WATER MANAGEMENT AND CONSERVATION PLAN

West Extension Irrigation District

December 2011

Prepared By:

WEST EXTENSION IRRIGATION DISTRICT

and

J·U·B ENGINEERS, INC.

Acknowledgements

Special acknowledgement goes to Bev Bridgewater, District Manager, who wrote the majority of Chapter 1, WEID History, and significant portions of the document.

Key contributors at J-U-B Engineers included Alex Fazzari, Benjamin Haws, Ben Volk, Justin Baerlocher, and Christine Roemeling.

Special acknowledgement to Said Amali, Amali Consulting LLC, who prepared Chapter 4, Water Supply Element.

AMALI CONSULTING LLC
Water.Environment.People

This plan was partially funded with a matching grant from the U.S. Bureau of Reclamation's WaterSMART (Sustain and Manage America's Resources for Tomorrow) System Optimization Review Program. Special thanks to Kathy Kihara for her support and guidance.

WaterSMART

Table of Contents

List of Figures

List of Tables

Executive Summary

This Water Management and Conservation Plan (WMCP) was written to be a resource for the West Extension Irrigation District (WEID or District) and to meet the requirements of the State of Oregon and the Bureau of Reclamation (USBR or Reclamation). It was written following the regulations found in the Oregon Administrative Rules (OAR) Chapter 690-086. The organization of the document follows the guidelines found in the 2007 Agricultural Water Management and Conservation Planning guidebook. A checklist showing the page numbers of the key features of the document from the guidebook is listed at the end of this Executive Summary. The WMCP was funded with a matching federal grant under the USBR's Water 2025 System Optimization Review Program. The final section summarizes key information contained in the WMCP and satisfies the requirements of a USBR WaterSMART System Optimization Review. The Document also contains additional information, such as some of the history of the District, that was not required by either the OAR or the USBR. These details were added to be an aid in further development of the District, and to document some of the unique challenges and successes of the District.

Water Supplier Description

A description and brief history of the WEID is described. Starting with its early beginnings as the Bailey Ditch Company in 1893, the District formed and grew. Several additions and changes to the District have been made through the years. Some of these historical happenings include:

- 1914 Three Mile Falls Diversion Dam completed.
- 1916 West Extension Main Canal completed through Boardman.
- 1919 West Extension Irrigation District formed.
- 1960's Land taken by Corp of Engineers for the John Day Reservoir.
- 1968 WEID submitted a request to Oregon Water Resources Department for additional acreage and its Columbia River supplemental water right.
- 1978 Irrigon wood stave service pipe failed, ceasing Umatilla River water delivery to Irrigon.
- 1993 Phase I Exchange began.
- 2004 WEID's water right surveying and remapping project (3111) was certified by the State of Oregon.

The WEID has two delivery systems. The Main Canal (gravity) System (9,234.8 Ac) and the Irrigon (pressurized) System (1,144 Ac). The Main Canal Delivery System receives water from the Umatilla River, with some supplemental and exchange water from the Columbia River. The Irrigon Delivery System is supplied water from the Columbia River.

The Main Canal Delivery System serves primarily land growing alfalfa or pasture. Irrigation methods are generally split between flood, set sprinkler, and center pivot sprinkler. The Irrigon Delivery System serves primarily lawn/non-ag or pasture, and the irrigation methods are mostly set sprinklers. Based on 18 year historical averages, the peak consumptive use is 41,683 Ac-Ft for the Main Canal Delivery System, and 4,372 Ac-Ft for the Irrigon Delivery System.

The District has a five member Board of Directors. The administration and operations tasks are performed by the District Manager, Operations Manager, and the field crew. Repair and maintenance is an on-going practice by the District. Considerable effort has been put in by the District to be proactive on preventative maintenance. For example, each year $100,000 (10% of annual budget) is budgeted for canal lining and headgate replacement.

Water Conservation Element

By comparing the Districts water use and irrigation needs, the need for conservation is apparent. Several water conservation projects have been completed over the last eleven years, and many more are planned for the future as funding and opportunities become available. Planned projects for the next 10 years are estimated to save approximately 1,800 ac-ft. The total water use required by the District was found by summing all of the operational and transmission losses as well the crop consumptive use. It was found that the Main Canal Delivery System irrigation demands may be greater than the available Umatilla River water for the District.

Water Curtailment Element

The District is confronted with continuing challenges associated with drought and water scarcity, especially on its Main Canal Delivery System. Historically, a drought has occurred once or twice every ten years. During foreseen drought years, the District makes decisions and gives direction for curtailment and allocation of water. When a drought is realized, the WEID may ask for voluntary cutbacks from users, as well as other curtailment procedures.

Water Supply Element

It is expected that the water supply for the District will be impacted in the next 20 years by District controlled factors, agricultural trends, urbanization trends, and climate trends. It is expected that the District's planned conservation projects and agricultural trends will decrease irrigation demand. Urbanization trends are not expected to adversely increase irrigation demand. Climate change could cause a shift in the peak river flows in the Umatilla Basin to occur earlier in the Season. This would exacerbate the water shortage in the Umatilla River. Several different options for meeting the WEID's irrigation demands include: conservation projects, acquisition of additional water rights, securing groundwater sources, and utilizing the Umatilla Basin Aquifer Recharge and Recovery Project. The most economical of these sources is conservation.

SECTION 1.0 - WATER SUPPLIER DESCRIPTION

1.1 DESCRIPTION AND HISTORY OF WEST EXTENSION IRRIGATION DISTRICT

West Extension Irrigation District (WEID or District) is located in the Umatilla Basin in Northeastern Oregon. The District was formed in 1919 under the Irrigation laws of Oregon which is now Chapter 545 of the Oregon Revised Statutes. It diverts irrigation water from the Umatilla River and Columbia River to deliver water to 11,379 acres.

WEID is one of four irrigation districts that comprise the federal Umatilla Basin Project (Project). Known as the West End of the Project, WEID has two major facilities for its Umatilla River Diversion: 1) Three Mile Falls Diversion Dam (also referred to as Three Mile Falls Dam or Three Mile Dam) and 2) the 27-mile long West Extension Main Canal (Main Canal). The District owns two pumping stations on the Columbia River. Water rights for these stations have been developed with District funds and independently from the federal Project.

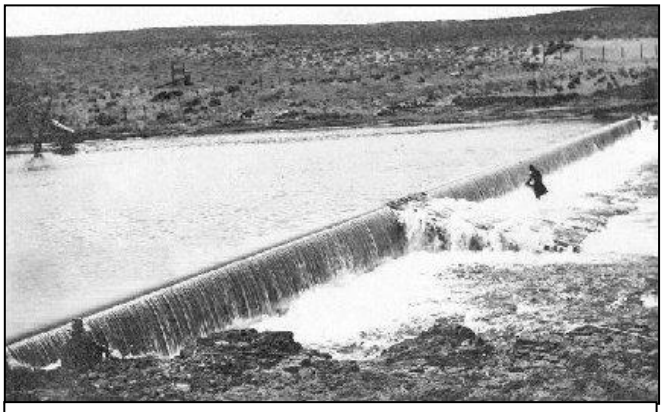
1.1.1 Purpose

The purpose of the District is to deliver irrigation water in an efficient and cost effective manner, as provided by the laws of Oregon, federal Reclamation laws, and policies established by the Board of Directors (BOD).

1.1.2 Project History

1.1.2.1 Early Development

The District began as a private ditch company. In 1893, the Bailey Ditch Company (Bailey) filed for water rights for 3000 acres of land in Umatilla and Irrigon from the Umatilla River. They installed a weir in the River, about two miles upstream from the mouth of the Umatilla, and began building a concrete-lined ditch. They constructed nine miles of canal carrying the water from the Umatilla River to Irrigon. Although they successfully delivered domestic, irrigation and livestock water, they ran into financial difficulty. Bailey went into receivership in October 1896. The Columbia Desert Land and Irrigation Company (CDLIC) purchased the assets of Bailey. They intended to extend the canal and develop more land, but there is no record of such work done by the CDLIC.



OLWC Canal located about two miles upstream from the Columbia on the Umatilla River. Circa 1904.

Proposed Canal Site. Circa 1914.

The Oregon Land and Water Company (OLWC) incorporated in 1901 and acquired the assets of the CDLIC. The former Bailey Ditch became the OLWC canal. An additional 3,974 acres of

water rights from the Umatilla River were filed in 1906. The OLWC planned to develop the area south and west of Irrigon. However, summer flows were not sufficient to sustain the irrigation needs. OLWC soon discovered that they had difficulty supplying their current water users (about 1300 acres) and abandoned any plan to extend its delivery system. A storage system would need to be built to hold the water and release it during the critical periods. The citizens were in contact with the U.S. Reclamation Service about a federal project. The East and West Divisions of the Umatilla Project were authorized by the Secretary of the Interior on December 4, 1905 under provisions of the 1902 Reclamation Act. Construction began on the East end of the Project (Cold Springs Reservoir, Feed Canal and distribution system) the following year.

The OLWC went into receivership in 1912. A 1914 court decree followed by a 1916 quitclaim deed assigned the water rights and assets of the OLWC to the U.S.

From 1912 to 1916, Reclamation constructed the Three Mile Falls Diversion Dam and the West Extension Main Canal. This canal relocated and replaced the OLWC canal from Umatilla to Irrigon and extended service to Boardman. Early reports estimated that 11,300 acres would be developed under the West Division (10,000 acres of new land for irrigation with the 1,300 acres of OLWC land). The water supply consisted of natural flow in the Umatilla River and return flow from upstream storage (Cold Springs and a planned reservoir). The U.S. executed individual irrigation water right contracts and began selling public land to settlers in the Project. The land was advertised as the "Watermelon Capital of the West."

Umatilla Project. Circa 1914.
Boys in the watermelon fields

1.1.2.2 District Formation and Contracts

West Extension Irrigation District was formed in 1919 to be the operating entity for the Project. WEID entered into a 1920 contract with Reclamation that would assume the remaining obligations of the individual water users. This contract was amended in 1922. Lack of dependable water supply coupled with large areas of sandy land resulted in less farm development than anticipated. On April 27, 1926, the original contract was amended that 1) transferred the operation and maintenance of the Project to WEID and 2) provided for repayment of the construction costs on a crop production basis under the Fact Finders Act.

The District built its office in Irrigon in 1926, a building it still occupies.

The United States decided not to build a reservoir for WEID, but amended Permit 7400 (McKay Reservoir) in 1928 to show that the West Extension received the benefit of return flow from water stored in McKay Reservoir. Thus, return flows from both Cold Springs and McKay Reservoir were a critical component to the success of the WEID.

The settlers in the area faced serious financial problems, and by 1931, the District was unable to make its contract payments. Discussion began with Reclamation regarding writing off a portion of the repayment contract. The lands were reclassified under the Project Reclamation Act of 1939 and, in 1954, Congress approved the current repayment contract.

The Repayment Contract between WEID and USBR dated July 6, 1954 (Contract No. 14-06-W-68) was approved by Congress, and the WEID currently makes payments pursuant to it. This Contract contains several provisions:

1) It reduced WEID's obligation to the U.S., established the irrigable area to be 2,853 acres and set a 164-year repayment period.
2) No changes are to be made in the WEID by inclusion or exclusion of lands without the consent of the Secretary of the Interior in writing.
3) The excess land limitations of Reclamation laws apply until the construction obligation has been repaid.
4) It allows WEID to determine other lands to be irrigable and to deliver irrigation water to them on an annual basis, including outside the District boundaries.

1.1.2.3 Historic Water Shortages and Key Impacts to Water Delivery

An analysis of historic river flows below Three Mile Falls Dam show the effect of return flows on the lower Umatilla River and the water supply for WEID. Flows below the Three Mile Falls Dam site were near zero during the late summer from 1904 to 1909 before the Umatilla Project was constructed. Cold Springs Dam was completed and the delivery of Project water to the Hermiston Irrigation District (HID) was begun in 1908. Late summer flows below Three Mile Dam increased to 120 cfs between 1910 and 1917 due to the return flows from HID and provided a water supply for WEID.

Figures 1 and 2 show the average August flows in the Umatilla River USGS Gage (below the WEID diversion at Three Mile Falls Dam) and flows diverted at Three Mile Falls Dam into the WEID Main Canal. The figures also show the total Umatilla River flow at the WEID Diversion (sum of diverted flow and USGS gage).

Starting in 1996 releases from McKay Reservoir for fisheries purposes began. Releases from 25 cfs to 75 cfs are protected by Oregon Water Resources Department as part of the Umatilla Exchange program in August.

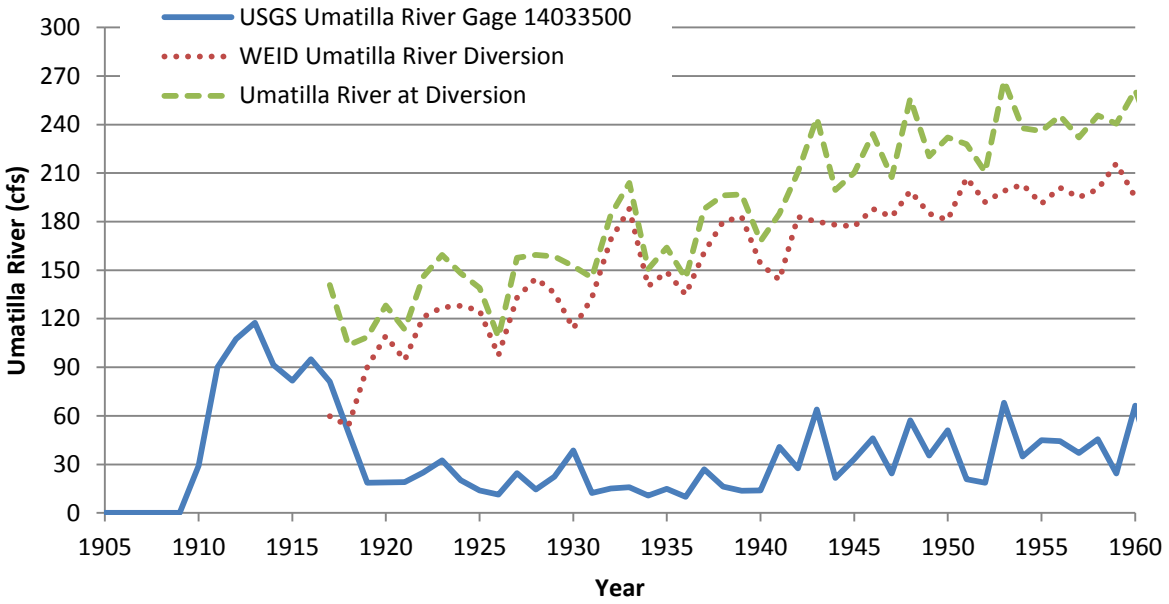


Figure 1 Average August Umatilla River Flows and Diversion (1905 – 1960)

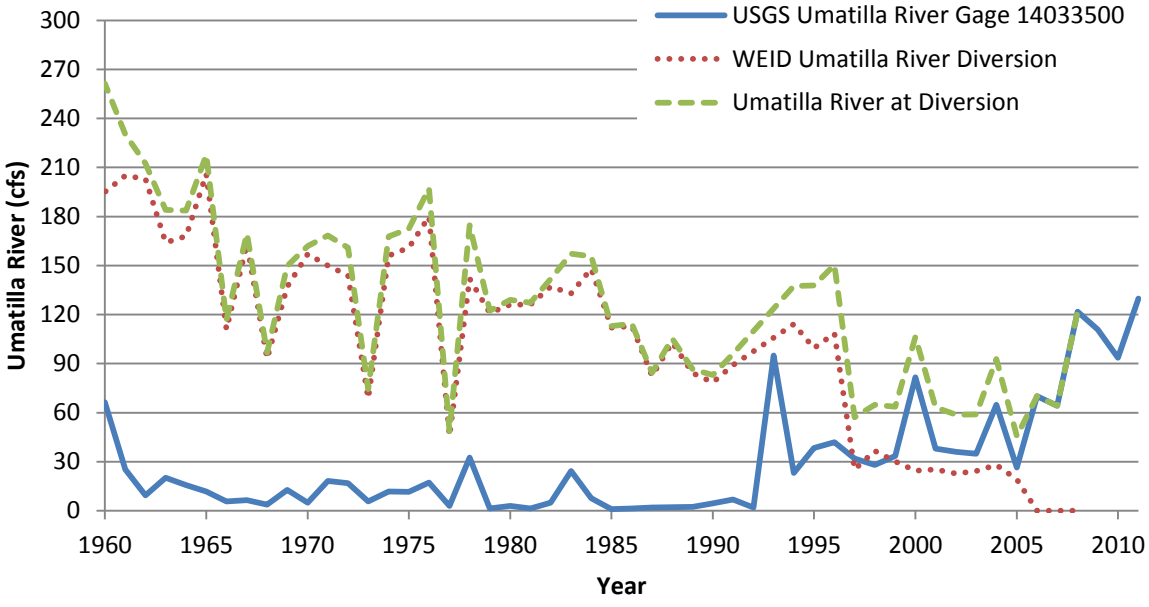


Figure 2 Average August Umatilla River Flows and Diversion (1960 – 2011)

Three Mile Falls Dam and the WEID Canal were completed in 1916. Average flows during August and September diverted into WEID Canal increased from around 100 in 1922 to 200 cfs in 1950. During this same period, average flows below Three Mile Falls Dam were between 10

and 50 cfs. This indicates that WEID was able to supply its irrigation demand. McKay Dam was completed in 1927 and provides supplemental irrigation water to Westland Irrigation District (WID) and Stanfield Irrigation District (SID). Return flows from WID and SID account for the increased diversion by WEID in August and September without a decrease in flows below Three Mile Dam.

Average late summer river flows and District diversions remained fairly stable during the fifties. Flows at Three Mile Dam started to decline in the sixties. WEID's mean canal diversions in August and September went from 200 cfs in 1962 to less than 100 cfs in the late 1980s. During this time, flows below Three Mile Falls Dam were also dropping. Flows below Three Mile Falls Dam during the late summer were near 0 cfs during the 1980s indicating that WEID was diverting all available water, and not able to meet its demand.

Farmer working his flood irrigation field

In the early 1960's, WEID and Reclamation worked to identify the lands that would be lost to the District because of the taking of lands by the Corps of Engineers for the John Day Reservoir. A 1963 Reclamation reports shows that in 1962, the total acreage of lands served in the Corps of Engineers taking area was 1021.8 acres. In 1967, Reclamation informed WEID that transferring the water rights off the John Day lands would weaken the position of Reclamation and WEID in its negotiations with the Corps for funding to offset the construction charges and increased operation and maintenance for replacement lands for WEID. The negotiations failed. Iin 1968, WEID proposed serving 2000 acres lying south of its Main Canal. WEID obtained an additional water right from the State of Oregon from the Umatilla River in 1968 to serve these new lands.

At the same time, since late season Umatilla River flows were insufficient to meet existing demands, WEID obtained a supplemental Columbia River water right to all WEID lands. In 1969, WEID constructed the Umatilla Pumping Station (UPS) on the lower Umatilla River within the John Day Pool to provide water under the supplemental water right.

In 1975, WEID submitted a request to the State of Oregon for water rights to cover acres within the federal boundaries that were being irrigated, but did not have a water right. These acres were added to the 1968 Umatilla River permit for a total of 3289.01 acres.

In 1978 a wood stave pipe serving WEID land near Irrigon failed. The lands located below the wood stave pipe could not receive Project water. WEID had been exchanging water under an agreement with Western Empire Corporation since October 1972. WEID purchased the Western Empire pumping plant, which is located in Irrigon, in late 1979 to serve these lands. It obtained a primary Columbia River water right in 1981. These lands are no longer irrigated with Federal water and are not part of the Project.

From 1993 to 2004, WEID participated in a State of Oregon water right survey and remapping project, commonly known as "3111". This project allowed WEID to remap its water rights and present a map and petition to the State. Water rights would be recognized as submitted, with any rights not being used cancelled. During this process, the lands lying under the John Day pool were put in abeyance for future cancellation (but lost to the District) and other rights no longer being used were cancelled. New water right certificates were issued in 2004.

1.1.2.4 Umatilla Basin Project Act

The reduction in flow at Three Mile Falls Dam had a serious impact on anadromous fish passage as well as reducing the water available to WEID. The mean flow below Three Mile Falls Dam in August was less than 5 cfs throughout most of the 1980's. To improve stream flows, Umatilla Basin agricultural leaders, the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and Reclamation developed a plan to exchange water diverted from the Umatilla River for water pumped from the Columbia River.

In 1988, Congress enacted the Umatilla Basin Project Act (Public Law 100-557 102 Stat. 2782). The Act authorized construction of a new project (exchange) that was intended to replace water historically diverted from the Umatilla River for irrigation with water from the Columbia River. Phase One of the exchange, which involves WEID, began pumping water in 1993. WEID entered into two contracts as a result of the exchange: 1) exchange of water (Contract No. 9-07-10-W1229 dated October 4, 1990) and 2) conjunctive use water (Contract No. 4-07-10-W0983 dated February 9, 1994).

1.1.2.5 WEID Managers

A.C. Houghton was hired by WEID in 1926 to take over the Project from the USBR. He was a USBR engineer who came from the Attalia project in Walla Walla County. He managed the Project for 26 years and became an important figure in the history of Irrigon. A list of the District Managers indicate that each contributed to the development of the District.

