or become inconsequential.

and reservoirs. The construction fundamentally changed the character of the watershed, moderating flood flows during the winter by strategically storing and releasing water to minimize flooding. In addition to flood control, the dams and reservoirs function maintain downstream flows throughout the summer via the strategic release of water to supplement downstream inflows. Given the year-round maintenance of downstream flows, the OWRD and the Reclamation have issued a number of water rights and irrigation contracts over time to meet authorized purposes and downstream uses.

5.2. Present Actions

- Operation and maintenance of the Dorena and Cottage Grove dams and reservoirs;
- Water contracts for irrigation and existing water rights;
- Operation and maintenance of the new hydropower facility at Dorena Dam;
- The Nature Conservancy funded restoration at Pudding Creek near the confluence of Middle Fork Willamette River
- Maintenance of approximately 100 miles of power line between the Alvey sub-station and Fairview, Oregon.

5.3. Reasonably Foreseeable Future Actions

While present and ongoing activities could continue for many years into the future, and which could contribute to cumulative impacts, it is speculative to consider actions beyond what is reasonably foreseeable. The reasonably foreseeable nature of future actions promotes a forward-looking perspective, and the temporal boundary for this analysis has been established for 10 years. This timeframe captures the effects of future actions within the timeframe relevant to the 5-year surplus water agreement, with a possible 5-year extension period (total of 10 years).

- Continued operation and maintenance of the Dorena and Cottage Grove dams and reservoirs;
- Issuance of new water rights and/or irrigation contracts, in agreement with the OWRD's policies and regulations, the Corps, and Reclamation;
- Full allocation of the WVP for all authorized purposes;
- Growth and development in the City of Creswell.

The Corps intends to continue operating and maintaining the Dorena and Cottage Grove reservoirs into the future and it is assumed that Reclamation and the OWRD will continue to issue new irrigation contracts and water rights when and where it is authorized.

The Proposed Action is a separate activity that is fully independent from the proposed full-scale allocation of the stored water in the WVP. The proposed full-scale allocation is a reasonably foreseeable future action, but it is currently unknown when the Corps (and project sponsors) will initiate a feasibility study to evaluate the alternatives and potential effects of this action on the authorized purposes. In addition, the evaluation of potential effects on relevant resources from the proposed full-scale allocation is speculative in nature and cannot be adequately accounted for or described in this analysis. Per NEPA requirements, any future allocations will undergo an independent analysis to evaluate all potential effects, and that analysis will be made publicly available during the decision-making process.

Local population growth and urban development is expected to occur over time and additional water supply would support this growth and development. However, local and state land use restrictions and planning guidelines offer a multitude of conservation measures to protect vital natural resources and prevent the functional loss of these resources. The Oregon Department of Land Conservation and Development (DLCD) maintains a program dedicated to land use planning for the state, and has described 19 statewide planning goals, policies, and guidelines which are achieved through comprehensive local planning (DLCD 2010). Specific to the resources evaluated in this EA, Goal 5 of the statewide planning goals and guidelines intends "to protect natural resources and conserve scenic and historic areas and open spaces", which includes riparian areas (inclusive of water, riparian areas, and fish habitat), wetlands, wildlife habitat, natural areas, and several other natural resources (DLCD 2010).

While future growth and development are reasonably foreseeable to occur over the period of analysis (10 years), it is speculative to predict the socio-economic impacts that would occur following termination of the surplus water supply agreement. It is assumed that the City's need for additional water supply would continue, especially if growth continues to stress existing water sources. The scope of analysis for this EA is limited to a 10 year timeframe, after which another water supply mechanism would be necessary. At that time, the effects of a new water supply agreement would be fully evaluated if seeking Federal resources (such as water stored in federally owned reservoirs).

These future projects would necessarily need to work with federal, state and local resource agencies to adhere to conservation measures and permitting requirements.

5.4. Cumulative Effects Summary

The cumulative effects analysis considered the effects of implementing the Proposed Action against the No Action alternative in association with past, present, and reasonably foreseeable future actions by the Corps and other parties.

A summary of the cumulative effects to relevant resources that may occur in the Action Area are provided in Table 8.

Table 8: Cumulative effects to resources

	No Action Alternative	Proposed Action
Water Resources	When combined with the past, present, and reasonably foreseeable future actions, the No Action Alternative would have no impact on water resources in the Coast Fork Willamette River watershed. Minimum and maximum flows would continue to be regulated by strategic release of water from the Dorena and Cottage Grove dams and reservoirs, and these releases would not change in response to the actions detailed above.	Water resources would not measurably change from current conditions in the Action Area by implementing the Proposed Action. In addition, the operation of the Dorena and Cottage Grove dams would not change in support of the Proposed Action. As a result, the cumulative effects of present and reasonably foreseeable future actions would not affect the hydraulics or hydrology of the Coast Fork watershed. Minimum and maximum flows would continue to be regulated by strategic release of water from the Dorena and Cottage Grove dams and reservoirs, and these releases would not change in response to the present and future actions detailed above.
Riparian Habitats and Vegetation	Past, present and reasonably foreseeable future actions would not result in cumulatively measurable impacts on riparian habitats and vegetation in the Action Area under the No Action Alternative. Invasive species would continue to stress native species but would be controlled to the extent practicable. Present and future actions would continue stressing riparian habitats, and land use planning goals and policies would continue to provide protective measures for these resources.	There would be no measurable cumulative effects to riparian habitats or vegetation in the Action Area from implementing the Proposed Action when evaluated in combination with the present and reasonably foreseeable future actions. Current land use activities already stress these habitats and the Proposed Action would not measurably decrease quality or quantity of habitat, neither would it directly increase the extent of invasive species coverage. Population growth and the conversion of natural habitats into urban and rural land uses are expected to occur regardless of implementing the Proposed Action. However, the rate and extent of growth is speculative, and the Proposed Action would support increased demand for reliable water supply. Despite growth, statewide planning goals and conservation policies provide a multitude of safeguards to protect these resources. Planning and conservation options identified by LCOG are expected to minimize adverse effects to riparian areas that would result from increased growth, which is expected to occur irrespective of the additional supply of reliable water. Any impacts to riparian areas or other sensitive habitats are expected to be similar to those that would occur as a result of changing land use

