North Unit Irrigation District
Water and Energy Conservation Initiative
Phase II

Reclamation WaterSMART Water and Energy Efficiency Grant Proposal

January 19, 2012

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1. Technical Proposal

1.1. Executive Summary

Date:	January 19, 2012
Applicant Name:	North Unit Irrigation District
City/County/State:	Madras, Jefferson County, Oregon

North Unit Irrigation District (NUID) proposes to invest in a Central Oregon Irrigation District (COID) piping project that will pipe approximately one mile of its I-Lateral canal and conserve 1,300 acre-feet (AF) of water from the Deschutes River. A water banking agreement will allocate the COID conserved water to NUID lands currently supported by water that is pumped from the Crooked River. The Crooked River water rights displaced by the new water allocated from COID will be transferred instream to support water quality and fish habitat improvements in the Crooked River. COID will benefit from improved water management and increased hydropower generation at two existing facilities. The project will provide benefits within all four Task Areas defined by the Bureau of Reclamation (Reclamation) in Funding Opportunity Announcement No. R11SF80303. The project will enhance irrigation conveyance efficiencies within COID, generate **1,300 acre-feet** of new Deschutes River water supply for farmers in NUID and **1,300 acre-feet** of new instream water rights in the lower Crooked River (Task A). The project **will conserve an estimated average 191,178 kilowatt hours of electricity**, and will **generate 318,638 kilowatt hours of renewable energy** annually in perpetuity (Task B). The project will improve conditions **by restoring 4.9 cfs of water rights to the lower Crooked River** for ESA listed Mid-Columbia steelhead trout in the lower Crooked River, addressing limiting factors of low flow and temperature (Task C). The project will utilize a **water banking agreement** to facilitate the reallocation of water from an agricultural water use to an environmental water use and the allocation of the conserved water in one irrigation district to existing agricultural uses in another irrigation district (Task D). This project is the second phase of the North Unit Water and Energy Conservation Initiative. The Initiative will ultimately restore up to 22,500 acre-feet and protect up to 220 cfs in the lower Crooked River. It will reduce NUID annual pumping costs by over $300,000. Phase I, which is being implemented in 2011-12 with support from a 2011 WaterSmart grant, restores 7,880 acre-feet to the lower Crooked River and reduces NUID pumping by 1,220,163 kilowatt hours. Phase II will use the same water banking mechanism piloted in Phase I, but elevates the innovation by including a second irrigation district, thereby piloting inter-district transfers and generating additional renewable energy.

1.2. Background Data

1.2.1. Area Maps, Project Map & Instream Restoration Reach Map

Figure 1. Irrigation Districts in the Deschutes Basin

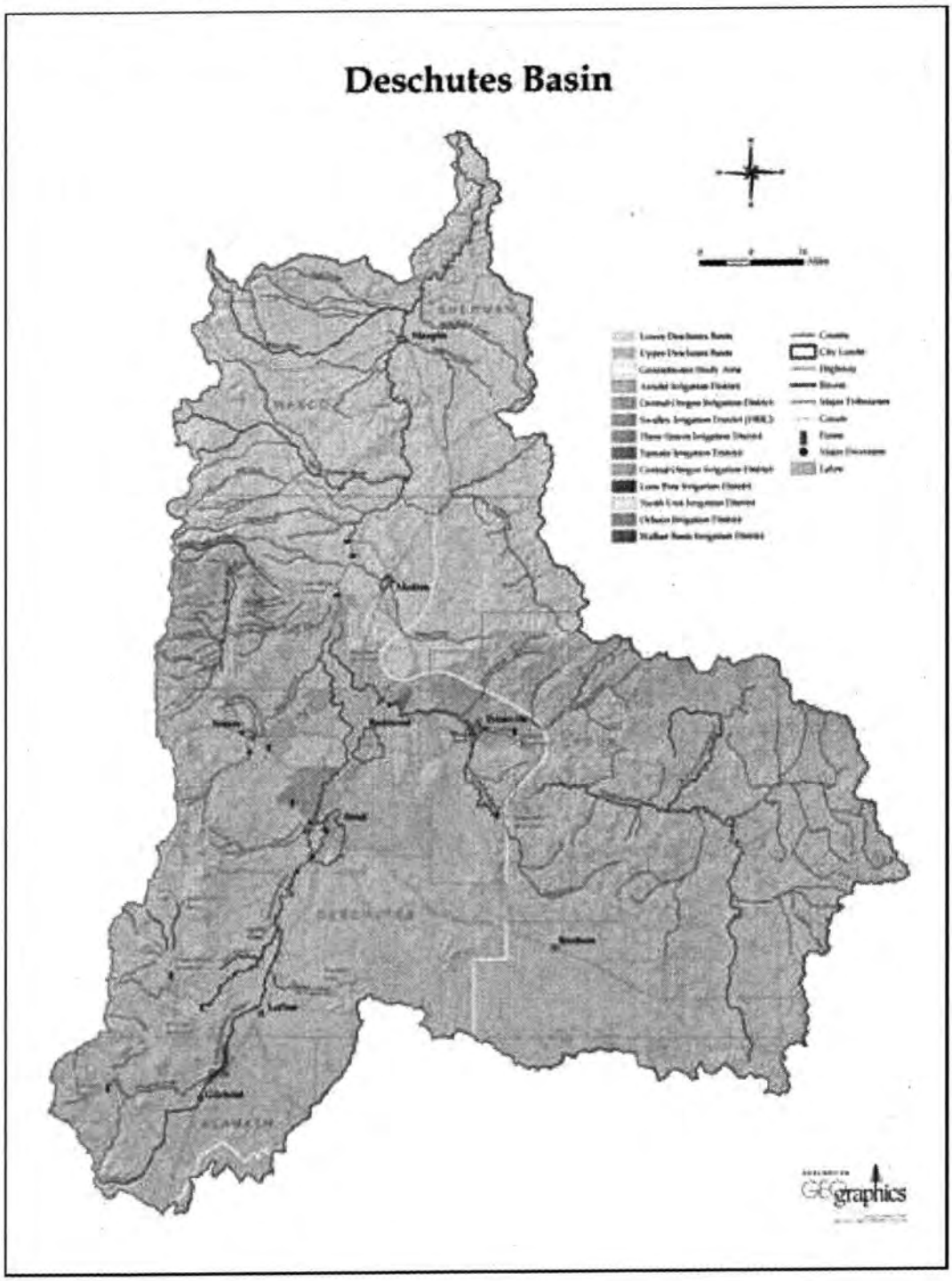


Figure 2. Project Vicinity Map

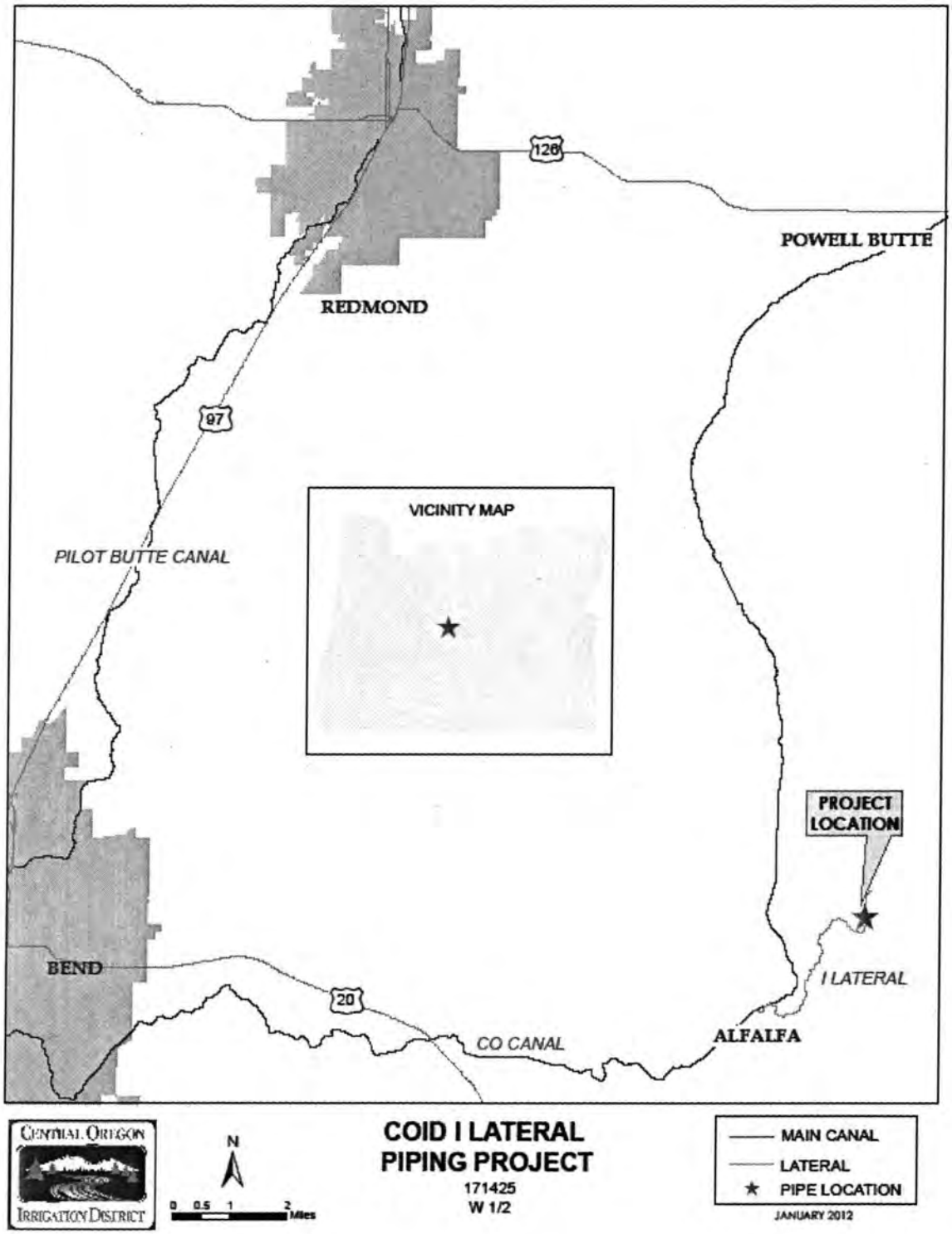


Figure 3. I-Lateral Piping Project Plan and Profile Map

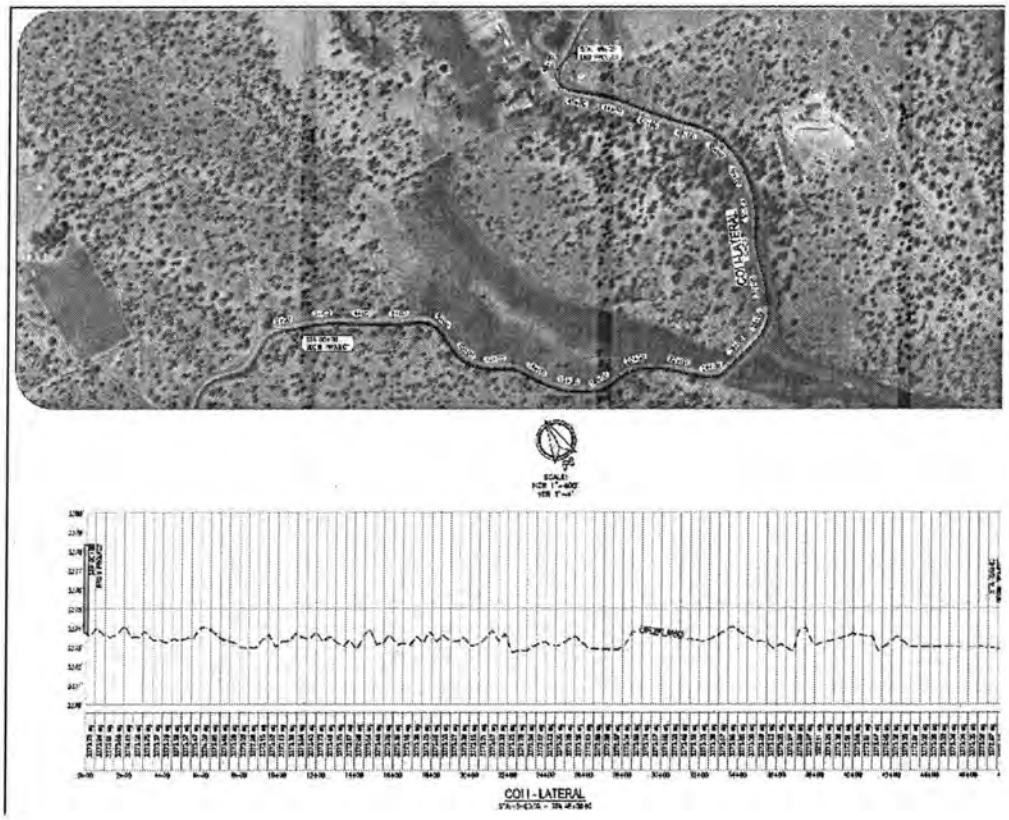
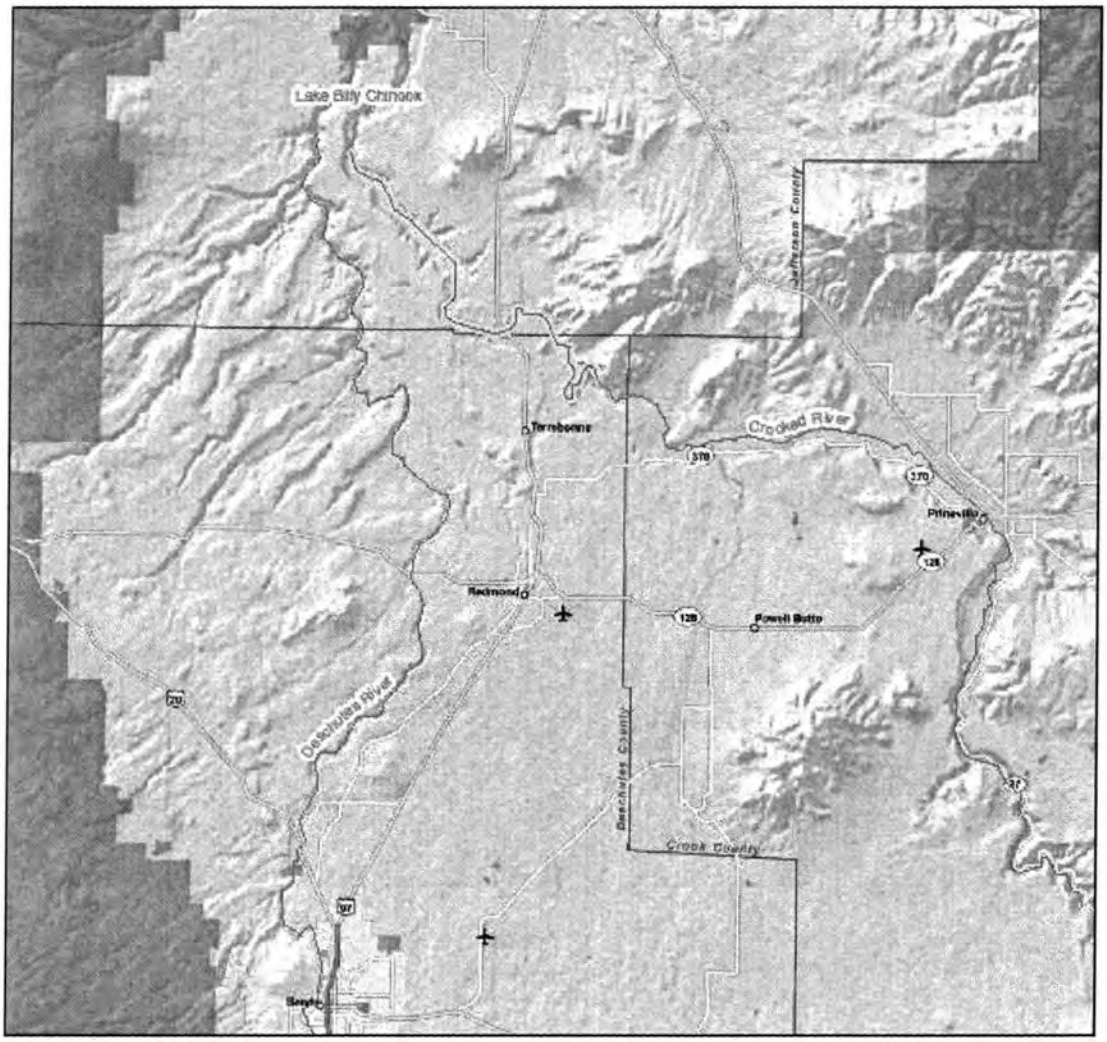
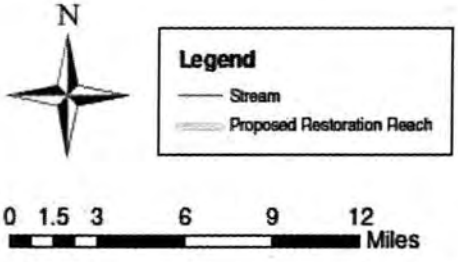


Figure 4. Lower Crooked River Instream Restoration Reach Map

North Unit Water Supply Initiative - Restoration Reach



Locator Map



1.2.2. Deschutes Basin Water Management

Within the Deschutes Basin, eight irrigation districts serve the water needs of their patrons by diverting water from the Deschutes River and its tributaries. The districts are local governments formed under Oregon Revised Statutes Chapter 545. They are also political subdivisions of the state of Oregon and municipal corporations. The districts deliver water to over 150,000 acres of land through approximately 627 miles of canals and laterals.

The porous, volcanic soils of the Deschutes Basin cause a significant portion of the water that flows through irrigation canals to seep into the ground. Approximately 50% of the water that is diverted from the river is lost due to seepage from canals and cannot be used for irrigation. This means that the irrigation districts who manage these canals must divert twice the amount of water that they need to serve their patrons' needs for irrigation water.

Past water conservation efforts have reduced the amount of water diverted from the river; however, the river is still over-appropriated, meaning that more water is authorized to be diverted from the river than actually exists in the river. Irrigation districts in the basin have different needs based on the seniority of their water rights and their power usage. Senior irrigation districts, like Central Oregon Irrigation District (COID), are looking to increase operational efficiencies by piping open canals, but don't need additional water supply. They also have the potential to generate additional in-conduit power through altering conveyance routes. The junior irrigation district, North Unit Irrigation District (NUID), seeks to make its water supply more reliable, while reducing major energy costs associated with pumping Crooked River water. This project capitalizes on these different needs to maximize conservation and agricultural outcomes in the most cost-effective way possible. As such, the following provides background on both irrigation districts.