Table 1 District Managers

Manager Name	Years	Major Issues
A.C. Houghton	1926-1951	Key developments of Irrigon, Boardman, and the Federal Project
Harry Smith	1951-1956	Completed 1954 Repayment Contract
Lloyd Berger	1956-1957	
D.L. Anderson	1957-1958	
Chester Collins	1958-1966	Worked on takings issue
Max Jones	1966-1973	Obtained 1968 Water rights and developed UPS
Bill Gilbert	1973-1979	Jointly managed with Stanfield and Westland ID, failure of Irrigon wood stave pipe.
Darrel Dick	1979-1986	Worked on District roads, easements; developed the Irrigon Delivery System
Tim Largent	1986-1987	Served 6 months
Jerry Franke	1988-1992	Maintenance issues, pre-exchange era, fish-kill at UPS
Leann Rea	1992-1996	Started 3111, scoping for boundary change, Exchange
Bev Bridgewater	1996-current	3111, Boundary Change, Conservation Plan, Water Right and flow issues

1.1.3 District Characteristics

1.1.3.1 Climate

The climate is semi-arid with dry warm summers and moderately cold winters. The climate supports shrub-steppe plant communities. The average annual rainfall is 10 inches. On average about 60% falls in the winter months November through March. Usually little rain falls during the months of July and August. The average monthly temperatures range from 30° in January to 67° in July. The peak daytime temperature in summer can often exceed 100° but is usually in the 90's. There is an average of 168 frost free days annually.

1.1.3.2 Soils

The soils in the WEID tend to be both sandy and shallow. A few places near the river have more fine-textured soil types. Most of the land in the District is relatively flat and slopes downward to the north. In the east end of the District, the slopes can be steep near the Main Canal.

In the Boardman area, the soil layer is quite coarse and varies from 7 inches to 15 inches deep. Many areas collect water and the land becomes quite marshy.

1.1.3.3 Demographics

The majority of WEID accounts are small holdings. Over two-thirds of the ownerships are of five acres or less (Table 1). District Lands include small city lots with lawns and flowers; ranchettes with pastures, gardens and fruit trees. The commercial farms irrigate potatoes, corn, wheat, hay, legumes, and melons.

Pictures of WEID land, Circa 1930's.

Table 2 Size of WEID Ownership

Size (acres)	Number in 1988	Number in 1999	Number in 2009
Less than 1 ac.	0	249	321
5 or less	263	367	426
5 – 20 acres	161	119	112
20 – 100 acres	61	78	72
100 or more	7	17	16
TOTAL Owners	492	830	947

Picture of land along Southshore Drive, Circa 1930's.

1.1.4 Major Facilities

1.1.4.1 Three Mile Falls Dam.

The main feature is the Three Mile Falls Diversion Dam. The structure was built 1912-1914 by the U.S. Bureau of Reclamation. It is located about three miles above the original confluence of the Umatilla River with the Columbia River. The diversion dam has a unique tri-arch design. It serves as a weir for the WEID irrigation diversion in the Umatilla River. Three Mile Falls Dam has a height of 24 feet and a length of 915 feet. The crest elevation of the dam is 404.3 feet.

A fish ladder located at the right (east) abutment was originally part of the 1914 structure; rebuilt in 1963, then idled for 20 years until it was restored in 1984. The left (west) abutment ladder, fish screen and fish bypass was completed in 1964. At the canal intake, a louver-type fish screen structure was installed. It was approximately 30-feet long and 10-feet high and

consisted of a series of fixed metal slats spaced 1 - 2 inches apart. This prevented smolts from entering the canal and guided them to the bypass pipe that dropped fish into the tailrace pool. In 1988, with funds from BPA, reconstruction of the east and west bank fish ladders was completed. Construction of adult fish trapping and viewing facilities, installation of rotating drum screens at the WEID canal diversion, and a juvenile fish trapping and passage evaluation facility on the west bank was completed.

Three Mile Falls Dam, 1998

The gatehouse at the left abutment of the dam contains three manually operated 5-by 6-foot slide gates, which originally served as the headworks to the West Extension Main Canal. There is a checkgate located downstream of the fishscreens that control the water going into the canal.

Aerial View of Facilities at Three Mile Falls Dam in 1994

West Division Main Canal (also known as West Extension Main Canal).
The West Division Main Canal (Main Canal) was built from 1914 to 1916. It is concrete lined and about 27 miles long, extending westward past Boardman. The canal has a design capacity of 375 cubic feet per second.

WEID Canal

Ramp Weir One

1.1.4.2 Pumping Stations

WEID Diversion Facilities include three pumping stations, one of which is federally owned and operated.

1) Columbia River Pumping Station at Umatilla (Umatilla Pump Station or UPS): The District developed the Umatilla Pumping Station (UPS), which pumps water from the Columbia River about 0.5 mile from the mouth of the Columbia River, near the City of Umatilla. It consists of three 600 horsepower (HP) vertical turbine pumps with a combined capacity of about 40,400 gallons per minute (90 cfs). The station pumps through a 770-foot long, 36-inch diameter pipeline into the Main Canal with a lift of about 120 feet. It supplies supplemental water to the irrigators off the Main Canal.

Umatilla Pump Station (UPS)

2) Columbia River Pumping Station at Irrigon (Irrigon Pump Station or IPS): The District purchased the plant from Western Empire Corporation prior to the 1980 irrigation season. The Columbia River Pump Station is the sole source of water for the Irrigon Delivery System. The pump station has two 100 HP pumps and one 300 HP pump with a combined total capacity of 12,831 gpm (28.59 cfs). Six booster

Irrigon Pump Station (IPS)

stations scattered throughout the system pressurize the water for the pipeline networks that serve small acreage delivery points in the Irrigon pressurized system.

3) USBR Phase One Columbia River Pumping Station: The main facility of the 1988 Umatilla Basin Project that affects WEID is the Phase One Pumping Station located south of the city of Umatilla. This pumping plant has three 500 HP and three 300 HP pumps with a total design capacity of 66,000 gpm (147 cfs). The water comes to the pump station from McNary Dam via a canal and is then pumped into the West Extension Main Canal through a pipeline that crosses the Umatilla River. This plant delivers both exchange water and conjunctive use water into the WEID system. The facility is owned and operated by the USBR.

Phase One, operated by USBR

Phase One Inlet to the WEID Canal

These facilities improve Umatilla River flows at critical times of the year for adult fish return and juvenile out-migration. The first water exchange occurred in the 1993 irrigation season.

1.1.4.3 Spillways

There are four spillways along the Main Canal. Two return the irrigation flows to the Columbia River and two flow into ponds.

SPILLWAY NO. 1: This spillway is located at mile post (MP) 4 on the canal. It is an emergency spill during the season and is used to flush the upper end of the canal during start-up and shut-down. The spillway has three large vertical gates at its head, is concrete-lined, 800 feet long and drops 120 feet from the canal to the backwaters of the Columbia River. It is manually operated.

Gate for Spillway No. 4

SPILLWAY NO. 2: This spillway is also known as Slaughter Spill and is located southwest of the City of Irrigon at MP 13.5 of the canal. It is used during start-up and for emergencies. The spillway drains into a natural drainage system which includes several ponds. It is manually operated.

SPILLWAY NO. 3: This spillway is located at I-84 where water is turned out into a large pond. The spill is used at start-up and for emergencies. It is also used operationally during the season to control the amount of water going into Boardman, specifically during aquatic herbicide treatment. It has an automated gate and is the site of one of the District's water measuring stations.

Gate for Spillway No. 3 at I-84 Siphon

SPILLWAY NO. 4: This spillway is also known as the endspill and is located at MP 27.5 – the end of the concrete-lined Main Canal. There is a Langemann gate at the site. This gate measures the water being spilled and can control the spill, as necessary. Water emerging from this spillway meanders through a ditch which serves five landowners and ultimately spills back to the Columbia River. A fish barrier was installed in 2008 near the Boardman Rest Area to prevent fish from migrating from the Columbia River and up the WEID spillway.

There are four drains built into the Main Canal that are operated during the off season.

1.1.4.4 Booster Pump Stations

District delivery criteria is 8.5 gpm per acre to the turnout or delivery point. Pumps are designed to meet this criteria at 55 psi. Tables 3 – 6 list the main booster pump stations on the WEID systems. All pump stations are metered deliveries.

Table 3 Main Canal Booster Pump Stations – District Owned

Name	Acres Served	Landowners	Year Installed
Southshore	40.3	27	1995
Westfall	5.5	3	2001
Honeywilde	14.1	18	1996
Division/RL 2	36.75	57	Original in 1994, Rebuilt and enlarged in 2010
Sunrise	79.6	22	1999
Bonner	27.3	16	2011
Hamilton	49	12	1996
McGraw	36	9	1997
Donovan	24.2	9	2002
16 D	31.85	8	1995
Total	**344.6**	**181**	

RL2 Booster Station

Table 4 Main Canal Booster Pump Stations – Privately Owned (Over 20 Acres Served)

Name	Map T/R/S	Tax Lot	Acres Served	Delivery
Nobles	T5N R28 17D	1200 - 1600	63.4	HG1
Feinberg	T5N R27 22	200, 203, 206, 207	78.8	HG45
Brown	T5N R27 22	202, 204	53.6	D44
Engbretson	T5N R27 22	400	63.7	D48
Phillips	T5N R27 21	1817	30.2	HG60
McNamee – Home	T5N R27 20 T5N R27 21C	2403, 2407, 2408 1000, 1100	67.4	D63 & 66

Name	Map T/R/S	Tax Lot	Acres Served	Delivery
D & D Farming	T5N R27 20 T5N R27 21 T5N R27 28 T5N R27 29	800, 900, 1000, 1300 2404 1200 100 100, 200	652.4	D64, D65 & 68
Schnell	T5N R27 30 T5N R27 31	110, 135 200	261.7	D69 & 71
Strebin – Strebin	T5N R27 30 T5N R27 19 T5N R26 25 T5N R26 36	100 – 109 2900 603 101, 115, 116	492.8	Relocation Canal 4 pump stations
Anacapa/Orchard Farms	T5N R27 31 T5N R26 36	100 800	341	D72
McNamee – Tagg	T5N R26 36	400	126.7	HG77
Walker	T4N R26 02	200	55.2	HG82
Cleaver	T4N R26 02 T4N R26 03 T5N R26 34	300, 400 100, 101, 102, 200, 300, 500, 600 101	571.9	HG86, 89, 90
Kaizen Holdings LLC	T4N R26 03 T4N R26 04 T5N R26 33	203 101, 201 101	244.7	HG91
Name	**Map T/R/S**	**Tax Lot**	**Acres Served**	**Delivery**
Port of Morrow/ City of Boardman	T4N R26 07 T4N R26 12	200 106, 301, 400	70	HG94
Riekkola	T4N R25 11 T4N R25 12 T5N R25 13 T5N R25 14	1200 104, 201 200 100	92.8	Boardman canal –HG1
Bartlett	T4N R25 13	300	45	Boardman canal - HG2
Terra Poma Lnd LLC	T4N R25 13	301	46.6	Boardman canal – D3A
Terra Poma Lnd LLC	T4N R25 13	100	59	Boardman canal – D3B
Bailey	T4N R25 13	1400	73	Boardman canal - Sump
Frederickson	T4N R25 14	300, 500, 701	56.4	Lateral 5
Frederickson	T4N R25 14	200, 400, 401, 900, 901	68.8	Lateral 7
Rea	T4N R25 11	600, 900	71.3	Lateral 7
Sage Hollow	T4N R25 11	500	128.1	Lateral 9

Name	Map T/R/S	Tax Lot	Acres Served	Delivery
	T4N R25 14 T4N R25 15	1100, 1101 101		
Headding	T4N R25 15	1203, 1204, 1500	22.1	Boardman canal – D10
Holmes - Home	T4N R25 15	200	35.5	Lateral 11
Holmes - Olsen	T4N R25 16	700, 703	24	Lateral 15
Allison/Boardman LLC	T4N R25 16 T4N R25 21	407, 605 101	250.9	Boardman canal – D15A
Carlson/Baker	T4N R25 16 T4N R25 17D T4N R25 20A T4N R25 21	500, 600 3200 102, 400 200	95.9	Boardman canal – D15B
Karl Smith	T4N R25 20 T4N R25 20A	802 7300	148.8	Boardman canal –D17A
Philippi	T4N R25 18 T4N R25 19	300, 1100, 1200, 1300 100, 200, 201	570.4	Boardman canal – HG20
McLachlan	T4N R24 24	1203, 1300	161.4	Boardman canal – D21A
Bebb/Ten Eyck	T4N R24 24	901, 901, 1001	42.6	Boardman canal – D26
Partlow	T4N R24 24	601, 701	29	Boardman canal – D27
Krebs	T4N R24 14	100, 202, 205	129.7	Spillway
Golf Course	T4N R24 13	401, 600	21.9	Spillway
Total			**5346.7**	

Table 5 Irrigon Delivery System Booster Pump Stations – District Owned

Name	Acres Served	Landowners	Year Installed
6th Street	45.8	22	1991
7th Street	205.4	71	2008
4th Street	114.6	70	2003
Oregon Street	114.2	90	2008
Columbia Lane	147.1	81	2008
Huke Station	73.3	22	2008
Total	**700.4**	**356**	

Table 6 Irrigon Delivery System Booster Pump Stations – Privately Owned

Name	Map T/R/S	Tax Lot	Acres Served	Delivery
Frederickson	T4N R26 S04 T4N R25 S05 T4N R25 S09	101, 201 100 100	159.1	CR Diversion

Name	Map T/R/S	Tax Lot	Acres Served	Delivery
Coffman	T5N R26 S23A	400	7.0	36" mainline
Holt/Winter	T5N R26 S23A	1200, 1201, 1300	8.4	21" mainline
Steagall	T5N R26 S23A	300, 400, 900, 1000	31.4	21" mainline
McNamee	T5N R26 S23D	1901	17	26" mainline
Rawhide Mob Park	T5N R26 S23D	2000	7.4	26" mainline
Hellberg	T5N R26 S23C T5N R26 S23D T5N R26 S26	3100 – 3108 1903 – 1916 200, 202, 203, 204	55.7	26" mainline
Richards	T5N R26 T26	102	38.9	26" mainline
McNamee	T5N R26 T26	400, 500	96.3	18" mainline
Total			**421.2**	

A total of 14 acres receive low pressure on the system and there are 8.4 water right acres awaiting transfer, totaling 1,144 acres on the Irrigon Delivery System.

1.2 SUMMARY OF WATER RIGHTS

WEID has several water rights associated with its supply of irrigation water. Water is supplied from both the Umatilla and Columbia Rivers. Table 7 and 8 give a summary of these water rights.

The Umatilla River Decree (paragraph 32 and 33 of Volume 3) specifies different irrigation diversions based on land conditions. These land conditions are:

1st – Raw sage brush land not reclaimed, or in process of reclamation;
2nd – Reclaimed land of loam or fine sand or fine soil texture; and
3rd – Reclaimed land of coarse sand or loose gravel subsoil, or loose coarse soil texture.

The 1st and 3rd soil condition has a diversion rate of 1/40 cfs/Ac and a duty of 6 Ac-ft/Ac. The 2nd soil condition has a diversion rate of 1/80 cfs/Ac and a duty of 3 Ac-ft/Ac.

These listed diversions come with the intention that they can economically be put to beneficial use. Based on soil conditions found in the WEID boundaries, the land most closely coincides with the 3rd land condition. This is illustrated in the NRCS on-line database which classifies approximately 91% of the land in West Extension Irrigation District as "Not Prime Farmland". See the NRCS farmland classification map in the attached appendix. As explained in this Water Management and Conservation Plan, WEID has the ability to put to beneficial use the full water

allotment as indicated by the Umatilla River Decree. Low water levels in the Umatilla River, however, have historically prevented WEID from using the full water allotment from the Umatilla River.

Table 7 Main Canal Delivery Water Rights - Irrigation

Certificate	Permit	Priority Year	Source	Acres Primary & (Supplement)	Maximum Flow (cfs)	Duty Ac-ft/ Ac
79924	Decree	1893	Umatilla River	1,369.90	17.12 or 34.24	3 or 6*
79925	Decree	1906	Umatilla River	347.10	4.34 or 8.64	3 or 6*
79926	408	1909	Umatilla River	4,121.70	295.67	10
79927	27941	1962	Umatilla River	20.00	0.50	4.5
79928	33883	1968	Umatilla River	3,248.10	81.20	4.5
79930	33883	1969	Umatilla River	128.00	3.20	4.5
79929	33883	1968	Columbia River	(8,516.60)	(90.00)	(4.5)
-	7400	1928	Return Flows†	5838.7	87.0	N/A
			Total:	**9,234.80**	**423.45**	

* Based on soil type.

† Return flows from the McKay Reservoir in Umatilla River. This Permit is pending.

The WEID also receives 500 Ac-ft of water stored at McKay Reservoir under Westland Irrigation District's right as mitigation for the Westland boundary change in 2004.

Table 8 Irrigon Delivery System Delivery Water Rights - Irrigation

Certificate	Permit	Priority Year	Source	Acres	Maximum Flow (cfs)	Duty Ac-ft/ Ac
Pending	45999	1981	Columbia River	1,144	28.59	4.5

1.3 SOURCES OF WATER

The District has two main water delivery sources.

1) Main Canal Delivery System – Umatilla River and Columbia River
   The Main Canal delivers live flows, including seepage and return flows, from the Umatilla River, diverted at Three Mile Dam for irrigation. Supplemental water is pumped from the Columbia River into the canal by the Umatilla Pumping Station. The District also participates in the Umatilla Exchange program where water is left in the Umatilla River in exchange for water pumped through the USBR Phase One Pumping Station in Umatilla. On-farms deliveries are via pipelines or open ditches using a variety of gravity, pumped and flood irrigation methods.

2) Irrigon Delivery System – Columbia River

The Irrigon Delivery System is a fully enclosed system that provides irrigation water from the Columbia River pumping station in Irrigon. The system consists of three lifting pumps at the river and six booster pump stations that are operated by the District. There are other private pumping stations on the system.

1.3.1 Main Canal Delivery System

There are three diversions that provide irrigation water for the Main Canal Delivery System. They are:

1) Three Mile Dam on the Umatilla River (primary source)
2) Columbia River Pumping Station near Umatilla (supplemental source)
3) Columbia River Pumping Station (Phase I) owned by the Bureau of Reclamation (exchange and supplemental or conjunctive use water)

The flow in the Umatilla River reaches a peak in the spring as snowpacks at high elevations melt. The natural flow diminishes to a very low level by June. By late June, seepage and return flows from upriver irrigation bring river flow back and sustain flow through most of the summer. In the 1980's, summer flow was about 90 to 120 cubic feet per second (cfs), but this flow has been dropping in recent years to a range of 50 to 65 cfs available for WEID (see Figure 2).

Table 9 2008 Main Canal Irrigation Season Diversions

Month	Main Canal Acre-Feet	Three Mile Dam Acre-feet	UPS (supp) Acre-Feet	Exchange Acre-Feet	Conj. Use (supp) Acre-Feet
March	1498	1498	0	0	0
April	4387	4387	0	0	0
May	5843	5843	0	0	0
June	6556	4791	0	951	634
July	7204	0	0	3589	3615
August	6226	0	0	4968	1258
September	4713	196	0	4278	239
October	3074	0	0	3074	0
TOTAL	**39501**	**16895**	**0**	**16860**	**5746**

Table 9 indicates how the District used each of the four main sources of irrigation water for the Main Canal needs. Water supplied by the WEID is diverted from the Umatilla River at Three Mile Dam early in the season; typically through mid-June. As the flows in the river decrease, the District goes on exchange and the USBR pumps are started at the Phase I Pump Station. Water is left in the Umatilla River and replacement water from the Columbia River is provided via the exchange pumping station. When irrigation demand is higher than the water available, the District uses its supplemental water. It can turn on its own Columbia River pumps near Umatilla (UPS) or purchase conjunctive use water from the USBR.

These three diversion points all deliver water to the Main Canal. Water flows in the open canal to be distributed to the District irrigators. As of 2011, there are twenty-eight privately owned booster stations that lift the water from the canal onto the farmland. There are 120 gravity flow deliveries from the canal. Many deliveries are piped, but there are open ditch laterals that deliver flood irrigation water to over one third of the District's service area.

1.3.2 Irrigon Delivery System

The Irrigon Delivery System is a fully pressurized system that was enclosed in 1998. This is an urban system with 360 customers on 1,144 acres in and around the City of Irrigon. There are fourteen booster stations off the mainline; eight are privately owned and six are District owned. One large irrigator takes their water at the point of diversion as they share the diversion site with WEID. All stations are metered. In 2008, the District installed a variable frequency drive (VFD) on the large pump (300 hp) at the pump station and this has worked to conserve water as well as energy.

Table 10 2008 Irrigon Irrigation Season Diversions

Month	Irrigon Pump Station Acre-Feet[1]
March	0
April	351
May	630
June	670
July	1044
August	821
September	664
October	367
TOTAL	**4547**

[1] These values do not include 159.1 acres of irrigated land supplied by a private pumping station.

1.4 SYSTEM MAP

Figure 3 illustrates the entire WEID boundaries and notes the location of major facilities.

(INSERT SYSTEM MAP HERE)

Figure 3 WEID System Map

1.5 CURRENT WATER USE AND RETURN FLOWS

Irrigation water is delivered to the customers based on demand for the irrigated acres above five and on a schedule for the smaller acres and flood irrigators. Some customers pump directly out of the main canal. Others receive water from regulated head gates that are opened on a predetermined date and duration based on their acreage. WEID asks to be notified of weekly needs so that operation personnel can make necessary adjustments to meet the demands.

When there is sufficient water flowing down the Umatilla River, the District diverts all of its needed water at the Three Mile Falls Dam. Minimum flow in the Umatilla River is set by the USBR based on fishery needs. When there is not enough water to divert all of the District's needs, water is supplied by the USBR's Phase One Pumping Station at McNary Dam, or the District may turn on its supplemental pumping plant (Umatilla Pump Station).

Water from the USBR's pumping station is accounted for in two categories. If the water replaces flow that is left in the Umatilla River it is considered exchange water. If the water is supplied by the USBR when there is insufficient flow in the Umatilla River, then it is considered conjunctive use. Both conjunctive use and exchange water come from the Phase One Pumping Station.

The following tables outline the District's current water deliveries for the past fourteen years.

