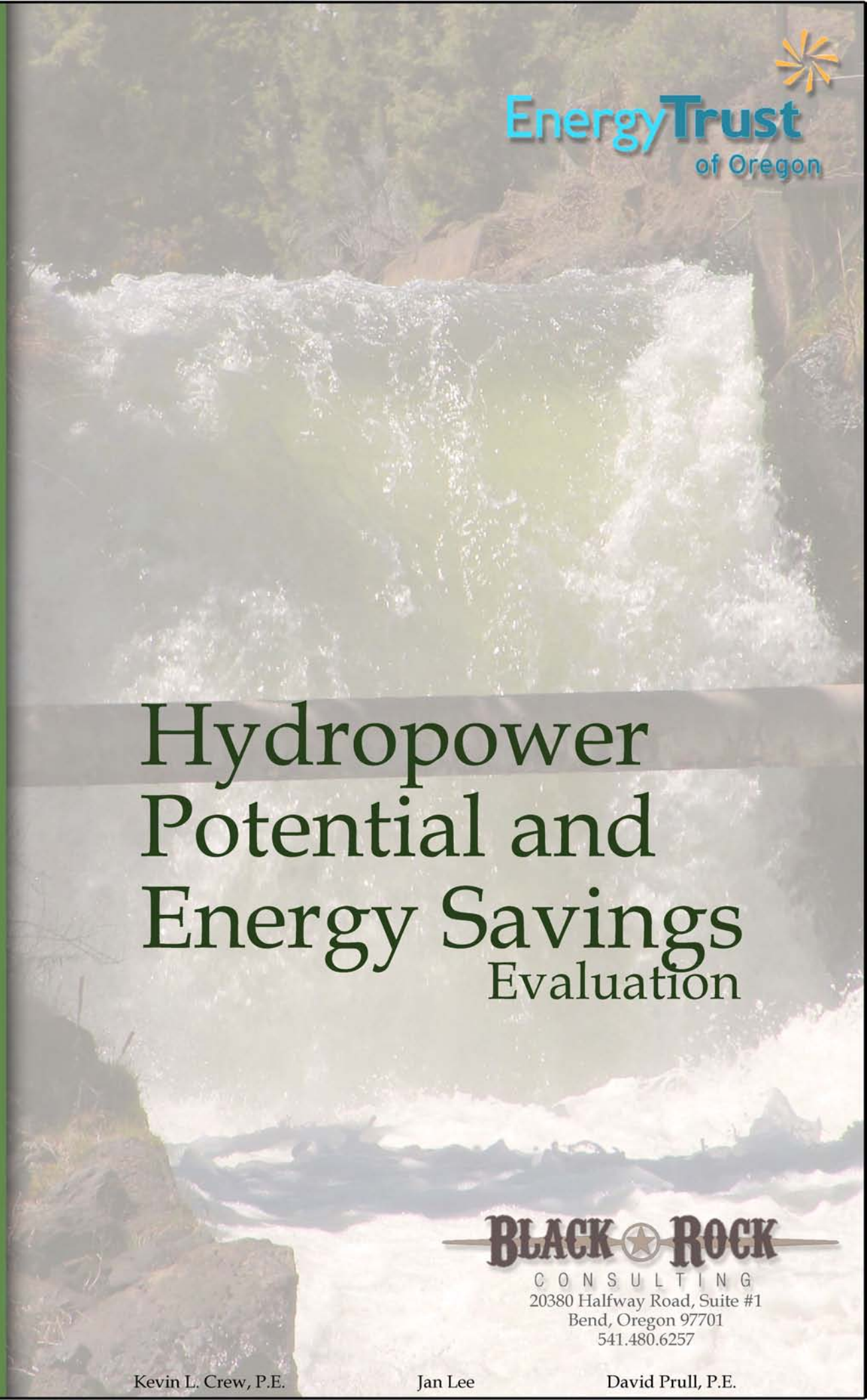
Irrigation Water Providers of Oregon



Energy Trust of Oregon

Hydropower Potential and Energy Savings Evaluation

BLACK ROCK CONSULTING
20380 Halfway Road, Suite #1
Bend, Oregon 97701
541.480.6257