1.2.3. North Unit Irrigation District Infrastructure, Water Supply and Water Rights

North Unit Irrigation District (NUID) utilizes water from the Crooked and Deschutes Rivers to serve approximately 59,000 acres of productive farmland. NUID lands are predominately in Jefferson County. Water is delivered through a network consisting of 65 miles of canals and 235 miles of laterals. Of the total area served, approximately 50,000 acres receive their primary supply from the Deschutes River and the remaining 9,000 acres receive deliveries from the Crooked River. A total of 850 landowners receive water from NUID. Principal crops produced by NUID farmers include irrigated pasture, hay, alfalfa, wheat, carrot seed, and grass seed. North Unit Irrigation District's 2003 Water Conservation Plan documents that on an average year, with an estimated 65% district-wide on-farm efficiency, supply averages 121,492 AF for a demand of 151,000 AF, signaling that additional irrigation water supply of approximately 29,400 AF would be necessary to meet the on-farm crop use for the total acres (Net Irrigation Requirement) (NUID, 2003).

Deschutes River Water Supply

Water from the Deschutes River is supplied by a diversion at river mile 160 that diverts water into the Main Canal. The canal was built in the mid 1940s by Reclamation and transferred to NUID to manage and operate shortly thereafter. The Main Canal is approximately 65 miles long, starting at the diversion dam and heading generally in a northerly direction before terminating just north of the town of Madras. The canal was built for a maximum capacity of

1000 cfs. Water diverted from the Deschutes River can be delivered by gravity and the district does not incur any pumping costs associated with these water rights.

In the late 1990s, NUID lined a portion of the Main Canal from near its diversion point in Bend (canal mile 0.5) to approximately canal mile 11.8. The bottom is lined with roller compacted concrete (RCC) and the sides are lined with shotcrete for the first 6.9 miles. From that point forward, only the bottom of the canal is lined with RCC. North Unit Irrigation District estimates 23,000 AF of water were saved by the project, which represents a 51% reduction in total seepage losses. The North Unit Water Conservation and Efficiency Phase I project being constructed in 2011-12, partially funded by a Reclamation Watersmart Grant, will line the unlined sides of the canal from canal mile 6.9 to 11.8, saving up to 7,880 AF of water.

North Unit Irrigation District's principal water right from the Deschutes River is described in Certificate 72279. It certificates the right to divert water from the Deschutes River, Wickiup Reservoir and Haystack Reservoir to irrigate 49,916 acres, with a priority date of February 28, 1913. The district is the junior water right holder on the Deschutes River and as such, relies more heavily on stored water than other irrigation districts in the basin. Based on historic averages of water diverted from the Deschutes River at Bend, roughly 30% of the water is from the district's natural flow water right and 70% is from stored water originating in Wickiup Reservoir. Wickiup Reservoir has a maximum capacity of 200,000 AF and reaches full fill in approximately seven out of ten years. In years that the reservoir does not fill, the district must employ a number of drought management strategies including additional supplemental pumping from the Crooked River, land fallowing, and deficit irrigation practices.

Crooked River Water Supply

In 1968, NUID constructed a pumping plant adjacent to and at the point where the Main Canal crosses the Crooked River. The primary purpose of the plant is to furnish a supplemental water supply, when needed, by pumping from the Crooked River and discharging into the Main Canal. However, the plant also provides a primary water supply to approximately 9,000 acres of land, which are spread throughout the district. The plant consists of nine vertical shaft pumps with a total capacity of 200 cubic feet per second at a total dynamic head of 150 feet. Each pump is powered by a 450-horsepower motor that pumps the water into a 60-inch steel-pipe discharge line 220 feet long. The power for the pumping plant is supplied under contract by the Central Electric Cooperative.

NUID uses water from the Crooked River under four water right certificates (cert. 72281, 72282, 72283, and 72284). Pumping water from the Crooked River canyon costs approximately $13 per acre foot in electricity charges due to the change in elevation between river and canal. Pumping costs can exceed $300,000 during a normal irrigation season and rates are expected to increase significantly in the future. Pumping costs are covered by assessing fees to farmers based on the number of acres of water rights they own. NUID's top priority is reducing these pumping costs.

1.2.4. North Unit Irrigation District Energy Utilization

North Unit's main energy usage is associated with the Crooked River Pumping Plant described above. It sources energy from Central Electric Cooperative and averages 3,982,912 kilowatt hours per year. The district is highly invested in reducing its pumping demand from the Crooked River, and is also actively assessing small hydropower opportunities on its canals. The district

completed a feasibility study of five potential hydropower sites in 2009 and is in the process of conducting feasibility on an additional six sites. The district intends to move forwards with preliminary design of at least one hydropower project.

1.2.5. North Unit Bureau of Reclamation Partnership

North Unit Irrigation District has a long-standing relationship with the Reclamation as part of the Deschutes Project. The Deschutes Project includes Wickiup Reservoir, Haystack Dam and Reservoir, the North Unit Main Canal, and the Crooked River Pumping Plant. The Deschutes project was authorized by a finding of feasibility by the Secretary of the Interior dated September 24, 1937, approved by the President on November 1, 1937, pursuant to section 4 of the Act of June 25, 1910 (36 Stat. 836) and subsection B of section 4 of the Act of December 5, 1924 (43 Stat. 702). Construction of Haystack Dam and equalizing reservoir was authorized by act of the Congress on August 10, 1954, (68 Stat. 679, Public Law 83-573).

The District has participated in numerous water conservation projects with Reclamation's financial support. Recent projects are summarized below:

Completed

1995 – Lateral 52, installation of 12,500 feet of pipe to enclose an open canal.
Reclamation Funding: $126,000

1998 – Lateral 51-4, demonstration high head pressure pipeline system, installation of 25,000 feet of pipe to enclose an open canal.
Reclamation Funding: $105,000

2002 – Lateral 58-1, pipe approximately 5 miles of open canal to save water and reduce soil erosion by decreasing canal seepage.
Reclamation Funding: $107,188

2003 – North Unit Small Pipelines 2003 – piping of various short sections of canals in the distribution system to prevent erosive destruction of the canal banks by livestock and to save water. The project included installation of three pipelines for a total of 6,291 feet.
Reclamation Funding: $38,000

2004 – Lateral 58, this project included 6,600 feet of pipe and abandon a section of lateral that passes through an industrial park. This piping project saved water and prevented soil erosion by decreasing canal seepage. Abandoning the section through the industrial park will kept runoff from parking lots and roofs from entering the irrigation system.
Reclamation Funding: $66,972

2004 – Lateral 51-1, piping approximately 3,500 feet of the distribution system to prevent seepage losses and soil erosion.
Reclamation Funding: $11,470

2005 – Automation and Telemetry Financial and Technical Assistance to install telemetry at Haystack Reservoir, 58 lateral turnout, 37–6 lateral and 58-11 lateral to conserve water and enhance water management through automation.
Reclamation Funding: $24,100

2005 – Water 2025 GIS and Aerial Imagery Consortium: Using Technology, Best Practices and Information System Management to Support Conservation Program Development and Implementation.
Reclamation Funding: $25,000

2006 – Lateral 58-3, pipe 1,800 feet to conserve water and enhance on farm irrigation efficiency.
Reclamation Funding: $20,017

2007 – Piping Laterals 53, 58-13 and 63-1. Upgrade 3 laterals from open ditch or leaking pipe to plastic pipe to conserve water, increase water use efficiency and enhance water management.
Reclamation Funding: $55,410

2007 – Water 2025 Challenge Grant, Telemetry & Action Plan. Partner with 5 other irrigation districts in Central Oregon to install flow measurement telemetry stations at 18 strategic locations across the 5 districts to measure the benefits of water conservation. Two sites were installed on the district.
Reclamation Funding: $8,818

2007 – Water 2025 Challenge Cost Share Program, Lateral 58-9 Pipeline Phase I – improve Lateral 58-9 by converting one half mile of open earth ditch to two parallel pipes to conserve water and thereby increase available water supplies associated with Reclamation's Deschutes River Project.
Reclamation Funding: $237,002

2008 – WCFSP Pipelines 41-6 Lateral and 43-7-1 Lateral (1425-08-FG-1L-1350) Convert sections of two earthen ditches to pipe to conserve water by reducing seepage and evaporation losses.
Reclamation Funding: $38,906

2009 – WCFSP Ramp Flume – Lateral 58 (09FG1U1421) Install an acoustic Doppler on Lateral 58 to for more accurate measure of water at the head end of the lateral to conserve an estimated 900 AF of water per year.
Reclamation Funding: $16,270

<u>In Progress</u>

2009 – WCFSP Lateral 58-9 Piping Phase II (09FG1U1446) Install 22,000 feet of pipe to provide improved water management; eliminate soil erosion; pressurize a portion of the water delivery system and improve water quality.

Reclamation Funding: $318,663

2010 – Modernization of the Bend Diversion (R10AP1C006) NUID will replace and/or install at the headgate, river site, flow monitoring station and the canal site flow monitoring station SCADA Programmable Logic Controllers, river/gate position sensors, and cellular modem to communicate data.
Reclamation Funding: $31,016

2010 – Haystack Flow Measurement (R10AP1C052) – Install a Horizontal Acoustic Doppler Current Profiler within the district's easement near the base of Haystack Dam just downstream where the bypass chute and Haystack discharge come together.
Reclamation Funding: $10,899

2011-12- WaterSmart Grant" North Unit Irrigation District Energy and Conservation Initiative- Line approximately five miles of the sides of its Main Canal and conserve up to 7,880 acre-feet (AF) of water from the Deschutes River. The saved water is being used to irrigate lands currently supported by water that is pumped from the Crooked River. The Crooked River water rights displaced by the new water resulting from the lining project will be retired to support water quality and fish habitat improvements in the Crooked River. Reclamation Funding: $1,000,000

1.2.6. Central Oregon Irrigation District Infrastructure, Water Supply and Water Rights

At present, COID operates 2 main canals using water from the Deschutes River. The Central Oregon Canal serves the areas of Alfalfa, Bend, and Powell Butte; and the Pilot Butte Canal (PBC) serves the areas of Bend, Redmond, and Terrebonne. The PBC is mainly an unlined open canal running 42 miles in length itself, much of it running through heavily fractured basalt. There is a small section of the PBC through the city limits of Redmond that was piped in 2005 for a Highway 97 reroute. There is also a 2.5 mile section just north of Bend that was piped in 2009/2010 to conserve water and allow a 5 megawatt hydropower plant, known as the Juniper Ridge Hydropower Project, to be installed and operated at the end of this piped section. There are numerous laterals and sub-laterals that branch off of the main PBC throughout the entire system to serve its north area Bend, Redmond, and Terrebonne deliveries. There are 2 laterals in Terrebonne (H-14 and H-14-1) that were piped in 2005 to conserve water and more efficiently deliver water to those deliveries that these laterals serve. All of the conserved water from these 2 piping projects was marketed to and permanently transferred instream to the Middle Deschutes River through the DWA Water Bank.

COID's primary Deschutes River water right is described in Certificate 83571. It carries a priority date of October 31, 1900 for 978 cfs and December 2, 1907 for 392 cfs. Its primary use is for the irrigation of 43,440 acres, mostly alfalfa hay and forage with a small amount of field crops like potatoes and mint. Certificates 76685 and 76714 describe the right to store and use 50,000 acre-feet of water from Crane Prairie Reservoir as a supplemental water source. These rights carry a 1913 priority date. COID also holds three water rights certificates for hydropower

use. Certificate 29582 describes the use of 90.0 cfs from the Deschutes River for energy generation with a priority date of 1892. Certificate 65215 describes the use of 640 cfs from the Deschutes River for energy generation at the Central Oregon siphon hydroelectric project with a priority date 1981. Certificate 82606 authorizes the use of existing water rights delivered through the North Canal for energy generation, subject to the existing conditions on those water rights. COID's primary water rights are senior and highly reliable. Generally, COID relies on stored water only in the shoulder seasons.

1.2.7. Central Oregon Irrigation District Energy Utilization

COID has two existing hydropower generation facilities that will benefit from this proposal as well as future planned facilities that would benefit if completed.

Siphon Power Project (FERC P-3571): The Siphon Power Project (SPP) is located 2 miles south of the city of Bend, Oregon. This facility is a 5.5 MW powerhouse that commenced commercial operation on October 16, 1989. The powerhouse draws water directly from the Deschutes River at river mile 170.9, generates hydro power from the water, and then returns the water back to the river. It operates on 640 cfs of water to generate an estimated 9,804 hp. The SPP has a FERC license issued September 29, 1987.

Juniper Ridge Hydropower Project (FERC P-13607): The Juniper Ridge powerhouse is located north of Bend, Oregon, on COID's Pilot Butte Canal near Deschutes Junction at Highway 97. This 5.0 MW facility commenced commercial operation on October 4, 2010. The powerhouse draws water directly from the PBC during the irrigation season (April – October) and winter stock runs (November – March), generates hydro power, and then returns the water back to the canal. It operates on 480 cfs of water to generate an estimated 7,909 hp. The Juniper Ridge project had a FERC conduit exemption issued March 11, 2009.

COID is also underway pursuing the development of an additional in-canal hydro facility. This project is called the NC-2 Drop and will have a generation capacity of 400kW. This project is a joint venture with Natel Energy utilizing their SLH100 low head technology. Construction is anticipated in the winter of 2012-2013. Two additional in-canal sites have been deemed feasible and will be pursued after completion of the NC-2 Drop.

1.2.6 Central Oregon Irrigation District Bureau of Reclamation Partnership

COID has a long-standing relationship with Reclamation beginning with the Deschutes Project authorization and construction of Crane Prairie Reservoir in 1938, of which COID is the manager and operator, and interacts with local and regional Reclamation offices in that capacity. COID has conducted several piping projects on its canals and laterals over the decades with Reclamation funds, and Water Conservation Field Services Program funds. The most recent piping projects in conjunction with Reclamation funds include the Juniper Ridge piping on the PBC north of Bend completed April 2010, the H-14 and H-14-1 laterals off the PBC in Terrebonne in 2005, and the C-1 lateral in Bend off the COC completed March 2009. The District has also been awarded Reclamation grants from the Water 2025 program in 2004, 2006,

and 2008. The original grant in 2004 assisted COID and other basin stakeholders in creating a regional water planning body named the Deschutes Water Alliance. That same grant also provided for the formulation of a pilot water bank, now called the Deschutes Water Alliance Water Bank, that was and is still one of the few water banks in the country that facilitate permanent as well as temporary water transfers. The subsequent Water 2025 grants were for finalization of the water bank, and then for a basin-wide, multi-irrigation district field conservation study and installation of telemetry stations to better monitor the flows and losses of the canals and laterals throughout the District and basin. Another grant was issued to COID in 2007/2008 through a field technology improvements grant for field computers so that personnel including ditchriders and the District Watermaster are able to have access to COID maps and aerial photos while in the field, as well as their weir books and rotation schedules in electronic format. Water Conservation Field Services Program funds were also awarded to COID for the installation of ramp flumes throughout the District in 2005/2006, and for a water management and telemetry action plan from 2007 - 2009. In addition to COID receiving Reclamation funding for improvements to the District and to be able to conserve water through the DWA Water Bank, COID has also received Water 2025 funds in conjunction with the DRC, DWA, and DWA Water Bank for various projects related to the Deschutes Basin, water conservation, and water marketing.

A major COID project accomplished with financial assistance from Reclamation involved the replacement of an 800 cfs capacity 1.5 mile long wooden flume with a 10' diameter steel pipe in the early 1970s. This pipe became instrumental in not only providing for a much safer and secure facility for COID and its patrons, but also ended up becoming the backbone structure for the construction by COID of a 5.5 MW hydro-electric facility in the late 1980s. COID has owned and operated this facility under FERC license since 1989.

Another major COID project accomplished with financial assistance from Reclamation is the Juniper Ridge Hydropower & Piping Project briefly mentioned above. This project consisted of piping approximately 2.50 miles of the PBC with 9 foot diameter steel pipe and the installation of a hydropower plant consisting of one 5 MW turbine and generator at the north end of the pipe. The plant will produce 3.4 MWH of electricity at the start of its operations in the 2011 irrigation season. The plant will generate approximately 13 million kilowatt hours of renewable energy throughout each irrigation season. Through future phases of additional piping of the PBC, it is estimated that 10 cfs per mile (3,782 af per year) of additional piped canal will be conserved and permanently instreamed through the DWA Water Bank. A maximum of 4 additional miles added to the south end of this project is planned to be piped within the next 10 – 20 years. In addition to the conserved water created by the additional sections of pipe, more head will be captured for increased renewable energy through the hydropower plant up to 5 MWH. COID will own and operate this facility under FERC license.

1.3. Technical Project Description

1.3.1 Project Background

North Unit Water and Energy Conservation Initiative Phase II is the next phase in the larger North Unit Water and Energy Conservation Initiative. The whole initiative will conserve 22,250

acre-feet of Deschutes River water rights in NUID and other districts. It will allocate the conserved Deschutes River water rights to 8,900 acres in NUID that currently receive primary irrigation water from the Crooked River. It will allocate the associated displaced Crooked River water rights permanently instream in the Crooked River.

NUID benefits by eliminating its need to pump water from the Crooked River. Increased flows in the Crooked River benefit the reintroduction of federally-listed mid-Columbia summer steelhead. The whole initiative will restore up to 220 cfs to the Crooked River and save on average 3,982,912 kWh of energy annually. The conserved water projects constructed to generate the water will improve district water management and, wherever possible, increase the generation of renewable energy from existing hydropower facilities.

Phase I of this project is being implemented in 2011-12 with support from a 2011 Reclamation WaterSMART grant. Phase I lines five miles of NUID's main canal and utilizes a water banking agreement to allocate up to 7,880 acre-feet of conserved Deschutes River water to up to 3,152 acres in NUID that currently receive Crooked River water. Phase I will allocate the 3,152 acres of associated Crooked River water rights instream in the Crooked River. Phase I will save NUID approximately 1,220,163 kWh of electricity, save an estimated $64,290 to $93,564 annually. It will restore up to 18.6 cfs to the lower Crooked River to benefit federally-listed mid-Columbia summer steelhead.