Table 11 Current Irrigation Water Use to Irrigon Delivery System

Year	Source[1]	Total Yearly Diversion (Acre-ft)	Peak Monthly Diversion (Acre-ft)	Peak Monthly Diversion (cfs)
1997	Irrigon Pump Station	5,834	1,205	19.60
1998	Irrigon Pump Station	4,556	1,018	16.56
1999	Irrigon Pump Station	5,196	1,044	16.98
2000	Irrigon Pump Station	5,863	1,208	19.65
2001	Irrigon Pump Station	5,602	1,184	19.26
2002	Irrigon Pump Station	5,944	1,264	20.56
2003*	Irrigon Pump Station	4,518	959	15.60
2004	Irrigon Pump Station	3,650	771	12.54
2005	Irrigon Pump Station	3,913	795	12.93
2006	Irrigon Pump Station	3,685	830	13.50
2007	Irrigon Pump Station	4,075	840	13.66
2008	Irrigon Pump Station	4,547	1044	16.98
2009	Irrigon Pump Station	4,519	930	15.13
2010	Irrigon Pump Station	3,231	805	13.09
2011	Irrigon Pump Station	3,338	789	12.83

* Meters installed

[1] These values do not include 159.1 acres of irrigated land supplied by a private pumping station.

Table 12 Current Irrigation Water use to Main Canal

Year	Source	Total Yearly Diversion (Acre-ft)	Peak Monthly Diversion (Acre-ft)	Peak Monthly Diversion (cfs)
1997	Umatilla River Diversion	15,774	4,239	68.94
	Phase One Pump Station	16,374	4,748	77.22
1998	Umatilla River Diversion	14,328	4,362	70.94
	Umatilla Pump Station	5,437	2,845	46.27
	Phase One Pump Station	17,876	4,746	77.19
1999	Umatilla River Diversion	16,904	5,680	92.38
	Umatilla Pump Station	2,075	1,076	17.50
	Phase One Pump Station	18,201	5,390	87.66
2000	Umatilla River Diversion	14,656	4,192	68.18
	Umatilla Pump Station	2,006	966	15.71
	Phase One Pump Station	18,647	4,048	65.83
2001	Umatilla River Diversion	13,456	4,260	69.28
	Phase One Pump Station	22,134	5,619	91.38
2002	Umatilla River Diversion	15,654	5,310	86.36
	Phase One Pump Station	22,393	5,459	88.78
2003	Umatilla River Diversion	13,830	4,090	66.52
	Phase One Pump Station	24,191	6,792	110.46
2004	Umatilla River Diversion	19,270	5,830	94.82
	Phase One Pump Station	17,215	4,532	73.71
2005	Umatilla River Diversion	10,892	2,885	46.92
	Umatilla Pump Station	10,752	4,148	67.46
	Phase One Pump Station	16,204	3,832	62.32
2006	Umatilla River Diversion	14,992	5,621	91.42
	Umatilla Pump Station	7,630	4,253	69.17
	Phase One Pump Station	16,677	4,661	75.80
2007	Umatilla River Diversion	7,094	4,401	71.58
	Umatilla Pump Station	11,989	3,512	57.12
	Phase One Pump Station	21,079	4,370	71.07
2008	Umatilla River Diversion	16,895	5,843	95.03
	Phase One Pump Station	22,606	7,204	117.16
2009	Umatilla River Diversion	10,478	5,593	90.96
	Phase One Pump Station	27,849	7,878	128.12
2010	Umatilla River Diversion	14,349	5,169	84.07
	Phase One Pump Station	21,803	7,335	119.29
2011	Umatilla River Diversion	14,749	5,272	85.74
	Phase One Pump Station	22,340	7,293	118.61

The District does not currently account for recapture/reuse of irrigation return flows. There is a small amount of return flows coming into the Main Canal – Manager's estimate is approximately 2 – 3 cfs. These flows enter the canal from irrigated lands on the south side of the Main Canal having sub-surface drainage systems and/or pressure relief and overflow systems. Seepage into the canal from groundwater has also been observed. All of these return flows are variable with time of year and location.

Unused water from the Main Canal is returned to the Columbia River via the drainway shown in Figure 3. Much of the unused water from diversions along the Main Canal also drains into the Columbia River through groundwater. Reuse of return flow water is recognized as a valuable source for the District. WEID is currently investigating the feasibility of capturing part or all of the return flow from the Main Canal operational spills for use in the high-demand seasons of the District.

1.6 SUMMARY OF WATER USER CLASSIFICATIONS

The following Table 13 and Table 14 are a summary of water user account classifications. This data is based on information collected in 2009.

Table 13 Water User Classification of Main Canal Delivery System

Major Classification	Description	Acreage	Number of Accounts
Agricultural	Forage	5,362.80	233
Agricultural	Rotation†	2,657.20	14
Agricultural	Spring Grain	171.60	3
Agricultural	Fruit	103.90	9
Agricultural	Fallow	108.30	12
Non-Agricultural	Lawn and Garden	831.00	390
	Total:	**9,234.80**	**661**

† includes: grains, potatoes, onions, legumes, and mint

Table 14 Water User Classification of Irrigon Delivery System

Major Classification	Description	Acreage	Number of Accounts
Agricultural	Forage	385.40	123
Agricultural	Rotation†	271.40	3
Agricultural	Spring Grain	0.00	0
Agricultural	Fruit	68.90	2
Agricultural	Fallow	22.40	1
Non-Agricultural	Lawn and Garden	395.90	238
		1,144.00	**367**

† includes: grains, potatoes, onions, legumes, and mint

1.7 TYPES OF ON-FARM IRRIGATION SYSTEMS

The percentage of irrigation land for each irrigation system type is estimated in the following table.

Table 15 Types of On-Farm Irrigation Systems (2006 – 2011)

Irrigation Type	Main Canal	Irrigon Delivery System
Drip	0.7 %	2.0 %
Flood	28.9 %	0.0 %
Set Sprinkler	30.8 %	73.3 %
Center Pivot Sprinkler	39.7 %	24.7 %

1.8 CROPS COMMONLY GROWN AND CONSUMPTIVE USE

Crops grown in WEID along with their representative acreage are shown in the Table 16 and Table 17. These tables are based on crops grown in 2009. The District prepares an annual crop report for its own use.

Table 16 Crops Grown in Main Canal Delivery System (2009)

Crop	Acres	Percentage
Pasture	3,142.40	34.0%
Alfalfa / Hay	2,220.40	24.0%
Corn	1,777.30	19.2%
Potato	348.40	3.8%
Onion	333.10	3.6%
Beans/Peas	117.70	1.3%
Mint	80.70	0.9%
Spring Grain	171.60	1.9%
Apple/Peach	43.90	0.5%
Melons/Berries	60.00	0.6%
Fallow	108.30	1.2%
Lawn/Non-Ag	831.00	9.0%
Total:	**9,234.80**	**100%**

Table 17 Crops Grown in Irrigon Delivery System (2009)

Crop	Acres	Percentage
Pasture	385.40	33.7%
Corn	271.40	23.7%
Melons/Berries	68.90	6.0%
Fallow	22.40	2.0%
Lawn/Non-Ag	395.90	34.6%
Total:	**1,144.00**	**100%**

The actual irrigation needed at the crops (Consumptive Use) in the WEID can be estimated by the following Consumptive Use Equation:

$$C = (E - P)/n \quad \textbf{1.1}$$

where:
C = Consumptive Use (Irrigation required for crops)
E = Crop Evapotranspiration
P = Effective Precipitation
n = Watering Efficiency

1.8.1 Evapotranspiration

The USBR's AgriMet records were used in calculating crop evapotranspiration. The Hermiston Weather Station (HRMO) contains 18 years (1994 – 2011) of logged measurements. The monthly average evapotranspiration was found for each crop grown in the WEID, based on the and is summarized in Table 18.

Table 18 Average Monthly Evapotranspiration (Inches) for WEID Crops

Crop	Mar	April	May	June	July	Aug	Sept	Oct	Total
Pasture	1.15	3.08	4.78	6.15	7.54	6.45	3.69	0.77	33.60
Alfalfa/Hay	1.04	4.23	7.02	9.07	11.09	9.53	5.82	1.58	49.37
Corn	0.00	0.57	2.68	6.38	10.86	8.74	1.28	0.00	30.51
Potato	0.13	1.33	4.62	8.23	9.71	4.63	0.00	0.00	28.66
Onion	0.37	1.89	4.36	8.26	10.95	4.94	0.09	0.00	30.84
Beans/Peas	0.00	0.02	1.17	6.28	10.21	5.45	0.21	0.00	23.33
Mint	0.18	1.73	5.58	8.55	8.74	0.00	0.00	0.00	24.78
Spring Grain	0.45	3.30	6.93	8.89	5.71	0.09	0.00	0.00	25.37
Apple/Peach	0.25	2.28	6.32	8.77	11.06	9.39	4.02	0.27	42.36
Melons/Berries	0.00	0.00	0.86	4.80	7.40	3.42	0.00	0.00	16.48
Lawn/Non-Ag	1.47	3.70	5.62	7.26	8.87	7.63	4.65	1.26	40.46

The peak monthly evapotranspiration was found by the highest ranking evapotranspiration year for the Hermiston Weather Station, which was 2003. The peak monthly evapotranspiration is listed in Table 19.

Table 19 Peak Monthly Evapotranspiration (Inches) for WEID Crops

Crop	Mar	April	May	June	July	Aug	Sept	Oct	Total
Pasture	1.79	3.01	4.59	7.11	8.56	6.56	3.80	0.90	36.32
Alfalfa/Hay	1.95	4.39	6.75	10.49	12.57	9.72	6.09	1.89	53.85
Corn	0.00	0.50	2.63	7.36	12.35	8.86	0.75	0.00	32.45
Potato	0.00	0.82	3.97	9.40	11.23	5.60	0.00	0.00	31.02
Onion	1.24	2.30	5.37	10.44	11.97	1.89	0.00	0.00	33.21
Beans/Peas	0.00	0.00	0.68	6.75	11.92	6.66	0.00	0.00	26.01
Mint	0.22	1.77	5.51	9.88	9.19	0.00	0.00	0.00	26.57
Spring Grain	1.17	4.22	6.75	9.51	1.52	0.00	0.00	0.00	23.17
Apple/Peach	0.00	1.61	5.95	10.11	12.52	9.62	4.17	0.26	44.24
Melons/Berries	0.00	0.00	1.12	5.94	8.18	3.07	0.00	0.00	18.31
Lawn/Non-Ag	2.31	3.52	5.41	8.41	10.04	7.77	4.90	1.50	43.86

The maximum evapotranspiration usually occurs in July when temperature is high and plant foliage is large. July also typically involves low rainfall which increases the crop watering demands.

1.8.2 Effective Precipitation

Effective precipitation is the amount of rainfall that can actually be used to meet the needs of the crops. Some of the rainfall is lost by evaporation, runoff, or deep percolation. This effective precipitation was determined by applying a regression equation developed by the Soil Conservation Service. As outlined in Part 623 of the National Engineering Handbook, effective precipitation can be estimated by the following equation.

$$P = SF\left(0.70917P_t^{0.82416} - 0.11556\right)\left(10^{0.02426ET_c}\right) \quad \textbf{1.2}$$

where:
SF = Soil water storage factor
P_t = Monthly mean precipitation (in)
Et_c = Average monthly crop evapotranspiration (in)

The soil water storage factor is defined as:

$$SF = \left(0.531747 + 0.295164D - 0.057697D^2 + 0.003804D^3\right) \quad \textbf{1.3}$$

where:
D = the usable soil water storage (in)

The usable soil water storage (D) is a factor of soil water capacity (texture) and crop root zone. The soils in the WEID vary from sand to loamy fine sand. The soil moisture capacity ranged from 0.5 to 2.2 in/ft. The average for the Main Canal Delivery System and the Irrigon Delivery System were respectively 1.1 in/ft and 0.8 in/ft. The crop root zone varies from 6 inches (Mint)

to 6 feet (Orchards). Table 20 and Table 21 list the effective precipitation for the "Peak" year of record (2003) for the Main Canal Delivery System and Irrigon Delivery System, respectively.

Table 20 Peak Monthly Effective Precipitation (Inches) for Main Canal Delivery System

Crop	Mar	April	May	June	July	Aug	Sept	Oct	Total
Pasture	0.15	0.30	0.12	0.00	0.00	0.40	0.28	0.07	1.32
Alfalfa/Hay	0.18	0.39	0.16	0.00	0.00	0.57	0.38	0.08	1.77
Corn	0.15	0.29	0.12	0.00	0.00	0.50	0.26	0.07	1.40
Potato	0.14	0.27	0.12	0.00	0.00	0.38	0.23	0.06	1.19
Onion	0.14	0.27	0.12	0.00	0.00	0.29	0.21	0.06	1.09
Beans/Peas	0.15	0.27	0.10	0.00	0.00	0.43	0.24	0.07	1.25
Mint	0.11	0.22	0.10	0.00	0.00	0.21	0.17	0.05	0.86
Spring Grain	0.17	0.36	0.15	0.00	0.00	0.31	0.25	0.07	1.31
Apple/Peach	0.18	0.36	0.17	0.00	0.00	0.61	0.36	0.08	1.76
Melons/Berries	0.14	0.26	0.10	0.00	0.00	0.33	0.23	0.06	1.11
Lawn/Non-Ag	0.16	0.31	0.13	0.00	0.00	0.43	0.30	0.07	1.39

Table 21 Peak Monthly Effective Precipitation (Inches) for Irrigon Delivery System

Crop	Mar	April	May	June	July	Aug	Sept	Oct	Total
Pasture	0.14	0.28	0.11	0.00	0.00	0.37	0.26	0.06	1.23
Alfalfa/Hay	0.17	0.36	0.15	0.00	0.00	0.53	0.35	0.08	1.63
Corn	0.14	0.27	0.11	0.00	0.00	0.46	0.24	0.07	1.29
Potato	0.13	0.25	0.11	0.00	0.00	0.35	0.21	0.06	1.10
Onion	0.13	0.25	0.11	0.00	0.00	0.27	0.20	0.06	1.01
Beans/Peas	0.14	0.25	0.09	0.00	0.00	0.39	0.22	0.06	1.16
Mint	0.10	0.21	0.09	0.00	0.00	0.21	0.17	0.05	0.83
Spring Grain	0.15	0.33	0.14	0.00	0.00	0.28	0.23	0.07	1.20
Apple/Peach	0.17	0.34	0.16	0.00	0.00	0.58	0.35	0.08	1.67
Melons/Berries	0.13	0.24	0.09	0.00	0.00	0.30	0.21	0.06	1.03
Lawn/Non-Ag	0.15	0.29	0.12	0.00	0.00	0.40	0.27	0.06	1.29

1.8.3 Watering Efficiency

The watering efficiency refers to the uniformity and effectiveness of applying water to crops. Table 22 lists the estimated irrigation efficiency for the various watering methods used in WEID. The weighted average is the overall watering efficiency taking into account the acreage of each irrigation method (see Table 15).

Table 22 Irrigation System Efficiency

Method	Efficiency
Drip	0.87
Flood	0.50
Set-Sprinkler	0.75
Pivot	0.80
Main Canal Weighted Average	**0.70**
Irrigon Weighted Average	**0.76**

1.8.4 Consumptive Use

The volume of water needed by a crop is determined by multiplying the crop irrigation requirement (see Equation 1.1) by the crop acreage. The average year (18 year average, 1994 – 2011) irrigation crop requirement for the Main Canal Delivery System is shown in Table 23. Table 24 lists the average year (18 year average, 1994 – 2011) irrigation crop requirement for the Irrigon Delivery System.

Table 23 Average Year Crop Irrigation Requirements (Ac-ft) for Main Canal Delivery System

Crop	Mar	April	May	June	July	Aug	Sept	Oct	Season
Pasture	306	1,017	1,631	2,185	2,784	2,356	1,304	181	11,763
Alfalfa/Hay	172	999	1,707	2,282	2,893	2,463	1,467	322	12,303
Corn	0	46	480	1,275	2,271	1,810	229	0	6,111
Potato	0	42	175	327	398	186	0	0	1,128
Onion	3	62	158	315	430	191	0	0	1,158
Beans/Peas	0	0	11	83	141	74	0	0	311
Mint	0	14	50	80	83	0	0	0	227
Spring Grain	2	59	131	173	115	0	0	0	480
Apple/Peach	0	10	30	43	57	48	20	0	208
Melons/Berries	0	0	4	32	52	23	0	0	112
Lawn/Non-Ag	112	330	513	685	867	738	439	96	3,781
Total	**594**	**2,580**	**4,890**	**7,480**	**10,091**	**7,890**	**3,459**	**598**	**37,582**

Table 24 Average Year Crop Irrigation Requirements (Ac-ft) for Irrigon Delivery System

Crop	Mar	April	May	June	July	Aug	Sept	Oct	Season
Pasture	35	115	184	246	312	265	147	21	1,326
Corn	0	7	68	179	317	253	32	0	857
Melons/Berries	0	0	4	34	55	25	0	0	118
Lawn/Non-Ag	50	145	225	300	378	322	192	43	1,654
Total	**85**	**267**	**481**	**758**	**1,063**	**865**	**371**	**64**	**3,955**

The peak crop irrigation requirements for the Main Canal Delivery System and the Irrigon Delivery System are shown on Table 25 and Table 26, respectively.

Table 25 Peak Year Crop Irrigation Requirements (Ac-ft) for Main Canal Delivery System

Crop	Mar	April	May	June	July	Aug	Sept	Oct	Season
Pasture	613	1,014	1,674	2,663	3,206	2,307	1,319	312	13,107
Alfalfa/Hay	467	1,058	1,743	2,776	3,327	2,422	1,512	478	13,783
Corn	0	44	532	1,559	2,616	1,770	104	0	6,624
Potato	0	23	160	390	466	217	0	0	1,256
Onion	44	81	209	414	475	64	0	0	1,286
Beans/Peas	0	0	8	95	167	87	0	0	357
Mint	1	15	52	95	88	0	0	0	251
Spring Grain	21	79	135	195	31	0	0	0	460
Apple/Peach	0	7	30	53	66	47	20	1	223
Melons/Berries	0	0	7	42	58	20	0	0	128
Lawn/Non-Ag	213	318	523	833	994	727	456	142	4,206
Total	**1,358**	**2,637**	**5,073**	**9,115**	**11,495**	**7,661**	**3,410**	**933**	**41,683**

Table 26 Peak Year Crop Irrigation Requirements (Ac-ft) for Irrigon Delivery System

Crop	Mar	April	May	June	July	Aug	Sept	Oct	Season
Pasture	69	115	188	299	359	260	149	35	1,474
Corn	0	7	75	218	365	248	15	0	928
Melons/Berries	0	0	8	45	61	21	0	0	134
Lawn/Non-Ag	93	139	228	363	433	318	200	62	1,837
Total	**163**	**261**	**499**	**924**	**1,219**	**847**	**363**	**97**	**4,372**

The irrigation delivery demand represents the irrigation needed at the field based on crop consumptive use and irrigation method. Peak delivery rate was estimated by dividing the peak month demand (July) by the number of days in the month. The resulting irrigation demands are summarized in Table 27.

Table 27 Summarized Crop Irrigation Demands

	Main Canal	Irrigon Delivery System	Total
Average Max. Monthly Demand (Ac-ft)	10,091	1,063	**11,154**
Average Max. Delivery Rate (cfs)	164	17	**181**
Average Annual Demand (Ac-ft)	37,582	3,955	**41,537**
Peak Monthly Demand (Ac-ft)	11,495	1,219	**12,714**
Peak Delivery Rate (cfs)	187	20	**207**
Peak Annual Demand (Ac-ft)	41,683	4,372	**46,056**

It should be noted that the Irrigon Delivery System is a demand delivery system which serves mostly residential customers. Users can turn-on their water when they desire it. This causes peaks in the delivery rate that may be higher than what is shown here.

1.9 OPERATION AND MAINTENANCE

1.9.1 Board of Directors

The District has a five member Board of Directors (BOD) that serve the five Divisions of the District. They are elected for staggering three-year terms. The BOD is the policy making body of the District. They meet monthly to review finances, operations, contracts, issues and provide policy direction to the Managers. Special meetings are held, as needed, to address emergencies, special projects or emerging concerns. The BOD sets a budget annually, as required by Oregon state law.

Table 28 Board of Directors

Name	Position	Year first elected or served
William "Bill" Cline	Division 1 - Umatilla	2009
Douglas W. Strebin	Division 2 – Irrigon South	1996
Max Hellberg	Division 3 – Irrigon North	2005
Suzi Frederickson	Division 4 - Boardman East	2007
Dalarie Philippi	Division 5 – Boardman West	2000

1.9.2 Managers

The District Manager serves as Secretary to the Board of Directors and is the administrative and financial officer for the District. The Operations Manager oversees the field crew and the operations and maintenance of the District's irrigation system. The Office Manager is responsible for the functions of the District office. Together, they make up the management team that works to assure the policies of the District are followed while delivering water to the patrons in an economical and efficient manner. They assure that the District follows state and federal irrigation law as well as the directives established by the BOD.

1.9.3 Crew

The District has three field technicians that perform the ditchriding and maintenance duties. During the irrigation season, they assure water is delivered to the patrons of the District and the system is running smoothly. The four man (including the Operations Manager) field crew provides seven-day per week coverage of the District during the irrigation season. They also take care of mowing and spraying of the Main Canal and the various pump stations owned or operated by the District. Employees have a wide range of skills including welding, equipment repair & operation, pump repair & operation, concrete work, knowledge of safe working practices, water management and customer service. The District provides training to employees to develop their skills. Field technicians are required to obtain pesticide applicators license and a Commercial Driver's License (CDL) as part of their advancement program. Part-time personnel are hired as needed for maintenance, mowing and other work.