	No Action Alternative	Proposed Action
		practices under the expected population growth, and therefore indirect impacts from the Proposed Action are considered to be inconsequential. Consequently the Proposed Action is not expected to result in cumulative impact to riparian habitats in the Action Area.
Wetlands and Aquatic Habitats	The No Action Alternative would not measurably increase impacts to wetlands and aquatic habitats above the baseline conditions currently present in the Coast Fork watershed. Existing regulatory mechanisms prevent the widespread loss or conversion of wetland habitats. In addition, the above listed present and future actions are not expected to substantially impact wetland or aquatic habitats, and as a result, there would be no measurable cumulative effects to these areas under the No Action Alternative.	There would be no measurable cumulative effects to wetlands and aquatic habitats in the Action Area from implementing the Proposed Action when evaluated in combination with the present and reasonably foreseeable future actions. Current land use activities already stress these habitats and the Proposed Action would not measurably decrease quality or quantity of habitat, neither would it directly increase the extent of invasive species coverage. Population growth and the conversion of natural habitats into urban and rural land uses are expected to occur regardless of implementing the Proposed Action. However, the rate and extent of growth is speculative and the Proposed Action would support increased demand for reliable water supply. Despite growth, statewide planning goals and conservation policies provide a multitude of safeguards to protect these valuable resources. Similar to riparian areas, wetlands are protected under the statewide planning goals (Goal 5), and further protected under the Clean Water Act (CWA). While development or expansion of the urban growth boundary could adversely affect wetlands or aquatic habitats, these impacts would be minimized to the extent practicable. Consequently, the Proposed Action and all present and future actions are not expected cumulative impact wetland habitats in the Action Area.
Water Quality	The combined effects of the present and future actions listed above are not expected to measurably degrade water quality over baseline conditions or impact specific water quality parameters over time. Current regulatory mechanisms would continue to safe guard water quality, and the No Action Alternative would have no measurable cumulative effect to water quality in the	The combined effects of the Proposed Action and all present and future actions listed above are not expected to measurably degrade water quality over baseline conditions or impact specific water quality parameters over time. Current regulatory mechanisms safeguard water quality

	No Action Alternative	Proposed Action
	Coast Fork Willamette River.	and the Proposed Action would have immeasurable effects to water quality in the Coast Fork Willamette River. Minimum flows in the river are maintained to support water quality, and the volume of stored water withdrawn from the river is too inconsequential to affect downstream water quality, resulting in no measureable cumulative effects from implementing the Proposed Action.
Fish and Wildlife	Cumulative impacts to fish and wildlife resources would result from habitat loss and degradation, which are summarized in Chapter 4. For example, habitats could become increasingly fragmented or degraded to a point where they are non-functional for feeding, sheltering and migrating fish and wildlife.	Cumulative impacts to fish and wildlife resources result from indirect effects of habitat loss and degradation which results from increased growth and development in the Action Area. As population growth occurs in the watershed land use conversion is expected to occur, which could reduce the availability, quality and quantity, and accessibility of habitats for fish and wildlife. However, local and regional planning goals and objectives consider impacts to fish and wildlife, and consequently impacts to these resources is expected to be minimized, even if the Proposed Action were implemented (DLCD 2010 and LCOG 2010). Despite these goals and objectives, there may be minor changes to land uses resulting from implementing the Proposed Action. While these changes are not expected to result in substantial impacts to fish and wildlife, there could be minor, cumulative effects to these resources.
Air Quality and Noise Pollution	The cumulative effects to air quality and noise pollution in the Action Area would not measurably degrade or increase over the existing baseline conditions in response to the present and future actions. While population growth is expected to occur, increasing the volume of traffic, traffic patterns along major highways and roads would remain similar to current conditions in the future. Road improvements would be largely restricted to existing roadways. It is assumed that no major changes to noise patterns would occur in the Action Area as a result of increased traffic, as a result of population growth and development.	The cumulative effects to air quality from implementing the Proposed Action, when considered in tandem with the present and future actions listed above, are not expected to measurably change from current conditions and trends in the Action Area. All present and future actions would adhere to state and federal air quality standards, and as a result, the cumulative effects are not expected to increase from current conditions. While population growth is expected to occur, this could result in more roaded areas and increased traffic throughout the region. However, these actions are speculative and are not expected to occur within the temporal scope of this analysis. As a result, the cumulative effects on air quality and noise pollution

	No Action Alternative	Proposed Action
		from traffic would be slightly different from current conditions.
Cultural Resources	Under the No Action Alternative, the cumulative effects to cultural and historic resources in the Action Area would not measurably increase over existing conditions. The present and reasonably foreseeable future actions would not impact cultural or historic resources, and as a result, these resources would not experience substantially greater impacts over time.	Under the Proposed Action, the cumulative effects to cultural and historic resources in the Action Area would not be measurably greater than aggregate effects of past actions. Increased population growth and development is assumed to occur with a reliable supply of water for M&I use. As a result, the Proposed Action could have the potential to indirectly affect cultural and historic resources. However, existing regulatory mechanisms at the local, state, national and tribal level would protect these resources where construction or ground disturbing activities would occur. For this reason, the present and reasonably foreseeable future actions are not expected to impact cultural or historic resources, and as a result, these resources would not experience substantially greater impacts over time.
Recreation	Recreational use of the Dorena and Cottage Grove reservoirs, the Coast Fork Willamette River and its watershed are expected to increase over time in response to natural population growth. As more natural areas are used for recreation, the existing pressures on natural resources are expected to continue into the future, causing increase habitat degradation and further limiting recovery of threatened and endangered species. For this reason, the cumulative effects to (and of) recreation in the Coast Fork Willamette River watershed would not be measurably greater than existing conditions under the No Action Alternative.	Similar to the No Action Alternative, as more natural areas are used for recreation, the existing pressures on natural resources are expected to continue into the future, cumulatively degrading habitats. However, many regulatory mechanisms are in place to safe guard natural resources and prevent the continued degradation of public use areas. As a result, the cumulative effects to (and of) recreation in the Coast Fork Willamette River watershed would not be measurably greater than existing conditions under the Proposed Action. As population growth occurs throughout the Willamette Basin, increased use of the reservoirs and the river is expected to occur. While the magnitude or frequency of recreation may increase, the types of recreation are not expected to differ from what the current types of opportunities (fishing, boating, swimming, etc.). However, any potential population growth associated with the Proposed Action is not likely to substantially impact the magnitude, frequency or type of recreation that current occurs in the Coast Fork watershed.