The Phase II project proposed here utilizes the same water banking process but generates the conserved water through a piping project in Central Oregon Irrigation District (COID). This elevates the innovation of water management in the Deschutes Basin, allowing districts to cooperate to leverage the most cost-effective projects to meet the goals of the Initiative. This inter-district cooperation also allows districts with different needs to meet their particular goals. For example, COID does not need additional water, but benefits from the operational efficiencies of canal piping and from additional hydropower generation associated with conveying the water to NUID. NUID benefits from putting the available conserved water on agricultural lands from which Crooked River rights can be transferred instream, saving energy costs and improving flows in the Crooked River. This approach allows NUID and partners to invest in the most cost-effective projects to reach the ultimate goal of eliminating the need to pump Crooked River primary rights, and leverages the more numerous conservation opportunities in the Deschutes sub-watershed to benefit reintroduced anadromous fish in the Crooked River. To date, the supply of Crooked River water rights available to be restored instream has been extremely limited. This project pilots the inter-district cooperation that will facilitate the expansion of these opportunities. Phase II will conserve 1,300 acre-feet of COID water, reduces NUID pumping by approximately 191,178 kWh annually, and restores 4.9 cfs of water rights permanently to the lower Crooked River. Rerouting COID water to NUID will generate an additional 318,638 kWh of renewable energy at two existing COID hydroelectric plants, creating approximately $27,249 in value.

The proposed Phase II project includes two major components:

- Construction of a COID canal piping project
- Implementation of a water banking agreement that:

- uses Oregon's Allocation of Conserved Water Program to allocate COID conserved water to NUID lands currently served by Crooked River water rights, and
- uses Oregon's Allocation of Conserved Water Program allocate the Crooked River water rights appurtenant to the NUID lands receiving COID conserved water permanently instream in a critically dewatered reach of the Crooked River

These components are further described below.

1.3.2 COID I-Lateral Piping Project

COID proposes to pipe an open earth lateral off of the Central Oregon Canal, known as the I-Lateral. The I-Lateral pipeline is a district-owned conveyance system with a federally-held right-of-way that allows construction and maintenance by COID. The COID Central Oregon Canal Diversion is located near Bend on the Deschutes River (approximately RM 170) at SW 1/4, NE 1/4, Sec 13, T.18 S., R.11 E., W.M. Water is diverted through a headgate structure and travels through the open earth Central Oregon Canal before reaching the diversion for the I-Lateral. The proposed piping project is approximately 4,800' in length. Water conveyed through the I-Lateral is described in water right certifcate 83571 with a priority date of 10/31/1900 and 12/02/1907.

Approximately half of all water diverted into the I-Lateral canal is lost to seepage through the sides and bottom of the canal. By replacing open earthen canals with enclosed pipelines, water seepage can be reduced to virtually zero. COID has worked with Black Rock Consulting, Inc. to quantify the amount of water that will be saved by analyzing pre-project water loss data. Measurements have shown that 4,800' of piping will result in a peak total of 4 cfs conserved.

A feasibility report and initial engineering design has been completed for the I-Lateral project. The report investigated seepage mitigation alternatives including shotcrete lining, exposed geomembrane, polyurea over geotextile membrane, and piping. Over a 50-year project life cycle analysis, piping was found to be the most cost effective. Of low-head piping alternatives investigated, profile wall and solid wall high density polyethylene alternatives were evaluated and the solid wall option was the lease cost alternative for piping. Central Oregon Irrigation District is contracting with Kevin Crew of Black Rock Consulting for the final design of this piping project. The project will install 4,800 feet of 54" diameter DR 41 HDPE pipe (4710 resin) which will be buried and backfilled. It includes one reinforced concrete inlet/trash rack, one reinforced concrete outlet structure, two service turnouts, and canal bank compacted fill upstream of the proposed intake.

Black Rock Consulting has conducted similar design work on other major irrigation projects in Central Oregon such as the COID Pilot Butte/Juniper Ridge piping, the Tumalo Irrigation District Bend Feed Canal, and the Swalley Main Canal. Black Rock Consulting is a well established, experienced and reputable engineering firm. In addition to the project designs, biological assessments and cultural resource surveys of the canal have already been conducted and are ready to submit to satisfy the federal environmental and historical compliance. See Appendix A for project photos.

1.3.3 Water Banking Agreement

North Unit Irrigation District, Central Oregon Irrigation District and the Deschutes River Conservancy will execute a water banking agreement to apply water conserved through COID's piping project to lands that NUID currently irrigates with water from the Crooked River. Simultaneously, NUID will transfer instream a corresponding volume of water from the Crooked River, thereby increasing instream flows, enhancing water quality and improving habitat for native fish like redband trout, mid-Columbia steelhead and Chinook salmon. This agreement will facilitate: (1) the allocation of saved water to existing agricultural uses, and (2) the reallocation of water from agricultural uses to instream uses.

The water banking agreement will utilize existing tools under Oregon water law to accomplish the reallocation of the water. It will utilize Oregon's Conserved Water Statute, described in OAR 690-018-0010 to 690-018-0090 and ORS 537.455 to 537.500, to convey COID conserved water to NUID lands currently served by Crooked River water rights. The new water right issued to NUID will maintain the same priority date as the conserved water. In turn, the Crooked River water rights appurtenant to those NUID lands receiving COID conserved water will be transferred to an instream use under Oregon water law and permanently protected in a critically dewatered reach of the Crooked River. The DRC will partner with NUID and COID to submit a conserved water application for 4 cfs. The finalization of transferring conserved water to NUID lands will be concurrent with and contingent upon the instream transfer of Crooked River water rights. The resulting new water rights will be in the name of NUID, and will be conveyed to NUID through COID's Pilot Butte Canal. Both districts have Conserved Water Policies (as required by OAR 690-018-0025) that set forth the terms on which the districts implement Conserved Water Applications on behalf of district landowners. Both districts have passed board resolutions approving the mechanics of the project. The proposed phase II project will use the same water banking structure piloted in Phase I, but it will include the inter-district transfer of COID conserved water to NUID. State law and federal contracts have been reviewed to make sure they accommodate the proposed activities.

1.3.4 Project Summary

In summary, this project conserves 1,300 acre-feet through piping the COID I-Lateral Canal, allocates that water to existing agricultural uses in NUID, and transfers existing NUID Crooked River water rights permanently instream in the Crooked River. It restores 1,300 acre-feet, or 4.9[1] cfs, to a critically-dewatered reach of the Crooked River, saves an average of 191,178 kWh of energy annually, generates 318,638 kWh of energy annually and improves water management in COID. This project elevates the innovation and collaboration of water management in the Deschutes Basin and opens the door to additional inter-district projects that will ultimately restore up to 220 cfs to the Crooked River and eliminate NUID's need to pump primary water rights from the Crooked River.

1.4. Evaluation Criteria

[1] It should be noted that the 1,300 acre-feet equates to 4 cfs of COID Deschutes water, but 4.9 cfs of NUID's Crooked River water supply, based on a different number of days in the seasons of use for those water sources.

1.4.1. Evaluation Criterion A: Water Conservation

Subcriterion No. 1—Water Conservation

Subcriterion No. A.1(a)—Quantifiable Water Savings

The project will conserve 1,300 AF on an annual basis. The water that will be conserved currently seeps into the ground through the sides of COID's I-Lateral and eventually enters the regional aquifer and discharges in the lower Deschutes River. Conserved water will be allocated to NUID to meet existing irrigation needs. NUID will transfer a corresponding volume of water permanently instream to restore 4.9 cfs to the Crooked River.

Average Annual Water Supply

COID's average annual water supply in the Central Oregon Canal is 150,000 acre-feet.

NUID's average annual supply of Crooked River primary water rights is 16,841 acre-feet. After the Phase I project is complete, it will be reduced to 8,961 acre-feet. The 1,300 acre-feet Deschutes River water conserved through piping the I-Lateral will replace 1,300 acre-feet of NUID Crooked River water rights, or 15% of the projected annual NUID Crooked River supply.

Where the Proposed Conserved Water Is Currently Going

As described above, the water that will be saved by this project currently seeps into the porous volcanic soil surrounding the I-Lateral. In general, water that leaks out of canals and laterals in Central Oregon enters the regional aquifer and ultimately discharges downstream in the Deschutes River and its tributaries near the confluence of the Deschutes, Crooked, and Metolious Rivers. Flows in the reach of the Deschutes River below this point of groundwater return are not limited due to the magnitude of groundwater returns originating from percolating snowmelt in the Cascades. However, flows in the Deschutes and Crooked Rivers above this point become severely depleted due to excessive irrigation withdrawals.

Proposed Use of Conserved Water Supply

The water conserved through this project will be allocated to irrigated lands within NUID, using a water banking agreement and Oregon's Conserved Water Statute, and a corresponding volume of Crooked River water rights will be transferred instream. NUID currently irrigates these lands with water from the Crooked River, a tributary to the Deschutes River. The agreement will stipulate that water conserved from piping COID's I-Lateral will be used to replace NUID's existing water supply from the Crooked River. It will also stipulate that in return for being provided new gravity flow water from the Deschutes River, NUID will retire instream a corresponding volume of their Crooked River water right to help satisfy instream flow needs in the lower Crooked River. This arrangement will provide cost-relief to NUID farmers who currently have to pay to pump water from the lower Crooked River by providing them with new water rights that are delivered by gravity from the Deschutes River.

The District has established a lottery system to distribute the conserved water within the irrigation district. The lottery will give Crooked River water right holders first priority for new Deschutes River water rights. Approximately 9,000 acres are irrigated from the Crooked River.

These acres are dispersed geographically throughout NUID. The project will eliminate an additional 15% of NUID's remaining Crooked River water use.

The approach described above was piloted in Phase I, which generated conserved water through lining 5 miles of NUID's Main Canal. Phase II includes the additional innovation of transferring conserved water generated in another irrigation district. Reviews of Oregon's Conserved Water Statute and numerous conversations with staff at the Oregon Water Resources Department show that this is within the parameters of the Conserved Water Statute. Implementing this project will demonstrate increased flexibility in the conserved water program, increasing the ability to leverage the most cost-effectiveness projects in the basin, and increasing opportunities to restore streamflow in critical reaches like the lower Crooked River.

Canal Lining/Piping

Estimated Average Annual Savings

Approximately half of all water diverted into the I-Lateral canal is lost to seepage through the sides and bottom of the canal. Replacing open earthen canals with enclosed pipelines reduces water seepage to virtually zero. Estimated average annual savings of 1,300 acre-feet are derived from estimated seepage losses described below.

Estimated Canal Seepage Losses

Losses in the I-Lateral canal have been documented in the following studies:

- Upper Deschutes River Basin Water Conservation Study. 1997. Bureau of Reclamation and Oregon Water Resources Department.
- U.S. Bureau of Reclamation Water 2025 Challenge Grant Action Plan for Cenntreal Oregon Irrigation District, Ochoco Irrigation District and Swalley Irrigation District. Newton Consultants. 2009.
- Central Oregon Irrigation District Water Management Conservation Plan, Draft. 2011. COID.
- I-Lateral Seepage Mitigation Feasibility Study (8,200 LF Section South of Willard Road). 2009. Black Rock Consulting.

COID has aggressively measured seepage loss throughout the district as part of its water loss measurement program to assist in identifying prioritized seepage loss areas within the district. Numerous measurements were taken throughout the district using an acoustic Doppler profiler, price meter measuring equipment, as well as conventional cipoletti measuring weirs and associated pools/staff gauges. This program has been effective in providing COID the data to develop a prioritization of areas to study in more detail. One such identified high water loss areas was the subject area of the I-Lateral. Once significant seepage loss was initially noted by the District, COID performed additional loss measurements on the I-Lateral in 2007 over a 12-node segmented measurement regime from the I-Lateral diversion from the main Central Oregon Canal to approximately 6-miles downstream. Measurement devices included an existing check structure and use of the COID doppler system (measures segmented velocities and associated depths across the canal with approximately 2% loss). COID then contracted with Black Rock Consulting to evaluate the loss measurements provided by COID and provide feasibility design. Losses for the 4,800 linear foot section proposed here were determined to be 4 cfs, or 1,300 acre-

feet over the irrigation season. See Appendix A: I-Lateral Seepage Mitigation Feasibility Study. The COID maintains a continuing program of seepage loss measurements that are intended to assist the District in identifying future conservation projects and to confirm seepage losses already mitigated.

Estimated Post-Project Seepage Losses
As described above, piping reduces seepage losses to zero. Applicants do not expect any post-project seepage losses in the project reach.

Anticipated Transit Loss Reductions
Transit loss reductions amount to 1429 AF/mile.

Seepage Verification
Piping eliminates all seepage in the canal. COID uses ditch riders, weirs, and gages located at their point of diversions to verify all deliveries. Delivery records and legally reduced diversions will verify seepage reductions post project.

Materials Being Used
This project will use 54" DR 41 4710 HDPE pipe to pipe the I-Lateral. COID and other districts in Central Oregon and around the country have had extensive successful experience using HDPE pipe to pipe open earthen canals

Subcriterion No.A.1(b)—Improved Water Management:

This project will result in the more efficient use of the 10,955 average annual acre-feet of water delivered down the I-Lateral: 1,300 acre-feet will be conserved and 9,655 acre-feet will be better managed, reducing transport time of water and operational and maintenance costs. This reflects approximately 7% of COID's deliveries down the Central Oregon Canal (average 150,000 acre-feet) that will be better managed. As discussed above, the project will save 1,300 acre-feet of water that currently seeps into the ground as canal transmission losses, and will transfer it to NUID lands that currently rely on pumped water from the Crooked River for their water supply. The ultimate goal of this and future phases of this project is to eliminate NUID's need to pump water from the Crooked River. Once achieved, 100% of NUID's primary water will stem from a single more reliable source resulting in more efficient, and cost effective water management.

Subcriterion No. A.2—Percentage of Total Supply:

This project will conserve 1,300 acre-feet in COID and allocate it to lands in NUID that currently receive water from the Crooked River. NUID's associated Crooked River water rights will be converted to instream water rights in the Crooked River and maintain their existing priority date. NUID's average annual water supply for the Crooked River lands is 16,841 acre-feet. The Phase I project being implemented in 2011-12 will reduce this by 7,880 acre-feet to 8,961 acre-feet. The 1,300 acre-feet of conserved water generated in Phase II will represent approximately 15% of NUID's Crooked River supply.

Subcriterion No. A.3—Reasonableness of Costs:

The estimated project cost is $1,347,935 to pipe 4,800 linear feet of the I-Lateral. Piping the I-Lateral will save a calculated volume of 1,300 AF of irrigation water annually from seepage

losses. The expected life of the project is estimated conservatively to be 50 years based on extensive experience using HDPE pipe domestically and abroad. Project reasonableness calculates to be $20.74 /(acre-feet x year).

$1,347,935
(1300 acre-feet x 50 years)

Note: Manufacturers typically refer to the HDPE pipe as a 100 year pipe. Currently, all HDPE pipe manufacturers offer a 50 year warranty.

1.4.2. Evaluation Criterion B: Energy-Water Nexus

Subcriterion No B. 1— Implementing Renewable Energy Projects Related to Water Management and Delivery

Amount of Energy Capacity

COID has two existing hydropower generation facilities that will benefit from this proposal as well as future planned facilities that would benefit if completed.

Siphon Power Project (FERC P-3571): The Siphon Power Project (SPP) is located 2 miles south of the city of Bend, Oregon. This facility is a 5.5 MW powerhouse that commenced commercial operation on October 16, 1989. The powerhouse draws water directly from the Deschutes River at river mile 170.9, generates hydro power from the water, and then returns the water back to the river. It operates on 640 cfs of water to generate an estimated 9,804 hp. The SPP has a FERC license issued September 29, 1987.

Juniper Ridge Hydropower Project (FERC P-13607): The Juniper Ridge powerhouse is located north of Bend, Oregon, on COID's Pilot Butte Canal near Deschutes Junction at Highway 97. This 5.0 MW facility commenced commercial operation on October 4, 2010. The powerhouse draws water directly from the PBC during the irrigation season (April – October) and winter stock runs (November – March), generates hydro power, and then returns the water back to the canal. It operates on 480 cfs of water to generate an estimated 7,909 hp. The Juniper Ridge project had a FERC conduit exemption issued March 11, 2009.

COID is also underway pursuing the development of an additional in-canal hydro facility. This project is called the NC-2 Drop and will have a generation capacity of 400kW. This project is a joint venture with Natel Energy utilizing their SLH100 low head technology. Construction is anticipated in the winter of 2012-2013. Two additional in-canal sites have been deemed feasible and will be pursued after completion of the NC-2 Drop.

Amount of Energy Generation

The Siphon Power Plant will produce an additional 203,294 kWh annually, valued at $20,329, and the Juniper Ridge will generate an additional 115,344 kWh annually, valued at $6,920. In total, the project will result in additional renewable energy generation of 318,638 kWh, valued at

$27,249 at 2011 power rates. Hydro electric generation is a linear function based on flow per the properties of each plant individually. Generally if flow increases 10% you generate 10% more electricity from your base calculation. Calculations below:

Siphon Power Plant
85 cfs produces 1 MW (1,000 kilowatts)in one hour.
4 cfs is .047 (4.7%) of 85cfs. So 4 cfs works out to be 1,000 kW x .047 =
47 kilowatts per hour x 24 hours x 180 days = 203,294 kWh (kilowatt hours). The contractual price for a kWh at SPP for 2012 is $.101 which yields $20,339.

Juniper Ridge
150 cfs produces 1 MW in one hour.
4 cfs is .0267 of 150 cfs. 26.7 kWh x 24 x 180 = 115,344 kWh. The contractual price per kWh on Juniper Ridge is $.065 which yields the $6,920.

This project will allow existing systems to operate closer to their maximum capacity. The water conveyed through the I-Lateral is currently delivered through COID's Central Oregon Canal (COC). It does not pass through COID's Siphon Hydropower Plant located on the Deschutes River below the COC diversion. It does not pass through the Juniper Ridge hydroelectric facility located on the COID's Pilot Butte Canal, which has a diversion point downstream from the COID's Siphon Hydropower Plant.

Following this project, COID will no longer divert the conserved 4 cfs at the COC diversion. The conserved water will run through COID's Siphon Power Plant under COID's existing water right and return to the Deschutes River upstream from North Canal Dam. COID will then divert the conserved water into the Pilot Butte Canal at North Canal Dam, delivering it to NUID at its current NUID spill near the Crooked River pumps. The water will pass through both the Siphon and Juniper Ridge hydropower facilities.