1.9.4 Equipment

The District uses various types of equipment in the course of its operations. Equipment owned by WEID includes two backhoes, trackhoe, mower, and dump truck. The backhoes are used for loading and unloading pipe and for construction jobs, such as pipe repair or replacement. The trackhoe is a key piece of maintenance equipment. It is used for cleaning the canal, removing concrete liner from the canal during repair and for larger pipe repairs or replacement. The dump truck is used to haul rock for road maintenance, fill material for projects and for moving the excavator on a trailer from site to site. The mower is used for mowing along the Main Canal and laterals.

The District has three sets of propane tanks and burners for burning weeds and debris from the Main Canal and laterals prior to water start-up. There is a spray truck set up for spraying the canals and laterals. There is a trailer set-up specifically for conducting aquatic weed control operations during the irrigation season.

1.9.5 Irrigation Season Operations

1.9.5.1 Start-Up Procedures

Around the 15th of March annually, water is diverted from the Umatilla River at Three Mile Dam. Prior to starting the water, the Operations Manager will confirm the canal is clear of weeds and debris from Three Mile to the siphon at I-84 (Spillway No. 3). About 30 cfs is sent down the canal to Spillway No. 1. This is a 4 mile stretch which takes one man 5-6 hours to flush and remove weeds. Water is released there for a minimum of a few hours to flush the weeds from the upper stretch of canal. Sometimes, the water may run for a few days down Spillway No. 1, especially if the weather is windy. Windy weather often requires staging of the start-up over a few days. After reaching Spillway No. 1, another 15-20 cfs is added to the canal and the water is sent down the canal to Spillway No. 3 at the I-84 siphon. On the way, water is released to Spillway No. 2 for an hour to flush the weeds that have collected or blown into the canal. The water then continues to Spillway No. 3. This is a 15.5 mile stretch and takes 4-6 men about 16 hours to flush and remove weeds. While the water is running in the canal, crews flush the District's lateral lines and close all the system drains. They also visually inspect for leaks. The excavator is moved to key points along the canal where weeds many pile up.

The day after the initial start-up, which is considered a "flush" of the canal, the water is turned off at Three Mile Dam for 3-4 hours. This causes the canal level to drop. The checkboards in the upper canal can then be placed in the canal by the crew. If no repairs or problems are found, the water is turned back on (40-50 cfs) and sent down the canal. The upper canal is now ready for irrigation.

The crew will then start burning the Boardman canal preparing for water. A few days later, typically 3 – 10 days, water is turned into Boardman. This is a six-hour process and can be done with two men. The laterals are locked until they have been cleared to take water and irrigators have called to notify the District that they are ready to start water for the season. The clearing of laterals and start-up in Boardman typically takes another 7 – 10 days with a two man crew.

Between April 1st and 15th, the Columbia River pumps in Irrigon are started and this turns on the Irrigon Delivery System. The start-up takes a full day with the full crew. The system is first turned on with low pressure to get the air out of the pipes and flush the lines. All drains are then closed and individual deliveries are checked visually for leaks. The booster stations are started up as demand increases.

1.9.5.2 Start-Up Problems

Over the past 15 years, four major problems have occurred in the Main Canal during start-up:

1) Sand blowing into the canal overnight causing it to fill;
2) Panels sloughing into the canal;
3) Siphon at I-84 failing;
4) Headgates or canal leakage.

In each of these cases, the water was shut off and repairs made. There are some critical crops that need water in mid-March, so delay of water can cause a concern to a few growers.

The problem of high pressure in the Irrigon Delivery System was eliminated when the District installed a Variable Frequency Drive (VFD). Since a small portion of that system is steel pipe, and it is very old, it is susceptible to leaks. Controlling the pressure has prolonged the life of the main pipe. Most of the pipe has been replaced, but there is a section from the river pump station to the 4th Street pump station yet to be done. In 2012, 650 feet of this line will be replaced. Since the Irrigon Delivery System is a pressurized system, the District responds quickly to any leaks on the system.

1.9.5.3 Irrigation Season

The District takes water from Three Mile Dam until the river flows fall to 250 cfs. At this time, typically mid-June, the exchange is called for. The District goes on exchange which means they cease taking water at Three Mile and water is pumped to the canal by the Phase One pumping station. The exchange cannot exceed the amount of water left in the Umatilla River by WEID at Three Mile Dam. The District may be on partial exchange for a few days before going on full exchange, depending on how quickly the river drops. When the irrigation demand is higher than the flow available to the District, it has to go on supplemental supply. Either the District-owned Columbia River pumps at Umatilla will be turned on or the District will purchase conjunctive use water from Reclamation. The District is typically on its supplemental water from late June through mid-September. Demand has usually decreased by mid-September so available Umatilla River flows are sufficient.

The Columbia River pumping station in Irrigon has a VFD which has substantially reduced operation concerns on that system. The system is set at 31-34 psi at the Station, which provides 14-30 psi to each of the booster pumps. The booster pumps are checked at least twice daily by the ditchrider and adjustments made to meet the demand of the irrigators.

Flood irrigators receive water every other week and are on a set schedule. They can request additional water and it will be allotted if sufficient water is available. Irrigators up to five acres are on a watering schedule where they are assigned certain days of the week to take their water. Timing of the delivery is their choice (from 7 am – 7 am the next day). Irrigators above

20 acres are required to call in their water order 24 hours in advance of turning on or turning off their systems. The District has a specific water order line to take the calls. Each morning and afternoon, water orders are taken and written in the water order log, then transposed to the ditchrider run sheet. Two field personnel typically serve as ditchriders daily, except on weekends when one ditchrider covers the entire District. The ditchrider run sheet indicates which of the larger landowners (above 20 acres) and flood irrigators will be on each day. This assists the District in assuring enough water is in the canal or making adjustments to match demand with the available water.

During the irrigation season, the crew addresses various District repairs and customer concerns. A work order system is used. A problem is called in by a customer or noticed by the crew and the work order is written up. The Operations Manager assigns the work orders to the crew. Each crew member turns in the work orders they have completed to the office with a listing of time and materials used. Any customer billings or updates to District records are done with information from the work orders.

Aquatic weeds are typically noticed growing in the canal about late May to early June. The first herbicide treatment starts in late May. Sometimes it is a full canal treatment, but often Boardman only. The District has a NPDES permit for the application of aquatic weeds and applies product in accordance with the permit. Crews use the herbicide Magnicide H (acrolien) in the canal. They usually apply the herbicide on a Wednesday. An acrolien treatment is followed by application of copper sulfate the following week (usually Wednesday). During treatment times, all spills to the Columbia River are locked closed and the canal is closely monitored.

The crew does its mowing and spraying for terrestrial weeds as time allows. Mowing is often completed in the fall. All weed racks are cleaned daily and debris removed from the site as time allows. The pump stations are closely monitored to assure they are operating properly and maintenance done as needed.

1.9.5.4 Irrigation Shutdown

At the end of the irrigation season, the pumps are turned off. Standing canal water near Thee Mile Dam is flushed. Systems are flushed, drains are opened, and pumps are winterized. This process takes a few days in Irrigon and a few days along the Main Canal. The Oregon Department of Transportation (ODOT) is contacted to open the drain at the I-84 Highway. During the winter, some seepage and drainage water comes into the Main Canal and is managed through the canal drainage system.

1.9.5.5 Irrigation Problems

The main problems during the irrigation season are plugged pipes, leaking or broken valves or headgates, broken pipes and pump issues. In these cases, the system is isolated as close as possible to the damaged area and water shut-off so repairs can be made. The District contacts landowners to let them know what is going on through various communication methods. These include phone calls, letters and the local reader board at A.C. Houghton School. If a number of users are to be shut off for a day or more, the District tries to hold off the repair until water

users are contacted so they can make plans. There is usually one or two emergency situations a year where such notice is not able to be provided.

1.9.5.6 Repair and Maintenance

The small repairs on the system are done during the irrigation season (March through October). The larger repairs and ones that affect operations are done during the off-season (November through February). The off season work is a very busy time. Table 29 shows a typical yearly maintenance and repair schedule.

Annually, the Manager submits a project list to the BOD for their review and budget purposes. Projects are then prioritized by management as time, budget, manpower, weather and other factors allow.

Table 29 Maintenance and Repairs

Description	Man Hours	Equipment	Timeframe
Canal cleaning	320	Excavator	January - February
Mowing	400	Mower	October - January
Valves, meters, pumps Repaired or pulled	160		October - November
Canal panel repair and replacement 120 - 150 panels	1000 - 1300	Excavator, Dump Truck	Nov – Feb
Headgate and screen inspections	40		November
Projects (usually pipeline)	480 - 1200	Excavator, backhoe, Dump truck	November - March
Tree removal, easement clean-up	160		December and March
Headgate, checkboard, weir repairs	80		December and February
Lateral cleaning	260 hours – WEID 200 hrs – Prison crew		February - March
Burn canal and laterals	360	Burner, water truck	March
Diversion inspections and maintenance	40-80		November, March

The District hires temporary workers during the non-irrigation season to assist with the tasks. Sometimes, contractors are hired for specific work, such as pipe installations or concrete work. Any purchasing of materials or hiring of contractors is done in compliance with Oregon Public Contracting rules. There are several local qualified contractors that can be contacted to bid on work projects.

The District hires a ten-man inmate crew from the Two River Correctional Facility for five weeks each season to manually clean the open laterals. A District employee works with and supervises the inmate crew.

1.9.5.7 Maintenance Successes

The West Extension Main Canal was built from 1914-1916. It is in poor to fair condition. Ten years ago, the District increased its annual assessment and has put $100,000 (labor, equipment and materials) into canal replacement each year. Priorities were established by loss potential. WEID estimates that 50% of canal loss identified in 1994/95 studies (see Section 2.5.1.1) have been addressed. By doing so, the District has moved from responding to canal failures to planning for replacement of sections of the canal.

The District is in the process of completing the replacement of the steel line on the original Irrigon Delivery System. JUB and the District developed the Irrigon Pressurization Modeling Report in 2004 to plan for the pipe replacement. Another 650 feet will be replaced in 2012 along with a 24-inch valve. This is a $90,000 project. As of 2011, about 10,000 feet of pipe has been replaced in sizes 12, 18 and 21-inch. About 2,500 feet of 24-inch pipe remains to be replaced.

The 1998 project of enclosing the Irrigon System and eliminating all flood deliveries was a successful project. Not only were old, open flood ditches eliminated, but water conservation resulted (from 7.24 AF/Acre in 1997 to 4.38 AF/Acre in 2009).

As of 2011, the four legs of the Relocation Canal (RL1, RL2, RL3, and RL4) have been substantially replaced. This canal connected the “new” 1916 system to the “old” 1893 system. 1600 feet of the old system (15%) remains to be replaced.

The District has been able to install Variable Frequency Drives (VFDs) on critical pumps and this has saved energy costs. Criteria for new pumps include VFDs.

1.9.5.8 Maintenance Issues

- The District needs to remain vigilant about the Main Canal repair so it doesn’t fall behind on its replacement program. At some point, a multi-million dollar project may have to occur. Lack of floor in many areas of the canal is a concern.
- Headgates along the canal are deteriorating and a few are replaced each year.
- The concrete laterals are in very poor to fair condition and a few have significant transportation losses. In 2004, the District and J-U-B Engineers developed the Boardman Master Plan. It shows how the laterals in Boardman will be enclosed and how the conversion from a flood system to an enclosed system will be developed. In 2010, the District began looking for funding to replace the laterals with buried pipe.
- Steel lines taking delivery off the Main Canal are deteriorating. They are being replaced when they fail, and the District can expect more of this to occur.

- The fish screens at both Columbia River Stations (Umatilla and Irrigon) need to be updated. Both sites are expected to require new fish screens. Funds are actively being sought for these replacements.
- The District is using a small lot in Irrigon as a shop. This lot is not sufficient to effectively allow for the District's work. The District owns a five-acre lot east of Irrigon and hopes to build a shop there some day. As of 2011, there is $90,000 in the shop fund. In order for the District crews to perform more maintenance and repair work, the shop will need to be built.

The District's equipment is well used. A new mower will be purchased in 2012. A 2000 excavator purchased in 2004 and will need replacement in the next few years. The 1986 dump truck was used when purchased in 2003 and is wearing out as well. Funds are put aside annually to assist with purchases. However, with all the work being done by District crews in the last ten years, equipment is wearing out sooner than replacement funds are available. This presents a challenge.

Installation of meters on private deliveries assures that irrigators are taking the correct amount of water. It takes three crew members two days to read all the meters. This is done monthly, so is time consuming. Notifying the landowners when their meters are not working also takes more time since the landowners are not quick to repair the meters. This issue is challenging.

Financially, the District is solvent. But, one really bad year with more than one unexpected equipment repair or operational failure could change that. The Board of Directors and management balance getting the best from their dollars by not charging excessive costs to the patrons. This will continue to be a management challenge.

SECTION 2.0 - WATER CONSERVATION ELEMENT

2.1 PROGRESS REPORT ON CONSERVATION MEASURES

The District has completed a significant amount of projects since the 1999 Water Conservation Plan was completed. The focus has been given to water measurement as well as conservation. Following is a list of water conservation measures planned in 1999 that have been completed:

- Repair of strategic sections of Main Canal to minimize seepage losses;
- Conversion of irrigation systems – flood to sprinkler;
- Spillway rebuilt at the end of the Main Canal;
- Remote telemetry monitoring stations constructed;
- Improved water measurement and monitoring;
- Expansion of the Irrigon Pressurized System to include the "Joe Huke" section;
- Re-regulation reservoir preliminary study;
- Educational programs.

These two items have not been completed, but are still being considered:

- Recovering canal losses by pumping groundwater along the Main Canal;
- Build new maintenance shop.

A list of completed projects since the 1999 Conservation Plan is shown in Table 30. The location of these projects is shown on Figure 4. Prior to 2001, severe water delivery shortages occurred at the end of the canal. Over 5,000 AF of estimated water savings have occurred from the projects listed. These savings have been used to shore up water deliveries, and avert severe water shortages from occurring.

Projects listed were mostly funded by the District, developers or individual landowners, with the following exceptions:

Items D and E – Matching grant funds were obtained from the Bureau of Reclamation

Item H – Matching grant funds were obtained from Morrow Soil and Water Conservation District under the EQIP program.

Item I – Reimbursable funds were received from Umatilla Electric Co-op for part of the project cost.

Item M – Matching grant funds were received from Umatilla Soil and Water Conservation District under the EQIP program.

Table 30 Conservation Projects Completed (years 2000 - 2011)

Project	Service Area Description	Comments	Pipe Details (Feet)	Cost	Estimated Savings	Year Completed
A	Irrigon – Huke System	Install pipeline, eliminate flood ditches Install booster pump	6,480 ft 4" – 10"	$67,800	50 AF	2000
B	Sunrise Hamilton, Donovan McGraw (210 Ac) Bonner	Development converted land from flood to sprinkler		Unknown – Developer cost	570 AF	2001 - 11
C	Philippi (570 Ac)	Convert from flood to sprinkler irrigation		Unknown – Landowner cost	2100 AF	2001
D	Main Canal	Data Loggers, weirs in laterals, automated gates and SCADA		$222,386	Water Accounting	2001-02
E	Main Canal	Automated gates and SCADA		$577,525	Water Accounting	2003-06
F	Irrigon (610 Ac)	Landowner Meters	99 meters		1500 AF	2003 - 05
G	Main Canal (4373 Ac)	Landowner Meters	132 meters		500 AF	2004 - 06
H	Depot Lane	Replace open lateral system	3800 ft. 6"-12"	$72,000	150 AF	2004
I	IPS	Install VFD		$76,690	Energy	2007
J	RL 1 & RL4	Replace old and install valves/meters	1920 ft. 8" & 12"	$14,700	25 AF	2009
K	HUKE PS	VFD Upgrade		$8,891	Energy	2010
L	RL 2	Replace open lateral/install VFD booster station	2,820' 4" – 10"	$63,000	200 AF	2010
M	Cleaver (289 Ac)	Convert from flood to sprinkler	1,300 ft 8"	Unknown	460 AF	2008
N	Kennedy et. Al (35 Ac)	Converted from flood to sprinkler	800' 6"	Unknown	40 AF	2008

(INSERT COMPLETED PROJECTS FIGURE)

Figure 4 Completed Projects

2.2 WATER MEASUREMENT PROGRAM DESCRIPTION

The current water measurement program is compliant with measuring and reporting standards in OAR chapter 690, division 85. Diversions from Umatilla River at Three Mile Dam are measured by the USBR as part of their HydroMet program at Powerline Road. The District's Ramp Weir #1 is located downstream of the Three Mile Dam diversion but upstream of where Phase One water enters the Main Canal. Just downstream of where Phase One water enters the canal, there is another HydroMet measuring point. The USBR Phase One Pumping Station uses an ultrasonic flow meter to measure flowrate at the pumps. Ramp Weir #2 is located approximately 1,000 feet downstream of where Umatilla pump station water enters the Main Canal. Ramp Weir #3 is installed in the Main Canal just downstream of the emergency spillway #3 but upstream of the I-84 crossing. Ramp Weir #4 is located at the end spill of the Main Canal. These water measurement locations are shown in Figure 3. The District does have other flow measurement devices, but the limited number of devices does not provide total system details.

Measurements at the ramp flumes and weirs are reported to the SCADA system at the WEID office and monthly volumes are recorded as shown in Table 9 and Table 10.

2.2.1 Telemetry

The District has two ramp flumes and six telemetry sites along the Main Canal that send information to the District office. Water canal height, water measurements, and temperature are monitored at the sites. Below is a list of the measurement sites:

- Ramp Flume One - Measures the water flow from the Umatilla River;
- Ramp Flume Two – Measures the water flow below all inlets;
- Relocation Canal – Reports water level in the Main Canal and the Relocation Canal;
- Patterson Road – Reports water level in the Main Canal;
- Ramp Weir Three/Siphon – Measures the water flow going into Boardman and controls the spill gate at I-84;
- Langemann Gate below HG 15 – Measures canal and lateral 15 flows and controls water level in the canal;
- Langemann Gate below HG 25 – Measures canal and lateral 24 flows and controls water level in the canal;
- Langemann Gate/Spillway – Reports canal and laterals 30 & 31 flows and controls canal water level.

In addition to the telemetry stations, there are measuring sites located at Laterals 7 and 17 that provide instantaneous and accumulated flow information.

2.3 DESCRIPTION OF CURRENTLY IMPLEMENTED CONSERVATION MEASURES

The District will continue current conservation measures, including:

- Canal maintenance program, replacing 120 - 180 concrete panels per year;

- Replacement of canal bottom in selected sections to minimize seepage;
- Nozzle replacement program for irrigators;
- Installation of water meters – typically five to ten per year;
- Education program with newsletters and at least one general meeting;
- Support of landowners converting from flood to sprinkler irrigation.

2.4 SHORT AND LONG-TERM GOALS TO IMPROVE WATER MANAGEMENT

WEID has established a set of priorities and objectives that will work towards water conservation and management within the District.

WATER MANAGEMENT:

1. Plan, develop and implement appropriate conservation measures within the WEID:
    a. Water delivery scheduling;
    b. Installation of meters and other measuring devices;
    c. Piping of open laterals;
    d. Upgrading pump stations to VFDs, as feasible;
    e. Monitor and enforce District's partition and sub-division policies;
    f. Monitor and enforce District's rules and regulations;
    g. Support conversion of customers from flood to sprinkler;
    h. Continue nozzle replacement program;
    i. Participate in other programs that provide conservation benefits.
2. Monitor and support quality of water within WEID:
    a. Meet or exceed criteria under our NPDES permit;
    b. Meet or exceed criteria in our pesticide management plan;
    c. Assure water is food product safe;
    d. Assure return flows are ag exempt under the Clean Water Act.
3. Provide training and resources to employees:
    a. Local training opportunities;
    b. Training through associations such as Oregon Water Resources Congress (OWRC), Special Districts Association of Oregon (SDAO) and Occupational Safety and Health Administration (OSHA);
    c. Specialty training as needed.
4. Provide and promote public education and outreach:
    a. Update WEID Policy and Procedures manual annually and make available to water users;
    b. Provide workshops of interest and value to the water users;
    c. Assure water users learn of important issues through the WEID newsletter, local media or direct contact.
5. Support creative regional approaches to water needs and supply:
    a. Water banking and marketing;
    b. Conjunctive management of surface and groundwater;
    c. Conserved Water Program;
    d. Recharge and reuse of water.

6. Work with regional partners to develop plan and policies:
    a. Umatilla Water Coalition;
    b. Confederate Tribes of the Umatilla Indian Reservation (CTUIR);
    c. US Bureau of Reclamation, Umatilla Water Commission and others.

FACILITY MANAGEMENT:

1. Annually assess and maintain all District facilities to extent allowed by budgets, including:
    a. Main Canal;
    b. Laterals and pipelines;
    c. Pumping Stations;
    d. Spills and Drains;
    e. Telemetry and automated gates;
    f. Fish screens;
    g. Canal roads, easements, and gates;
    h. Office and shop areas.
2. Repair and replace the aging Main Canal infrastructure though the annual maintenance program, investing $100,000 annually (materials, labor, and equipment).
3. Develop a plan to repair and replace Boardman open laterals with pipelines in accordance with the Boardman Master Plan. Identify funding to support the plan.
4. Replace aging steel pipelines on the Irrigon Pressurized system in accordance with the Irrigon Pressurized Project, Hydraulic Modeling Report.
5. Address screening concerns at the UPS and IPS.
6. Assure pumping stations are regularly maintained and operations are observed daily.
7. Maintain District roadways and rights-of-ways:
    a. Address areas where road is below canal liner;
    b. Assure access is available on all laterals for District Crews;
    c. Clean up overgrown areas, removing trees and brush.
8. Continue current preventative maintenance, repair and replacement activities.
9. Meet all current and anticipated regulatory requirements.
10. Provide training and resources to employees.
11. Obtain proper equipment to maintain facilities:
    a. Pickups are regularly maintained and replacement program is reviewed annually;
    b. Backhoes, trackhoes and dump truck are regularly maintained and inspected.
    c. Qualified operators are hired by the distinct;
    d. District trailers are maintained and operated in a safe manner;
    e. Mower is maintained and operated safely;
    f. Other equipment, such as grader and loader may be purchased or rented as budget allows.
    g. Shop equipment maintained and operated in a safe manner.
12. Geographic Information Systems (GIS) mapping and asset management.