	No Action Alternative	Proposed Action
Socio-Ecomonics	Population growth is expected to continue into the future, though the rates and extent of growth is speculative. Current living practices are not expected to change in the future, and it is expected that future trends will mimic regional trends and conditions. Under the No Action Alternative, the socio-economic conditions and population growth in the Action Area is expected to result increased stress to other resources.	Population growth is expected to continue into the future, which would be supported by implementing the Proposed Action. Current living practices are expected to continue and all future land plans would be guided by local and comprehensive statewide community plans and goals. The socio-economic conditions for the City are not expected to cumulatively change in response to the present and reasonably foreseeable future actions. This analysis is limited to a 10-year time period, and all population growth and resulting effects from the present and future actions would be supported by the Proposed Action.
Hydropower	Hydropower generation is expected to increase in the future as the private plant at Dorena comes online. However, the Dorena dam would not impact reservoir elevations, downstream flows, or the Corps operations of Dorena. As a result, the cumulative effects of present and future actions under the No Action Alternative would not result in measurable changes to hydropower resources in the Coast Fork watershed.	Hydropower generation is expected to increase in the future as the private plant at Dorena comes online. However, the Dorena dam would not impact reservoir elevations, downstream flows, or the Corps operations of Dorena. As a result, the cumulative effects of present and future actions under the Proposed Action would not measurably change hydropower generation in the Coast Fork watershed.
Irrigation	While population growth is expected to occur throughout the Action Area, there are no known plans to expand agricultural areas (and consequential expansion of irrigation) to support this growth. As a result, implementation of the No Action alternative, combined with the present and future actions listed above, are not expected to result in measurable, cumulative effects to irrigation throughout the Coast Fork watershed.	The Proposed Action would support increased population growth, and no agricultural expansion is foreseeable. Any future irrigation in the Coast Fork watershed is not expected to substantially exceed the relative proportion of water currently used for these purposes or measurably impact other authorized purposes. Consequently, when the Proposed Action is evaluated with regards to the present and future actions listed above, no measurable cumulative effects to irrigation would occur throughout the Action Area.
Navigation	The cumulative effects of present and future actions would have no measurable impact on minimum flows in the Coast Fork Willamette River. Consequently, there are no measurable cumulative effects on navigation in the Coast Fork watershed with the No Action alternative	The cumulative effects of present and future actions would have no measurable impact on minimum flows in the Coast Fork Willamette River. Consequently, there are no measurable cumulative effects on navigation in the Coast Fork watershed with the Proposed Action.

	No Action Alternative	Proposed Action
Municipal & Industrial Water Supply	The City of Creswell cannot currently meet existing water supply needs. As population growth occurs in the future the demand for M&I water supply is expected to measurably increase. The City would have decreased ability to support increased M&I needs under the No Action alternative.	Under the Proposed Action, the City of Creswell would have a reliable source of water to meet its current and forecasted M&I water needs. As population growth occurs, the demands for M&I water supply are expected to measurably increase. Assuming growth rates do not exceed the City's projected population by 2025, implementation of the Proposed Action would meet present and future M&I water supply needs, and the cumulative effects would be immeasurable.

6. STATUS OF ENVIRONMENTAL COMPLIANCE

The following laws provide environmental standards for operation and maintenance activities at Corps civil works projects, associated lands, and outgrant, and are related to environmental stewardship. The following discussions demonstrate how the Proposed Action complies with environmental laws and executive orders for operation and maintenance activities at Corps civil works projects, associated lands, and out-grants.

6.1. National Environmental Policy Act (NEPA) of 1969

Under NEPA, federal agencies are required to identify significant environmental resources likely to be affected by proposed activities as well as make an assessment of the impacts to those resources and consider a full range of alternative actions. Environmental considerations are fully integrated into the decision-making process. The analysis of impacts to the environmental baseline in response to the proposed alternatives, and in consideration of the laws and Executive Orders described herein, this Environmental Assessment furthers the requirements of the NEPA, as amended (42 U.S.C. § 4321 et seq.) as discussed within this document.

Finding: After the public comment period for this EA, the Corps would consider their impacts and their level of significance.

6.2. Endangered Species Act (ESA) of 1973

The ESA (16 U.S.C. § 1531 *et seq*.) was enacted to protect and conserve endangered and threatened species and critical habitat. Requirements established in 16 U.S.C. § 1531 ensure activities authorized, funded, and carried out by federal agencies are not likely to jeopardize the continued existence of any listed species or result in adverse impacts to designated critical habitat of a listed species. The USFWS and NMFS share responsibility for the administration of ESA listed species.

Finding: The proposed action will not disturb physical, chemical, or biological resources in the project area. The loss of 2 cfs from the Coast Fork Willamette River downstream from the City of Creswell will not measurably affect velocities and therefore will not measurably influence parameters associated with water quantity or quality (temperature, pH, turbidity, etc.), thereby having no effect to habitat availability. Furthermore, minimum flows for ESA-listed fish are a required component of the 2008 biological opinions which further support the continued existence and recovery of threatened and endangered fish. The proposed use of surplus water will not decrease minimum flows in the Coast Fork watershed.

For these reasons, the City's withdrawal of 437 acre-feet of water from the Coast Fork Willamette River for M&I use will have *"no effect"* on any ESA-listed species or their habitats that may be present in the project area.

6.3. Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, 6 November 2000

Executive Order 13175 requires all Federal agencies to formulate "an accountable process to ensure meaningful and timely input by tribal officials in the development of regulatory policies that have tribal implications. This consultation is meant to work towards a mutual consensus

and is intended to begin at the earliest planning stages, before decisions are made and actions are taken.

Finding: Government-to-government coordination for cultural and natural resources was coordinated via letter correspondence (5 May 2014) with the Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians; Confederated Tribes of the Grand Ronde; Confederated Tribes of Siletz Indians; Confederated Tribes of the Warm Springs; Cow Creek Band of Umpqua Indians; and the Cowlitz Indian Tribe. To date, no response has been received.

6.4. Magnuson-Stevens Fishery Conservation and Management Act (MSA) of 1976

The MSA (U.S.C. 1801 *et seq*.) is designed to actively conserve and manage fishery resources found off the coasts of the United States to support international fishery agreements for the conservation and management of highly migratory species. The MSA established procedures designed to identify, conserve and enhance Essential Fish Habitat (EFH) for fisheries regulated under a federal fisheries management plan. EFH is defined as "…those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Federal agencies must consult with the NMFS on all proposed actions authorized, funded or carried out by the agency which may adversely affect EFH.