Other Benefits

Renewable energy generated through COID's in conduit hydroelectric facilities will feed into the larger power grid, thereby reducing the demand to use non-renewable sources of energy in the Pacific Northwest. This has the potential to reduce greenhouse gas emissions and the reliance on flows in the Columbia dictated largely by dams and their associated hydroelectric facilities.

Additionally, conserved water resulting from the piping of COID's canal will ultimately reduce NUID's need to pump from the Crooked River resulting in an estimated savings of nearly192,000 kwh/year. The Crooked River pumping station is part of Reclamation's Deschutes River Project.

Subcriterion No. B.2—Increasing Energy Efficiency in Water Management

Energy Efficiencies from Project

In 1968, NUID constructed a pumping plant adjacent to and at the point where the Main Canal crosses the Crooked River. The primary purpose of the plant is to furnish a supplemental water supply, when needed, by pumping from the Crooked River and discharging into the Main Canal.

However, the plant also provides a primary water supply to approximately 9,000 acres of land, which are spread throughout the district. The plant consists of nine vertical shaft pumps with a total capacity of 200 cubic feet per second at a total dynamic head of 150 feet. Each pump is powered by a 450-horsepower motor that pumps the water into a 60-inch steel-pipe discharge line 220 feet long. The power for the pumping plant is supplied under contract by the Central Electric Cooperative.

On average, NUID pumps 3,982,912 kilowatt hours annually. Pumping water from the Crooked River canyon costs approximately $13 per acre-foot in electricity charges due to the change in elevation between river and canal. Pumping costs can exceed $350,000 during a normal irrigation season and rates are expected to increase significantly in the future. Pumping costs are covered by assessing fees to farmers based on the number of acres of water rights they own.

The proposed project will reduce the amount of water that NUID pumps from the Crooked River by 1,300 AF. On average, this reduction in pumping will conserve approximately 191,178 kilowatt hours of electricity. Average annual cost savings have been estimated at $14,503 at 2011 power rates. See Appendix C for a detailed analysis of energy savings estimates that was prepared for Phase I based on savings of 7,880 acre-feet. The estimates here used the equations established in that analysis to estimate cost and energy savings for 1,300 acre-feet.

Point of Diversion
This energy savings estimate originates from the NUID's point of diversion on the Crooked River.

Water Treatment
NUID does not treat this water for agricultural use so these calculations do not include any analysis of energy used to treat the water.

Renewable Energy Components Resulting in Minimal Energy Savings
This project does not include any renewable energy components resulting in minimal energy savings.

1.4.3. Evaluation Criterion C: Benefits to Endangered Species

This project will improve conditions for Endangered Species Act listed Middle Columbia Steelhead in the Crooked River, a tributary to Oregon's Deschutes River. Cascades Eastern Slope Tributaries is a Major Population Group (MPG) of Middle Columbia Steelhead. Three Distinct Population Segments (DPS) of this MPG exist in Deschutes Basin: 1) Deschutes River West Side, 2) Deschutes River East Side, and 3) Crooked River (extinct).

Crooked River steelhead became extinct following the development of Pelton Round Butte hydroelectric facility. The facility blocked downstream anadromous fish passage in the Deschutes River at its confluence with the Metolius and Crooked Rivers. NOAA's NOAA's Middle Columbia River Steelhead Distinct Population Segment ESA Recovery Plan (NOAA 2009: 7-17) describes restoring passage into the Crooked River above the Pelton Round Butte Dam complex as a key action to recover the Cascades Eastern Slope Tributaries Major Population Group (MPG) of Middle Columbia Steelhead.

As part of a FERC relicensing agreement completed in 2005, facilities co-managers Portland General Electric and the Confederated Tribes of the Warm Springs Reservation agreed to provide passage at and reintroduce anadromous fish above the Pelton Round Butte facility. They first reintroduced juvenile steelhead to the Crooked River in 2008 and will continue to release juvenile fish above the Pelton Round Butte project until they meet standards set out in the relicensing agreement.

Middle Columbia Steelhead, including Crooked River steelhead, are protected under the Endangered Species Act. When reintroduction is complete above the Pelton Round Butte project, the Crooked River population will extend the range of the species and contribute to the population numbers included in the Cascades Eastern Slope Tributaries MPG and help to meet recovery goals for the species. Fisheries managers expect adult steelhead will return to the lower Crooked River in 2012.

Adverse Affects on the Species by a Reclamation Project

As described elsewhere in this application, NUID is a major part of Reclamation's Deschutes Project. NUID's pumps water from the Crooked River at RM 27 at their Crooked River Pumping Plant, part of the Deschutes Project. NUID's pumps draw down stream flows in the Crooked River as low as 10 cfs, severely limiting conditions for resident and anadromous fish.

The Mid-Columbia Steelhead Distinct Population Segment Recovery Plan (NMFS 2009) lists degraded water quality in the Crooked River from RM 17 to RM 51 as a primary factor limiting steelhead recovery. This portion of the Crooked River is listed by Oregon DEQ as a 303(d) impaired stream for exceeding temperature, dissolved gas, and pH standards. Low stream flows resulting from pumping in the lower Crooked River contribute to elevated stream temperatures, turbidity, and low dissolved oxygen during the irrigation season.

Recovery Plan for Species

Oregon's *Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment* (ODFW 2010) documents recovery plans for steelhead in the Deschutes River and its tributaries. This plan is included as Appendix A of NOAA's *Middle Columbia River Steelhead Distinct Population Segment ESA Recovery Plan* (NOAA 2009).

Benefits of Proposed Project to the Status of the Species

The proposed project, Phase II of the NUID Water and Energy Conservation Initiative, will protect 4.9 cfs of instream water rights in the Crooked River downstream from NUID's pumps throughout the irrigation season. As a part of this entire initiative, NUID will legally condition their existing Crooked River irrigation water rights to protect new monthly minimum flows in addition to the new instream water rights created by each phase. Together, these new minimum flows and water rights will restore up to 220 cfs of stream flow upon completion of all phases of the initiative.

ODFW (2010) and NOAA (2009) highlight restoring a more natural hydrograph as a strategy for improving steelhead in the Crooked River. Actions associated with this strategy include implementing agricultural water conservation measures, improving irrigation conveyance and efficiency, and leasing or purchasing water rights and converting those rights to instream use

(NOAA 2009: 7-21). The conservation project proposed here will satisfy many of the actions recommended in the Recovery Plan and will accelerate the recovery of listed fish species. This project phase, as well as the larger North Unit Water and Energy Conservation Initiative, is a critical piece to restoring stream flow in the lower Crooked River as other opportunities to do so are extremely limited. See attached letters of support from ODFW and DEQ in Appendix D.

NOAA (2009) highlights improving degraded water quality (NOAA 2009: 7-21) as a strategy for improving steelhead in the Crooked River. Currently, high temperatures downstream from NUID's pumps create a seasonal thermal barrier to fish migration in the Crooked River. Modeling completed in 2011 by the Oregon Department of Environmental Quality (ODEQ) identified that low stream flows downstream from the Crooked River pumps contribute to increased stream temperatures. Their modeling demonstrated that decreased pumping will contribute to lowered river temperatures below NUID's pumps and decrease the magnitude of this thermal barrier.

1.4.4. Evaluation Criterion D: Water Marketing

An essential component of this project involves the use of water banking techniques to reallocate water from one water use to another and one irrigation district to another. Broadly speaking, water banking is a mechanism that facilitates the legal transfer and market exchange of various types of surface, groundwater, and storage entitlements. Banking facilitates the reallocation of water rights to alternate uses. This project will provide new supply of water while promoting conservation, regulatory compliance and reduced transaction costs associated with water transfers.

Estimate of the Amount of Water to Be Marketed

The proposed project will market 1,300 acre-feet each of COID Deschutes River and NUID Crooked River water rights. COID's Deschutes River water rights will be allocated to NUID for irrigation use. NUID's Crooked River water rights will be marketed to environmental funders and allocated for instream use.

Market Mechanism

The NUID Water Supply Initiative created a new market for water rights in the Deschutes and Crooked Rivers. Phase II provides for a set of transactions under this market. The Phase I NUID project has demonstrated the success of the proposed approach. Phase II expands the water marketing component by involving a second irrigation district, expanding innovation and water management opportunities basin-wide.

Number of Users and Types of Water Use

Phase II will conserve Deschutes River water through piping the I-Lateral in COID. It will allocate the conserved water to approximately 32 district accounts in NUID that currently receive NUID water pumped from the Crooked River. This allocation will allow 1,300 acre-feet of NUID's Crooked River water rights to enter the market. Phase II will allocate these Crooked River water rights instream in the Crooked River. The transactions will meet new Deschutes River irrigation and new Crooked River environmental uses.

Legal Issues

These transactions will all occur under Oregon's Allocation of Conserved Water Program. COID, NUID, and the Deschutes River Conservancy developed this process in coordination with the Oregon Water Resources Department, the Oregon Department of Fish and Wildlife and the Oregon Department of Environmental Quality. They do not expect any state legal issues. Both COID and NUID have identified that this process aligns with their contracts with Reclamation. NUID does not expect any federal legal issues. NUID's recent Warren Act contract amendment will allow them to participate in this process:

> *The water supply available for irrigation of the lands within the project entitled to receive water and incidental stock and domestic uses and for instream purposes, including fish or wildlife purposes, to the extent that such use is required by Oregon State law in order for the District to engage in, or take advantage of, conserved water projects as authorized by Oregon State law, shall comprise all of the water within the rights, both natural flow and storage, acquired and appropriated, or to be acquired and appropriated, for the project for irrigation, stock and domestic uses, and for instream purposes as described above, that becomes available by the operation of the irrigation system, including natural flow rights out of the Crooked River held by the District. ***.*

The COID water to be marketed is live flow rights from the Deschutes River, not stored water from the Deschutes Project (Crane Prairie Reservoir). COID does not expect any federal legal issues

Estimated Duration of Water Market

Applicant expects that the water market created through the NUID Water and Energy Conservation Initiative will be active for up to ten years. Phase II transactions should be complete within three years of the initiation of the project. Applicants expect future phases of this initiative to contribute to the market. All of the transactions under this market will be permanent.

1.4.5. Evaluation Criterion E: Other Contributions to Water Supply Sustainability

Making Water Available for a Specific Concern

Water Shortages

This project simultaneously increases the reliability of NUID's water supply, being the junior irrigation district in the basin, while marketing water to permanently restore instream flows to both improve water quality and fish habitat for ESA listed mid-Columbia steelhead trout. Both NUID and the Crooked River have unmet water needs illustrated previously in this grant application. These needs, based on a 2011 climate change report specific to the Deschutes Basin (ClimateWise 2011), will only become increasingly acute with predicted climate variability and population growth in the basin.

Marketing to Other Users and Increasing Water Availability

The broader water management context of the Deschutes Basin is one of overallocated rivers, a recent reintroduction of an Endangered Species Act listed fish, increasing municipal demand for

water, and variability in the seniority and reliability of irrigation water rights. In addition, climate change forecasts estimate reduced snowpack and seasonal water availability. The partners in the Deschutes Basin have been working proactively to create a water management plan that identifies and implements a suite of projects that meet multiple demands and avoids potential water conflict. This project exemplifies the type of project that a broader basin-wide plan is being developed to support, piloting inter-district transactions, and breaking open a new set of opportunities in the basin that capitalize on the strengths/limitations of individual irrigation districts to meet agricultural and environmental needs.

Water Available to Indian Tribes

A description of important Native American Indian trust assets in the Deschutes River basin has been documented by the Confederated Tribes of the Warm Springs Reservation in Restoring Oregon's Deschutes River – Developing Partnerships and Economic Incentives to Improve Water Quality and Instream Flows (Environmental Defense Fund, 1995). The Tribes have identified that their paramount goal is to enhance Deschutes River tribal fisheries by increasing instream flows. This project will enhance instream flows and water quality and as such is expected to improve the condition of Native American trust assets in the region.

Promoting Collaboration

This project is widely supported by not only the two irrigation districts participating in the project, but also by the diverse interests represented on the DRC board and the Deschutes Water Alliance (DWA). Collaborative efforts in the basin gained momentum when the DWA was formed in 2004 by the Deschutes Basin Board of Control, the Deschutes River Conservancy, the Confederated Tribes of the Warm Springs Reservation, and the Central Oregon Cities Organization, with assistance from a Reclamation 2025 Challenge Grant, to plan for long term water resource management in the Deschutes Basin. The DWA was formed around the belief that it is possible to simultaneously meet new and existing demands for water in the Basin through the cooperation and voluntary participation of the key water suppliers and users in the basin.

The mission of the DWA contains the following three elements:

- Move stream flows toward a more natural hydrograph while securing and maintaining improved instream flows and water quality to support fish and wildlife
- Secure and maintain a reliable and affordable supply of water to sustain agriculture
- Secure a safe, affordable, and high quality water supply for urban communities

The DWA has been expanded to include all stakeholders in the basin and is working towards a long-term water management plan. It has become clear that instream flow needs cannot be fully met in the basin unless the needs of water-short irrigation districts are also addressed. While other Deschutes Basin irrigation districts have completed conservation projects and utilized Oregon's Conserved Water Statute to put water instream, North Unit, as the junior user, has had the challenge of seeking opportunities to firm up supply while benefiting the rivers. Prior to 2008, NUID's contract with Reclamation preventing them from moving conserved water instream. Changes in their contract with Reclamation in 2008 now allow them to move conserved water instream. By increasing the reliability of water and reducing NUID's energy costs while demonstrably restoring instream flows, the project serves as a model to promote and encourage the collaboration necessary to meet broader DWA goals for the basin. Projects like

this will increase the district's ability to support and participate in increasingly creative projects to restore streamflow. The inter-district nature of the proposed Phase II project elevates the collaborative efforts even higher, allowing for more flexibility and creativity in meeting multiple goals. It will build cooperation and reduce the potential for conflicts that interrupt water supplies.

As discussed above, this project integrates water and energy conservation. Deschutes River water saved by COID piping projects replaces Crooked River water rights, allowing the Crooked River rights to be marketed to permanent instream use, obviating the need to pump that water for irrigation. The annual pumping costs on the Crooked River Pumping Plant average approximately 15% of NUID's annual operating budget, and create a significant burden to efficient operations. In addition, COID will benefit from producing additional renewable energy at its existing Siphon Hydropower Plant and its Juniper Ridge hydroelectric facility because the 4 cfs that is currently conveyed through the Central Oregon Canal will now be conveyed to NUID through the Pilot Butte Canal.

Irrigation districts and water conservation partners in the Deschutes Basin are actively looking to integrate water conservation projects with reduced energy demand and hydropower generation. This project will provide a strong example of the feasibility and multiple benefits of such projects.

Future On-Farm Improvements

This project is not expected to change on-farm conveyance and efficiencies.

Public Awareness of Water and Energy Conservation and Efficiency Efforts

A Local and National Example

This project will undoubtedly serve as an example of water and energy conservation within the community. This is the first conservation project in the basin that coordinates water management between two districts to the benefit of each district and the environment. Previously funded Reclamation water/energy conservation projects in the Deschutes have received national notoriety on the public and political stage, and it is anticipated that the project proposed here will receive similar attention.

Increased Capability for Future Conservation

By demonstrating how collaboration between multiple districts can result in increased reliability for irrigation, decreased operational costs, increased hydroelectric revenue, and more water for our valued streams and river, this project will open the door to future collaborative projects in the basin.

Water and Energy

This project simultaneously restores flows to the Crooked River while decreasing NUID energy consumption in the form of pumping and increasing COID renewable energy generation potential.

1.4.6. Evaluation Criterion F: Implementation and Results

Subcriterion No. 1—Project Planning

Studies completed over the last two decades have consistently highlighted conservation opportunities along COID's I-Lateral Canal. The proposed COID I-Lateral piping project is identified in COID's Water Management Conservation Plan, (COID, Draft, 2011) and the U.S. Bureau of Reclamation Water 2025 Challenge Grant Action Plan for Central Oregon Irrigation District, Ochoco Irrigation District and Swalley Irrigation District (Newton Consultants, 2009). Reclamation's Upper Deschutes River Basin Water Conservation Study (1997) highlighted losses in the district, including the I-Lateral.

The Deschutes Water Alliance, a group of stakeholders focused on collaboratively meeting water needs in the upper Deschutes Basin, completed a series of regional water supply and demand studies in 2006 with support from a Water2025 grant. The Deschutes Water Alliance's Final Report on District Water Efficiency identified water conservation as the greatest opportunity for meeting new agricultural, municipal, and environmental water demands in the upper Deschutes Basin. It identified and prioritized piping COID laterals as a source of water to meet new demands. This project directly aligns with the goals of the Deschutes Water Alliance and the findings of their studies.

After the I-Lateral was identified as a priority conservation project, COID contracted with Black Rock Consulting to produce the I-Lateral Seepage Mitigation Feasibility Study (Crew, 2009). This study provides feasibility and preliminary design for piping the I-Lateral section proposed here.

Oregon does not have a state water plan. However, piping the I-Lateral meets both COID goals, North Unit Irrigation District's goals and the goals of a broad coalition of local, state, and federal basin stakeholders. Marketing the water to instream flow buyers such as the Pelton Water Fund, which has committed to investing in this project, meets the need for projects that restore flow in the lower Crooked River. The following assessments and action plans of the following agencies and organizations highlight the need to restore flow in the Crooked River:

- US Bureau of Reclamation, Upper Deschutes River Basin Water Conservation Study (1997)
- Oregon Department of Fish and Wildlife, Crooked River Basin Plan (1996)
- Northwest Power and Conservation Council, Deschutes Subbasin Plan (2004)
- Upper Deschutes River Watershed Council, Upper Deschutes Watershed Assessment (2003)
- Crooked River Watershed Council, Crooked River Watershed Assessment/Action Plan (2003)
- Oregon Department of Agriculture, Upper Deschutes Agricultural Water Quality Management Area Plan (2002)
- Mid- Columbia River Steelhead (Oncorhynchus mykiss) Distinct Population Segment Recovery Plan (2009)

Subcriterion No. 2—Readiness to Proceed

Project Implementation

Design & Construction
In March 2012, COID staff will perform field survey/cross sectioning of the canal within the project limits and approximately 2,000 linear feet upstream and downstream of the project utilizing its survey-grade GPS system. This data will be provided to Black Rock Consulting for preparation of design.