PUBLIC PARTNERS:

Develop and maintain effective relationships with the USBR, other neighboring irrigation Districts, agencies, counties, cities, the CTUIR and special Districts for the enhancement of District water supplies, contracts, operational efficiency and public cooperation.

Objectives:

1. Maintain ongoing partnership with the Bureau of Reclamation;
2. Maintain ongoing partnership with the City of Hermiston;
3. Continue involvement with the Umatilla Recharge Project;
4. Continue to identify, develop, plan and pursue opportunities for selected mutually beneficial activities with neighboring entities or agencies;
5. Look for co-operative opportunities with the City of Irrigon, City of Umatilla, City of Boardman, and the Port of Morrow.

2.4.1 Conservation Project Priorities

A list of future conservation projects is shown in Table 31. The completion of these projects is dependent on finding funding sources. The location of these projects is shown on Figure 5.

Table 31 Future Conservation Projects

Project	Service Area Lateral (Acres)	Comment	Length of Pipe (Feet)	Size	Estimated Project Cost	Estimated Savings	Priority	Year
1	17 & 18 (317 Ac)	Some flood to be converted	8300	8" - 18 "	$381,000	372 AF	HIGH	2012/13
2	17 (80 Ac)	Press System Funded by BPA & Landowners	Part of Above project	4" - 6 "	$108,000	Energy	HIGH	2012/13
3	15 (519 Ac)	Some flood to be converted	8900	4" - 24"	$465,000	320 AF	HIGH	2017/18
4	15 (40 Ac)	Press System Funded by BPA & Landowners	1800	4"	$123,000	Energy	HIGH	2017/18
5	7 – 5 (290 Ac)	30 ac N I-84 Some flood to be converted	10100	4" - 15"	$353,000	650 AF	HIGH	2015/16
6	9 (160 Ac)	Wetland area at No. end	3500	8" - 12"	$98,000	160 AF	LOW	Over 10 years
7	11 (164 Ac)	Some flood to be converted to sprinkler	4000	8" - 12"	$120,000	200 AF	MEDIUM	Over 10 years
8	12 (92 Ac)	Some flood to Be converted	1900	4" - 8"	$76,000	160 AF	LOW	Over 10 years
9	13 (116 Ac)	Some flood to be converted to sprinkler	3000	4" - 8"	$86,000	200 AF	MEDIUM	2016
10	RL-1 (40 Ac)		2600	12"	$78,000	360 AF	HIGH	2013/14
11	Relocation Canal (800 Ac)	Main delivery system	15,840	12" - 30"	$1.1 M	450 AF	MEDIUM	Over 10 years
12	79	Flood	1350	8" - 12"	$84,000	60 AF	MEDIUM	2012
13	86	Flood	600	12"	$50,000	50 AF	MEDIUM	2014
14	Boardman Main Canal (4,548 Ac)	Re-Reg. Reservoir and pipe Boardman Main Canal	49,740	36" - 84"	$20 M	7,350 AF	LOW	Over 10 years

(INSERT FUTURE CONSERVATION PROJECTS FIGURE)

Figure 5 Future Conservation Projects

2.5 IMPROVING WATER USE EFFICIENCY

2.5.1 Assessment of Delivery System Losses

2.5.1.1 Main Canal

Water is lost in the delivery between the diversions/pump stations and the consumer. The two main areas of losses are operational spills and losses from canals and laterals.

The amount of water lost from operational spills was found from three sources: initial fill, flushing flow, and discharges down the ends of laterals and the drainway at the end of the canal. Initial fill is the volume of water required to fill up the canal for operational use. Once the season ends, this water is lost to seepage or flows down the drainway. Flushing flow is the volume of water used to clean out the canal at the beginning of the season. The WEID typically runs 35 cfs for about a day before the season begins. This water in not used, and is lost down the drainway. Throughout the season, any water in the canal that is not used flows down the drainway and into the Columbia River. Water that is not used by the time it reaches the ends of some laterals is also returned to the Columbia River. Table 32 shows the estimated volume of water that is lost to the District from these operational spills.

Canal transmission losses generally occur due to seepage and evaporation. In November of 1994 a ponded water test was conducted in a high loss area of the Main Canal between Wilson Road Bridge to Headgate 6. This test involved damming the Main Canal, filling the test section, and measuring the change in height over time. Since this test was done in November, evaporation was assumed negligible. Seepage loss was calculated to be around 0.14 cfs per 1,000 ft. In April of 1995 an inflow-outflow loss rate test was conducted on three sections of the Main Canal. This test involved measuring the flow rate at four locations and calculating the change in flow between consecutive stations. Again, evaporation was deemed negligible, and the seepage loss rate was measured to be on average 0.14 cfs per 1,000 ft. Many panels have been replaced in the Main Canal since these tests were conducted. The District's manager has estimated that by replacing these panels, the average seepage loss in the Main Canal has been reduced by 50% (0.07 cfs/1,000 ft).

Ponded water loss rate tests were also conducted on several open ditch laterals during October of 1994. Laterals were a conglomerate of concrete and earth canals in varying condition. Seepage loss rates ranged from 0.01 to 0.10 cfs per 1,000 feet. This data was applied to each lateral on the basis of whether the ditch condition was considered "good" (0.01 cfs/1,000ft), "Fair" (0.055 cfs/1,000ft), or "Poor" (0.1 cfs/1,000ft). A section of the lateral on Headgate #15 was given a seepage rate of 0.2 cfs/1,000 ft. This lateral in particular has been known to have high seepage loss rates where part of the canal travels underground, then re-emerges downstream.

Average evaporation estimates were taken from pan evaporation rate data from the Hermiston weather station. Table 32 gives the total delivery losses estimated.

Table 32 Main Canal Delivery System Losses (Ac-ft)

Loss	Mar	April	May	June	July	Aug	Sept	Oct	Total
Operational	1,042	1,446	1,543	1,109	877	914	1,031	1,252	9,214
Transmission	356	714	739	731	762	752	713	354	5,120
Total	**1,398**	**2,160**	**2,282**	**1,840**	**1,639**	**1,666**	**1,744**	**1,606**	**14,335**

2.5.1.2 Irrigon Delivery System

The Irrigon Delivery System consists of approximately 101,700 linear feet of pressurized pipe ranging from 2 inches to 36 inches in diameter. The piped system prevents much of the delivery losses that occur on the Main Canal Delivery System. It is estimated, however, that there is some water loss due to leakage and other operational losses. In general, a 10 to 20 percent allowance for delivery losses in a piped system is normal. Operation losses were assumed to make up 5%, and transmission losses were assumed to account for 10% of the total flow. Table 33 lists the delivery losses assumed for the Irrigon Delivery System based on average Irrigon Pump Station flows (1999 – 2011).

Table 33 Irrigon Delivery System Losses (Ac-ft)

Loss	Mar	April	May	June	July	Aug	Sept	Oct	Total
Operational	0	18	30	39	46	45	34	12	224
Transmission	1	35	59	78	91	90	68	24	447
Total	**1**	**53**	**89**	**117**	**137**	**136**	**102**	**36**	**671**

2.5.2 Assessment of Extent to Which Water Deliveries are Insufficient for Crop Needs

The adequacy of the water supply to meet demands can be limited by either a facility capacity (ie. canal or pump is not large enough), water rights limitations, and/or flows in the rivers. Total water demands for WEID were determined by summing crop consumptive use and delivery losses.

2.5.2.1 Main Canal Delivery System

Table 34 summarizes the average and peak year's irrigation demand for the Main Canal Delivery System.

Table 34 Main Canal Delivery System Irrigation Volumetric Demands (Ac-ft)

	Mar	April	May	June	July	Aug	Sept	Oct	Total
Average	1,992	4,740	7,172	9,320	11,730	9,556	5,203	2,203	51,917
Peak	2,756	4,797	7,355	10,955	13,134	9,327	5,154	2,538	56,018

The total water rights for the Main Canal Delivery System are listed in Table 7. The duty volume for decrees 79924 and 79925 vary from 3 to 6 ac-ft/acre. Assuming the more conservative 3 ac-ft/acre for these two, the total primary water rights volume for the Main Canal Delivery System

is 61,650 Ac-ft. As seen by the total demand in Table 34, there is enough water rights for the volume of water required in both the average and peak years. As explained in Section 1.2, soil conditions justify WEID in using the full 6 Ac-ft/Ac as allowed in the Umatilla River Decree. Low water levels in the Umatilla River, however, have historically prevented WEID from using the full water allotment from the Umatilla River (see Section 2.5.2.3). WEID has the ability to put to beneficial use the full water allotment of the Umatilla River Decree.

Table 35 lists the irrigation instantaneous flow demand for each month for the Main Canal Delivery System. These numbers were calculated by converting the monthly demand to cubic feet per second (cfs).

Table 35 Main Canal Irrigation Monthly Flow Demands (cfs)

	Mar	April	May	June	July	Aug	Sept	Oct
Average	32	80	117	157	191	155	87	36
Peak	45	81	120	184	214	152	87	41

The maximum flow determined by the primary water rights of the Main Canal Delivery System (see Table 7) is 423.45 cfs. The peak irrigation demand occurs in July and is lower than the max flow allotted by the water rights.

2.5.2.2 Irrigon Delivery System

Table 36 summarizes the average and peak year's irrigation demand for the Irrigon Delivery System.

Table 36 Irrigon Delivery System Irrigation Volumetric Demands (Ac-ft)

	Mar	April	May	June	July	Aug	Sept	Oct	Total
Average	87	320	570	876	1,199	1,000	473	100	4,626
Peak	164	314	588	1,041	1,356	983	465	133	5,043

The total water rights for the Irrigon Delivery System are listed in Table 8. The duty volume for pending permit 45999 is 5,148 ac-ft. This is just 105 ac-ft more than what the irrigation demands are during an expected peak year. Table 37 lists the irrigation instantaneous flow demand for each month on the Irrigon Delivery System.

Table 37 Irrigon Delivery System Irrigation Monthly Flow Demands (cfs)

	Mar	April	May	June	July	Aug	Sept	Oct
Average	1	5	9	15	20	16	8	2
Peak	3	5	10	17	22	16	8	2

The max flow allotted for the pending 45999 permit is 28.59 cfs. It should be noted that the Irrigon Delivery System is a demand delivery system which serves mostly residential customers. Users can turn-on their water when they desire it. This can cause peaks in the delivery rate that may be higher than what is shown here. It is estimated that peak delivery rate to the Irrigon Delivery System is 28.59 cfs.

2.5.2.3 Water Delivery Assessment

As shown by the irrigation demands in Table 34 through Table 37 there is sufficient water rights to meet the demand. The crop needs, however, assume a perfect scheduling of water deliveries. In other words, the exact volume of water is given and at exactly the right time. This would require all the farmers to be familiar enough with their crops and soil to schedule just what they need.

Historically, the District has had difficulty getting enough water to its customers during times of peak need. This peak water shortage is caused by scheduling conflicts as multiple farmers apply water to their crops at the same time. The water shortage is also caused by low flows in the Umatilla River. Low flows in the Umatilla River are discussed in Section 1.1.2.3 and Section 4.2.

There are several ways to alleviate the water shortages caused by peak demands of the system. Some of these include:

1) Decrease the transmission losses of the canal by piping/lining projects;
2) Decrease the consumptive use by encouraging efficient on-farm watering methods;
3) Decrease the operational losses by improving management efficiency of the canal through:
    a. In-line storage through canal gate system,
    b. Re-regulation reservoir.
4) Decrease peak demand through:
    a. On-farm scheduling based on consumptive use information;
    b. Adding meters to the system;
    c. Improving District's scheduling system.

2.6 EVALUATION OF WATER CONSERVATION PROJECTS

2.6.1 Promotion of Energy Audits

WEID encourages local utilities to support energy audits for customers. Energy audits were done on a sampling of pumps as part of the 1996 IRZ Conservation Project. It found that the overall pumping plant efficiency of these pumps was good, but had some pumps that could be improved.

WEID has also looked at the efficiency of its Irrigon Pumping Station. In 2007, J-U-B Engineers found that WEID could save considerable power cost by installing a Variable Frequency Drive (VFD) motor. Umatilla Electric Company also offered a $20,000 grant to pay for the VFD, if it could demonstrate energy savings. A new motor and VFD were installed and in use for the 2008 irrigation season.

WEID has also investigated improvements for the Umatilla Pumping Station. Upgrades were not feasible because of the high capacity of the pumps and motors.

Energy Trust of Oregon, Inc. could provide incentives for reducing energy consumption. As of the time of this report, for approved projects, Energy Trust pays the incentives listed below for energy efficiency upgrades:

- Variable frequency drive added to new or existing pump – up to 50% cash back;
- Drip irrigation system conversion – up to 40% energy savings;
- Liner/pivot system conversion – up to 50% energy savings.

Energy Trust also provides cash incentives for linear and pivot systems as well as wheel and hand-line irrigation system improvements.

2.6.2 Conversion to Metered, Pressurized Deliveries to All Parcels of One Acre or Less

West Extension Irrigation District intends to have all water within the District measured or metered. Measurement of water deliveries in the WEID Main Canal will provide data to the District. This information will be used to maintain its water scheduling and delivery spreadsheets. As a result of the information, the District will be able to better manage its water. This will enhance conservation efforts within the District, thus minimizing pumping costs within the WEID and maximizing the District's commitment to fishery resources in the Umatilla and Columbia Rivers.

Metering the individual deliveries of the District pump stations will allow for the District to manage and conserve water. The year-end power charges will be billed to the customer based on their use as indicated by the water meter, as each system is fully metered. All meters shall be installed in accordance with the manufacturer's recommendations and will be inspected by the District.

The District began implementation of its metering policy in 2002. Grant funds were used for many installations with priority of installation decided by management and approved by the Board of Directors. Known grant funds were exhausted as of 2006. Since it is the goal of the District to be fully metered or measured, existing deliveries will be metered on a volunteer basis or as grant funds are identified. Grant funds will cover at least 50% of the cost of the meter. New deliveries will be metered as installed, with cost paid by the owner or developer.

Table 38 Meters to be installed as of Dec. 2011

System	Number of Meters	Cost, Each	Total Cost
Irrigon System	271	$900	$243,900
Southshore Drive	27	$950	$25,650
Honeywilde	18	$900	$16,200
RL2/Division	57	$850	$48,450
Boardman 16-D	8	$900	$7,200
Total	**381**		**$341,400**

The District plans to install meters on the Boardman 16-D pump system in 2012. The new meters will be paid by the District.

2.6.3 Piping or Lining Earthen Canals to Reduce Losses

The District has a very small amount of earthen laterals (less than two miles total). There are thirty open laterals (approximately 18 miles) in the District that are concrete-lined which vary in condition from good to poor.

West Extension Irrigation District has adopted a long-term goal of converting the open ditch laterals to a piped, closed system. The implementation of this plan will encourage a conversion to more efficient irrigation practices and will eliminate tailwater at the end of the laterals.

The Boardman Master Plan identified many piping projects. The estimated water savings for each of these is summarized in Table 39. These projects will likely require a mixture of funding sources. These are listed and discussed in Section 2.6.9.

Table 39 Piping Projects Water Savings

Lateral	Project Cost	New Pipe Sizes (in)	Pipe Length (ft)	Estimated Water Savings (Ac-Ft/year)	Cost of Water Savings ($/Ac-ft)
5, 7	$353,000	4 - 15	10,100	650	$543
9	$98,000	8 - 12	3,500	160	$613
11	$120,000	8 - 12	4,000	200	$600
12	$76,000	4 - 8	1,900	160	$475
13	$86,000	4 - 8	3,000	200	$430
15	$465,000	4 - 24	8,900	320	$1,453
17, 18	$381,000	8 - 18	8,300	372	$1,024
21	$252,000	8 - 15	6,900	447	$564
24	$359,000	8 - 21	9,400	2,106	$170
28, 29	$262,000	4 - 15	11,030	365	$718
30, 31	$549,000	6 - 18	13,200	796	$690

2.6.4 Modifying Distribution Facilities and District Policies

The District has been updating its distribution system and adopting pertinent policies.

2.6.4.1 Open Ditches

The District has its Boardman Master Plan that will address how the open laterals in the Boardman area will be enclosed. Enclosure of any open lateral, by either the District or private funding, has to meet WEID standards. As open ditches are enclosed, conversion from flood to sprinkler irrigation will be required.

2.6.4.2 Pumping Stations

Pumping stations have specific requirements, including the installation of VFD on all pumps. Meters are also required, not only at the pump, but at each individual turnout.

2.6.4.3 Control Gates

The District has four Langemann control gates on its system. Additional gates will provide water measurement information as well as canal level control. Gates at the Relocation Canal (head and tail) and at Three Mile Dam are in planning stages, pending funding.

2.6.5 Provision of On-Farm Irrigation Scheduling Assistance

On-farm losses in the District occur in one of these ways:

1) Over-use of the water by leaving water running too long, leaks or breaks in the system, or worn sprinklers systems;
2) Surface run-off from flood irrigation;
3) Deep percolation of applied water due to errors in irrigation scheduling.

The District includes information about the first item in their annual newsletter and works with the irrigators to address the first two issues. The ditchriders monitor the individual use of the irrigators daily. If problems occur, the ditchrider contacts the irrigator and provides basic information. If problems continue, the District has policies that prescribe fines to offensive irrigators. Fines have been levied in past years. Water shut-off is a potential if problems are not repaired.

There are written policies to provide guidance for new systems that are available at the District office. Local suppliers provide assistance with designing of new systems. In 1999 and 2000, the District participated in a program that included the Bureau of Reclamation, and California Polytechnic State University's Irrigation Training and Research Center (ITRC). Students from ITRC provided field evaluations of irrigation distribution uniformity for growers in the District. Several types of irrigation systems, including center pivot, linear move, hand lines wheel lines and drip systems, were evaluated for efficiency. Grower results were discussed with the landowners and shared with the District. Repairs and changes to several systems resulted from this work. This was a successful program and the District would like to find funding to repeat this program in 2013 or 2014.

Many of the flood irrigators have tailwater running off their fields onto other properties or drainways. Some of the on-farm ditches are not maintained properly from year to year and cause inefficiencies. District crews do not have time to monitor each flood property and the District does not have specific guidelines for flood irrigators. This is an area that needs attention.

The District works cooperatively with Umatilla County Soil and Water Conservation District and Morrow County Soil and Water Conservation District to promote their programs, including on-farm scheduling. The Morrow County Soil and Water Conservation District has co-sponsored

several workshops with the District, including a flood irrigation workshop, water conservation practices for small landowners, water scheduling and water sampling. These workshops will continue, typically every few years. Additionally, District personnel are asked to visit with landowners who are having difficulty with scheduling to review their needs and identify ways to better schedule their irrigation needs. Funding for these programs has been through the EQIP program and/or using District funds.

2.6.6 Construction of Re-Regulating Reservoir

As identified in the Boardman Master Plan, the District could benefit from storage such as a re-regulation reservoir. As the Boardman Master Plan is implemented and more acreage has "on-demand" use directly from the Main Canal, a re-regulation reservoir will be necessary to provide peak demands without dramatic changes in the water level of the Main Canal. A re-regulation reservoir would ideally be constructed to the side of the Main Canal in a natural drainage channel. It most likely would require a pumping station to lift water from the Main Canal into the reservoir (or visa-versa). The reservoir could be used to primarily store surplus water that would otherwise run down the end of the Main Canal. In order to serve the Boardman area it is estimated that a 300 Ac-Ft reservoir would be sufficient size to provide for one to two days of storage for the Boardman Area. In combination with the Boardman Master Plan, a re-regulation reservoir and piping the last 10 miles of the Main Canal would allow the District to capture operational losses thus conserving 7,350 Ac-Ft per year. The approximate cost for this project is $20 million. This project will require a mixture of funding sources. These are listed and discussed in Section 2.6.9.

2.6.7 Rate Structure

The District's rate structure provides for the following charges as of 2011:

Customer or delivery charge	$260
O & M Annual fee	$47 per acre
Pressurization fee	$25 per acre with a one-acre minimum
System replacement fees	$2.50 - $7.50 per acre with a one-acre minimum

In addition, customers on a pressurized system pay their pro-rated share of the power bill for that system. If the system is fully metered, the power bill is based on use. If the system is not fully metered, the power bill is based on water right acres. The District is actively working to fully meter each of its pressurized systems as experience shows this to be a good conservation tool.

In 2001 and 2002, the District worked on its rate structure and considered various rate proposals. Due to the facts that 1)the District does not have storage, 2) needs to take the water when it is available and 3) cannot meet current demands, the current rate structure was determined to be the best and provides certainty.

A rate structure designed around a charge for volume of water used is not possible because not all deliveries are metered. In addition, this type of structure is not appropriate for WEID. Most

of the District expenses, other than power, are fixed expenses. The District would suffer financial problems in both dry and wet years if the charges were based on water use. In wet years, the use would go down and in dry years, the District doesn't have the water to deliver.

2.6.8 Other Methods to Improve Water Use Efficiency

The District is considering reduction of operational losses. Improvement of the ditchrider schedules and preparing a daily and monthly water use budget is important to this reduction. While the District has information from its telemetry and its ditchrider log books, this information has not been compiled in a timely manner to allow for better management of the resource.

The District has a nozzle exchange program where irrigators can bring in their worn nozzles and replace them for new. The new nozzles are 1/8-inch nozzles and are provided free of charge to the customer. This is funded by the District and costs less than $300 per year.

Installing telemetry stations at larger water user sites is a consideration. BPA has incentives to assist the landowners with soil moisture monitoring and scheduling. By providing this information instantaneously to the District and the farmers, advance planning can be done for better management of the Main Canal. Funding for this work will be provided on a 50/50 cost share basis with BPA and the landowner's delivery system.