Kevin L. Crew, P.E. Jan Lee David Prull, P.E.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Evaluation of Energy Savings and Hydropower Potential Among Irrigation Water Providers

Energy Trust of Oregon (Energy Trust) secured the services of Black Rock Consulting (Black Rock) to evaluate the state's largest irrigation water users to provide base feasibility evaluations which could result in subsequent development of hydropower projects in Oregon. An earlier 2008 Hydropower Technology and Resource Assessment produced for Energy Trust identified irrigation water providers as one of the state's largest resources for the development of untapped hydropower potential.

Currently Energy Trust provides incentives for hydro projects smaller than 20 Megawatts (MWs) through its Open Solicitation program on a case-by-case basis within the utility service territories of Portland General Electric and PacifiCorp. For this assessment, project potential was addressed on a statewide basis, including the service territories of all utilities serving the irrigation water providers. Energy Trust anticipates, as a result of this evaluation, making funds available to encourage further feasibility refinement and project development at the best sites inventoried in this evaluation, given that the project is within one of the two Oregon investor-owned utilities or may wheel power to these utilities.

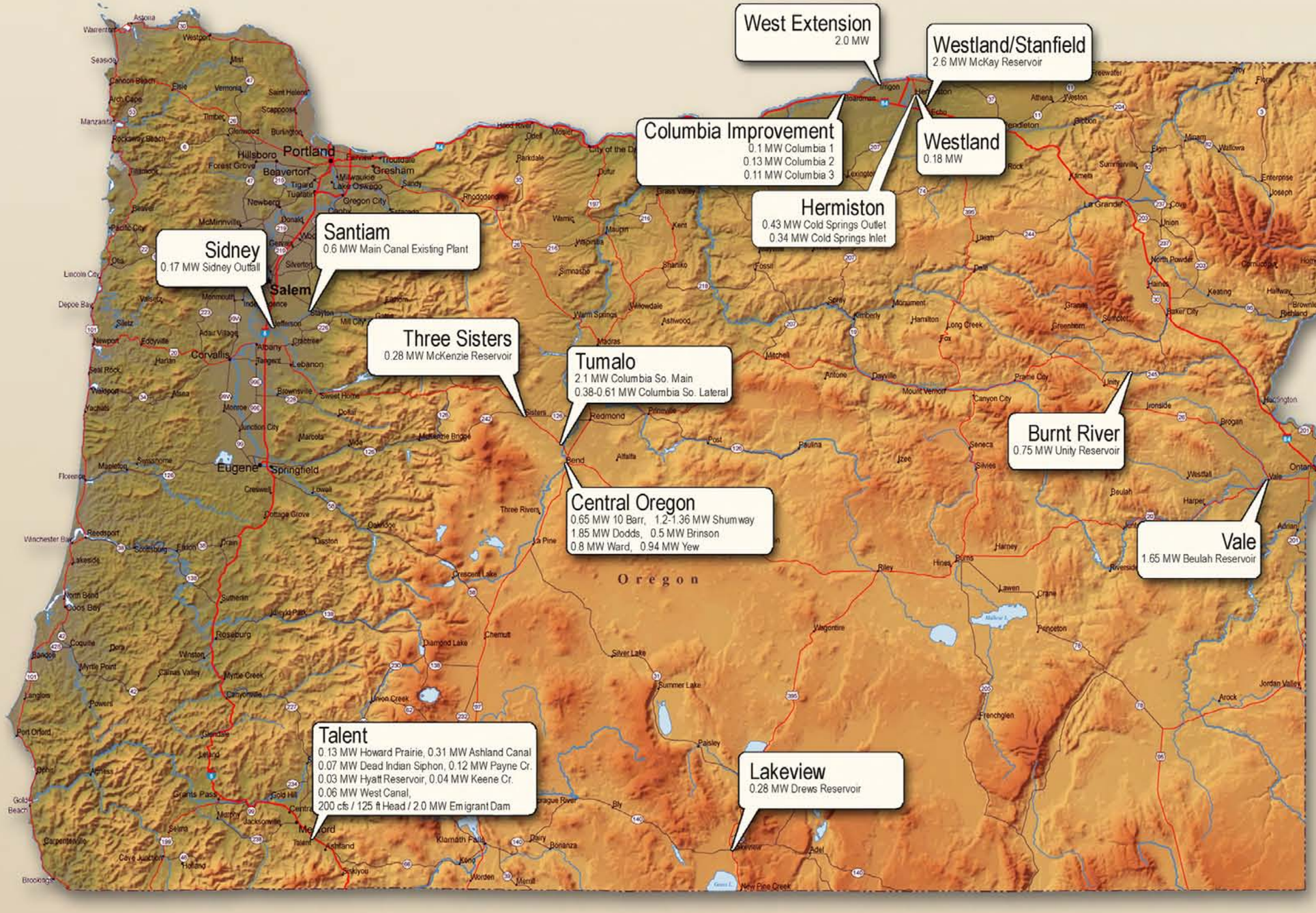
A secondary goal of the project was to identify potential energy upgrade projects, either in delivery systems or in end-user equipment when these potential projects are within a participating irrigation water provider system and that system is provided electricity by Portland General Electric or PacifiCorp. Energy Trust supports irrigation efficiency through standardized and custom incentives for projects resulting from energy savings from a variety of project implementations: upgrades to pumping systems, equipment replacements or other technologies.