Finding: As with the above determination for ESA, the effects of the proposed action will not affect ESA-listed fish or their designated critical habitat. As a result, there will be *"no adverse effect"* on EFH.

6.5. National Historic Preservation Act

This Act is designed to protect and conserve cultural resources and ensure that development does not harm or degrade them. Section 106 of the National Historic Preservation Act (NHPA) requires all Federal agencies to consider the potential effects of their projects and undertakings on historic properties eligible for or currently listed on the National Register of Historic Places (National Register): http://www.cr.nps.gov/nr/. Historic properties are archaeological sites or historic structures or the remnants of sites or structures. To determine the potential effect of the project on known or unknown historic properties: the nature of the proposed activity and its effect on the landscape is evaluated; the likelihood that historic properties are present within a project area is assessed; an assessment is made as to whether the ground is disturbed by previous land use activities and the extent of the disturbance; and there is a review of listings of known archeological or historic site locations, including site data bases and areas previously surveyed or listings of sites on the National Register of Historic Places.

Finding: Although Dorena Dam and Cottage Grove Dam (constructed in 1949 and 1942, respectively) are both considered historic properties, neither would be affected by the withdrawal of surplus water. Furthermore, use of surplus water from the Dorena and Cottage Grove reservoirs for use in the Coast Fork sub-basin would not require additional construction, ground-disturbing activities or cause changes to the landscape. Surplus water would only involve water redistribution through existing infrastructure and would not cause changes in reservoir elevations and downstream river levels. Therefore, on 31 July 2013, the District Archaeologist, Daniel Mulligan, determined that the proposed undertaking will result in a determination of "*no potential to affect*" and that Section 106

coordination with the Oregon State Historic Preservation Office and Native American Tribes is not required.

6.6. Other Laws and Executive Orders

Supplying the City with 437 acre-feet of surplus water is confined to the Coast Fork Willamette River, including the Cottage Grove and Dorena reservoirs and areas downstream of the dam. The proposed action, the release and use of surplus water, will not involve the construction of any new infrastructure and is not considered a new water resource project. The proposed action would not impact farmlands, cultural or natural resources (including fish and wildlife, nor would it impact wetlands or floodplain habitats), nor would it alter or degrade the physical, chemical, or biological components in the Coast Fork watershed, including air and water quality. No birds will be negatively impacted by the release or M&I use of surplus water, and no nesting habitat will be destroyed or adversely modified. The Coast Fork watershed is outside of the coastal zone and inaccessible to marine mammals. In addition, neither the Coast Fork of the Willamette River nor the Row River are designated as Wild and Scenic Rivers. No communities or environmental justice populations will be impacted by the proposed action.

For these reasons, the following laws do not require further evaluation for impact or assessment for compliance:

- Bald and Golden Eagle Protection Act, 1940
- Clean Air Act, 1970
- Clean Water Act, 1972
- Coastal Zone Management Act, 1972
- Comprehensive Environmental Response, Compensation and Liability Act, 1980
- Farmlands Protection Policy Act, 1994
- Fish and Wildlife Coordination Act, 1958
- Marine Mammal Protection Act, 1972
- Marine Protection, Research and Sanctuaries Act (Section 103), 1972
- Migratory Bird Treaty Act, 1918
- Native American Graves Protection and Repatriation Act, 1990
- Wild and Scenic Rivers Act, 1968
- Executive Order 11593, Protection and Enhancement of the Cultural Environment, May 1971
- Executive Order 11988, Flood Plain Management, 24 May 1977
- Executive Order 11990, Protection of Wetlands, 24 May 1977
- Executive Order 12898, Environmental Justice, 11 February 1994
- Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance, 5 October 2009
- Executive Order 13186, Migratory Birds, 10 January 2001

7. COORDINATION AND DISTRIBUTION

Public concerns identified in comments would aid in determination of whether or not an EIS is necessary for the Proposed Action. If it is determined that an EIS is not required, a FONSI would be prepared and signed, concluding the NEPA process.

This draft EA is being issued for a 15-day public review period, beginning 5 May 2014 and ending 20 May 2014. Comments are requested from all members of the public, federal and state agencies, interested Tribes and other interested parties. The Surplus Letter Report (Corps 2014) was made available for public review and comment via the Corps' website in February 2014, http://www.nwp.usace.army.mil/Media/Announcements.aspx. A public notice was sent to all interested parties with water rights on the Coast Fork Willamette River for the public review period for this EA, including the following agencies and groups:

City of Creswell, Oregon

City of Cottage Grove, Oregon

City of Eugene, Oregon

Coast Fork Willamette Watershed Council

Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians

Confederated Tribes of the Grand Ronde

Confederated Tribes of Siletz Indians

Confederated Tribes of the Warm Springs

Cow Creek Band of Umpqua Indians

Cowlitz Indian Tribe

Junction City Water Control District

Lane County, Oregon

National Marine Fisheries Service

Natural Resources Conservation Service

Oregon State Historic Preservation Office

Oregon Department of Environmental Quality

Oregon Department of Fish and Wildlife

Oregon Department of Geology and Mineral Industries

Oregon Department of Land Conservation and Development

Oregon Department of Parks and Recreation

Oregon Department of State Lands

Oregon Natural Resources Council

Oregon Water Resource Department, District #2 Watermaster

State of Oregon, Governor's Office

U.S. Bureau of Reclamation

U.S. Environmental Protection Agency

U.S. Fish and Wildlife Service

Willamette Riverkeeper

8. REFERENCES AND LITERATURE CITED

Council on Environmental Quality (CEQ). 2011a. Federal agency climate change adaptation planning: Implementing instructions. 4 March 2011. President's Council on Environmental Quality, Office of the White House, Washington, DC. http://www.whitehouse.gov/sites/default/files/microsites/ceq/adaptation_final_implementing_instructions_3_3.pdf

CEQ (Council on Environmental Quality). 2011b. Federal agency climate change adaptation planning: Support Document. 4 March 2011. President's Council on Environmental Quality, Office of the White House, Washington, DC. http://www.whitehouse.gov/sites/default/files/microsites/ceq/adaptation_support_document_3_3.pdfCoast Fork Willamette Watershed Council (CFWWC) 2005. Lower Coast Fork Willamette River, Oregon Watershed Assessment.

Cottage Grove Historical Society. 2012. Website accessed at: *http://cottagegrovehistoricalsociety.com/*

DEQ 2012. 2012 Oregon Air Quality Data Summaries. State of Oregon Department of Environmental Quality. November 2013. DEQ-AQ-034-13.