2.6.9 Possible Funding Sources

Most of the projects listed in Section 2.6 require a funding source in order for the District to implement them. Possible funding sources include the following:

- USBR WaterSmart program;
- Bureau of Reclamation Field Services program;
- Oregon Watershed Enhancement Board (OWEB);
- NRCS Agricultural Management Assistance (AMA);
- NRCS Agricultural Water Enhancement Program (AWEP);
- NRCS Environmental Quality Incentives Program (EQIP);
- District funding;
- Private funding;
- Public funding; and
- Energy Conservation Funding.

2.6.10 Allocation of Conserved Water Program

The Allocation of Conserved Water Program is a voluntary program that can benefit the water user and provide instream benefits. Oregon law allows a water user who conserves water to use a portion of the conserved water on additional lands, lease or sell the water; or dedicate the water to instream use.

The District has analyzed the benefits of OWRD's Allocation of Conserved Water Program. There are two ways the program could be used to benefit the WEID.

1) Use of the program within the District. While this would enable the District to add additional acres, it is not considered viable for lands taking delivery from the main canal at this time. Water that would be conserved by the District would need to be used by the District to shore up its own water supply. The District relies on its supplemental water during the late spring and summer months, indicating that the primary source water is not sufficient to meet demand. However, this does not preclude the District from considering use of the program in the future if it benefits District patrons. Use of the program on the Irrigon Pressurized System will be considered.

2) Purchase of water from another landowner under the program. The District is very interested in purchasing additional water, and the Conserved Water Program may make such water available for purchase. Additional water would be used as a supplemental supply to meet irrigation demands within the District as opposed to irrigating new land.

The District will continue to consider the program and develop policies if the Allocation of Conserved Water Program becomes of interest to the District in the future.

2.7 SCHEDULE FOR IMPLEMENTING OF PROPOSED CONSERVATION PROJECTS

Conversion to a metered system is a long-term goal of the District. Due to the cost, it will take time. As of 2011, there are 271 unmetered deliveries on the Irrigon Delivery System and 109 unmetered deliveries on District pressurized systems along the Main Canal. The District will meter the 7 deliveries off 16D in 2012. Cost will be $6,300. The remaining 373 meters are for deliveries under two acres. The cost of the meters will be $336,000. These meters are a low priority until funding is identified.

In 2010, the District began looking for funding to start enclosing the laterals in Boardman. Lateral 17 funding is the first focus. WEID plans to start this project in 2012. Other laterals will be enclosed as funding is found. The expectation is that one lateral will be enclosed every two to three years.

Gate control on the Relocation Canal and at the headworks at Three Mile Dam will assist in water management. Funding assistance will be needed. This project is five or more years out.

In 2012, the WEID will begin its focus on reducing operational losses. The first step will be redesigning the ditchrider logs and implementing a daily water budget spreadsheet. Ditchriders will be asked to assess lateral losses daily and work to minimize them.

Installation of telemetry stations at larger irrigator sites has been done by other irrigation Districts and WEID is interested in this technology. A meeting will be held with BPA, a prime funding source, in 2012 to see if this is a possibility.

2.8 PUBLIC EDUCATION PROGRAM

The following are currently in use:

- The District puts out two newsletters per year and includes information about water conservation at least once per year;
- Annual and special meetings are held periodically to address District issues. Conservation is often a part of these meetings;
- Each new water user meets with a ditchrider where policies and procedures are reviewed. A conservation component is part of this meeting;
- Morrow County Soil and Water Conservation District sponsors an annual informational session in the District that WEID supports.

The following are ideas that WEID can utilize in its public education program. An estimated implementation schedule is shown in parenthesis:

- Development and use of a webpage (September 2013);
- Obtaining brochures and having them available at the office (July 2013);
- Providing speakers at local events to promote conservation (June 2013).

2.9 PROGRAM FOR EVALUATING EFFECTIVENESS OF CONSERVATION MEASURES

Each conservation measure has been and will be evaluated during the planning stages for effectiveness and efficiency. Evaluation parameters may vary from project to project. Following is a matrix to be used in the evaluation of conservation measures or projects.

Criteria	**Considerations**
Type of customer	Who will the project affect? What is the cost to the customer and can they afford the cost? Will the measure provide benefit to the targeted customer group? How will the customer be notified and feedback obtained?
Cost of the conservation project	What is the cost of the project? How will it be funded? Are funding partners available? Does the project need to be spread over a 2-3-year period to obtain adequate funding?
Result of the project	What is the expected result of the project? If water savings, how much do we expect? Are there other side or related results?
Effectiveness of the project to the District and/or patrons	How sure are we that the project will accomplish what is planned? Is this the most effective way to get the desired results? What are the other choices and have they been considered? How can the effectiveness be measured?
Consistency of the project with District	Is this project consistent with the goals of the District? Does the planning for this project follow the District policies and best

policies	management practices?
Timing of project	How long will the project take? When will it be done?
Staff and operational resources	Do we have the crew to do the job in the period needed or allotted? Will we need to hire? Will additional equipment be needed? What other demands will we have on our crew or resources at the time this job will be done?
Impact on District revenue or expenses	Will this project impact the District's revenue? Will this project impact the District's expenses? What, if anything can be done to mitigate any negative impacts?
Public values – Patron acceptance	Is there a public perception issue with the project – negative or positive? If negative, now can we address this? If positive, how can we build on this?

All water conservation projects will be evaluated upon completion to determine:

- If the project came in within budget;
- If the desired and/or expected results were seen;
- If other benefits were noted;
- Provide an analysis of the project for future benefit.

SECTION 3.0 - WATER CURTAILMENT ELEMENT

3.1 PAST SUPPLY DEFICIENCIES AND CURRENT CAPACITY LIMITATIONS

The District is confronted with continuing challenges associated with drought and water scarcity. The challenges are intensified by a rapid population growth within the WEID. Annually, the District makes decisions based on water availability and demand.

3.1.1 Droughts

WEID experiences a major drought once or twice every ten years. Drought emergencies were declared in Morrow County in 1968, 1977, 1988, 1992, 1994, 1997, 2001, 2003, 2005, 2007 and 2011 (although the year turned moist).

History of droughts in Oregon show the following information:

1904-05: drought period of about 18 months
1917-31: very dry period punctuated by brief wet spells (1920 and 1927)
1939-41: three-year intense drought
1965-66: three-year drought
1976-77: brief, but very intense drought
1985-94: generally dry period, capped by droughts in 1992 and 1994
2001-02: the second most intense drought in Oregon's history
2002-05: Drought conditions continue, more severe in 2005

3.1.2 Drought Historical Management in WEID

During average flow years, most irrigators received water throughout the season, with an every other week rotation schedule for flood irrigators. In dry years, delivery in some areas was scant and crop damage occurred.

In 1977, severe drought conditions occurred and the entire District was placed on a rotation. Irrigators received water every other week, regardless of type of on-farm delivery system. Operational and management spills were eliminated, which required much more intensive water control management than normal and many hours of overtime. Deficit water supply conditions occurred on some field crop acreage resulting in crop loss and reduced yields.

Drought conditions occurred in 1994. The District supplied the minimum necessary water supply to all users. Water was distributed evenly to all users on a regular rotation or on-order basis. Operational and management spills were eliminated, which required much more intensive water control management than normal and many hours of overtime. No user had to forego their water delivery. All irrigators were asked to use extreme care in their use of the water. However, deficit water supply conditions occurred on some field crop acreage resulting in reduced yields.

In 2007, large growers in the District planted crops that used water evenly throughout the season. By planning ahead, a severe water shortage was eliminated. Other conditions, as in the 1994 drought, were put in place by the District.

3.1.3 Supply Deficiencies

The District currently experiences shortages in water, especially in July and August. These are managed with water scheduling and strict adherence to delivery criteria (8.5 gpm per acre). In 2010, the District cut its seasonal water allotment to 3.5 Ac-ft for sprinkler and 6.0 Ac-ft for flood. This is another way to address water shortage issues.

3.1.4 Current Capacity Limitations

The operational system of the WEID has capacity for its needs. The Main Canal can convey 375 cfs. The capacity of the Irrigon Delivery System is 28.59 cfs. The Phase One Pumping Station has a capacity of 147 cfs. The UPS has a capacity of 90 cfs.

3.1.5 Emergency Water Loss Situations

At times, emergencies along the Main Canal occur and water has to be shut off. Three instances have occurred in the past 15 years:

1) A canal breach in Boardman shutting water off to Boardman irrigators in July of 2002;
2) The siphon under I-84 washed out and was shut down for three weeks in March/April 2006 at water start-up;
3) A private pressurized pipeline crossing the Main Canal blew apart and caused a landslide into the Main Canal, filling the canal with sand. The system was shut off for five days in 2011.

These are good examples of what can happen, but certainly not the only ones. Near misses have been caught by diligent ditchriders and the canal shut down for emergency repairs for a day or two.

In emergency cases, the District continues to deliver water to as many areas as possible. For instance, water can be delivered to the siphon at I-84 and spilled there in order to keep the upper canal running while the Boardman canal is being repaired.

In the canal breach situation, the District was able to purchase water from two irrigators that had Columbia River pipelines over the Main Canal and could release some water into the Main Canal. That water was delivered to critical crops. This approach was allowed through Water Resources Department because Morrow County had declared a water emergency and their statutes allowed for an alternate source of water when the primary source failed.

In preparation for future problems, the District should file for diversion of all alternate water sources in order to have these available.

The District has a list of local contractors to assist with emergency work on the canal and has successfully used those contractors to repair the canal in the shortest possible time.

3.2 DESCRIPTION OF SITUATIONS THAT TRIGGER IMPLEMENTATION

3.2.1 Planning for Drought

All of the irrigation Districts in the basin and the Umatilla County watermaster meet monthly to review current issues pertaining to irrigation water, i.e. supply, diversion, data, records, pending rules, innovative ideas, etc. This is an on-going program, and especially when there is a subject that is essential for review, such as a drought condition.

3.2.2 Information Sources

The WEID cooperates closely with NRCS and the USBR in maintaining current awareness of snowpack in the upper watershed.

NRCS and U.S. Weather Service provide public forecast information for potential runoff from January through early spring months in all river basins in Oregon. This information is readily available on computer Internet web sites for USBR, USGS, NRCS and US Weather Service.

Storage in the reservoirs and river flows are readily available on a continuing basis through the USBR Hydromet, on-site visits and through NRCS Sno-tel System data files. Runoff projections are known immediately upon release via the Internet. When the data appears to be bad, on-site visits are made by District staff to personally read or verify the gauges.

3.2.3 Triggers for Drought

These are the triggers that indicate a drought season is imminent:

- The lack of low elevation winter precipitation becomes critical at 50% normal by March 1;
- On March 1, McKay and Cold Springs Reservoirs storage is at or below 75% of normal;
- The projected runoff for April - June reaches 75% of normal.

3.3 DESCRIPTION OF PROCEDURE USED TO ALLOCATE WATER

3.3.1 WEID Curtailment and Allocation Plan & Procedures

Upon recommendations of the WEID staff, the Board of Directors makes the final decision and gives direction for curtailment and allocation of water each year based on the projected reduced water supply.

When a drought is realized, the WEID will begin asking for voluntary cutbacks from users before going on a full-scale unilateral cutback program.

3.3.1.1 Curtailment Procedures

- Implement an intensive program management and control of all water within the District;
- Decrease operation and management spills leaving the District to near zero;
- Provide educational information to District users on how to reduce water use;
- Intensify aquatic weed control along canals and laterals to reduce water use consumption of riparian area weeds, following Federal, State and local laws;
- Evaluate the potential for providing financial incentives to users for reduced delivery. Examples of this would be reducing annual water charges in order for irrigators to use their wells or city water sources, or look for energy incentives.

3.3.1.2 Allocation Procedures

Allocation steps will be taken in this order:

1) Voluntarily reduce irrigated acres or reduce water supply;
2) Voluntary sharing of water;
3) District implementation of a water schedule program that allocates water among irrigators on a rotation basis;
4) District implementation of a reduced water supply to municipal and industrial uses;
5) District allocation a reduced water supply uniformly to all acreage;
6) District continues allocated water supply and implements a rotation of all irrigators;
7) Water will be shut off when it is deemed impractical to maintain canal and lateral flow for deliveries to users.

3.3.2 Evaluation

WEID will evaluate its procedures at end of the drought year irrigation season to determine effectiveness of decisions and procedures. Evaluation will include the effects on the water users, stream flows, and on fish and wildlife in District owned and operated facilities.

SECTION 4.0 - WATER SUPPLY ELEMENT

4.1 DEMAND FORECAST

The future 20-year District water demand includes the delivery system demand due to routine system losses (District controlled demand), crop irrigation demand including crop ET and on-farm irrigation system efficiencies (agricultural demand), demand from urbanization within the District service area (urbanization demand), and changes in the balance of supply and demand caused by climatic factors (climate change demand). These four demand sources are discussed below.

4.1.1 District Controlled Factors

A source of water demand to the District is the loss of water in its Main Canal Delivery System from system operations. The loss includes operational spills such as initial Main Canal recharging and clean-out that is needed as part of normal canal operation, and transmission leaks, and other end-of canal losses (Section 2.5.1.1). The Irrigon Delivery System is a piped pressurized system and therefore, has much less loss than the Main Canal.

The total delivery loss in the Main Canal is currently estimated at 14,335 acre feet per year (Table 32). Between 1997 and 2011, the total District diversions into the Main Canal ranged between 32,148 (1997) and 40,162 (2001) acre feet (Table 12). It is clear that the Main Canal delivery losses constitute a large portion of the annual diversion volumes. For the Irrigon Delivery System, the comparable values are 671 acre feet of delivery losses (Table 33) and between 3,232 to 5,944 acre feet of diversions (Table 11). The relative losses from the Irrigon Delivery System (21 and 11 percent, respectively) are much less than from the Main Canal (36 and 45 percent, respectively) due to the piped and pressurized nature of the Irrigon Delivery System.

The District's continuous maintenance improvements and system upgrades (Section 2.6) are expected to reduce the delivery losses over the next 20 years. As a result, more of the diverted water will be available for crop irrigation. Additionally, the District doesn't plan on constructing new canals or laterals that may increase system losses. Examples of relevant system upgrades and improvements are listed below.

Main Canal Renovation – In 2003, the District increased its assessment base charge by $10 in order to put $100,000 per year into renovation of its Main Canal. Annually, 120-180 concrete panels are replaced at a cost of $600-800 each. Worn headgates and outlets are replaced as well. During this time, the District has progressed from responding to canal failures to selecting areas of canal for replacement. While there are areas of concrete that are deteriorated, the replacement is controlled and can be planned from year to year. These improvements are expected to reduce canal leaks. The District plans to conduct another leak test of its canal system in 2013 to compare with the 1994-1995 results.

Use Reduction Through Metering – The District has a plan for full metering of its delivered water (Sections 2.2 and 2.6.2). As development occurs, metering is required. Currently, many of the pressurized systems are fully metered. Though the larger users on both systems are already metered or measured, savings will still occur by the metering program since metering encourages conservation.

Main Canal Laterals – The District developed its Boardman Master Plan to address anticipated development in the Boardman area. This plan indicates how the District open laterals will be replaced with piped systems. Priorities were established for the laterals based on water conservation possibilities. Enclosing these and other districts' laterals will decrease irrigation demand.

Management Actions – The District collects daily and monthly canal use information to assist the ditchriders in better management of the canal water deliveries. The District will work to create a more frequent information sharing system so it can be used by management to reduce canal spills.

Boundary Change – The District is in the process of changing the federal boundaries on its Main Canal Delivery System to match the state boundaries. The boundary change will also assure there are lands to take water as urbanization affects the irrigated land base. There will be no expansion of irrigated acres due to the boundary change and therefore, no additional water demand. Water rights will be transferred to new land as former lands are fallowed on a one-to-one basis.

4.1.2 Agricultural Trends

The District has primary and supplemental water rights to provide water to 9,234.8 acres of farmland through its Main Canal Delivery System and an additional 1,144 acres through its Irrigon Delivery System (Tables 7 and 8). Although the total acreage under irrigation may change slightly from year to year due to transfers, fallow acreage, and rotations, there are no plans to expand the total District irrigated acreage during the next 20 years. Table 40 summarizes the total irrigated acres between 1998 and 2011. The irrigated acreage shown on this table is less than the 10,378.8 acres on which the District has a water right due to annual changes in the extent of fallow land.

Table 40 Total District Acreage Irrigated by the Main Canal and the Irrigon Delivery System

Year	Main Canal (AF)	Irrigon Delivery System (AF)[1]
1998	8,155	949.6
1999	8,365	966.4
2000	8,665	962
2001	7,867	958.2
2002	8,276	959.1
2003	8,726	949.9
2004	8,653	948.9
2005	8,680	931.6
2006	8,737	896.45
2007	8,746	907.45
2008	8,734	921.7
2009	9,126	938.7
2010	9,162	938.7
2011	9,119	936.9

[1] These acreage values do not include an additional 159.1 Acres of irrigated land supplied by the District (from District Crop reports)

The District's average and peak annual crop ET needs served by the Main Canal between 1994 and 2011 are estimated at approximately 28,000 and 30,000 acre feet, respectively (Tables 18, 19, and 16). The three crops pasture, alfalfa/hay, and corn account for more than 80% of the District's average and peak ET needs served by the Main Canal. The relatively greater need of these crops is partly because of the greater ET need of these crops compared with other crops but mostly because of their larger acreage.

The District acreage under the three crops served by the Main Canal between 1999 and 2011 is listed in Table 41 and shown pictorially in Figure 6. The main change for these crops is the increase in corn and decrease in alfalfa/hay acreage. The ET requirement of corn in the District is significantly less than alfalfa/hay (Table 18). Gradual change may occur in the mix of crops over time due to changes in commodity prices and overall economy or climatic changes. It appears that there has been a gradual trend within the District toward growing more water efficient crops. Therefore, the District-wide crop ET demand is expected to decrease over the next 20 years.

Table 41 Acreages of the Greatest ET-Demand Crops Served by the Main Canal

Year	Pasture	Alfalfa/Hay	Corn
1999	3512	1957	707
2000	3341	2008	739
2001	2878	2543	827
2002	3022	2679	826
2003	3014	2715	1035
2004	2948	2693	1035
2005	2964	2450	1294
2006	3138	2080	1006
2007	3169	1890	1705
2008	3123	1790	1523
2009	3142	2220	1777
2010	3226	1825	1697
2011	3560	1287	1420

[1] These acreage values do not include an additional 159.1 acres of irrigated land supplied by the District.

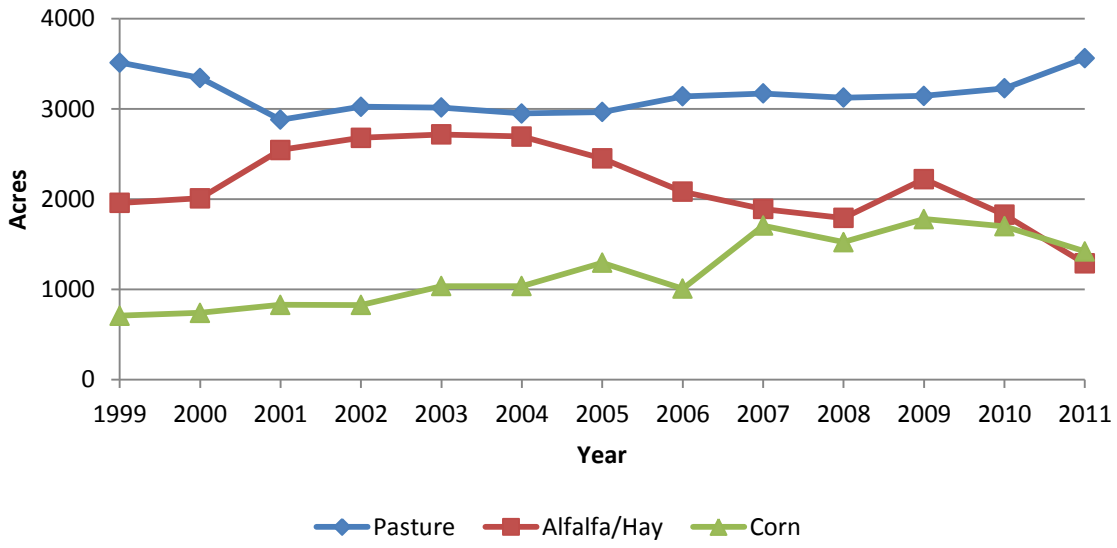


Figure 6 Change in Acreage of Irrigated Pasture, Alfalfa/Hay, and Corn

The total District's average and peak annual crop irrigation requirements (Crop ET plus system inefficiencies) served by the Main Canal are 37,582 and 41,682 acre feet, respectively (Table 23 and 25). The highest water-use crops served by the District Main Canal are again pasture, alfalfa/hay, and corn. Together, these three crops account for 30,177 and 33,514 acre feet (or more than 80%) of the average and peak crop irrigation requirements, respectively.

The general trend in the District, as elsewhere in the Umatilla Basin, has been to convert the irrigation systems to more efficient ones. The percentage of District land served by the Main Canal under flood irrigation, the least efficient system (Table 15), has decreased over time. Table 42 and Figure 7 show the acreage under flood, center pivot, and set-sprinkler systems between 2001 and 2011. The most notable change is a general reduction in flood and significant increase in sprinkler-irrigated acres. As the conversions occur, the increased irrigation system efficiencies allow for reductions in water demand.