Black Rock analyzed the water rights of 108 irrigation water suppliers in Oregon and then provided a survey to 29 of those suppliers with potential of developing hydropower projects of .5 MWs or larger in capacity. Of the 29 surveyed suppliers, 14 suppliers representing 30 specific sites were identified for further evaluation and field review. For each site, Black Rock gathered specific flow rate, elevation, and utility interconnect information that would determine the potential capacity of projects and identified, in consultation with the water providers, what level of technical assistance would be required for development of the projects. An At-A-Glance Map and Data summarizing the project results are appended to this Executive Summary.

The following report details

- The approach followed and tabular data representing water right research and results;
- The survey methodology to obtain specific irrigation water supplier information and capabilities and associated table of survey results;
- The approach to field data acquisition;
- Cost estimating approach and methodology;
- Institutional constraints faced by the Districts;
- Tabular data including key elevation and flow rate components, reconnaissance level hydropower development cost information and photographs of specific potential sites;
- The potential for energy upgrade projects within delivery systems or individual water user systems;
- Appendices including water right records, survey mailer example, and an existing Talent Irrigation District hydropower potential report included by permission of the District and the Energy Trust.

Irrigation Water Providers of Oregon



Statewide At-A-Glance Map

Irrigation Water Providers of Oregon

Site	Location	Utility	Net Head (ft)	Avg. Flow Rate (cfs)	Peak Power (MW)	Annual Power (MWh)	Conceptual Cost
Western Oregon							
Sidney Irrigation District							
Sidney	Jefferson	Pacificorp	30	70	0.17	575	
Santiam Water Control District							
Santiam	Stayton	Pacificorp	10	780	0.60	Pending	
Southern Oregon							
Lakeview Water Users, inc.							
Drews Reservoir	Lakeview	Surprise Valley Electric Coop	46-27	75	0.28	850	
Talent Irrigation District							
Howard Prairie Outlet Works	Talent	Pacificorp	40	23-52	0.13	732	
Ashland Canal	Talent	Pacificorp	130	15, 40	0.31	1,752	
Dead Indian Siphon	Talent	Pacificorp	118	10	0.07	304	
Payne Creek	Talent	Pacificorp	100	20	0.12	521	
Hyatt Reservoir Outlet Works	Talent	Pacificorp	30	3-19	0.03	122	
Keene Creek Reservoir	Talent	Pacificorp	14	28-50	0.04	139	
West Canal	Talent	Pacificorp	245	4	0.06	255	
Emigrant Dam	Talent	Pacificorp	125	200	2.0	6,318	
Central Oregon							
Central Oregon Irrigation District							
Ward	Redmond	Central Oregon Coop/Pacificorp	25	330	0.80	2,480	
Brinson	Redmond	Pacificorp	17	370	0.50	2,000	
10 Barr	Redmond	Central Oregon Coop	27	260	0.65	2,100	
Dodds	Redmond	Central Oregon Coop	79	245	1.85	5,800	