Dykaar, B.B. July 2005. Status and trends of Middle and Coast Forks Willamette River and their floodplain habitat using geomorphic indicators. Prepared for Willamette Partnership and U.S. Army Corps of Engineers by Ecohydrology West, Santa Cruz CA.

GSI Water Solutions, Inc., CH2M Hill, and HDR Inc. 2010. City of Corvallis, Water Use and Water Conservation Project, August 2010.

Heritage Research Associates (HRA). 2012. Archaeological Survey of The Nature Conservancy's Willamette Confluence Preserve, Lane County, Oregon. Heritage Research Associates Report No. 369.

Hulse, D., S. Gregory and J. Baker (eds.). 2002. *Willamette River Basin Planning Atlas*, *Trajectories of environmental and ecological change*. 2nd Edition. Prepared by the Pacific Northwest Ecosystem Research Consortium. Oregon State University Press, Corvallis.

ISAB (Independent Scientific Advisory Board). 2007. Climate change impacts on Columbia River Basin fish and wildlife. ISAB Climate Change Report, ISAB 2007-2, Northwest Power and Conservation Council, Portland, OR. Jones, Philip. 2005. Lower Coast Fork Willamette River Watershed Assessment. Final Report, June 2005. Prepared for Coast Fork Willamette Watershed Council.

Lane Council of Governments (LCOG) 2010. Inventory, Assessment, and Protection of Wetland and Riparian Resources Using Oregon Statewide Planning Goal 5 and Goal 6: Options to Consider. Produced by the Lane Council of Governments for the Multi-City County Water Resource Assessment Project Team. June 2010.

LCOG 2013. City of Creswell Community Water Profile, June 2013.

Lane County. 2009. Report on Lane County Coordinated Population Forecast 2025-2030

Lane Regional Air Protection Agency (LRAPA). 2010. 2010 Annual Report.

National Marine Fisheries Service (NMFS). 2008. Endangered Species Act Section 7(a)(2) Consultation Biological Opinion and Magnuson-Stevens Fishery Conservation and

Management Act Essential Fish Habitat Consultation on the Willamette River Basin Flood Control Project. July 11, 2008. NOAA Fisheries Log Number: F/NWR/2000/02117.

Northwest Power and Conservation Council (NPCCa). May 28, 2004a. Draft Willamette Subbasin Plan. Prepared for the Northwest Power and Conservation Council by the Willamette Restoration Initiative.

Northwest Power and Conservation Council (NPCCb). May 28, 2004b. Protection, restoration, and management of terrestrial habitats and species of the Willamette subbasin. Technical Appendix D to the Draft Willamette Subbasin Plan. Prepared for the Northwest Power and Conservation Council by the Willamette Restoration Initiative.

O'Neill, B.L., T.J. Connolly, and D.E. Freidel. 2004. A Hologene Geoarchaeological Record for the Upper Willamette Valley, Oregon: The Long Tom and Chalker Sites. University of Oregon Anthropological Papers No. 61, Eugene, OR.

Oregon Department of Land Conservation and Development (DLCD). 2010. Oregon's Statewide Planning Goals and Guidelines. March 2010. Salem, Oregon.

Oregon Natural Heritage Information Center (ORNHIC). 2004. Rare, threatened and endangered species of Oregon. Oregon Natural Heritage Information Center, Oregon State University, Portland OR.

Southwood Engineering Corporation (Southwood). 2004. City of Creswell Water System Master Plan, July 2004.

Southwood Engineering Corporation. 2012. City of Creswell Water System Analysis, April 2012.

SWVMWP 2008. Southern Willamette Valley Municipal Water Providers (SWMWP), Final Report. Prepared by GSI, Water Solutions, Inc. for the Oregon Water Supply and Conservation Initiative (OWSCI). November 2008.

Thompson, K.E., J.M. Hutchison, J.D. Fortune, and R.W. Phillips. 1966. Fish resources of the Willamette Basin. Willamette Basin Review, App. D: Fish and Wildlife; Sect. II: Present Status. Oregon State Game Commission, Portland.

U.S. Army Corps of Engineers (Corps). 1982. Willamette River projects: hydrologic and temperature effects, preliminary literature review and data analysis. Portland District, Portland OR.

Corps. 2000. Biological Assessment of the Effects of the Willamette River Basin Flood Control Project on Species Listed under the Endangered Species Act. Prepared by U.S. Army Corps of Engineers, Portland, OR and R2 Resource Consultants, Seattle, WA.

Corps. 2011. USACE Climate Change Adaptation Policy Statement. 3 June 2011. Office of the Assistant Secretary of the Army for Civil Works, Washington, DC. http://www.corpsclimate.us/docs/USACEAdaptationPolicy3June2011.pdf

Corps. 2012. USACE 2012 Climate Change Adaptation Plan and Report. 23 June, 2012. https://corpsclimate.us/docs/2012_USACE_Adaptation_Plan_and_Report_23_June_2012%20final.pdf

Corps. 2013. 2013 Strategic Sustainability Performance Plan. 28 June 2013. Office of the Assistant Secretary of the Army for Civil Works, Washington, DC. http://www.usace.army.mil/missions/sustainability/strategicsustainabilityperformanceplans.aspx

Corps. 2014. Coast Fork Willamette River, Oregon Surplus Water Supply Letter Report. U.S. Army Corps of Engineers, Portland District. March 2014.

U.S. Fish and Wildlife Service (USFWS). 2008. Endangered Species Act Section 7 Consultation Biological Opinion on the Continued Operation and Maintenance of the Willamette River Basin Project and Effects to Oregon Chub, Bull Trout, and Bull Trout Critical Habitat Designated Under the Endangered Species Act. July 11, 2008. File number: 8330.F0224(07).

USGCSP (U.S. Global Change Research Program). 2009. Our Changing Planet: The U.S. Climate Change Science Program. Available at http://www.usgcrp.gov/usgcrp/Library/ocp2009/.

Appendix A

City of Creswell's Request Letter

City of Creswell
13 S. 1st Street PO Box 276 Creswell, Or. 97426
Ph (541) 895-2531 Fax (541) 895-3647

July 30, 2013

Colonel John W. Eisenhauer
U. S. Army Corps of Engineers, Portland District
P.O. Box 2946
Portland, OR 97208-2946

RE: Willamette Basin Project - Small Scale Reallocation Study

Dear Colonel Eisenhauer:

Since the late 1980's, the municipal water providers in the Willamette Basin have been seeking access to the water stored in the Willamette Basin projects. Today, this stored water represents a key primary and supplemental supply source for municipal water providers.