Design will meet the requirements of the COID. A kick-off meeting will initially be held with COID to discuss the planned project design including pipeline alignment, inlet and outlet structures, turnout details, venting, access, and other related project details. Incorporating the results of the meeting, Black Rock Consulting will develop preliminary design for the project (50% level design). This design will be submitted to the COID for review. Another meeting will be held with COID to review the 30% design to insure that it continues to meet the needs of the COID and to solicit additional input. Incorporating the results of the meeting, the design will be finalized and submitted to COID for final review and approval. Any final comments will be incorporated by Black Rock Consulting into the design. A final set of signed and stamped construction drawings (and necessary specifications) will be issued for construction. The design will incorporate tried and tested technologies in the pipe material (fusion welded HDPE), saddles, valves, and turnout materials. It is anticipated that the design will commence in June 2012 and the design process will be complete by October 2012 (Figure 2).

Given a funding phased project approach, the pipe materials for the project will be purchased ahead of construction starting in October 2012. HDPE is a commodity based material that generally reduces in price from the summer peak in the fall/winter so this will likely be the best timing for purchase.

Prior to project construction, a field survey will be performed to stake out the alignment and features of the project. This staking will establish, line and grade for the pipeline, inlet and outlet structures, bends, and turnout locations along the project. The survey will be performed in March 2012 prior to the 2012 irrigation season.

Construction will be performed by COID forces. With a 100-year history of canal operations, pipeline installations, and maintenance, COID has the experience, personnel and a majority of equipment to perform the work. In 2008, COID completed a high density polyethylene pipeline installation on its C-Lateral including trenching, reinforced concrete inlet and outlet structures, turnout installations, pipe welding and installation. Equipment necessary for the project such as water truck, dump truck, and large excavator, but not owned by COID will be rented at one of the many local rental yards that have such equipment on hand. The pipeline will be welded by the pipe vendor. The cost of welding will be included in the pipe purchase price. COID will perform all site construction operations including clearing and grubbing, trenching, pipe installation, backfill and compaction, forming and pouring reinforced concrete inlet and outlet structures, installing turnouts and vents, and restoration seeding.

Field observation and quality control will be conducted periodically during the work by Black Rock Consulting. It is customary for the design engineer to perform field observations and quality control. Black Rock Consulting is experienced with field observation services and

intends to observe, photograph, and document the observations and provide COID technical input during the course of construction.

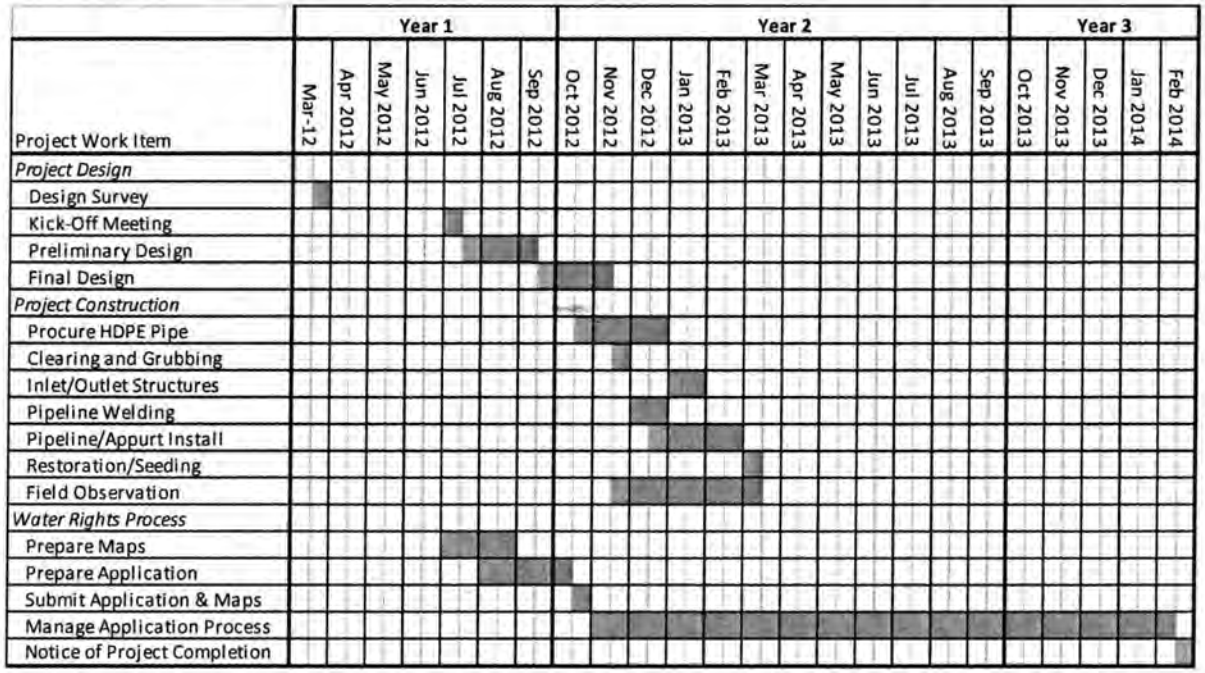
Water Rights Process
In July 2012, NUID will meet with DRC to coordinate the development, preparation and submission of water rights maps for the affected lands. NUID will identify the affected lands through a lottery process. NUID successfully used this process in Phase I of the NUID Water and Energy Conservation Initiative. DRC will submit these maps with the final Application for the Allocation of Conserved Water.

The Applicant will meet with COID, DRC and their representatives in August 2012 to initiate the development, preparation and submission of an Application for the Allocation of Conserved Water. The DRC will prepare the application following the process used in Phase I of the NUID Water and Energy Conservation Initiative. As in Phase I, the DRC will coordinate with COID, NUID , the Oregon Water Resources Department and the Oregon Department of Fish and Wildlife during application preparation.

The DRC will facilitate the necessary agreements between COID, NUID, and project funders following the development of an application. Agreements will ensure that water deliveries occur as specified by NUID and COID. The DRC will submit the application for the Allocation of Conserved Water to OWRD in November 2012.

The DRC will shepherd the application through the OWRD process. The DRC has extensive experience working with this process. NUID will submit a Notice of Project Completion to OWRD as appropriate following the completion of project construction March 2013. OWRD will issue a Final Order between 9 months and 15 months following submission of the application and pending a Notice of Project Completion.

Figure 2. NUID Water and Energy Conservation Initiative Phase II Schedule



Readiness Criteria

In addition to the project designs, biological assessments and cultural resource surveys of the canal have already been conducted and are ready to submit to satisfy the federal environmental and historical compliance. No other permits are needed.

Available & Proven Design Criteria

COID and other districts in Central Oregon and around the country have had extensive successful experience using HDPE pipe to pipe open earthen canals, resulting in demonstrable water savings. Phase I demonstrated how the water banking agreement will work to allocate conserved Deschutes River water to NUID Crooked River lands and NUID Crooked River water rights permanently instream, all approved measures under Oregon Water Law and federal Reclamation contracts.

Subcriterion No. 3—Performance Measures

Canal Piping

Deschutes River water saved through piping the COID I-Lateral will be documented through inflow/outflow testing using existing gages and COID measuring capabilities upstream and downstream from the proposed piping project. As described in Section 1.4.1 of this report, COID has adequately documented pre-project losses through this open reach of the I-Lateral using prior measurements. This project will reduce canal seepage. Post-project monitoring of this lateral will allow COID to evaluate post-project losses in the lateral. Comparing pre- and post-project losses will allow COID to confirm the benefits of the canal lining project.

Water Markets – Water Marketing

As described earlier, this project will provide an alternate source of Deschutes River water rights for lands in NUID currently served by water pumped from the Crooked River and will restore a corresponding amount of water instream in the Crooked River. The Oregon Water Resources Department operates a stream flow gage downstream from NUID's diversion on the Crooked River. This gage will provide both pre-project and post-project stream flow data, allowing NUID to demonstrate benefits of water marketing to stream flows in the Crooked River. NUID will also track the number of acres that receive conserved water from the Deschutes River as a result of this project, demonstrating success of the agricultural transfers.

Energy-Water Nexus – Increasing Energy Efficiency in Water Management

The proposed project will conserve an estimated 191,178 kilowatt hours of electricity every year in perpetuity. Energy savings will be documented by comparing pre and post project electricity use records provided by Central Electric Cooperative (CEC) to NUID. CEC provides monthly power bills to NUID that detail the district's electricity usage for that month and assesses a per kilowatt hour fee. NUID maintains a long-term record of these power bills and will use them as a baseline for quantifying actual post-project power savings. NUID will use the same records and methodology to quantify cost savings.

Energy-Water Nexus – Increasing Renewable Energy in Water Management

The proposed project will generate an additional 318,638 kilowatt hours of electricity every year in perpetuity at two existing COID hydropower facilities. This estimate was calculated by using existing energy generation records to calculate the generation produced by an additional 4 cfs through the facilities.

Generation at the Siphon Hydrolelectric Power Plant is expected to increase by 203,294 kWh valued at $20,329. Documenting the increase will be difficult using energy records due to naturally-variable water use in the district, but a description of the facility and its relationship to the Central Oregon (CO) Canal will confirm the expected increase. The Siphon Hydroelectric Power Plant (SPP) and the Central Oregon Canal (CO) are provided water from the Deschutes River from the same intake into a siphon pipe. At the outlet end of the siphon pipe, water can be diverted into the CO and/or down the penstock for the SPP. At present, the maximum carrying capacity of the pipe is 820 cfs. In the non-irrigation season, water is diverted into the siphon pipe solely for the purposes of providing water to the SPP (up to the maximum of 640 cfs). During the irrigation season, 820 cfs is diverted into the siphon pipe every day every hour. On the downstream end of the pipe the first priority of the 820 cfs is to meet the irrigation rights and the second priority is for hydro generation purposes at the SPP. To the extent that the irrigation demand can be reduced it provides the saved or conserved water quantity to be used for hydroelectric generation. The 1,300 acre feet of conserved water generated from the I-Lateral project will no longer be placed in the CO, but instead will be brought down the penstock to SPP.

Increased generation at the Juniper Ridge facility is estimated to be 115,344 kWh at $6,920. Using similar logic as above, the 1,300 acre-feet of water that had once traveled down the CO Canal will now be delivered to NUID through the Pilot Butte Canal, passing through Juniper Ridge, and increasing power generation.

Benefits to Endangered Species

The proposed project will improve habitat conditions for ESA listed Mid-Columbia Steelhead by improving instream flows in the lower Crooked River. Specifically, the project will contribute an additional 1,300AF of flow to the lower 28 miles of the Crooked River each year from March to October. As described in 1.4.3 above, this project addresses key limiting factors identified in the Mid-Columbia Steelhead Distinct Population Segment Recovery Plan. Portland General Electric (PGE) and the Confederated Tribes of the Warm Springs Reservation (Tribes) are required as stipulation of their federal license to operate the Pelton Round Butte Hydroelectric Project to monitor native fish populations (Hill and Quesada, 2009) in a portion of the upper Deschutes Basin that includes the lower 28 miles of the Crooked River. This monitoring effort is described in Section 9 of *Recovery Strategies and Management Actions Oregon Mid-C Steelhead Recovery Plan* and is administered primarily by PGE. NUID will utilize data and reporting by PGE and the Tribes to determine, to the extent possible, the recovery rate of Mid-Columbia Steelhead in the lower Crooked River.

1.4.7. Evaluation Criterion G: Connection to Reclamation Project Activities

(1) How is the proposed project connected to Reclamation project activities?

North Unit Irrigation District is a major part of Reclamation's Deschutes River Project. NUID Deschutes Project operations include Wickiup Reservoir, Haystack Dam and Reservoir, the North Unit Main Canal, and the Crooked River Pumping Plant. Central Oregon Irrigation District is also part of the Deschutes Project, and receives water from Crane Prairie Reservoir.

(2) Does the applicant receive Reclamation project water?

Yes, NUID receives stored water from Wickiup Reservoir. Wickiup Reservoir is part of the Deschutes Project. COID receives water from Crane Prairie Reservoir, part of the Deschutes Project.

(3) Is the project on Reclamation project lands or involving Reclamation facilities?

Yes. The project involves NUID lands and the Crooked River pumps.

(4) Is the project in the same basin as a Reclamation project or activity?

Yes.

(5) Will the proposed work contribute water to a basin where a Reclamation project is located?

Yes. The Deschutes Basin includes both the Deschutes and Crooked River Projects.

1.5. References

BOR. 1997. Upper Deschutes River Basin Water Conservation Study, Special Report, Crook, Deschutes, and Jefferson Counties, Oregon: Bureau of Reclamation.

BOR. 2002. Canal-Lining Demonstration Project: Year 10 Final Report. Bureau of Reclemation

Carmichael, RW, BJ Taylor. 2010. Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment. Oregon Department of Fish and Wildlife. February 2010.

Crew, Kevin. 2009. I-Lateral Seepage Mitigation Feasibiliy Study. Bend, OR.

CRWC. 2003. Crooked River Watershed Assessment and Action Plan. Prineville, OR: Crooked River Watershed Council.

DEQ. 2002. 2002 303(d) List Database. Salem, OR: Department of Environmental Quality.

DWA. 2006. Deschutes Water Alliance Final Report. Bend, OR: Deschutes Water Alliance.

Gannett, M.W., Lite, K.E., Morgan, D.S. and C.A. Collins. 2001. Ground-Water Hydrology of the Upper Deschutes Basin, Oregon. Water-Resources Investigations Report 00-4162. Portland, OR: USGS.

HDR Engineering. 2006. Technical Memorandum: North Unit Irrigation District Main Canal Feasibilitly Study.

Hill M, Quesada C. 2009. Native Fish Monitoring: Biological Component 2009 Annual Report and 2010 Work Plan. Portland General Electric Company. Portland, Oregon.

Newton Consultants. 2009. U.S. Bureau of Reclamation Water 2025 Challenge Grant Action Plan. Prepared for Central Oregon Irrigation District, Ochoco Irrigation District and Swalley Irrigation District. Bend, OR.

Newton Consultants. 2011.Report on Updated Costs and Schedule and Reductions in Power Costs for Proposed 4.9-Mile Sidewall Lining Project. Redmond, OR.

NFWF. 2007. Adaptive Management for ESA-Listed Salmon and Steelhead Recovery: Decision Framework and Monitoring Guidance http://www.nwr.noaa.gov/SalmonRecovery-Planning/ESA-Recovery-Plans/upload/Adaptive_Mngmnt.pdf.

NMFS. 2009. Mid- Columbia River Steelhead (Oncorhynchus mykiss) Distinct Population Segment Recovery Plan. Federal Register /Vol. 74, No. 188 /Wednesday, September 30, 2009

NUID. 2003. North Unit Irrigation District 5-Year Update: Water Management and Conservation Plan. Madras, Oregon.

NPCC. 2004. Deshutes Subbasin Plan. Portland, OR: Northwest Power and Conservation Council.

ODFW. 1996. Crooked River Basin Plan. Prineville, OR: Oregon Department of Fish and Wildlife.

Tonsfeldt and Gray. 2009. Cultural Resource Inventory of a Segment of the Central Oregon Irrigation District I-Lateral Canal, Deschutes County, OR. Bend, OR.

WH Pacific, Inc. 2009. I-Lateral Piping Project Biological Assessment. Bend, OR.

2. Environmental Compliance

(1) Will the project impact the surrounding environment (i.e., soil [dust], air, water [quality and quantity], animal habitat, etc.)?

This project will have minimal impacts on the surrounding environment. All work will occur within existing irrigation canals and the project sites will be accessed using existing access roads. Earth disturbing work, where required, will occur within existing irrigation canals.

(2) Are you aware of any species listed or proposed to be listed as a Federal endangered or threatened species, or designated Critical Habitat in the project area? If so, would they be affected by any activities associated with the proposed project?

No federally endangered or threatened species are known to exist in the project area. No designated Critical Habitat exists in the project area. The project will ultimately restore stream flow to the lower Crooked River, improving conditions for ESA listed steelhead trout. The lower Crooked River does not contain any designated Critical Habitat (WH Pacific, 2009).

(3) Are there wetlands or other surface waters inside the project boundaries that potentially fall under Federal Clean Water Act jurisdiction as "waters of the United States?" If so, please describe and estimate any impacts the project may have.

No wetlands or other surfaces waters that could fall under Clean Water Act jurisdiction exist in the project area. The project will ultimately reduce irrigation diversions from the Crooked River, likely improving water quality in the river (WH Pacific, 2009).

(4) When was the water delivery system constructed?

The Central Oregon and Pilot Butte Canals were completed in 1907. North Canal Dam and its connection to the Pilot Butte Canal were completed in 1912. Crane Prairie Reservoir was completed in 1940.

(5) Will the project result in any modification of or effects to, individual features of an irrigation system (e.g., headgates, canals, or flumes)? If so, state when those features were constructed and describe the nature and timing of any extensive alterations or modifications to those features completed previously.

This project will pipe 4,800 feet of the I-Lateral Canal, constructed between 1905 and 1907. Two turnouts will be constructed to serve existing users.

(6) Are any buildings, structures, or features in the irrigation district listed or eligible for listing on the National Register of Historic Places?

A search of state and county documents shows that neither the I-Lateral nor the Central Oregon canal have been determined eligible for nomination to the National Register of Historic Places. At some time in the future, the COID system might be proposed as an historic district. At that time, the I-Lateral could be proposed as a contributing resource within the district. As a stand-alone resource without consideration of its context within the system, however, the I-Lateral would not have adequate distinction of design or construction under NRHP Criterion C, or adequate historic associations under NRHP Criterion A to be considered eligible (Tonsfeldt and Gray, 2009).

(7) Are there any known archeological sites in the proposed project area?

No archeological sites were found during the cultural resources survey of the proposed project area (Tonsfeldt and Gray, 2009).

(8) Will the project have a disproportionately high and adverse effect on low income or minority populations?

The project will not have a disproportionally high and adverse effect on low income or minority populations.

(9) Will the project limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands?

This project will not limit access to and ceremonial use of Indian sacred sites. COID does not expect this project to negatively affect tribal lands.

(10) Will the project contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area?

This project will not contribute to the spread of noxious weeds or non-native invasive species. Piping an open irrigation canal will limit invasive and non-native plant habitat

along the canal, reducing the potential for invasive and non-native plant growth in the project area.