Shumway	Redmond	Central Oregon Coop	79-89	150	1.20-1.36	3,650-4,000	
Yew	Redmond	Pacificorp	45	190	0.94	2,600	
Three Sisters Irrigation District							
McKenzie	Sisters/Redmond	Central Oregon Coop	96	30	0.28	907	
Tumalo Irrigation District							
Columbia Southern Main	Bend	Central Oregon Coop	1,005	30	2.10	9,040	
Columbia Southern Lateral	Bend	Central Oregon Coop	68-111	65	0.38-0.61	1,325-2,160	
Northeast Oregon							
Columbia Improvement District							
Columbia 1	Boardman	Umatilla Electric Coop	5	180	0.10	260	
Columbia 2	Boardman	Umatilla Electric Coop	9.5	115	0.13	320	
Columbia 3	Boardman	Umatilla Electric Coop	15	64	0.11	280	
West Extension Irrigation District							
West Extension	Irrigon	Pacificorp	95	250	2.00	4,000	
Westland Irrigation District							
Westland	Hermiston	Umatilla Electric Coop	44	45	0.18	590	
Hermiston Irrigation District							
Cold Springs Outlet	Hermiston	Umatilla Electric Coop	42-4	129	0.43	1,010	
Cold Springs Inlet	Hermiston	Umatilla Electric Coop	33-2	174	0.34	360	
Westland/Stanfield Irrigation Districts							
McKay Reservoir	Hermiston/Stanfield	Pacificorp	130-40	150	2.6	4,500	
Eastern Oregon							
Burnt River Irrigation District							
Unity Reservoir	Hereford	Idaho Power	48-18	78	0.75	1,170	
Vale Oregon Irrigation District							
Beulah Reservoir	Vale	Idaho Power	60-18	310	1.65	3,688	

Statewide At-A-Glance Data

PRELIMINARY ASSESSMENT OF HYDROPOWER POTENTIAL

Potential Project Scoping

Energy Trust identified from the results of an earlier study developed in 2008 that a scoping level evaluation of the state's largest irrigation water providers could provide a number of economically viable hydropower projects to deliver power to the state's investor-owned utilities, PacifiCorp and Portland General Electric. Energy Trust indicated its primary interest in the evaluation of hydropower potential among irrigation water providers in this 2010 evaluation conducted by Black Rock Consulting was to identify conduit exemption projects that would be eligible for exemption from licensing under the Federal Energy Regulatory Commission (FERC) process. Energy Trust also recognized that a number of the districts have existing reservoirs with dams on which hydropower facilities have not been developed. Facilities on those existing structures could be constructed, or if an existing hydropower plant is in place, it may be enlarged. Those sites have been incorporated into the evaluation. While there may be potential pumped storage or aquifer storage projects within the irrigation water systems, those projects were excluded from this evaluation process.

All of the projects of interest would use existing water rights already allocated for irrigation beneficial use to provide an energy component as supplemental use to the existing water right. In this 2010 evaluation, the projects evaluated may be located at any site within the state, regardless of utility service areas.