Table 42 Crop Acreage Under Flood, Center Pivot, and Sprinkler System Served by the Main Canal

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Drip	72	11	23	23	25	25	25	44	55	80	252
Flood	2630	2634	2645	2645	2645	2586	2385	2385	2446	2285	2457
Sprinkler	1779	2644	2671	2598	2623	2739	2737	2701	3021	3090	3108
Pivot	3387	3387	3387	3387	3387	3387	3599	3604	3604	3707	3302
TOTAL	**7868**	**8676**	**8726**	**8653**	**8680**	**8737**	**8746**	**8734**	**9126**	**9162**	**9119**

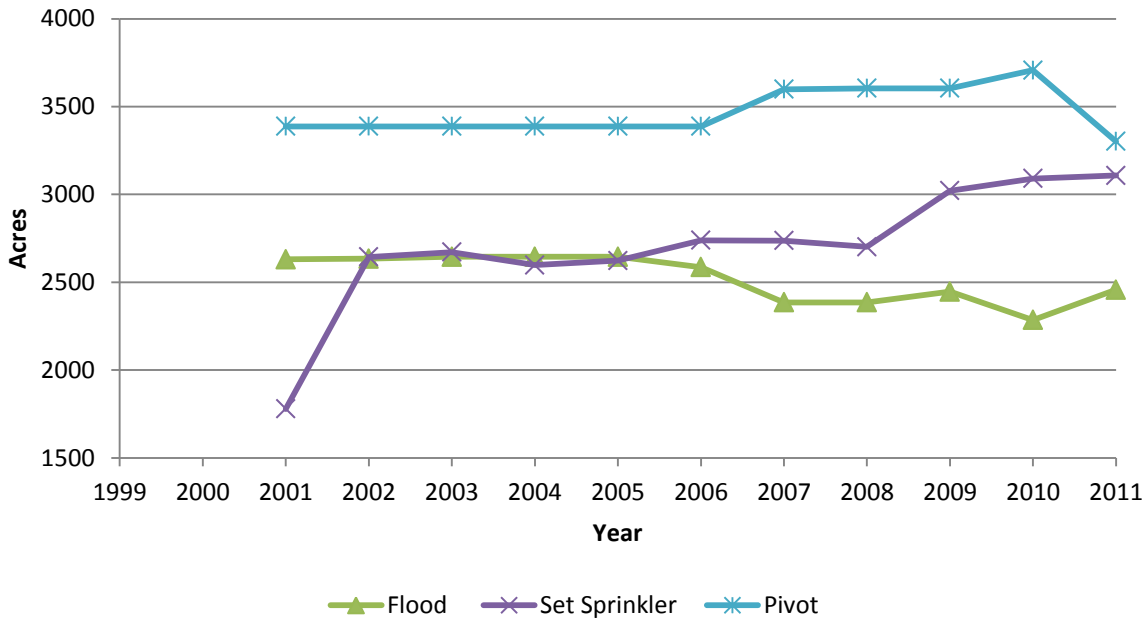


Figure 7 Crop Acreage Under Flood, Center Pivot, and Sprinkler System Served by the Main Canal

The District's average and peak crop irrigation needs served by the Irrigon Delivery System between 1994 and 2011 are estimated at approximately 3,955 and 4,372 acre feet, respectively (Table 24 and Table 26). The crops grown in that area include pasture, corn, melons/berries, and household lawns and landscaping (Table 17). The Irrigon Delivery System provides water to a more urbanized area compared with the rest of the District. As a result pasture and household lawn and landscaping areas comprise the greatest acreage. These crops also have relatively high crop ET values. Together they account for more than 75% of the District's average and peak irrigation needs. Due to the urban areas served by this system, the acreage

under these two crops is expected to remain steady or increase in the future with a corresponding increase in the total demand.

The above discussion indicates that the District's crop water demand served by the Main Canal is expected to decrease from the current average and peak values of 37,582 and 41,682 acre feet, respectively, during the next 20 years due to improved management of crop irrigation needs. The demand served by the Irrigon Delivery System will likely remain at current values or gradually increase with increasing urbanization.

4.1.3 Urbanization Trends

Approximately 2,500 agricultural acres of the District served by the Main Canal is zoned 2.0 and below (lots of minimum 2 acre in size) as included in the District's Boardman Master Plan. This development is targeted toward lands that are currently flood irrigated. Since the average annual use of water on flood ground is 7.0 acre feet per acre and average for sprinkler irrigated in the same area is 3.5 acre feet per acre, the District expects a net water saving on the developed land.

The District expects more development of small acreage properties in the future, resulting in more water users and more pressurized systems. Based on District's records, the number of District water user accounts less than 5 acres in size has more than doubled in the last 20 years to 970. This has occurred mostly within the Irrigon Delivery System service area. If we assume the same rate of urbanization within the District's Main Canal service area over the next 20 years, the number of households will then be expected to double. However, no significant net increase in the irrigated acreage is expected.

4.1.4 Climate Trends

The projected changes in climate and the rise in air temperature have potential consequences for Oregon's water resources according to Oregon's Integrated Water Resources Strategy (IWRS). Figure 8 is excerpted from the State Integrated Water Resource Strategy (IWRS) document. It shows the dramatic changes in flow regime in a hypothetical stream in Oregon. The temperature rise will reduce winter snow pack that provides natural storage and will cause earlier outflow of rain water and melt water from the basins. Based on this graph, the hydrograph peak is predicted to occur earlier in the season, perhaps by as much as approximately one month earlier, than currently observed.

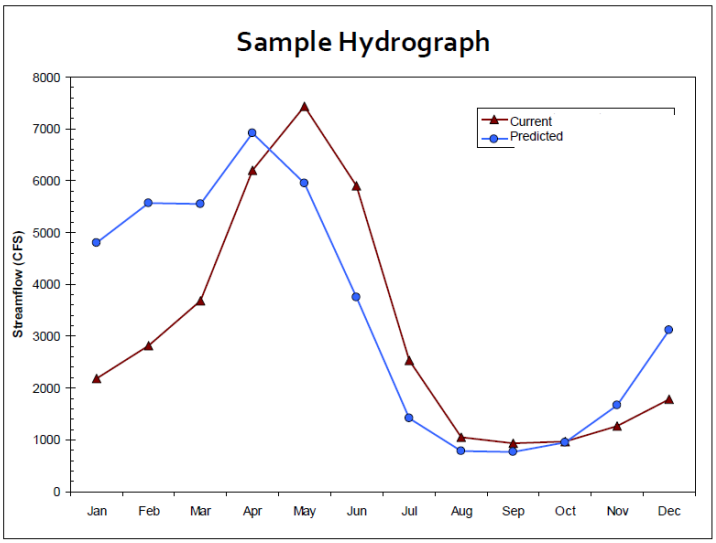


Figure 8 Hypothetical Changes in Stream Hydrograph (Source Oregon Draft IWRS 2011)

The rise in air temperature in the Umatilla Basin is expected to change the flow regime (flow rate and timing) and stream flow availability to the District during the irrigation season. The flow regime is currently suitable to provide the District's water during the early season with declining availability in later months. Figure 9 shows the average monthly total Main Canal demand supplied by the Umatilla River showing the peak of demand also during May. A shift of the river flow hydrograph to earlier months will exacerbate the District's water shortage problems.

The climatic changes will also result in a longer growing season causing the total irrigation water demand to increase and also changing the timing of crop water need relative to availability. Moreover, there will be additional pressure on water use throughout the basin causing reductions in irrigation return flow on which the District so critically depends.

The IWRS does not provide specific predictions of the timing and extent of the rise in temperature and the resulting changes in stream flow in various parts of Oregon. Therefore, the District doesn't foresee drastically changing its policies or plans to accommodate the impacts of climatic change. However, the next 20 years will provide the necessary time frame within which the members' water uses and District's water delivery practices will be improved to be as efficient as possible. Additional demand for water as a result of climatic changes will have to be met through local and regional solutions.

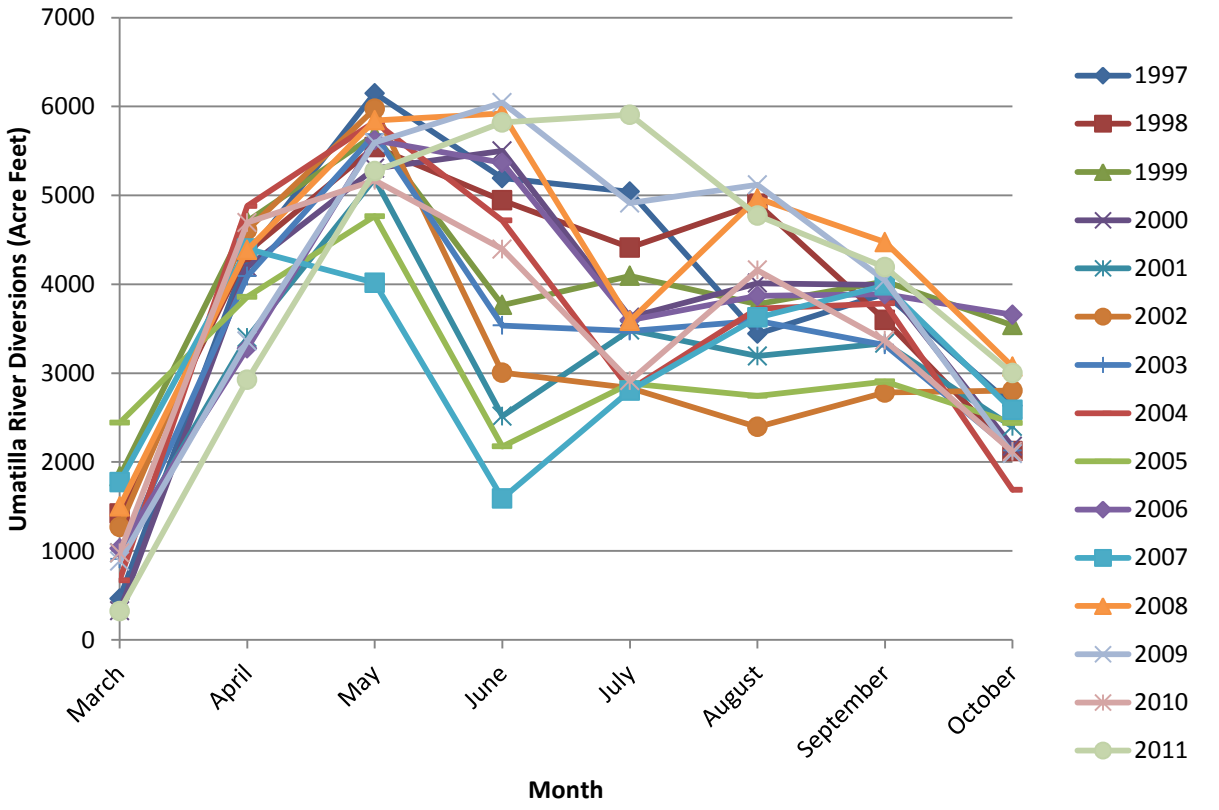


Figure 9 Main Canal Monthly Crop Irrigation Demand

4.2 COMPARISON OF PROJECTED NEED TO AVAILABLE SOURCES

The projected future crop water demand plus the delivery losses for the Main Canal service area add up to total annual average and peak values of 51,917 and 56,017 acre, respectively. The District has a total of 64,218.95 acre feet of primary water right out of the Umatilla River into its Main Canal (Table 7). The District's average monthly demand flow rate (Table 35) is greatest in July at 214 cfs. The maximum flow permitted by the District's water right is 295.67 cfs for the 1909 water right (Table 7). As discussed in the previous section, the District expects that its demand will decrease over the next 20 years. Therefore, on an annual and monthly basis, the District's "paper" water right is sufficient for its current and projected 20-year need. Finally, the District's Main Canal Delivery System does not have a delivery capacity limitation. The Main Canal has a maximum flow capacity of 375 cfs and the Umatilla Pump Station has a current capacity of 90 cfs. The District doesn't expect changes to its Main Canal Delivery System to accommodate future demand.

Although the District's water rights are adequate to meet its demand, its actual diversions have been considerably less. Table 12 includes the Main Canal annual diversion volumes between 1997 and 2011. Figure 10 shows this data, the District's total Umatilla River water right, and the average and peak demand volumes. As is shown, the District's annual diversion volumes between 1997 and 2011 were considerably less than the District's water right or demand. The

difference between the total diversions and the average demand ranged from approximately 12,000 to 20,000 acre feet between 1997 and 2011.

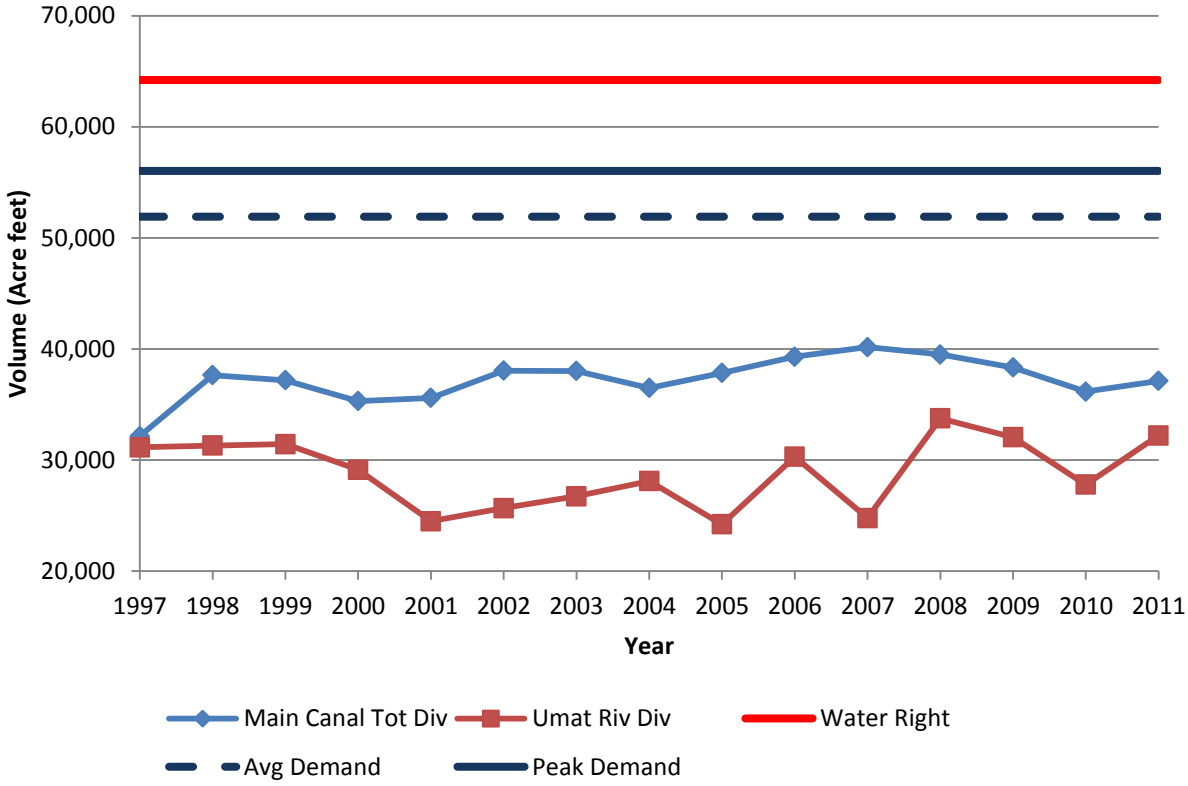


Figure 10 Annual Diversions, Umatilla River Water Right, and Average and Peak Demands

On a monthly basis, the Main Canal diversions between 1997 and 2011 were close to demand only during March and October and only for a few years. The demand greatly exceeded the diversions during most other months. Table 43 lists the monthly diversions from 1997 through 2011 and the average demand volumes.

Table 43 Monthly Diversions into Main Canal and the Average Demand

Average	March	April	May	June	July	August	September	October
Demand	**1,992**	**4,740**	**7,172**	**9,320**	**11,730**	**9,556**	**5,203**	**2,204**
1997	463	4,320	6,148	5,404	5,069	4,124	3,985	**2,635**[1]
1998	1,420	4,362	5,543	5,919	7,483	6,772	4,019	2,123
1999	1,838	4,710	5,680	5,861	6,180	5,218	4,146	**3,547**
2000	326	4,192	5,611	6,465	6,917	5,575	4,048	2,175
2001	976	3,400	6,236	5,619	6,446	6,181	4,334	**2,398**
2002	1,270	4,610	5,974	5,725	6,729	6,305	4,631	**2,803**
2003	910	4,090	5,687	6,792	7,833	6,929	3,650	2,130
2004	669	**4,880**	5,830	5,752	7,282	6,002	4,382	1,688
2005	**2,442**	3,858	4,938	6,600	6,833	6,699	4,038	**2,440**
2006	1,027	3,279	5,621	6,311	7,879	6,832	4,661	**3,689**
2007	1,775	4,401	5,552	6,689	7,398	6,554	**5,207**	**2,586**
2008	1,498	4,387	5,843	6,556	7,204	6,226	4,713	**3,074**
2009	883	3,360	5,593	7,094	7,878	6,626	4,800	2,093
2010	978	4,693	5,169	5,223	7,335	6,861	3,785	2,118
2011	323	2,925	5,272	5,959	7,118	7,293	**5,240**	2,999

[1] Bolded values indicate exceedance of the average demand.

The District's total annual diversions has progressively decreased from a high of approximately 80,000 acre feet in the mid-1950s to values which have remained stable since early 1980s within a range of 30,000 and 40,000 acre feet (Figure 10). The decrease in diversions has had a lot to do with a decrease in demand due to conservation efforts and increased efficiencies in the delivery and on-farm irrigation systems. Most of the easy low-cost conversions were done by the early 1980s and additional conversions have occurred since then on a more gradual basis. Also by the early 1980s, the District's crop water demand stabilized at about the average and peak rates specified above as the cropping patterns and irrigation systems achieved their current general distributions.

Since the 1980s, the District has managed to use the available diversions, which are less than its demand, the best it could. However, this is not sustainable long term in today's competitive commodities market. The District has compensated for the shortage by pumping water from the Phase One Pump Station via the USBR Exchange Program and via its Umatilla Pump Station (which uses the supplemental Columbia River water right in Table 7). The District can only use these systems if there is flow in the river that the District would have diverted prior to the Umatilla Basin Project. Otherwise, the District has to buy water from the USBR Phase One facilities or pump water from its Umatilla Pump Station, both at a greater cost than from the Umatilla River. Figure 11 shows how the District's reliability on water from the Umatilla River has changed over the years.

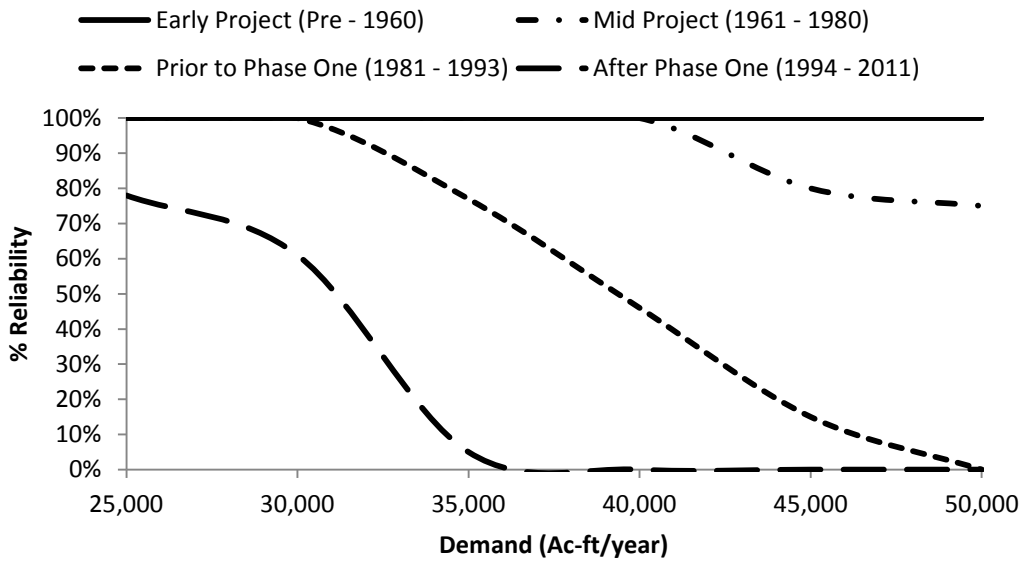


Figure 11 Historical Reliability of Umatilla River to Meet WEID Irrigation Demands

Insufficient diversionary flow in the Umatilla River is caused by a significant reduction in the volume of irrigation "return flow" since the 1950s. These are return flows from use of Cold Springs and McKay reservoirs water for irrigation in the middle Umatilla River basin and form the source of supply for the District's diversions. As stated earlier, the diversions were up to 80,000 acre feet in the 1950s and dropped to values between 30,000 and 40,000 acre feet by the early 2000s. The major causes of the decline in the return flows are as follows:

a. Irrigation water conservation efforts implemented by the upstream irrigation Districts;

b. Federally-approved boundary expansions of other Districts causing irrigation of larger areas with the conserved water, and the resulting increase in crop consumptive use and a corresponding reduction in the volume of return flow;

c. Protection of live flow and McKay Reservoir storage under the Umatilla Basin Project reducing the live flow volume available to the District, especially during the late season;

d. Additional groundwater pumping by upstream irrigators near the Umatilla River thereby reducing river flow or intercepting return flows before they reach the river.

In 1994, the District hired HDR Engineering who completed an evaluation of the WEID Water Supply. Several efforts by the District in conjunction with the USBR and Oregon Water Resources Department have helped to stabilize the District's available diversionary flows. The District has additionally negotiated a temporary arrangement with the owners of some of the groundwater wells to allow them to operate while a solution is developed. However, none of these losses have been mitigated nor measures implemented to prevent their future increase.

The District is concerned that with increased conservation efforts and additional groundwater pumping, its diversionary flow volume, rate, and reliability are subject to further jeopardy in the future.