3. Required Permits or Approvals

3.1. Federal Permitting

The most significant federal approval necessary for construction of this project will be National Environmental Policy Act (NEPA) compliance. The biological assessment and cultural resource surveys of the canal have already been conducted and are ready to submit to satisfy the federal environmental and historical compliance. Project partners will work with the Bureau of Reclamation to evaluate and satisfy NEPA compliance, modifying or generating any additional information as necessary. Reclamation has issued Categorical Exclusions for similar canal piping projects and for the NUID Energy and Water Conservation Initiative Phase I.

A description of important Native American Indian trust assets in the Deschutes River basin has been documented by the Confederated Tribes of the Warm Springs Reservation in Restoring Oregon's Deschutes River – Developing Partnerships and Economic Incentives to Improve Water Quality and Instream Flows (Environmental Defense Fund, 1995). The Tribes have identified that their paramount goal is to enhance Deschutes River tribal fisheries by increasing instream flows. This project will enhance instream flows and water quality and as such is expected to improve the condition of Native American trust assets in the region.

Based on previous experience with satisfying federal NEPA and cultural resource requirements, NUID and COID are confident that necessary approvals can be secured prior to October 2012.

3.2. State Permitting

No state permits are required.

3.3. Local Permitting

No local permits are required.

4. Funding Plan and Letters of Commitment

4.1. How Applicant Will Contribute to the Cost Share Requirement

NUID and its funding partners will provide $747,935 in non-federal match to leverage Reclamation's $600,000 investment. NUID will provide $13,826 of match funding through in-kind staff resources supported by district assessments (see Detailed Budget attachment). Non-federal partners will provide an additional $734,109 as described below.

4.2. In-Kind Costs Incurred Before the Project Start Date

NUID anticipates that this project, as funded by Reclamation, will start in July 2012. Initial survey work needs to occur prior to the 2012 irrigation season before any Reclamation contract. This survey work, which will be completed by COID and funded by non-federal investors, will cost approximately $3,500 and is included in the budget. COID expects to complete this work in March 2012. It will be critical to completing the project design.

4.3. Identify the Source and Amount of Funding Provided by Funding Partners

The Oregon Watershed Enhancement Board invests in watershed restoration across Oregon. They have a strong history of investing in the Deschutes Basin and have already invested over $8 million in water conservation projects. OWEB has committed $300,000 to this project (see Appendix D for Letter of Commitment).

The Pelton Fund is a mitigation fund established as part of a 2005 FERC relicensing process for the Pelton Round Butte hydroelectric project on the Deschutes River. The Pelton Fund has invested approximately $5 million in stream flow and habitat restoration along the Deschutes River and its tributaries. The Pelton Fund has committed $434,109 to this project (see Appendix D for Letter of Commitment).

4.4. Other Federal Funds

No federal funds have been requested or received from other sources.

4.5. Pending Funding Requests

No pending funding requests will affect this project. Funding partners have committed to providing adequate match funding.

4.6. Funding Summary

Table 1. Summary of non-federal and federal funding sources

Funding Sources	Funding Amount
Non-Federal Entities	
1. North Unit Irrigation District*	$ 13,826
2. Oregon Watershed Enhancement Board	$ 300,000
3. Pelton Fund	$ 434,109
Non-Federal Subtotal	*$ 747,935*
Other Federal Entities	
None	$ -
Other Federal Subtotal	$ -
Requested Reclamation Funding	*$ 600,000*
Total Project Funding	$ 1,347,935
*indicates in-kind contributions	

5. Letters of Project Support

Letters of support have been received from the following organizations (see Appendix E)

- Central Oregon Irrigation District
- Deschutes River Conservancy
- Crooked River Watershed Council
- Jefferson County Soil and Water Conservation District
- Oregon Department of Fish and Wildlife

- Oregon Department of Environmental Quality

6. Official Resolutions

COID and NUID have both passed official Board Resolutions specific to this project. Please see Appendix F.

7. Budget Narrative

The assembled cost of the project has been estimated to be $1,378,184. This project estimate is based on 2012 costs and rates for survey, engineering and contractor professionals familiar with Central Oregon and the COID I-Lateral for the project reach. These costs were assembled with the intent for project implementation to begin approximately June 2012 with final project construction and completion by February 2014.

The project cost estimates were developed in connection with review of previous COID piping projects and the I-Lateral Seepage Mitigation Feasibility Study (Crew, 2009, Attachment B). Crew (2009) provided summaries of Weholite and solid wall HDPE pipe alternatives (as well as other lining options) that were helpful to provide potential design considerations for formulation of current 2012 project cost estimates.

The preferred alternative from the report (Crew, 2009) was further refined by Black Rock Consulting and it was determined that 54" diameter HDPE with a 4710 resin would provide the necessary hydraulic characteristics to pass the required flow in conjunction with minor upstream bank improvements. This was the least cost alternative given a 50-year project life cycle. The budget estimates for the HDPE pipe material were obtained in January, 2012 including pipe procurement, shipping to the site and welding the pipe via a certified manufacturer's welder and welding device.

The following sections outline the various budget items appearing in the project budget.

7.1. Salaries and Wages

As described in the Detailed Budget, NUID expects to make an in-kind investment of $9,442 in salaries and wages (Table 3). These investments support grant and project management tasks specific to this project. The water marketing portion of this project requires intensive water rights mapping, processing, and review. The investments described below include these tasks along with construction related activities. They do not include general administration.

Table 2. Salaries and Wages

Staff	Unit Cost	Units	Quantity	Total Cost
Mike Britton, General Manager	$ 37.53	Hours	40	$ 1,501
Kirk Holcomb, Assistant Manager	$ 33.35	Hours	20	$ 667
Gary Calhoun, Watermaster	$ 25.96	Hours	20	$ 519
Victoria McKelvy, Office Manager	$ 27.41	Hours	75	$ 2,056
Sue Levitt, Water Records Clerk	$ 17.60	Hours	35	$ 616
Carla Bridges, Water Records Clerk	$ 11.99	Hours	35	$ 420
Pam Watson, Water Records Clerk	$ 19.74	Hours	105	$ 2,073
James Ennis, Foreman	$ 22.72	Hours	70	$ 1,590

7.2. Fringe Benefits

As described in Crew, 2009. I-Lateral Seepage Mitigation Feasibiliy Study. Bend, OR. Detailed Budget, NUID expects to make an in-kind investment of $4,385 in fringe benefits (Table 3). These investments provide for FICA taxes, retirement, health insurance, life & disability insurance, unemployment tax, workers compensation and HRA for staff hours spent on this project.

Table 3. Fringe Benefits

Staff	Unit Cost	Units	Quantity	Total Cost
Mike Britton, General Manager	$ 17.16	Hours	40	$ 686
Kirk Holcomb, Assistant Manager	$ 12.16	Hours	20	$ 243
Gary Calhoun, Watermaster	$ 14.23	Hours	20	$ 285
Victoria McKelvy, Office Manager	$ 10.72	Hours	75	$ 804
Sue Levitt, Water Records Clerk	$ 10.79	Hours	35	$ 378
Carla Bridges, Water Records Clerk	$ 8.20	Hours	35	$ 287
Pam Watson, Water Records Clerk	$ 9.36	Hours	105	$ 983
James Ennis, Foreman	$ 10.27	Hours	70	$ 719

7.3. Travel

None

7.4. Equipment

None

7.5. Materials and Supplies

None

7.6. Contractual

7.7. Surveying

Surveying costs were estimated by Black Rock Consultants based on extensive local experience. They include all design, construction, and post-construction surveying costs.

7.8. Engineering

Engineering costs were estimated by Black Rock Consultants based on extensive prior experience. They include design, construction, and post-construction engineering costs. They also include project management costs. COID will utilize its own experienced personnel to serve as project manager and these costs appear in this budget. Please refer to the Detailed Budget for additional detail on engineering costs.

7.9. Construction

NUID expects to contract with COID to construct the project. Construction costs are broken out into Salaries and Wages, Equipment, and Materials below. Construction costs are consistent with costs for similar projects completed in the region. Please refer to the detailed budget for additional detail on construction costs.

Construction – Salaries and Wages
Cost estimates for construction salaries and wages include all of the construction labor necessary to pipe the COID I-Lateral, construct the inlet and outlet structures, and provide restoration and seeding of the disturbed areas. Construction cost estimates were provided by Black Rock Consulting.

Construction – Equipment
Cost estimates for construction equipment include the equipment use necessary to pipe the COID I-Lateral, construct the inlet and outlet structures, and provide restoration and seeding of the disturbed areas. They include daily use and fuel charges provided by Black Rock Consulting.

Construction – Materials and Supplies
Cost estimates for materials and supplies include HDPE pipe, import soil, fittings, saddles, venting, valves, concrete, reinforcing steel, rip-rap, HDPE pipe materials and bend, and ancillary supplies necessary to properly install it in the COID I-Lateral. Costs were provided by Black Rock Consulting. They developed these costs based on extensive experience in the field.

7.10. Water Rights Process

Cost estimates for the water rights process include all of the legal, technical and administrative costs associated with preparing, submitting, and finalizing an application under the Oregon Water Resources Department's Allocation of Conserved Water Program. State administrative fees are based on the number of water rights and rate of water rights to be conserved. Technical costs include water rights review, application preparation, and shepherding the application through a two year administrative process. These costs are based on experiences with Phase I of the NUID Water Supply Initiative and similar projects. Legal costs include application review, agreement development, and shepherding the application through a two-year administrative process. These applications are critical to the water banking components of this project and are more complex than traditional water rights change applications. The Deschutes River Conservancy will lead the development of this application and associated agreements between

project partners. The Deschutes River Conservancy has extensive experience with this process and, as a non-profit organization, offers competitive rates. Please refer to the Detailed Budget for additional detail on water rights process costs.

7.11. Environmental and Regulatory Compliance Costs

As described in the project application, applicants expect to apply for and receive any local, state, and federal permits for this project. COID has completed cultural resources surveys for this project location. Applicants anticipate that prior agreements and existing surveys will expedite the completion of these permits. Costs under this budget item will support this work, the submittal of existing surveys to the appropriate agencies, the review of those surveys by Reclamation, and obtaining necessary approvals.

7.12. Reporting

This line item includes costs to be incurred while reporting to federal and non-federal funders.

7.13. Other

None

7.14. Indirect Costs

None

7.15. Contingency

This line item includes contingency costs at 10% of project construction costs. COID has extensive experience with designing and implementing water conservation projects. As this project has not had a final design, this line item allows for a conservative cost estimate that accounts for any unexpected design and implementation challenges. Any contingency costs will be covered by non-federal sources.

7.16. Total Cost

Table 4. Total Cost

Source	Amount	Proportion
Non-Federal	$ 747,935	0.55
Federal	$ 600,000	0.45
Total	$ 1,347,935	1

7.17. Detailed Project Budget

Please refer to the Detailed Budget accompanying this application.

Detailed Project Budget

Budget Item Description	$/Unit	Unit	Quantity	Recipient Funding	Reclamation Funding	Total Cost
Salaries and Wages						
Mike Britton, General Manager	$ 37.53	Hours	40	$ 1,501	$ -	$ 1,501
Kirk Holcomb, Assistant Manager	$ 33.35	Hours	20	$ 667	$ -	$ 667
Gary Calhoun, Watermaster	$ 25.96	Hours	20	$ 519	$ -	$ 519
Victoria McKelvy, Office Manager	$ 27.41	Hours	75	$ 2,056	$ -	$ 2,056
Sue Levitt, Water Records Clerk	$ 17.60	Hours	35	$ 616	$ -	$ 616
Carla Bridges, Water Records Clerk	$ 11.99	Hours	35	$ 420	$ -	$ 420
Pam Watson, Water Records Clerk	$ 19.74	Hours	105	$ 2,073	$ -	$ 2,073
James Ennis, Foreman	$ 22.72	Hours	70	$ 1,590	$ -	$ 1,590
Subtotal				**$ 9,442**	**$ -**	**$ 9,442**
Fringe Benefits						
Mike Britton, General Manager	$ 17.16	Hours	40	$ 686	$ -	$ 686
Kirk Holcomb, Assistant Manager	$ 12.16	Hours	20	$ 243	$ -	$ 243
Gary Calhoun, Watermaster	$ 14.23	Hours	20	$ 285	$ -	$ 285
Victoria McKelvy, Office Manager	$ 10.72	Hours	75	$ 804	$ -	$ 804
Sue Levitt, Water Records Clerk	$ 10.79	Hours	35	$ 378	$ -	$ 378
Carla Bridges, Water Records Clerk	$ 8.20	Hours	35	$ 287	$ -	$ 287
Pam Watson, Water Records Clerk	$ 9.36	Hours	105	$ 983	$ -	$ 983
James Ennis, Foreman	$ 10.27	Hours	70	$ 719	$ -	$ 719
Subtotal				**$ 4,385**	**$ -**	**$ 4,385**
Travel						
None			0	$ -	$ -	$ -
Subtotal				**$ -**	**$ -**	**$ -**
Equipment						
None						
Subtotal				**$ -**	**$ -**	**$ -**
Supplies/Materials						
None						
Subtotal				**$ -**	**$ -**	**$ -**
Contractual/Construction						
Surveyor						
Construction Phase Services						
Construction Staking	$ 145.00	Hour	24	$ -	$ 3,480	$3,480
Mileage, stakes, lathe, paper, etc	$ 500.00	Per Project	1	$ -	$ 500	$500
Engineer						
Design Survey						
Professional Engineer	$ 135.00	Hour	4	$ 540	$ -	$540
Base Mapping						
Professional Engineer	$ 135.00	Hour	4	$ 540	$ -	$540
Engineering Technician	$ 80.00	Hour	8	$ 640	$ -	$640
Preliminary Design						
Professional Engineer	$135.00	Hour	60	$ 8,100	$ -	$8,100
Engineering Technician	$80.00	Hour	64	$ 5,120	$ -	$5,120
Final Design Drawings & Specifications						
Professional Engineer	$135.00	Hour	40	$ -	$ 5,400	$5,400
Engineering Technician	$80.00	Hour	60	$ -	$ 4,800	$4,800
Construction - Bid/Pre-Construction Assistance						
Professional Engineer	$135.00	Hour	8	$ -	$ 1,080	$1,080
Construction - Oversight and Inspections						
Professional Engineer	$135.00	Hour	54	$ -	$ 7,290	$7,290
Construction Meetings with Owner						
Professional Engineer	$135.00	Hour	8	$ -	$ 1,080	$1,080
Completion - Record Drawings						
Professional Engineer	$135.00	Hour	4	$ -	$ 540	$540
Engineering Technician	$80.00	Hour	4	$ -	$ 320	$320
Reimbursable Expenses						
Mileage, Plotting,	$500.00	Per Project	1	$ -	$ 500	$500
CONSTRUCTION						
Construction Salaries and Wages						
Manager	$ 75.08	Hour	100	$ 7,508	$ -	$7,508
Assistant Manager	$ 46.80	Hour	200	$ 9,361	$ -	$9,361

Budget Item Description	$/Unit	Unit	Quantity	Recipient Funding	Reclamation Funding	Total Cost
Lead Man	$ 36.93	Hour	440	$ 16,248	$ -	$16,248
Operators (2)	$ 35.23	Hour	880	$ 31,006	$ -	$31,006
Laborers (4)	$ 35.23	Hour	1760	$ 62,012	$ -	$62,012
Construction Equipment						
480 Exc.	$ 480.00	Day	44	$ 21,120	$ -	$ 21,120
200 Cl. Exc.	$ 200.00	Day	44	$ 8,800	$ -	$ 8,800
Water Truck	$ 200.00	Day	44	$ 8,800	$ -	$ 8,800
Dozer D-4 Class	$ 360.00	Day	32	$ 11,520	$ -	$ 11,520
Backhoe	$ 280.00	Day	44	$ 12,320	$ -	$ 12,320
Dump Trucks (2)	$ 360.00	Day	88	$ 31,680	$ -	$ 31,680
Utility Truck (2)	$ 200.00	Day	88	$ 17,600	$ -	$ 17,600
Pickups (2)	$ 120.00	Day	100	$ 12,000	$ -	$ 12,000
Loader	$ 320.00	Day	44	$ 14,080	$ -	$ 14,080
Carpenter Trucks (2)	$ 120.00	Day	30	$ 3,600	$ -	$ 3,600
Fuel Truck	$ 60.00	Day	44	$ 2,640	$ -	$ 2,640
Construction Supplies and Materials						
54" DR 41 4710 HDPE Pipe	$ 148.00	LF	4800	$ 158,390	$ 552,010	$ 710,400
HDPE Bends	$ 2,500.00	EA	3	$ 7,500	$ -	$ 7,500
Saddle, Gate, Turnout	$ 5,000.00	EA	2	$ 10,000	$ -	$ 10,000
1/4 Ton Rip Rap	$ 25.00	CY	80	$ 2,000	$ -	$ 2,000
Bank Fill Dirt - COID	$ 5.00	CY	8000	$ 40,000	$ -	$ 40,000
Structural Concrete	$ 130.00	CY	120	$ 15,600	$ -	$ 15,600
Reinforcing Steel	$ 2,000.00	Ton	1	$ 2,000	$ -	$ 2,000
Forming Materials	$ 3.00	SF	1600	$ 4,800	$ -	$ 4,800
Seed/Drill	$ 250.00	lbs	10	$ 2,500	$ -	$ 2,500
WATER RIGHTS PROCESS						
Conserved Water Application Fees	1750	Application	1	$ 1,750	$ -	$ 1,750
Title Reports	200	Report	100	$ 20,000	$ -	$ 20,000
GIS Maps	100	Map	100	$ 10,000	$ -	$ 10,000
Limited License Fees	300	License	1	$ 300	$ -	$ 300
Program Manager	43	Hour	700	$ 30,100	$ -	$ 30,100
Project Manager	35	Hour	350	$ 12,250	$ -	$ 12,250
Senior Program Director	59	Hour	325	$ 19,175	$ -	$ 19,175
Subtotal				**$ 621,599**	**$ 577,000**	**$ 1,198,599**
Environmental and Regulatory Compliance						
Environmental and Regulatory Compliance	$ 20,000.00	Per Project	1	$ -	$ 20,000	$ 20,000
Subtotal				**$ -**	**$ 20,000**	**$ 20,000**
Other						
Reporting	$ 3,000.00	Per Year	3	$ 6,000	$ 3,000	$ 9,000
Subtotal				**$ 6,000**	**$ 3,000**	**$ 9,000**
Contingency						
10% Construction Costs				$ 106,509	$ -	$ 106,509
Subtotal				**$ 106,509**	**$ -**	**$ 106,509**
Total Direct Costs						
Indirect Costs - 0%				$ -	$ -	$ -
TOTAL PROJECT COSTS				**$ 747,935**	**$ 600,000**	**$ 1,347,935**

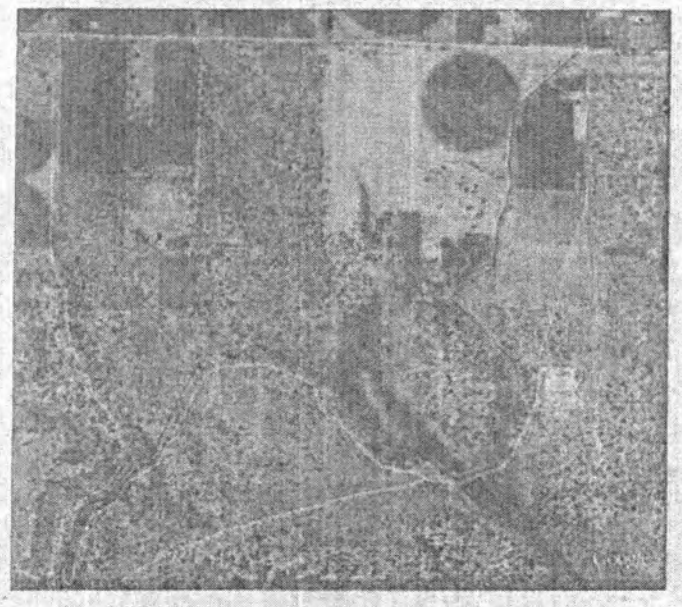
Appendix A- Photos of the I-Lateral Canal

Appendix B: I-Lateral Seepage Mitigation Feasibility Study

BLACK ROCK
CONSULTING INC

FEASIBILITY REPORT
to

CENTRAL OREGON IRRIGATION DISTRICT
July, 2009



I-LATERAL SEEPAGE MITIGATION

FEASIBILITY STUDY

(8,200 LF SECTION SOUTH OF WILLARD ROAD)

Prepared by:

Kevin L. Crew, P.E., Principal

CENTRAL OREGON IRRIGATION DISTRICT

REGISTERED PROFESSIONAL ENGINEER
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OREGON
SEPT. 28, 1984
KEVIN L. CREW
RENEWS 12-31-09

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EXHIBITS

A1 PLAN AND PROFILE OF EXISTING CANAL

A2 PLAN AND PROFILE OF EXISTING CANAL

A3 TYPICAL CANAL CROSS SECTION

EXECUTIVE SUMMARY

The Central Oregon Irrigation District (COI) has implemented a water loss measurement program that has assisted it in identifying prioritized canal seepage loss areas within the District.