Analysis of Irrigation Water Provider Rights

Considering the project focus as described above, Black Rock reviewed 108 irrigation delivery entities from lists secured from various sources: Oregon Water Resources Department, Bureau of Reclamation, Special Districts Association of Oregon, Oregon Water Resources Congress and internet sources. Please refer to chart **Appendix A**, indicating the districts for which Black Rock secured preliminary information. Black Rock specifically excluded a number of irrigation water provider projects for which other preliminary investigations were already underway through Energy Trust, as indicated on the chart.

An irrigation water provider is an entity authorized under Oregon Revised Statutes (ORS) as one of the following:

ORS 545	Irrigation District
ORS 547	Drainage District
ORS 549	Flood Control District
ORS 552	Water Improvement District
ORS 553	Water Control District
ORS 554	Corporations that may be ditch companies, associations and other corporate forms that are public corporations

In addition, there are some private associations and ditch companies that are not corporate entities but were also evaluated based on water rights information. These private entities are not required to report water use as are the public entities regulated by the above referenced statutes, so the verification of water right activity was not of the same quality.

The water right information came primarily from two sets of records from the Oregon Water Resources Department: 1) annual reports of use of water from the department's public entity database; and 2) existing water right records for public and private entities from the department's Water Rights Information System (WRIS) database. The Black Rock team also reviewed the priority date of water rights to assure that the water supply available would be reliable and not subject to availability based on other senior rights having priority for water use. Water rights for the irrigation providers were also based on the length of the irrigation season and how often the water was available historically as based on annual water reporting statistics. Securing updated contact information was also necessary as the water right records and other sources did not always have correct information for contacting the entity.

Black Rock then determined the list of irrigation water providers to be surveyed based on water rights that may provide at least 1/2 Megawatt (MW) of energy capacity, according to diversion, flow and priority date analysis of existing records. The original scope of work was aimed at locating only projects of 1 MW or larger capacity, but the water rights review indicated more projects potentially available at the lower threshold and therefore Energy Trust and Black Rock agreed to adjust the threshold lower.

In addition, an earlier study commissioned by Energy Trust relative to annual water use by various public entities was reviewed for comparable outcome. There was also a record review of proposed sites from past reconnaissance level data provided by the Bureau of Reclamation and the National Energy Laboratory in Idaho, an arm of the U.S. Department of Energy. Review of existing data from these sources helped to verify the information determined from the water right records, especially for potential reservoir projects.

Water right records produced for each of the surveyed irrigation water providers is located in **Appendix B**.

Survey of Irrigation Water Providers

Black Rock prepared a survey questionnaire to identify potential hydropower projects within irrigation water provider systems 1) that could reuse existing surface water rights to generate electricity; and 2) that had sufficient historic flow to potentially provide at least .5 MWs of generation capacity. The questionnaire addressed specifics such as the length of major canals in the delivery system, the flow in various canals and questions regarding elevation differential to determine if a field level review should be made of the surveyed entity. Black Rock also had access, with irrigation water provider approval, to review GIS records in districts with existing GIS systems to secure information regarding canal length and elevation drops. The survey also sought the level of technical assistance that an irrigation water provider would need to pursue the identified projects.

Each of the 29 entities with potential projects, based on the analysis of water rights, was sent a letter requesting survey completion, the survey form, a synopsis of the entity's water rights as secured through Water Resources Department records, and documents from the Energy Trust about its programs that could provide technical assistance to complete follow-on feasibility studies and other assistance. (See packet provided, **Appendix C**.)

The survey also asked for responses that would identify if potential energy efficiency projects might be identified either in the irrigation water provider's delivery system or in the end-user customer equipment.

A table of the survey results is located in **Appendix D.**

Review of Survey Results

Black Rock reviewed the survey results and followed up the survey with interviews with principals of each entity to add to the information received or to clarify information when needed. As a result, Black Rock was able to identify 14 Districts representing 30 sites by basin that would receive field reconnaissance review. Specific rationale for removing 15 of the Districts from site visit consideration is provided in the survey results table (**Appendix D**) under the last column of the table. Black Rock then set up appointments with those irrigation water provider principals to field verify the sites and to gain information relevant to flow rates and

seasonality of flow rate, real elevation differential, interconnection utility, pole location and costs, equipment requirements, potential conduit size, length and costs, consistency of reservoir withdrawals and other necessary data.