The Irrigon Delivery Systems total average and peak irrigation demands are 4,626 and 5,043 acre feet, respectively. The District's water right includes 5,148 acre feet of water from the Columbia River (Table 7). The water demand within the system's service area will likely remain stable or increase slightly during the next 20 years. The system's diversions between 1997 and 2011 are listed in Table 11 and range from a low of 3,231 to a high of 5,944 acre feet. The improved irrigation scheduling efforts, conservation workshops and installation of the variable frequency drive in 2007 has improved the total and monthly diversion rates to stable values since 2003. Finally, the system has a flow capacity of 29.6 cfs. The system typically peaks at 25 cfs. The system has adequate water right and flow capacity to meet demand within the next 20 years. No further discussion regarding this system is included in the remainder of this plan.

4.3 LIST OF POTENTIAL SOURCES TO MEET LONG-RANGE NEEDS

As discussed above, the cropping pattern changes, irrigation system conversions, and improvements in delivery systems have stabilized the District water demand. However, between 1997 and 2011 the average demand was short of the available supply between 12,000 to 20,000 acre feet. The potential sources to meet the expected future shortage include the following:

City of Hermiston Reclaimed Water – The City of Hermiston, the District and USBR are in negotiations for an agreement and permit to supply the city's Class A reclaimed wastewater to the District. The volume of reclaimed water that will become available to the District is approximately 2,000 acre feet. The reclaimed water will be supplied into the Main Canal via a new pipeline. During the non-irrigation season the reclaimed water will be released to the Umatilla River. The City and District would like to be able to store the water so the entire amount can be used by the WEID. The location of the storage pond has not been determined but it appears that it may have to be outside the District to take advantage of elevation differences. The District is open to other reclaimed water sources to augment its water supply.

On-Farm Conservation – The projected crop irrigation demand for the Main Canal was estimated at average and peak values of 28,000 and 30,000 acre feet, respectively. On-farm conservation efforts will include improvements in metering and in use of more efficient on-farm irrigation systems. As an example, currently there are approximately 2,600 acres of flood-irrigated land farmed to pasture. Assuming that the current cropping pattern remains stable, if 80 percent of this acreage was to convert to sprinkler irrigation in the next 20 years, the water demand would decrease by approximately 6,000 acre feet. The savings could be greater if this land is urbanized.

Changes in Cropping Patterns – Additional water conservation will occur if the current mix of crops changes to less water-intensive crops. This change is partly driven by availability of water

but more importantly by commodity prices. The future extent of savings from this change will be variable from year to year.

District Land Use Changes – The District's Boardman Master Plan includes water supply guidelines for development of up to approximately 2,500 acres of land as 2-acre parcels. The District would supply lawn and landscape water to the parcels via enclosed, pressurized pipelines. The parcels are located in the western part of the District where soils are shallow, over basalt bedrock, and are currently flood-irrigated. At 80% development, the conversion of 2,500 acres of flood-irrigated land to parcels may save the District up to 7,000 acre feet of water. However, note that this plan was developed in conjunction with a former proposal to develop a racetrack near Boardman. There is no assurance that this land will be developed within the next 20 years or at what rate. This information is included herein for completeness.

Reduction in Delivery Losses – Typical annual delivery losses were estimated to be 14,335 acre feet (Table 32). Some of the losses are unavoidable due to an open canal construction, type of soil on which the canal segments are constructed, presence of very shallow groundwater beneath segments of the canal, and operational necessities. However, with continuous improvements, regular maintenance, more intensive management of deliveries, metering, leak detection, and other mechanisms, the District believes that it can gradually reduce these losses down to approximately 10,000 acre feet. This amounts to a saving of more than 4,000 acre feet.

The District is very interested in more intensive management of deliveries. It collects daily and monthly canal use information to assist the ditchriders in better management of the canal water deliveries. Currently, the information is available in the District office, but is not in a format that is easily usable by the ditchriders for daily decisions. For example, daily information on tailwater flow will be useful in controlling flow in different segments of the canal to reduce operational end-of-canal spills. The District will work to create a more frequent information sharing system for this purpose in 2012. The District may review the system it used to eliminate operational and management spills during the drought of 1997 as an initial guide. Although this system was much more labor intensive than normal operations with increased labor cost, significant water savings were realized. Another opportunity to capture end-of-canal spills is the construction of a re-regulation reservoir. Such a reservoir will also be necessary to serve peak demand needs for the Boardman area once the Boardman Master Plan is implemented.

Another reason for more intensive management of Main Canal flow is the installation of a variable frequency drive (VFD) on USBR Phase One pumps. This will allow the USBR to closely match the District's requests. Up to now, the USBR's supply often provided a greater flow to the Main Canal than requested due to the pumps inability to provide exact requested flow. The extra water was either used by growers or spilled. With the installation of the VFD, the District loses an inadvertent, but useful, buffer mechanism and will need to manage the flow it receives more closely.

Acquisition of Additional Water Rights – A potential source of additional water supply for the District is the purchase of additional existing water rights that are offered up for sale by private

owners within and outside the District from time to time. Purchase and transfer of these rights is a component of the District's water supply strategy.

Securing Groundwater Sources – The potential for use of groundwater resources within or adjacent to the District boundaries has only minimally been evaluated.

Some of the WEID lands south and west of Irrigon are within the designated boundaries of the Lower Umatilla Basin Groundwater Management Area (LUGWMA), as designated by the Oregon Department of Environmental Quality (ODEQ). Some of WEID lands are within the Ordinance Critical Groundwater Area, as designated by Oregon Water Resources Department (OWRD). Site specific evaluations may require the location(s) to comply with the designated rules of OWRD and ODEQ.

Potential groundwater options include:

1) Collection and pumping of shallow groundwater within the District. Shallow groundwater is encountered at various locations within the District. Part of the shallow groundwater is generated within the District from irrigation over shallow soils. The irrigation water flows on top of shallow bedrock and ponds in several locations where it creates wet soil conditions not suitable for farming. This type of shallow groundwater is encountered mostly in the western part of the District, west of the junction of Highway 730 and Interstate 84.
2) Shallow groundwater is also encountered along segments of the Main Canal from the Umatilla/Morrow County Line to the west. This water is an operational nuisance and also exacerbates freeze damage to the canal. The source of this water appears to be irrigation south and upgradient of the District. The District is currently weighting its options to pump this water into the canal during the growing season in the vicinity of the City of Irrigon. It is looking into installing subsurface drains on the upgradient side of the canal and pumping the drain water into the canal during the irrigation season.
3) The District is considering using new groundwater wells as a supplemental supply to select farmers, based on their proximity to source wells, water needs, and other factors. The water thus supplied will remain in the canal for other users.
4) Use of the Main Canal to deliver Umatilla River water during non-irrigation months for subsurface aquifer storage at as-yet undetermined locations and subsequent recovery during irrigation season. The potential for aquifer storage and recovery within the District may be limited due to shallow soils. However, specific locations potentially exist with storage volumes and soil permeability values suitable to allow use of this option. This option has not been evaluated for the District.

Umatilla Basin Aquifer Recharge and Recovery Project – The State of Oregon has recently funded a project to evaluate a regional storage project to store Columbia River water in the Ordnance groundwater aquifer south of the District. Although the District is not a direct beneficiary of the project, the potential increase in the Umatilla River return flow that may

result from the additional irrigation may benefit the District. However, the project is not developed sufficiently to be certain about the extent and timing of this benefit to the District.

Other Regional Solutions – Long term increases in demand due to climatic change were discussed in Section 4.1.4. Figure 8 indicates that although the timing of summer flow in the Umatilla River may shift, the annual volume of stream flow may remain generally unchanged between the years. Therefore, storage structures, whether aquifer storage or above-ground storage, may provide a solution to the management of water availability. The District will actively participate in regional and state-wide discussions regarding additional storage facilities as long-term solutions for climate-induced water shortages.

Summary – Between reductions in canal losses, additional irrigation system conversions to more efficient systems, ongoing urbanization (mostly in the Boardman area), and wastewater reuse, the District may achieve water savings of up to approximately 12,000 AF over the next 20 years. The total existing water supply shortfall is between 12,000 and 20,000 AF and future climate change is expected to increase this need gradually. The other options must be considered for prioritization and implementation to meet the full demand. However, the above options must be compared with respect to a variety of factors to evaluate their feasibility.

Allocation of Conserved Water – The Oregon Water Resources Department's Allocation of Conserved Water Program allows a portion of conserved water to be used on additional lands, leased or sold, or dedicated to in-stream use. The program promotes the efficient use of water to satisfy current and future out-of-stream and in-stream flows. WEID's proposed list of projects (Table 31) may be well suited for acceptance in the Allocation of Conserved Water Program. Allocating conserved water to different lands may benefit WEID as land use changes occur within the district in the future. The program would be considered and developed within the WEID when it becomes a viable tool.

4.4 COMPARISON OF POTENTIAL WATER SOURCES

The water supply sources listed above can be secured at varying cost, timeline, and logistical requirements. Table 44 summarizes the results of a general evaluation of the above water supply options. More technical data and information must be obtained to allow detailed evaluation of these options for planning and implementation. The District will consider developing a mix of the above options to reduce the overall cost of obtaining new water.

In reviewing Table 44 please note that the cost and timeline entries are only generalized comparative descriptions.

Table 44 Summary Comparison of Water Supply Options

Supply Option	Reclaimed Water[1]	On-Farm Conservation[2]	Change Cropping Pattern	Reduce Lateral Losses	Add'l Water Rights	District Shallow Groundwater	Upgradient Shallow Groundwater	District ASR	Regional ASR	Re-Reg. Reservoir & Pipe Main Canal (I-84 to Endspill)
Water Volume Secured (AFY)	2,000	6,000	1,000s	4,000	100s	Unknown	Unknown	Unknown	Unknown	7,350
Cost ($)[3]	Medium	Low	Low	Medium	Medium	High	Medium	High	Low	High
Timeframe	<5 years	Ongoing	Ongoing	Ongoing	As available	<5 years	>5 years	>5 years	>5 years	>10 years
Required Permits	DEQ WPCF[4]	None	None	None	Transfers	none	New Water Rights[5]	Yes	unknown	unknown
Operational Complexity	Low	Low	Low	Medium	Low	Medium	Low	Medium	Low	High
Environmental Issues	Groundwater Quality Concerns	none	none	none	none	none	none	none	Groundwater Degredation	none
Availability	Available	Available	Available	Available	Occasional	Available	Available	Unknown	Unknown	Available
Other requirements	Storage Reservoir outside the District	Cost-Share and other District Assistance to Growers	Landowner initiative	none	Location and Type of Right are Important	Landowner cooperation needed	Landowner cooperation needed	Identify storage location	Protection of ASR water	Protection of ASR water

(1) City of Hermiston
(2) Assumes that 80% of the flood-irrigated farms will convert to sprinklers over 20 years.
(3) These are only comparative evaluations based on initial professional opinion.
(4) Water Pollution Control Facility permit.
(5) The District is currently evaluating the need for new water rights for this purpose.

4.5 EVALUATION OF VARIOUS FACTORS ON LONG-RANGE WATER NEEDS

4.5.1 Regional Options for Meeting Future Water Needs

A coalition of stakeholders within the Umatilla Basin (including the District) have been working on a regional plan since 2008 to import Columbia River water during non-irrigation season for aquifer storage and subsequent recovery. Their discussions and current plans envision a "water banking" approach which allows great flexibility in management of the stored water. The project planning and implementation will likely occur over the next 5 to 10 years. Depending on how this project is developed in the future, its operation may affect the flows in the Umatilla River in ways that may be beneficial, or detrimental, to the District water supply. The District actively participates in basin discussions on this project.

USBR submitted a "Claim of Beneficial Use" (COBU) for Permit S-7400 for the benefit of the District to the Oregon Water Resources Department (OWRD) in July 2011. The COBU requests OWRD to process WEID's 1928 right to use return flows from upland irrigators using McKay storage water. Once recognized as a project water source, McKay water can be protected from junior irrigators, such as those using shallow wells, that are intercepting the McKay return flow for their irrigation.

In addition to return flows from McKay Reservoir, the District also relies heavily on return flows from Cold Springs Reservoir, managed by the Hermiston Irrigation District (HID). The District is concerned about conservation measures taken by the HID where HID pipes open laterals in order to conserve their water. The historical open ditches provided return flows to the Umatilla River for the District to divert at its point of diversion. Discussions with the USBR have led to a suggestion that for the money provided to HID for pipe projects, funds could be provided to the District for conservation projects that would save the water that would be lost to the District due to the HID piping project. This matter is under discussion, but is a good solution that encourages both Districts to continue conservation projects.

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) are actively engaged in local and federal negotiations to secure their water right to the Umatilla River. It is uncertain how their negotiations will progress. The District isn't concerned that granting of the water right by itself will negatively affect their source of water supply. However, any changes in management of river flow regime or in the forced or voluntary response of the irrigation Districts and independent irrigators that are dependent on the Umatilla River is of great concern. The District has not been a party to the CTUIR negotiations. As a result, the District relies on the USBR to safeguard its water right, return flows and WEID's interests in this matter.

4.5.2 Urbanization and Other Land-Use Trends

Urbanization trends within the District's service area follow the regional trends. The area served by the Irrigon Delivery System, within the City of Irrigon, and the western District area near Boardman are subject to future urbanization, as has been discussed previously. These changes will reduce the crop acreage size and increase residential lawn and landscaping areas.

Urbanization won't affect volumetric needs but does affect peak flows as most residential users water on the same schedule.

Development of residential units over areas with shallow soil depths on top of basalt bedrock may create localized water drainage and/or wastewater issues. For example, the Sunrise subdivision near Rippee Road currently has issues with shallow groundwater ponding in areas that create a nuisance issue, and potentially health issues, for the residences. As development on such area increases, solutions to these issues must be sought. The District is currently considering its options to assist patrons with drainage problems, including the formation of a drainage district. Such a proposal will include consultation with the Bureau of Reclamation, who owns the facilities.

As urbanization occurs in the District, patrons are encouraged to transfer off any portion of a water right than they are no longer able to use, such as new homes, driveways, and/or outbuildings. The District plans to protect its water rights by using its ability to remove the water right during the fifth year of non-use and transfer it elsewhere in the District.

4.5.3 Local Government Related Provisions and Plans

The District works with planning departments of the cities of Umatilla, Irrigon, and Boardman, and Umatilla and Morrow counties. Discussions with the local planners have not raised any issues of concern to the District. Most planners are well informed and provide informative and timely materials to the District. The following planning efforts are underway that may potentially affect the District's efforts to manage its available water resources:

- The Umatilla Basin aquifer recharge project, as discussed previously (see Sections 4.3 and 4.5.1).

- CTUIR Water right settlement, as discussed previously (see Section 4.3).

- City of Hermiston growth – Hermiston is the largest urban community in Eastern Oregon and growing. The District is negotiating to receive their Class A reclaimed wastewater for irrigation use. As that community grows, their volume of reclaimed wastewater also increases, to the benefit of the District water supply.

- The City of Irrigon and the District share many water users and have ongoing discussions regarding how best to use their water. The City has a limited water supply and thus the District's irrigation water delivery is important. Care is taken to clearly mark the delivery valves and follow the State standards including requirements for backflow prevention.

- US Army Chemical Depot Closure – The U.S. Army Chemical Depot lies just south of the District. It encompasses approximately 20,000 acres of land and is one of the area's largest employers. The Depot's mission has been completed and closure activities have begun. Disposition of the lands is uncertain as of 2011, but an assumption is that it will

be a mix of natural lands and agricultural lands. The layoffs of the staff will affect the District as many of the workers reside in the District's service area. There are currently no water rights on the Depot land. The District will watch as the land is developed to both protect its water delivery and look for opportunities such as water storage and development.

SECTION 5.0 - ADDITIONAL REQUIREMENTS

5.1 LIST OF AFFECTED GOVERNMENTS

US Bureau of Reclamation
Columbia-Cascade Area Office
1917 Marsh Road
Yakima, WA 98901-2058

US Bureau of Reclamation
Umatilla Field Office
32871 Diagonal Blvd.
Hermiston, OR 97838
(541) 564-8618

Umatilla County Planning Department
216 SE. Fourth
Pendleton, OR 97801
(541) 278-6204

Morrow County Planning Department
P. O. Box 788
Heppner, OR 97836
(541) 676-5620

City of Boardman
P. O. Box 229
Boardman, OR 97818
(541) 481-9252

City of Irrigon
P. O. Box 428
Irrigon, OR 97844
(541) 922-3047

City of Umatilla
P. O. Box 130
Umatilla, OR 97882
(541) 922-3226

Port of Morrow
P.O. Box 200
Boardman, OR 97818

5.2 PROPOSED DATE FOR SUBMITTAL OF UPDATED PLAN

WEID proposes to update this Water Management and Conservation Plan in ten years. The proposed date is December 31, 2021.

SECTION 6.0 - SYSTEM OPTIMIZATION REVIEW

This review is an analysis of the system-wide efficiency of the WEID with a focus on improving the effectiveness and operations of the delivery system. Much of the information in the review is a summary of the detailed information in the previous sections of this Water Management and Conservation Plan.

Gathering the information necessary for this review was a combined effort between WEID and J-U-B Engineers. Historical records on flows, diversions, pumping, land use, irrigation methods, crop type, crop evapotranspiration, and seepage rates were gathered. Another component of data that has helped the WEID is the GIS data that has been added and collected as part of the 3111 water rights mapping project.

6.1 ISSUES AND PRIORITIES

As explained in Section 1.9.5, the main irrigation maintenance problems are leaking canals and laterals, plugged pipes, leaking or broken headgates or valves, broken pipes, and pump difficulties. The WEID Main Canal, is approximately 27 miles long, and represents a large proportion of the District's system. The Main Canal is aged (built in 1914 – 1916) and its concrete panels are in poor to fair condition. Laterals off the Main Canal vary greatly in estimated seepage loss rates. In 2004, the District and J-U-B Engineers developed the Boardman Master Plan which devises a plan for converting the open ditch laterals to buried pipes.

Historically, the District has had a difficult time getting enough water to its customers during the peak summer months. This is caused by water shortages in the Umatilla River, and not by deficient water right volumes (see Section 2.5.2). Insufficient flows in the Umatilla River decrease the allowable volume that WEID can divert into its Main Canal. The decreased flow in the Umatilla River is thought to be caused by significant reductions in return flows from upstream irrigated lands. So although the WEID has sufficient water rights, the availability of water is pressing the need for the District to optimize their system. The focus of the District has been on conservation efforts. WEID has emphasized conversion from flood to sprinkler systems as well as canal re-lining and lateral piping in order to decrease the water demands.

6.2 GOALS

WEID has established a set of priorities and objectives with a focus on water conservation and management within the District. These are listed in Section 2.4. Some of the main conservation objectives are:

- Plan, develop and implement appropriate conservation measures;
- Monitor and support quality of water;
- Provide training and resources to employees;
- Provide and promote public education and outreach;
- Support creative regional approaches to water needs and supply;
- Work with regional partners to develop plan and policies.

The main facility management objectives are:

- Assess and maintain all District facilities;
- Repair and replace the aging Main Canal infrastructure;
- Develop a plan to repair and replace Boardman open laterals with pipelines;
- Replace aging steel pipelines on the Irrigon Pressurized system;
- Address screening concerns at the Umatilla and Irrigon Pumping Stations;
- Assure pumping station are regularly maintained;
- Maintain District roadways and right-of-ways;
- Continue preventative maintenance, repair and replacement activities;
- Meet current and anticipated regulatory requirements;
- Obtain proper equipment to maintain facilities.

Many of the goals for the WEID are on-going programs, such as the canal panel replacements. The District has a long-term goal of converting the open ditch laterals to piped, closed systems and shifting flood deliveries to sprinkler deliveries. Other priority projects have specific dates the District would like to accomplish their goal.

6.3 POTENTIAL IMPROVEMENTS

Figure 5 shows conservation projects that are planned in the District. Many of the projects involve converting acreage that is currently served by flood irrigation to sprinkler irrigation. Table 31 lists the conservation projects, along with estimated water savings, costs, and year to be completed.

6.4 PLAN OF ACTION

Each of the specific improvements the WEID has targeted in Table 31 has a priority and a year to accomplish it. Other projects are dependent on private development or funding availability. The District has established standards and policies to guide the completion of future projects. Some of these standards include:

- The Boardman Master Plan showing open ditch lateral conversion to piped laterals;
- Pumping Station standards including the installation of variable frequency drives;
- Plans for additional control gates at the Relocation Canal and at the Three Mile Dam diversion;
- Partition and sub-division standards.

The District has recognized that one of the most cost effective ways it can decrease irrigation demand is through conservation efforts. The District has an active public education program (Section 2.8), and will continue to look for additional ways to increase the efficiency of on-farm scheduling as well as operation of the District. Several conservation projects have been completed (see Table 30) and several more are planned (see Table 31). The focus is to convert flood to sprinkler deliveries as well as repair canal linings and pipe laterals.

REFERENCES

Bureau of Reclamation, Umatilla Basin Water Supply Study Draft. October 2011.

Bureau of Reclamation, West Extension Irrigation District Boundary Environmental Assessment, Draft. October 2011.

HDR Engineering Inc., Evaluation of Umatilla River Water Supply for West Extension Irrigation District. July 2005.

J-U-B Engineers Inc., West Extension Irrigation District Boardman Master Plan. March 2004.

J-U-B Engineers Inc., West Extension Irrigation District Irrigon Pressurization Project Hydraulic Modeling Report. December 2004.

National Cooperative Soil Survey (NCSS), in cooperation with Morrow County Soil and Water Conservation Disctrict. Soil Survey of Morrow County Area, Oregon.

Oregon Water Resources Department, Oregon's Integrated Water Resources Strategy Discussion Draft. December 2011.

Trimmer, W, Trimmer Engineering Inc., West Extension Irrigation District Water Management & Conservation Plan. July 1999.

IRZ Consulting, West Extension Irrigation District Conservation Project, Final Report. May 1996.

Additional Information provided by:
Ted Ressler and Adam Sussman, GSI Water Solutions, Inc.
Loren Kjeldgaard, Bureau of Reclamation (retired)
Eric Glover, Bureau of Reclamation (retired)

APPENDIX