The I-Lateral, a branch off of the Central Oregon Canal, was identified by the District as an exceptionally high loss area. Within that branch lateral, the tail 8,200 LF of it located to the south of Willard Road near Alfalfa, Oregon, was losing an approximate 4.5-5.2 CFS as measured by the District.

The existing earthen canal is a very flat slope canal, only falling approximately 2.7 FT in the 8,200 LF of canal. The section of canal studied in this report conveys approximately 33 CFS. A section of the study area of canal may potentially be bypassed with a new canal section to reduce the total canal length by 2,520 LF (including the new section).

Several lining and piping alternatives were evaluated including geomembrane, shotcrete, polyurea over geotextile fabric, and two forms of HDPE piping. These alternative materials were evaluated over a 50-year life cycle to adequately compare the long term cost and benefit to the District, its outside funders, if any, and in support of any conserved water right potentially transferred as a result of the project.

The 50-year present worth project cost range for mitigating seepage in the entire canal was from $1,722,000 to $2,291,000 and for the shortened canal length was from $1,385,000 to $1,766,400. The associated benefit versus cost of 63-inch DR 32.5 solid wall fusion welded pipe was approximately 0.60 to 0.95 for the total canal project and 0.74 to 1.18 for the shortened canal project given an estimated range of $250,000 to $400,000 per CFS for conserved water value.

Given the appropriate funding availability, we recommend designing and constructing the shorter canal version if agreement is achieved with the landowner crossed or the longer version if not. The product would be 63-inch fusion welded DR 32.5 HDPE pipe in backfilled trench.

BACKGROUND

Over the last several years, the Central Oregon Irrigation District (COI) has incrementally implemented an aggressive program of water measurement that is improving its information and knowledge base of seepage and losses in its hundreds of miles of open canals. In conjunction with its Capital Improvement Program, the District is moving forward with such loss information to prioritize its efforts in mitigating the areas of highest water loss. One such priority area is within the I-Lateral (branch lateral off of the Central Oregon Canal) where the effects of seepage may be noted both visually and based upon field measured losses.

The I-Lateral is an earthen open canal sublateral of the COI Central Oregon Canal. Water is diverted into the Central Oregon Canal (COC) in the City of Bend area and is conveyed through Bend toward Alfalfa with laterals branching from the COC along its path. Generally speaking the branching laterals are labeled alphabetically starting with A and so on. The I-Lateral branches off of the COC canal in the Alfalfa area east of Bend, and the subject project feasibility area of the I-Lateral is located in T17S R14E, Sections 25 and 26 W.M.

Conventional mitigation involves the use of canal lining systems or piping. This Feasibility Report develops field survey data into useable drawing formats for evaluation of general channel geometry so that piping and lining alternatives could be developed. Such alternatives are further developed into reconnaissance level cost estimates such that the relative benefit of seepage mitigation through these alternatives may be compared and an associated recommendation be made.

COI SEEPAGE LOSS INFORMATION

COI has procured equipment and applied personnel resources to measure a large portion of its open canal system in an effort to identify and isolate areas of highest water loss. COI is utilizing state of the art "doppler boat" measurement equipment, price meter measuring equipment, as well as conventional cipoletti measuring weirs and associated pools/staff gauges. This program has been effective in providing COI the data to develop a prioritization of areas to study in more detail. One such identified high water loss area was the subject area of the I-Lateral.

Figure 1. below indicates the I-Lateral alignment and service area in the District. The nodes indicated on the Figure represent measurement locations along the I-Lateral that were gathered during the 2007 irrigation season. Nodes 7-10 represent the area of focused study of this Report being from approximate Station 20+00 on attached Exhibit A1 to Station 102+00 (Willard Road) on attached Exhibit A2. The total area is approximately 1.55 miles in length. A typical section of this earthen canal is indicated on attached Exhibit A3.
The measured losses in the reach from Node 7 to Node 10 were:

Node Range	Length of Segment(LF)	Canal Flow Rate (CFS)	Measured Loss (CFS)	Seasonal Loss (AF)
7-8	2,400	33.7	**1.2**	415
8-9	1,900	32.7	**1.7**	606
9-10	3,900	31	**2.3**	806.3

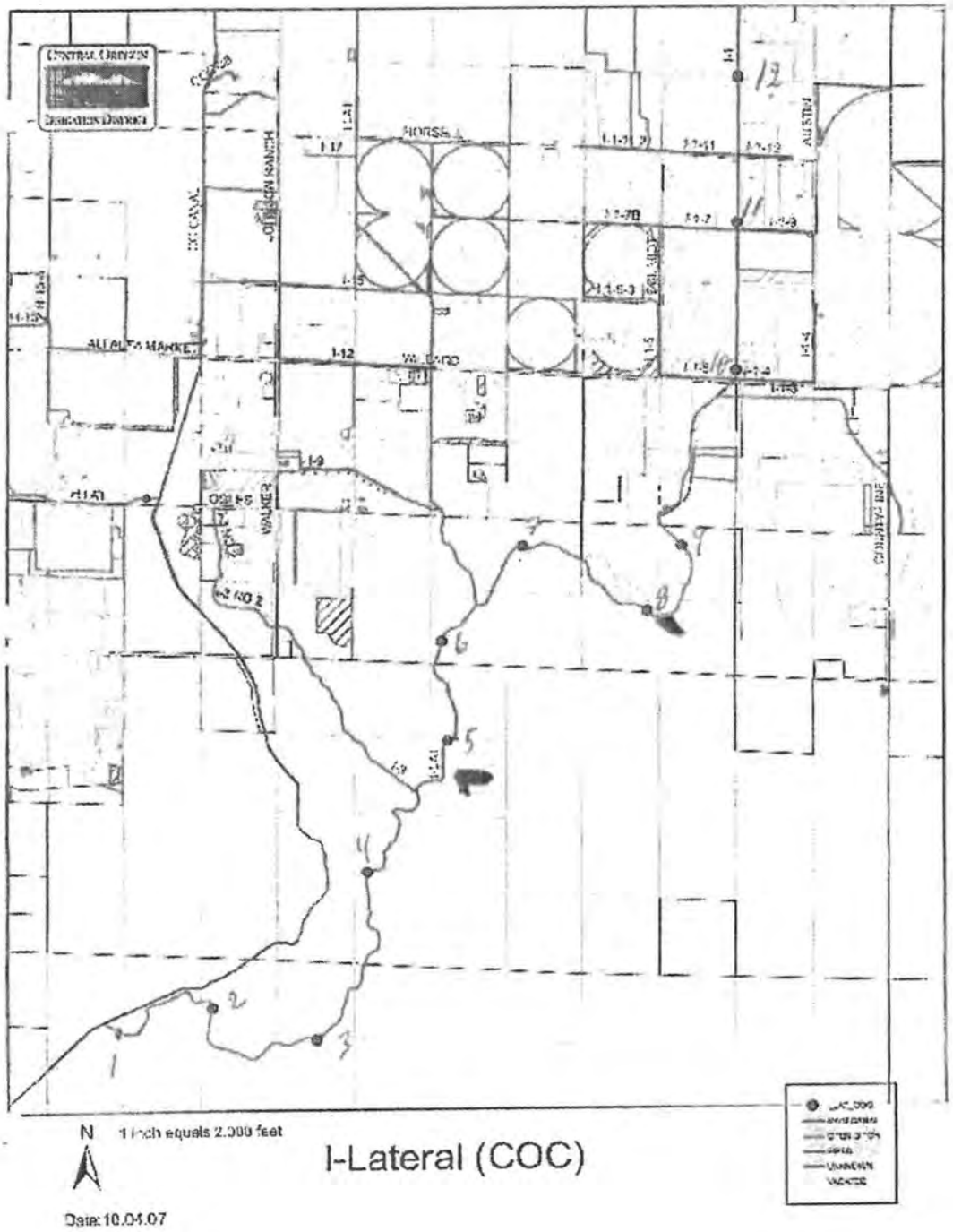


FIGURE 1. I-LATERAL OFF OF THE CENTRAL OREGON CANAL

The total loss for the Node 7-10 section was measured to be a total of 5.2 CFS in the approximate 8,200 LF reach. More recently, the COI ditch rider measurements during a stock run totaled 4.5 CFS in losses. Losses in earthen canals are not a constant factor. Earthen canals carry sediments and fines that tend to heal leaking sections over time, but animal disturbances and higher velocities can also disrupt the canal seasonally, therefore losses can vary. For the purposes of project feasibility analysis, we will use the ditch rider value minus 10% to be conservative. The loss estimate for this section is therefore 4.1 CFS.

RECONNAISSANCE LEVEL PLAN AND PROFILE DEVELOPMENT

Approximately 5 years ago, the Central Oregon Irrigation District performed a GPS survey of a majority of its canal system using Trimble survey-grade equipment. This centerline data was reduced by the District and provided for use in this study. Additionally, Black Rock Consulting in conjunction with the District performed a cross sectional survey of the canal from approximate station 20+00 to 52+00 on May 21, 2009. Both sets of data were used in preparation of the attached Exhibits A1 and A2. These Exhibits depict a 1"=400' plan view and 1"=4' vertical scale profile of the canal in the study area.

What can be seen when evaluating these plan and profile sheets is that the earthen canal in this area is very flat, only falling approximately 2.7 FT in the 8,200 LF of canal section. What also becomes obvious is that much of the canal is a conveyance canal, wherein seepage is lost throughout the length of conveyance.

One option for minimizing the length of the reach of the studied canal would be to re-align the canal in the area from approximate Station 35+00 to Station 74+50. By leaving the existing canal alignment and connecting directly from Station 35+00 to Station 74+50, the length of canal would be approximately 1,430 LF, thus reducing the canal length by approximately 2,520 LF. This concept will be included as an option in the lining and piping alternatives addressed below.

LINING CONSIDERATIONS

Canal lining is a challenging proposition that is even more difficult in Central Oregon. The significant seasonal and daily temperature swings, solar impacts, frost heave, wild and domestic animal impacts, and presence of shallow basalt all impact lining alternatives and selection. The U.S. Department of the Interior, Bureau of Reclamation prepared a report addressing a multitude of lining alternatives that were tested locally in Central Oregon. A copy of the Executive Summary of this report is attached (Exhibit B). What the report indicates is that Geomembrane with Concrete Cover, followed by Concrete alone, and then Exposed Geomembrane are in order of decreasing benefit/cost ratio.

In addition to this Bureau report, we have personally witnessed many of the test sites and issues with the various lining products on the local canals, including a Bureau lining failure site where a District's main canal was temporarily out of service as a result. Also, we prepared the fiber-mesh entrained shotcrete solution for an area of concern in another Central Oregon District. This system was installed about 5 years ago and we have visited that site from time to time during that period. About that same time period the North Unit Irrigation District installed approximately 11 miles of roller compacted concrete and shotcrete on its main canal from Bend toward Redmond that has also been observed from time to time.

Based upon the Bureau report, and other experiences with Central Oregon projects as noted above, there are three primary alternatives that may be considered for lining the study area of the I-Lateral from Node 7 to Node 10: Exposed Geomembrane, Concrete/Shotcrete, or Polyurea Over Geotextile.

Three specific lining alternatives were evaluated as indicated above based upon the Bureau findings and our personal experience with Central Oregon canal lining and piping projects:

- **Exposed Geomembrane** – exposed geomembranes are simply tarp-type liners. They are typically installed by smoothing out the bottom and sides of the canal with equipment and in some instances adding ¾"-0" gravel to prevent basalt rock protrusions from piercing the liner. The liner is typically anchored by digging trenches on each side of the canal about 1-2 feet back from the top of the bank and placing the tarp in those trenches and then backfilling them. Typically the millage thickness of the liner is 40-100 mils.

  The benefit of such liner is that it is fairly simple to install with minimal equipment and outside contractor assistance. Geomembranes are flexible and therefore are not affected by the movements caused by frost heave. Also the initial cost of the material is low.

  The issue that detracts from this material is its relative short life, potential for failure given lack of base support, its propensity to tear in the presence of animal hoof contact, and that its chemical properties diminish, causing it to fail more readily. Also, any liner will generally increase canal flow velocities and personnel exit risk. We used a 15-year life span for this product and have used the Firestone product as a typical lining example that has been readily used by irrigation districts in the West. Additionally, we estimate approximately 10 man-days per mile per year for maintenance of this product.

- **Concrete/Shotcrete** – Concrete and shotcrete have been used readily for canal liners in the West. The Central Oregon Irrigation District has experience with such liners in several locations within its systems. This product is typically installed by smoothing out the bottom and sides of the canal to some extent with equipment. Less preparation is typically necessary for hose-applied shotcrete than traditional structural concrete. The thickness of application and need for reinforcement will vary depending upon the canal substrate.

  The benefit of concrete or shotcrete liners is that they are fairly simple to install, although typically outside contractor assistance is necessary. The other benefit of concrete over geomembranes is that concrete is more tolerant to ultraviolet light from the sun. It is also more resistant to animal hoof damage than geomembranes.

  The issues that detract from concrete or shotcrete liners is that the initial cost of these materials is higher than tarp-type liners. Secondly, concrete is a rigid material that tends to crack when surrounding ground moves or reduces support. With the annual freeze-thaw cycle present in Central Oregon, the canal ground, especially at the canal banks, tends to heave and recede, causing stress fractures in the concrete liner. These are typically mitigated by annual placement of elastomeric caulking in the cracks to prevent irrigation water from entering them, getting behind the concrete and ultimately causing concrete liner failure. For this reason, we disagree with the Bureau report's estimated concrete liner longevity. In our opinion, shotecrete liners in

Central Oregon canals will last about 20-25 years and structural concrete liners will last about 30-35 years. We also estimate approximately 10 man-days per mile per year for maintenance of this product.

- **Polyurea over Geotextile Membrane** – Polyurea is an elastomeric spray applied product that is gaining popularity for use on canals. In a typical earthen canal installation such as the I-Lateral canal Node 7 to 10 area, the canal would be excavated to a standard trapezoidal canal shape, trenches would be excavated on each side of the top of the bank, a geotextile membrane would be installed across the canal and into the trenches on each side (and then trenches backfilled), and finally, the polyurea would be spray applied to the geotextile membrane.

  Polyurea (90 mil +/-) is a two part product that must be applied by someone certified and/or trained in the application. In a canal situation the build-up would be to an approximate minimum of 90-mils and thicker at the geomembrane seams.

  The benefit of Polyurea, especially in the Central Oregon area with severe temperature swings and winter frost heave is that the product will elongate over 600%. This allows the bridging of moving gaps and adjustment of substrate without tearing the product. The additional benefit of sprayed-on liner is that it ends up being a monolithic product versus a product with many seams as in tarp-type liners.

  The issues that detract from polyurea are its cost in comparison to other liners and that due to its exposure it is likely to deteriorate due to UV and it is susceptible to animal damage as an exposed flexible liner. For these reasons, we have estimated a similar maintenance interval of 10 man days per mile per year for this product. Maintenance would include the repair of any damaged liner sections due to animals (beef animals are present in this project area as well as elk and deer), and repairs of sections damaged due to sediment removal operations.

PIPE SIZING AND PIPING CONSIDERATIONS

Piping is a viable and much used solution to canal seepage mitigation. In Central Oregon, buried piping provides a stable environment much more protected from the harsh climate than exposed liner alternatives. Although many varieties of pipe materials have been used on canals in Central Oregon over the years including reinforced concrete, corrugated metal, ductile iron, spiral rib metal, coated and lined steel pipe, and reinforced concrete box culverts, the advent of High Density Polyethylene (HDPE) pipe has provided a product that works very well as a solution to large and small diameter and low and high head canal piping situations. HDPE is more abrasion resistant than steel, it is light weight, may be arced into a radius during installation, and may be welded into a fully sealed and watertight installation. For the purposes of this study, HDPE was assumed as the piping material of choice although other alternatives may be considered during final design and project bidding.