Black Rock appreciated the cooperation of the many irrigation water providers who worked with the team in providing support for review of water right documentation and field reconnaissance development.

FIELD RECONNAISSANCE RESULTS OF HYDROPOWER FACILITIES

Upon review of the surveys received and follow-up telephone conversations with the various Districts, many Districts and sites were excluded due to lack of elevation differential, specific operations or limited season of operation, significantly lower actual water diversion versus water right, and in some instances, lack of interest in our performing the field evaluation. This lack of interest apparently stemmed from previous studies performed or cost/permitting/processing concerns. Of the original 29 packages and surveys mailed, 14 Districts and 30 potential sites were evaluated. Of the 30 sites, 22 sites were personally visited in the field by Black Rock engineering and survey personnel and the other 8 were included in this report by reference to a previous study.

During the months of May and June, 2010, Black Rock performed the scheduling for and travel to the various sites throughout the State of Oregon. The State was partitioned into regions/basins and the site visits made accordingly. In all cases, District managers, in some cases accompanied by a Board member, were met with first and interviewed. The interview generally consisted of orienting Black Rock with specific sources of water supply and general irrigation system operation. Then more detailed questions regarding specific sites, power service provider, utility adjacency, flow rate monitoring, metering or web flow rate data access, reservoir operation and elevation information, as applicable, were normally covered. Additionally, information regarding the desire of the District or obstacles facing the District regarding moving projects forward were discussed.

Once all office information was gathered with the various Districts, site visits were performed to observe the site, physical features at the site, and to determine how a project might be installed on the particular site on a reconnaissance level basis. This evaluation generally included a field survey of potential forebay, powerhouse, nearest visible utility interconnect pole location and tag number, and existing elevation differential (via engineer's rod/level or data corrected hand-held GPS technology). In some instances, elevation information was also obtained or verified through the use of web imagery such as Google Earth Pro, USGS topography, or specific GIS layer.

In most cases, seasonal flow rate and reservoir level (as applicable) information was obtained either from the District or other source such as the United Stated Bureau of Reclamation Hydromet Pacific Northwest Region web site or the Oregon Water Resources Department web site. This data was used in conjunction with the elevation differential information to develop reconnaissance level information regarding flow rate and elevation available through a season for each site. This information was then used to calculate potential peak (MW) and annual

energy production (MWh) using the hydroelectric power generation equation and estimated plant efficiencies ranging from 0.7 to 0.85 depending upon particular site and type of plant that may be used.

PROJECTED COSTS:

Field review provided the basic information to develop reconnaissance-level cost information for each site. Due to the nature of this evaluation, the underlying purpose of the project was to identify potential sites and provide very basic level evaluations of each. As such, the development of conceptual costs is to the same level and it is anticipated that the project cost estimates will vary significantly from those reported herein as feasibility studies, designs, and associated new information and updated costing proceed for each site. Total anticipated costs by site include an additional 10% contingency. No costs have been included for cost of financing or specific commissioning.

Pipeline/Penstock

For each site involving the need for penstock pipeline, an estimated length and diameter of the pipeline was developed using the hazen-williams equation to estimate friction loss in the pipeline. Flow rates and associated friction loss at peak and average flow rates were calculated to estimate pipe diameters on a reconnaissance level basis. The length and diameter were reported for each site on the associated data sheet for each site. For the purposes of this estimate, coated and lined steel pipe was assumed for pipe sizes in excess of 63-inches in diameter and welded high density polyethylene solid wall pipe was assumed for pipe sizes 63-inches in diameter and smaller. Estimates for steel pipe were obtained from the recent installation of a 108-inch diameter conduit project in Central Oregon and a recent bid for HDPE pipe supplied in the Pacific Northwest in July, 2010.