For several years, the City of Creswell has been in communication with the Oregon Water Resources Department and the Oregon Water Utilities Council regarding a potential Army Corps of Engineers-led small scale reallocation study. We understand such a study could make available up to 499 acre-feet of stored water for municipal use.

On December 13, 2010, the City of Creswell City Council voted to participate in the small scale reallocation study. Consistent with that action, the City requests that the Army Corps of Engineers initiate and complete the small scale reallocation study. It is our understanding that the City will incur no financial obligations and is not making any commitments regarding future contracts for use of the stored water.

We look forward to working with you and your staff on this important project.

Sincerely,

Jamon Kerr, Interim City Administrator

TTY call: 1-800-735-2900 Spanish TTY Call 1-800-735-3896 Creswell is an Equal Opportunity Employer & Provider
Facilities are ADA Accessible and Creswell complies with section 504 of the Rehabilitation act of 1973

Appendix B

Summary of Comments and Responses on Draft EA

Comment 1: It was noted that some of the descriptions of the alternatives in the EA differed somewhat from the descriptions included in the Surplus Water Letter Report.

> ***Response:*** While the specific language of the alternative descriptions may be slightly different between the two documents, the substantive information is the same.

Comment 2: It was requested that the executive summary be clarified to acknowledge that the source of water to meet the City's needs is stored water from the Cottage Grove and Dorena Reservoirs and not surface flows from the Coast Fork Willamette River.

> ***Response:*** Language was added to the executive summary and to the text of this EA to help clarify that the Corps is proposing to provide stored water for the City's municipal and industrial use since surface flows are not available for this purpose.

Comment 3: It was requested that the term "surplus water" be defined as water legally stored in Willamette Valley Project reservoirs.

> ***Response:*** The EA explicitly defines the term "surplus water", per Corps regulations, in Section1.1 as "*water stored in a Department of the Army reservoir which is not required because the authorized need for the water never developed or the need is reduced by changes which have occurred since authorization or construction or 2) water that would be more beneficially used as municipal and industrial water than for the authorized purpose and which, when withdrawn, would not significantly affect authorized purposes over some specified time period.*" The Corps acknowledges that this definition sufficiently describes surplus water as water that is legally stored in the WVP reservoirs.

Comment 4: It was requested that the EA recognize Oregon state water laws, specifically that water right certificates and secondary use permits are required before the City can withdraw stored water for M&I purposes.

> ***Response:*** *Additional language was added to Sections 1 and 3.2 noting that the City is responsible for ensuring compliance with all state and federal regulations concerning the withdrawal and use of surplus water. However, this EA assessed the effects of the Corps' proposal with regards to entering into an agreement with the City for the purpose of supplying stored water for M&I uses. This EA does not intend to describe the processes by which the City must ensure compliance with state water laws.*

Comment 5: It was requested that language be revised throughout the EA to specify that water withdrawn to support M&I needs is stored water (water stored in the Corps' reservoirs and released as surplus water) and not direct surface flows or water "from the river".

> ***Response:*** Language was added to the EA to clarify the withdrawal of stored water versus surface flows.

Comment 6: Two commenters requested clarification on the specific location of the City's infrastructure for withdrawing stored water from the river.

> ***Response:*** The water will be withdrawn via the existing, potable water treatment plant within city limits, near Cloverdale Road, east of the city. Specifically, the treatment plant is located 800 feet south and 2,100 feet west from the east ¼ corner of Section 13, Township 19 South, Range 3 West (Willamette Meridian). This language was added to the document.

Comment 7: It was noted that the effects to social and economic resources following termination of the 5-year agreement with the City were not addressed in the EA, and neither was there a discussion about options to address water supply needs following termination of the agreement.

Response: The Corps acknowledges that there is a relatively high degree of speculation involved in describing options to address water supply needs for the City in 5-10 years. However, the Corps will not speculate as to how the City would seek to ensure its water supply needs are met in 5-10 years. Rather, the Corps would only respond to specific requests to supply surplus water for M&I use. If the City seeks to reinitiate a new water supply agreement following termination of the proposed agreement, the Corps would re-evaluate the availability of surplus water and if there is a mechanism to use stored water from the Willamette Valley Project reservoirs to meet this need.

It was noted in the EA that the scope of this analysis is limited to the maximum period of time over which the agreement, if signed, is valid and does not evaluate the impacts following termination of the agreement.

Comment 8: It was noted that the potential cumulative socio-economic impacts are not addressed in the EA.

Response: The cumulative socio-economic effects are described in Table 8, on page 38.

Appendix H
DRAFT SURPLUS WATER SUPPLY AGREEMENT

(This page intentionally left blank.)

AGREEMENT
BETWEEN
THE DEPARTMENT OF THE ARMY
AND
THE CITY OF CRESWELL
FOR
TEMPORARY WITHDRAWAL OF WATER
FROM
COTTAGE GROVE AND DORENA RESERVOIRS, OREGON
PURSUANT TO
SECTION 6 OF THE FLOOD CONTROL ACT OF 1944

THIS AGREEMENT, entered into this ____ day of _____, 2014, by and between the DEPARTMENT OF THE ARMY (hereinafter called the "Government") represented by the District Engineer executing this Agreement, and CITY OF CRESWELL, (hereinafter called the "User"*);

WITNESSETH THAT:

WHEREAS, pursuant to the Flood Control Acts of 1938 (Public Law 75-761) and 1950 (Public Law 81-516), the Government has constructed and is operating Dorena Dam and Reservoir on the Row River and Cottage Grove Dam and Reservoir on the Coast Fork Willamette River, (hereinafter called the "Project"); and

WHEREAS, Section 6 of the Flood Control Act of 1944 (Public Law 78-534), as amended (33 U.S.C. 708), provides that the Secretary of the Army is authorized to enter into agreements with states, municipalities, private concerns, or individuals, at such prices and on such terms as the Secretary may deem reasonable, for domestic and industrial uses for surplus water that may be available at any reservoir under the Secretary's control provided that no agreements for such water shall adversely affect the existing lawful uses of such water; and

WHEREAS, pursuant to Section 6 of the Flood Control Act of 1944, as amended, the Government has determined that up to 437 acre-feet of storage, as described in the Coast Fork Willamette River Surplus Water Supply Report (June 2014) (hereinafter called the "Report"), approved on XX July, 2014, is available at the Project as surplus water for domestic and industrial use, as the withdrawal of such amount will not interfere with Project purposes, nor adversely affect the existing lawful uses of water from the Project; and

WHEREAS, the User desires to enter into an agreement with the Government for the withdrawal of up to 437 acre-feet of surplus water downstream from the Project for municipal purposes; and

WHEREAS, the User, as shown in Exhibit "A", attached to and made a part of this Agreement, is empowered to enter into an agreement with the Government and is vested with all necessary powers of accomplishment of the purposes of this Agreement.