The estimated HDPE pipe diameter for this project study area based upon the manning's equation (n=0.01) , with the pipe completely full, a flow rate of 34 CFS, and 2.7-FT of fall in 8,200 LF of canal is:

- Weholite HDPE Profile Wall Pipe: 54-IN Dia. (15PSI or 30 PSI Rating)
- Solid Wall Fusion Welded DR32.5 Pipe: 63-IN Dia. (50 PSI Rating)

The benefit of HDPE piping is that it is a very abrasion resistant material, that when buried is essentially maintenance free. It has a very low friction loss component and its life span is lengthy. Based upon its use domestically and abroad, and our personal experience with the product in Central Oregon, we are comfortable giving it a 60-year life expectancy, but could just as easily say 100-years or more. For the purposes of this report and lining alternative comparisons, we will use 50-years.

There are several differences between the Weholite HDPE and the Solid Wall Fusion Welded HDPE pipes. Weholite is a proprietary product currently manufactured in Canada by KWH pipe. It has been used on several successful projects in Central Oregon. It is a profile wall pipe and does not arc as readily as solid wall pipe, therefore angle fittings are required at trench angles. It is a 15 PSI rated pipe, although it can be manufactured in 30 PSI as well for an additional expense of approximately 25%. All joints are completely welded by a factory robotic extrusion welder. Solid wall fusion welded HDPE pipe is manufactured by a variety of manufacturers in the USA and abroad. It is being used extensively in the USA and in irrigation district systems. This pipe is readily bendable. Joints are fusion welded and may be welded by factory personnel or certified District personnel.

RECONNAISSANCE LEVEL COST ESTIMATE

The five alternatives were compared on a cost basis given a 50 year project life cycle and based upon 2009 costs. The cost of membrane lining was compiled from recent irrigation projects in the West as well as current pricing for a 60-mil Firestone membrane liner system. The cost of concrete/shotcrete lining was developed using extrapolated costs from the NUID lining project, and recent pricing from Dan Mancino, an experienced shotcrete contractor (who also performed the initial SID Glacier View Estates project). HDPE pipe costs were obtained from a supplier for both low-head Weholite pipe and SDR 32.5 HDPE pipe, and values for the installation were taken from recent bidding/construction experience in Central Oregon. We must emphasize that this pricing is based upon this research and is contemporary. In the last 2-3 years the pricing for materials has been extremely volatile. For example, three years ago, standard concrete sold for bout $60/CY. Today it is over $100/CY. Shotcrete with fiber mesh in it will sell for about $150/CY now. HDPE and the Firestone liners are petroleum based products. Prices are lower recently, but have been significantly inflated over the last few years. The caution is that as the District moves forward the selected alternative will likely need to be repriced and adjusted prior to construction.

50-YEAR I-LATERAL RECON. COST ESTIMATE					8,200 LF SECTION		
	Total Canal Width	Cost/LF	Length	Initial cost	50 YR Maint.	Repl. Cost	TOTAL
Geomembrane	20'-25'	$85	8,200	$697,000	$200,000	$1,394,000	**$2,291,000**
Shotcrete	20'-25'	$115	8,200	$943,000	$200,000	$943,000	**$2,086,000**
Polyurea	20'-25'	$105	8,200	$861,000	$200,000	$861,000	**$1,922,000**
Weholite HDPE	54" Dia.	$235	8,200	$1,927,000	$0	$0	**$1,927,000**
Solid Wall HDPE	63" Dia.	$210	8,200	$1,722,000	$0	$0	**$1,722,000**

The above reconnaissance level cost estimate includes procurement, installation and maintenance of each product for a period of 50-years.

50-YEAR I-LATERAL RECON. COST ESTIMATE					5,680 LF SECTION			
	Total Canal Width	Cost/LF	Length	Initial cost	50 YR Maint.	Repl. Cost	1,430 LF Canal or Trench	TOTAL
Geomembrane	20'-25'	$85	5,680	$482,800	$125,000	$965,600	$143,000	**$1,716,400**
Shotcrete	20'-25'	$115	5,680	$653,200	$125,000	$653,200	$143,000	**$1,574,400**
Polyurea	20'-25'	$105	5,680	$596,400	$125,000	$596,400	$143,000	**$1,460,800**
Weholite HDPE	54" Dia.	$235	5,680	$1,334,800	$0	$0	$143,000	**$1,477,800**
Solid Wall HDPE	63" Dia.	$210	5,680	$1,192,800	$0	$0	$143,000	**$1,335,800**

The above reconnaissance level cost estimate assumes property owner cooperation, permission and minimal associated easement costs to install a new direct linear canal section or trench and pipe section between Stations 35+00 and 74+50 to cut off approximately 2,520 LF of existing canal section and replace it with approximately 1,430 LF of canal section. In addition to the TOTAL costs shown, there will likely be an additional cost of service to the small pond located at about station 52+50 as shown on Exhibit A1. We estimate this service to be approximately 8" dia. pipe at a total service installation cost of about $50,000.

BENEFIT VS. COST OF ALTERNATIVES

The project intends to conserve approximately 4.1 CFS as indicated above. The value of conserved water is dependent upon a variety of factors but it is our experience that projects have been provided funding at levels ranging from $250,000 per CFS to $400,000 per CFS. Given these potential funding levels, the value of conserved water for this project would be $1,025,000 to $1,640,000.

The best 50-year project cost for the full project length is solid wall HDPE at $1,722,000 and for the shortened project length is solid wall HDPE at $1,385,800 including the additional service to the pond. The benefit versus cost ratio for the full length project would be 0.60 to 0.95 depending upon funding level and for the shorter project would be 0.74 to 1.18.

SUMMARY RECOMMENDATION FOR PROJECT APPROACH

First, we recommend that the District evaluate funding opportunities that are available given the 4.1 CFS of conserved water potential for an installed project. If such funding appears to be acceptable given the reconnaissance level costs, we then recommend that the District approach the landowner affected by the realignment of the I-Lateral between Station 35+00 and 74+50 and determine if it may be an acceptable approach to cross the property at little easement expense to the District. The likely advantage to the landowner would be the reclamation of the existing canal alignment downstream of Station 35+00. Given a pipe in trench condition across the property, the landowner may also be able to farm over the proposed backfilled pipeline alignment. This will be dependent upon the final trench cross section in that reach. Should the landowner cooperate, then we recommend the design and installation of 5,680 LF of 63-inch diameter DR 32.5 HDPE fusion welded pipe.

Given that crossing the landowner property is not acceptable for cost or permission reasons, then we recommend the design and installation of 8,200 LF of 63-inch diameter DR 32.5 fusion welded pipe following the existing alignment of the entire section from Node 7 to Node 10.

BLACK ROCK
CONSULTING

June 30, 2010

Mr. Steve Johnson, Manager
Central Oregon Irrigation District
1055 SW Lake Court
Redmond, Oregon 97756

SUBJECT: **LETTER AMENDMENT TO JULY, 2009 FEASIBILITY REPORT TO CENTRAL OREGON IRRIGATION DISTRICT – I LATERAL SEEPAGE MITIGATION STUDY (8,200 LF SECTION SOUTH OF WILLARD ROAD)**

Dear Mr. Johnson:

This letter amendment to the subject feasibility study is intended to supplement the study with a new element. It is our understanding that the Central Oregon Irrigation District ("District") has considered the study, concurs with the use of HDPE pipe as the preferred alternative and requested this amendment for the purposes of evaluating additional piping length further upstream on the I Lateral. The purpose of the additional upstream length would be to mitigate additional seepage identified by the District in its ongoing water loss measurement and assessment program.

Following receipt of the study in August, 2009, a detailed series of loss measurements were performed by the District on the I Lateral above the area studied originally. It was determined that by extending the proposed I Lateral project approximately 1,600 LF further upstream that an additional approximate 2.0 CFS could be conserved. Given that the original 8,200 LF project would conserve an estimated 4.1 CFS, the proportional savings of this additional 1,600 LF section was found to be significant by the District. **With the entire approximate 9,800 LF section piped, the estimated conservation would be 6.1 CFS.**

It was mentioned in the original study that a short-cut is physically possible in the originally studied section and would save approximately 2,520 LF. This short-cut is predicated on obtaining land-owner permission that at the time of this amendment had not been received by the District. For the purposes of this amendment, it is assumed, therefore, that the project will follow the existing canal alignment. If permission is given by the landowner prior to project design, the same 6.1 CFS conserved water amount may be applied to the project and the length of the project will reduce by 2,520LF. A new easement would be required for the short cut area from the private landowner.

The attached Exhibits A-1 and A-2 indicate the revised project area with the extension of the project approximately 1,600 LF upstream. The proposed intake would be located about 600 LF upstream from the I-3 Lateral diversion. The extension would also institute removal of the weir/check located at approximate station 26+00. By observing the existing canal bottom profile

20380 Halfway Road Suite #1
Bend, Oregon 97701
(541) 480-6257 (866) 591-1513 Fax

on the exhibits. the total fall along the propose alignment is approximately 3.5-FT. This very flat profile will require a pipe at either 63-inches or 54-inches in diameter. This will be determined in final design after detailed survey is performed on the I-3 lateral and upstream bed and banks of the canal. For the purposes of this amendment, 63-inch diameter pipe is assumed.

An updated reconnaissance level cost estimate was prepared for project planning purposes and is provided below. The primary cost elements are the HDPE pipe material and associated installation costs. The pricing of HDPE is oil price dependent and therefore fluctuates similarly over time. The estimate assumes outside contractor installation and also includes contingency that may be adjusted upon final design and impending construction bidding.

CENTRAL OREGON IRRIGATION DISTRICT
I-LATERAL
RECONNAISSANCE LEVEL COST ESTIMATE
30-Jun-10
BLACK ROCK CONSULTING

Construction Item	Quantity	Units	Cost/Unit	Subtotal Cost
Earthwork and General Construction				
1. Mobilization	10	%	of Total	$286,000.00
2. Clearing and Grubbing	1	LS	$15,000.00	$15,000.00
3. Excavation, Backfill, Compaction of Pipeline	45,000	CY	$10.00	$450,000.00
4. Restoration/Seeding	1	LS	$15,000.00	$15,000.00
Pipe (HDPE)				
5. 63" Dia. Pipe Including Welding and Delivery	9,800	LF	$235.00	$2,303,000.00
Pipe Appurtenances				
6. I-3 Lateral Fittings	1	LS	$10,000.00	$10,000.00
7. Misc. appurtenances, venting	1	LS	$15,000.00	$15,000.00
8. Furnish and install turnout assemblies, complete	1	EA	$10,000.00	$10,000.00
Inlet/Outlet Structures				
9. Reinforced Concrete Inlet/Trash Rack	1	LS	$25,000.00	$25,000.00
10. Reinforced Concrete Outlet Structure	1	LS	$15,000.00	$15,000.00
11. Rip-Rap	1	LS	$2,000.00	$2,000.00
SUBTOTAL				$3,146,000.00
Final Survey, Engineering, Permitting, CM	2	%	of subtotal	$62,920.00
CONTINGENCY	15	%	of subtotal	$471,900.00
TOTAL				$3,680,820.00
REDUCTION FOR 54" INSTEAD OF 63"	$931,000	Total if 54" Allowable=		$2,591,550.00

We appreciate the opportunity to evaluate this 1,600 LF upstream extension of the I Lateral on a reconnaissance level basis.

Please call if you have any questions on this Amendment Letter to the original Study dated July, 2009.

Sincerely,

BLACK ROCK CONSULTING

Kevin L. Crew, P.E.
Principal

Attachments: Exhibits A-1, A-2, A-3

Appendix C – Report on Updated Costs, Schedule, and Reductions in Power Costs

REPORT ON UPDATED COSTS & SCHEDULE, & REDUCTIONS IN POWER COSTS

Including

QUANTIFIABLE WATER SAVINGS & INCREASED ENERGY EFFICIENCY

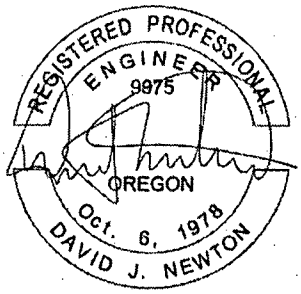
For

PROPOSED 4.9-MILE SIDEWALL LINING PROJECT

North Unit Irrigation District Main Canal

Deschutes County, Oregon

February 16, 2011



EXPIRES: 12 / 31 / 12

Prepared for:

Deschutes River Conservancy
700 NW Hill Street
Bend, Oregon 97701

Prepared by:

Newton Consultants, Inc.
P.O. Box 1728
Redmond, Oregon 97756

Project No. 960-232

CENTRAL OREGON IRRIGATION DISTRICT
1055 SW LAKE COURT, REDMOND, OR 97756
PHONE: 541.548.6047 FAX: 541.548.0243
www.coid.org
A MUNICIPAL CORPORATION OF THE STATE OF OREGON

RESOLUTION NUMBER: 2011–11
WATERSMART GRANT AUTHORIZATION
I-LATERAL PIPELINE

A RESOLUTION AUTHORIZING AND APPROVING EXECUTION OF A COOPERATIVE AGREEMENT FOR THE FISCAL YEAR 2012 – 2013 BUREAU OF RECLAMATION WATERSMART GRANT PROVIDING SUPPLEMENTAL FINANCING FOR THE CONSERVED WATER PROJECT ON THE CENTRAL OREGON CANAL, I-LATERAL PIPELINE.

WHEREAS: The project will provide an opportunity to conserve water and improve District delivery capabilities, in addition to eliminating a significant amount of operational and maintenance problem areas.

WHEREAS: The district will realize conserved water for in-stream restoration and create more efficient deliveries to patrons as a result of this project.

THEREFORE, BE IT RESOLVED that the Board of Directors of Central Oregon Irrigation District agrees and authorizes that:

1. The Board and or governing body has reviewed and supports the proposal submitted;
2. The district is capable of providing the amount of funding and/or in-kind contributions, specified in the funding plan; and
3. If selected to receive funds from a WaterSmart Grant under the Fiscal Year 2012 program the district will work with Reclamation to meet established deadlines for entering into a cooperative agreement.

ATTEST: CENTRAL OREGON IRRIGATION DISTRICT

Dated this 13th day of December 2011.

Steven C. Johnson, Manager	Carroll Penhollow, President
Terry Blackwell	Robert Borlen
Thomas Burke	Paul Kasberger

NORTH UNIT IRRIGATION DISTRICT

RESOLUTION NO. 2012-03

NUID Water Supply Phase II: COID I Lateral

WHEREAS: The proposed project will involve the piping of the Central Oregon Irrigation District's I Lateral. The project will be a cooperative effort between the North Unit Irrigation District, Central Oregon Irrigation District, and Deschutes River Conservancy. The project will provide water and energy conservation; and,

WHEREAS: The irrigation district will realize energy cost savings, improve water reliability and restore stream flow.

NOW THEREFORE, BE IT RESOLVED that the Board of Directors agrees and authorizes that:

1. Michael Britton is the district official with legal authority to enter into an agreement for financial assistance under the WaterSMART Grant;
2. The Board of Directors or governing body has reviewed and supports the proposal submitted;
3. The applicant is capable of providing the amount of funding and/or in-kind contributions specified in the funding plan; and
4. If selected for a WaterSMART Grant, the the applicant will work with Reclamation to meet established deadlines for entering into a cooperative agreement

DATED: 1-10-12

Richard Macy
Chairman

ATTEST:

Michael Britton
Secretary-Manager

Oregon
John A. Kitzhaber, MD, Governor

Oregon Watershed Enhancement Board
775 Summer St NE Ste 360
Salem, OR 97301-1290
(503) 986-0178
FAX (503) 986-0199
www.oregon.gov/OWEB

OWEB

January 17, 2011

Mike Britton
District Manager
North Unit Irrigation District
2024 N.W. Beech Street
Madras, Oregon 97741

RE: Oregon Watershed Enhancement Board - Commitment of Funding for the North Unit Irrigation District Water Supply Initiative

Dear Mike:

The purpose of this letter is to confirm that the Oregon Watershed Enhancement Board (OWEB) has committed to $300,000 of funding to Phase II of the North Unit Water Supply Initiative through the Deschutes Special Investments Partnership. The funds can be made available in FY2012 and will be available through the duration of the project.

OWEB has prioritized collaborative efforts to restore habitat for resident and anadromous fish in the Deschutes Basin. OWEB supported the first phase of this initiative and looks forward to restoring additional flow in the Crooked River.

Sincerely,

Kenneth F. Bierly
Partnership Program

Confederated Tribes of the Warm Springs Reservation of Oregon

P. O. Box 960 • Warm Springs, OR 97761

Portland General Electric Company

121 S.W. Salmon Street • Portland, OR 97204

January 18, 2012

Mike Britton
District Manager
North Unit Irrigation District
2024 N.W. Beech Street
Madras, Oregon 97741

RE: Pelton Water Fund - Commitment of Funding for the North Unit Irrigation District Water Supply Initiative

Dear Mike:

The purpose of this letter is to confirm that the Pelton Round Butte Water Fund has committed up to $525,000 of funding to the North Unit Water Supply Initiative. The funds will be provided from the mitigation fund established as a condition of the FERC license to operate the Pelton Round Butte Hydroelectric Project and is intended to be used specifically to support projects that restore instream flows. The mitigation fund is co-managed by Portland General Electric Company (PGE) and the Confederated Tribes of Warm Springs (Tribes), the joint licensees of the Project. The funds can be made available in FY2012 and will be available through the duration of the project.

The proposed project will pipe a portion of Central Oregon Irrigation District's I Lateral, resulting in water savings of 1,300 acre-feet of water from the Deschutes River. The saved water will be used to irrigate lands in North Unit Irrigation District that currently receive water pumped from the Crooked River. The existing Crooked River water rights that will be displaced by the new Deschutes River water rights will be allocated instream, creating 1,300 acre-feet of new instream water rights to support water quality and fish habitat improvements in the lower Crooked River.

PGE understands the importance of improving flows in the lower Crooked River for listed fish species, including recently reintroduced Mid-Columbia steelhead trout and Chinook salmon. PGE, in partnership with the Tribes, has invested heavily in this reintroduction program and supports efforts to restore flow to the Crooked River during critical times. We have supported the first phase of this initiative and look forward to restoring additional flow in the Crooked River.

Very truly yours,

Julie A. Keil, Director
Hydro Licensing and Water Rights