Interconnection Cost

Pole numbers and location were collected at each potential site and and associated length tap-line interconnect was determined and reported for each site. Utilities were contacted for interconnect pricing assistance and costs for recent utility project interconnects in Oregon were used to develop an estimated relationship of interconnect costs based upon rated project output. More specifically, a 0.75 MW project and an 3.8 MW project were used as examples and a range from $240/kW to $475/kW were calculated. For the purposes of this evaluation, a price of $500/kW was used and in instances where a significant tap-line length applied, additional cost was included. It should be noted that the cost of interconnection is very site and utility dependent and is expected to vary significantly from these estimates as feasibility, specific design and further utility processing is pursued.

Powerhouse Completion, Including Equipment and Civil Construction Costs
Powerhouse costs were estimated from recent projects installed in Oregon as indicated above. A cost of $1,500/SF was assumed for powerhouse construction and equipment installation. Powerhouse footprint area estimates were assumed based upon experience for the various project sizes, field observation at the sites, and expected turbine/generator/controls size and geometry. Civil costs were included to estimate the cost of forebay/tailrace/ and site work (as applicable) associated with the various sites based upon recent experience.

Turbine/Generator/Controls
Budgetary package pricing for Turbine/Generator/Controls were requested for the sites from three manufacturers including two domestic and one foreign (Chinese) manufacturer. Additionally, where higher volume, low-head projects existed, recent budgetary pricing from a newer technology manufacturer was incorporated. Pricing from the Chinese manufacturer was significantly less than Domestic manufacturers. For one installation, the pricing ranged from $800,000 for the Chinese equipment to $2,025,000 for Domestic. For the purposes of this evaluation, the middle cost suppliers were used in cost estimating. As each project moves forward and associated funding constraints are applied, each individual site may determine if it may take advantage of the foreign pricing for the turbine package and the associated integration of foreign materials and technology into the particular installation.

Design and Permitting, Including Land Use Siting Requirements
We applied a cost of 10% for design and permitting to projects over 0.5MW and a cost of 6% for design and permitting for those below 0.5MW. Generally speaking the cost associated with smaller projects will be less due to low thresholds of environmental disturbance, public and stakeholder concern, etc. The ultimate cost variability is high due to utility interconnect specific designs, federal agency involvement, as applicable in commenting or participating in the design process and other factors unknown prior to further site analysis. Land use permitting is a key project consideration and should be well considered. Hydropower project siting and the associated land-use may not be compatible on all sites evaluated and should be one of the first items covered in a full feasibility level study of each site.

Mitigation

No extraordinary mitigation beyond the need for fish screening was identified during our site visits. Due to the nature of this evaluation, it is probable that mitigation requirements will surface on some sites that were not noted during our short visits. It should also be noted that fish screening costs have not been included as need and feasibility for screens should be further evaluated on the few sites that require screens and funding programs are active in Oregon for sites requiring screening and/or screening retrofits.

ENVIRONMENTAL AND INSTITUTIONAL CONSTRAINTS

Development of hydroelectric projects must meet or exceed a number of environmental and institutional constraints for project siting to occur. Those constraints that affect the projects reviewed in this evaluation include, but are not limited to, the following programs.

Protected Areas

The Northwest Power and Conservation Council (NPCC) adopted its Fish and Wildlife Plan in 1988, including the provision of "protected areas." Since that time there has been a limitation in the Northwest to protect specific streams and wildlife habitats from hydroelectric development where the Council has decided impacts would be negative and irreversible. Studies that began in 1983 analyzed streams throughout the Northwest. Maps of the areas that are covered by the protected areas program are available at Streamnet on the Council's website (http://www.streamnet.org/ProtectedAreas.html). The program encompasses the majority of streams in the Northwest. The NPCC has called upon the Federal Energy Regulatory Commission (FERC) not to license new hydroelectric development within a protected area.