NOW, THEREFORE, the parties do mutually agree as follows:

ARTICLE 1 - Withdrawal of Surplus Water.

a. The Government grants the User the right to withdraw water from the Project for municipal use, subject to the User's compliance with its responsibility for water rights as set out in Article 3 of this Agreement. The rate of such withdrawal shall not exceed 1.2 MGD, and the volume shall not to exceed 437 acre-feet per year, during the term of this Agreement as specified in Article 5 hereof.

b. The User's rights under this Agreement are subject to the Government's control and use of any or all storage in the Project to fulfill the authorized purposes of the Project. In the event that the Government determines that withdrawals of any or all of the surplus water identified in the Report are resulting in unexpected adverse impacts to other Project purposes or operations, the User shall immediately suspend withdrawals.

c. The Government further reserves the right to take such measures as it determines in its sole discretion to be necessary to inspect, operate, maintain, and repair the Project, including taking any and all measures necessary to protect life and property.

d. The water which may be available for withdrawal by the User pursuant to this Agreement is raw water only. The Government makes no representation with respect to the quality of water which may be available and assumes no responsibility therefore, or for treatment of the water.

e. The Government makes no guarantee with respect to the availability of water. The water level of the Project will be maintained at elevations which the Government deems will best serve the authorized purposes of the Project, and this Agreement shall not be construed as giving the User any rights to have the water level maintained at any elevation.

ARTICLE 2 – Metering and Recordkeeping. For the purpose of maintaining an accurate record of the water withdrawn from the Project, the User agrees to furnish and install, or cause to be installed, meters or measuring devices satisfactory to the District Engineer, without cost to the Government. Such devices shall be available for inspection by Government representatives at all reasonable times. The User agrees to furnish to the District Engineer: (i) advance estimates of need; and (ii) records of the quantity of water actually withdrawn as requested by the District Engineer, but in any event no less frequently than once a year.

ARTICLE 3 - Regulation of and Right to the Use of Water. The regulation of the use of water withdrawn or released from the storage space under this Agreement shall be the sole responsibility of the User. The User has the full responsibility to acquire in accordance with applicable law, and if necessary to establish or defend, any and all water rights needed for the water withdrawn from the Project under this Agreement. The Government shall not be responsible for the use of water by the User, nor will it become a party to any controversies involving the water use, except as such controversies may affect the operations of the Project.

ARTICLE 4 - Consideration and Payment.

a. In consideration of the right to withdraw 437 acre-feet between June and September per year for a period not to exceed five (5) years from the Project for municipal and industrial water supply purposes, the User shall pay the Government $53,131 per year in capital costs, the first of which shall be due and payable within thirty (30) days of the effective date of the Agreement as set forth in Article 5 herein. In addition to the annual capital cost payment, the User shall be responsible for a share of the Operations and Maintenance (O&M) costs of the Project. The first payment will be for $3,651 and is due

within thirty (30) days of the effective date of the Agreement. Future capital and O&M payments thereafter will be due and payable on the anniversary date the first payment is due.

b. The repayment amount shown in Article 4(a) is based upon joint use and specific water supply construction costs updated to October 2013 price levels using appropriate indices and the Fiscal Year 2014 water supply interest rate of 3.125 percent as computed by the Secretary of the Treasury in accordance with Section 932 of the Water Resources Development Act of 1986 (Public Law 99-662).

c. If the User shall fail to make any payment under this agreement within thirty (30) days of the date due, interest thereon shall accrue at the rate as determined by the Department of Treasury's Treasury Fiscal Requirements Manual (1 TFRM 6-8000, "Cash Management") and shall compound annually from the date due until paid. This provision shall not be construed as waiving any other rights the Government may have in the event of default by the User, including but not limited to the right to terminate this agreement for default.

ARTICLE 5 - Duration of Agreement. This agreement shall become effective upon the date it is signed by the Government, and shall continue in full force and effect under the conditions set forth herein for a period of not to exceed five (5) years from the said date of approval. Upon expiration, this agreement may be extended by mutual agreement for additional periods of not to exceed five (5) years each. All such agreement extensions shall be subject to recalculation of reimbursement. Nothing in this agreement, nor in any extension thereto, shall imply a permanent right to utilize the storage space.

ARTICLE 6 - Termination of Agreement.

a. The User may terminate the Agreement upon fourteen (14) days written notice.

b. The Government may terminate this Agreement upon thirty (30) days written notice in the event the Government determines that withdrawals of any or all of the surplus water identified in the Report are resulting in unexpected adverse impacts to other Project purposes or operations.

c. The Government may terminate this Agreement and the User’s right to withdraw water upon thirty (30) days written notice if the User shall default in performance of any obligation of this Agreement. Upon such a termination, the User shall continue to be liable to the Government for any monies owed and for any costs incurred by the Government as a result of the default.

d. In the event of any termination pursuant to this Article or Article 5, User shall, upon request of the Government, promptly remove, at User's expense, any facilities constructed on Project land for water withdrawal and restore premises around the removed facilities to a condition satisfactory to the Government.

ARTICLE 7 - Rights-of-Way. Occupancy and use of Project lands shall be in accordance with any permits, rights-of-way, or easements granted to the User by the Government.

ARTICLE 8 - Release of Claims. The User shall hold and save the Government, including its officers, agents, and employees, harmless from liability of any nature or kind for or on account of any claim for damages which may be filed or asserted as a result of the withdrawal or release of water from the Project made pursuant to the terms of the Agreement, or as a result of the construction, operation or maintenance of any facilities or appurtenances owned and operated by the User except for damages due to the fault or negligence of the Government or its contractors.

ARTICLE 9 - Transfer or Assignment. The User shall not transfer or assign this Agreement nor any rights acquired thereunder, nor grant any interest, privilege or license whatsoever in connection with this Agreement, without the approval of the Secretary of the Army or his duly authorized representative.

ARTICLE 10 - Officials Not to Benefit. No member of or delegate to Congress, or Resident Commissioner, shall be admitted to any share or part of this Agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this Agreement if made with a corporation for its general benefit.

ARTICLE 11 - Covenant Against Contingent Fees. The User warrants that no person or selling agency has been employed or retained to solicit or secure this Agreement upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies by the User for the purpose of securing business. For breach or violation of this warranty, the Government shall have the right to annul this Agreement without liability, or in its discretion, to add to the Agreement price or consideration the full amount of such commission, percentage, brokerage, or contingent fee.

ARTICLE 12 - Environmental Quality. During any construction, operation, and maintenance by the User of any facilities, specific actions will be taken to control environmental pollution which could result from such activity and to comply with applicable Federal, State and local laws and regulations concerning environmental pollution. Particular attention should be given to (1) reduction of air pollution by control of burning, minimization of dust, containment of chemical vapors, and control of engine exhaust gases, and of smoke from temporary heaters; (2) reduction of water pollution by control of sanitary facilities, storage of fuels and other contaminants, and control of turbidity and siltation from erosion; (3) minimization of noise levels; (4) onsite and offsite disposal of water and spoil; and (5) prevention of landscape defacement and damage.

ARTICLE 13 - Civil Rights Assurance and Certification Regarding Lobbying .

a. The User furnishes, as part of the Agreement, an assurance (Exhibit C) that it will comply with Title VI of the Civil Rights Act of l964 (78 Stat. 252; 42 U.S.C. 2000d, et seq.) and Department of Defense Directive 5500.11 issued pursuant thereto and published in Part 195 of Title 32, Code of Federal Regulations.

b. The user furnishes, as part of this Agreement, a certification (Exhibit D) that no appropriated funds have been paid or will be paid to an officer or employee of a Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the execution of this Agreement; and that any funds other than appropriated funds that have been paid or will be paid to such persons will be disclosed on the appropriate form.

ARTICLE 14 - Approval of Agreement. This Agreement shall be subject to the written approval of the Secretary of the Army or his duly authorized representative and shall not be binding until so approved.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the day and year first above written.

FOR THE DEPARTMENT OF THE ARMY FOR THE CITY OF CRESWELL

By _____
Jose L. Aguilar, P.E.
Colonel, U.S. Army
District Engineer
U.S. Army Engineer District
Portland, Oregon

DATE:_____

By _____
City Administrator

DATE:_____

EXHIBIT A: CERTIFICATION

I _____, Attorney for the CITY OF CRESWELL, have reviewed the foregoing agreement executed by _____ and, as principal legal officer for the CITY OF CRESWELL, certify that the CITY OF CRESWELL is legally and financially capable of entering into the contractual obligations contained in the foregoing agreement and that, upon acceptance by the Department of the Army, it will be legally enforceable.

Given under my hand, this _____ day of _____ 2014.

_____

Attorney for City of Creswell

EXHIBIT B

The cost charged to the user for 437 acre-feet of storage for five years is $265,655, plus an annual O&M fee. For a surplus water supply agreement, the user will pay the annual fees as listed in the table below.

TOTAL ANNUAL COST TO USER
FOR SURPLUS WATER SUPPLY STORAGE

Item	Type of Use	Computation	Cost
Interest and amortization	Annual cost of storage space	$2345 x 437, (based on 30 year repayment plan) and 5 payments at interest rate of 3.125%.	$53,131
Operation and maintenance [1]	Joint-use actual for FY 13	0.027% [2] x $13,520,680	$3,651
Repair, rehabilitation and replacement [3]	Joint-use actual for FY 13	0.027% [2] x $0	$0

Notes:

1 Payment due and payable on the date specified in Article 4(a).

2 Percent of Users share of the Usable storage space in the project.

3 Repair, rehabilitation and replacement costs are payable only when incurred as specified in Article 5(b).

EXHIBIT C: ASSURANCE OF COMPLIANCE

ASSURANCE OF COMPLIANCE WITH THE DEPARTMENT OF DEFENSE DIRECTIVE UNDER TITLE VI OF THE CIVIL RIGHTS ACT OF 1964, AS AMENDED; THE AGE DISCRIMINATION ACT OF 1975; AND THE REHABILITATION ACT OF 1973, AS AMENDED

The party executing this assurance, being the applicant recipient of Federal financial assistance under the instrument to which this assurance is attached hereby agrees that, as a part of its obligations under the aforesaid instrument, it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), as amended (42 U.S.C. 2000d), and all requirements imposed by or pursuant to the Directive of the Department of Defense (32 CFR Part 195), issued as Department of Defense Directive 5500.11 pursuant to that title; The Age Discrimination Act of 1975 (42 U.S.C. 6102); the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), to the end that in accordance with the aforementioned Title, Directive and Acts, no person in the United States shall on the ground of race, color, age, sex, religion, handicap or national origin be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant-Recipient receives Federal financial assistance from the Department of the Army and gives assurances that it will immediately take any measures necessary to effectuate this agreement.

If any personal property or real property, or interest therein, or structure thereon is provided or improved with the aid of Federal financial assistance extended to the applicant-recipient by the Department of the Army, or if such assistance is in the form of personal property or real property, or interest therein or structure thereon, then this assurance shall obligate the applicant-recipient or in the case of any transfer of such property, any transferee, for the period during which the property is used for a purpose for which the Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits, or for the period during which it retains ownership or possession of the property whichever is longer. In all other cases, this assurance shall obligate the applicant-recipient for the period during which the Federal financial assistance is extended to it by the Department of the Army. The Department of the Army representatives will be allowed to visit the recipient's facilities. They will inspect the facilities to ensure that there are no barriers to impede the handicap's accessibility in either programs or activities.

This assurance is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property, discounts or other Federal financial assistance extended after the date hereof to the applicant-recipient by the Department of the Army, including installment payments after such date on account of arrangements for Federal financial assistance which were approved before such date. The applicant-recipient recognizes and agrees that such Federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the applicant-recipient, its successors, transferees, and assignees, and the person or persons whose signatures appear below are authorized to sign this assurance on behalf of the applicant.

Date _____ By _____

City Administrator
City of Creswell

Mailing Address:
City of Creswell
Attn: _____
13 S. 1st Street, P.O. Box 276
City of Creswell, Oregon 97426

EXHIBIT D: CERTIFICATION REGARDING LOBBYING

The undersigned certifies, to the best of his or her knowledge and belief that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

_____

City Administrator
City of Creswell

DATE: _____