The following projects are exempt from the protected areas designation:

- Facilities and impoundments licensed by FERC prior to August 10, 1988
- Relicensing of such facilities and impoundments
- Modifications to existing hydroelectric facilities or their impoundments
- Addition of hydroelectric generation projects to a non-hydroelectric dam or diversion if the facility existed as of the date Protected Area status was granted
- "Transition Projects" for which applications or permits were sought from FERC before August 10, 1988

All of the projects identified in this evaluation appear to be exempt from the Protected Areas program as they are either additions to an existing facility or diversion infrastructure in place before August 10, 1988.

Wild and Scenic River and Wilderness Designations

Certain federal designations preclude the development of hydroelectric projects. Any project that would occur on a federally designated wild and scenic river or sited within a federal wilderness designation would be precluded. The same restriction would occur relative to a state listing. None of the projects evaluated appear to fall within either federal or state designations of wild and scenic river stretches or wilderness boundaries.

Endangered Species Act

The federal Endangered Species Act (ESA) precludes development of hydropower when "critical habitat designations" apply to threatened or endangered species by either the National Marine Fisheries Service (NOAA Fisheries Service) or U.S. Fish and Wildlife Service authority. In cases where there are existing diversions, projects have been able to be sited when mitigation or special conditions are applied. For example, the Deschutes River Basin stakeholders are developing a "habitat conservation plan" to guide protection for reintroduced fish species while allowing some specific development at existing infrastructure sites. Both the Swalley Irrigation District and the Central Oregon Irrigation District developed hydropower sites as conduit exemptions from water diverted from the Deschutes River in agreement with the federal fishery agencies. All of the projects in the Deschutes Basin fall under the habitat conservation plan in progress. ESA listed species also occur at several other evaluated sites. Conduit exemptions will likely be able to proceed in these areas. Addition of hydropower to existing reservoirs and dams will likely require mitigation and negotiation with the federal and state fishery agencies. There could also be ESA listings for wildlife and plant species in project areas. The applicants during the preliminary evaluation did not identify any such listings for the projects reviewed.

Oregon's Endangered Species Act and protected and native fishery restrictions may apply in specific project areas. Because all of the projects reviewed in this evaluation are at existing infrastructure sites, the impact of these programs would be limited.

Clean Water Act

The Clean Water Act applies to discharges from penstocks where turbidity may occur. Review of projects at existing reservoirs could require review under the Act and potentially requirement of a 401 permit. In Oregon, DEQ will issue the permit, under its delegation from the federal Environmental Protection Agency. Conduit exemptions normally would not be subject to the Act. Projects at existing reservoirs that were evaluated under this project will need to address turbidity requirements if the project results in discharge to a river body. Only one of the projects appears to have a river discharge, the Sidney Irrigation Cooperative project.

Federal Energy Regulatory Commission

There are a number of changes that FERC could address to speed up the conduit exemption process. Several associations and other organizations, including Energy Trust, offered comments to FERC when FERC requested input on changes that might improve the process in December of 2009. One of the more significant changes that would have helped to expedite the two conduit exemptions approved in the last year (Swalley and COID) would be the requirement for FERC to respond within specific timelines upon receipt of comments or documents. In the case of Swalley, for example, an additional map was required. Swalley

quickly turned around the request, but the process remained on hold for several weeks after that. The same circumstance occurred when a comment was received by FERC after the comment deadline—that comment held up the process for several weeks unnecessarily as the comment was not relevant or substantial.

The Deschutes projects also suffered from required dual agency responses. Prior to filing the application, the applicants met with all relevant agencies and the tribal authority and secured letters from them acknowledging that there were no impacts. Those were filed with the application. After the application was accepted, another 60 day period was set for the agencies to respond and since they had already provided that response as part of the application, that was an unnecessary duplication that slowed down the process.

FERC is continuing to take input and there is a federal Congressional bill pending that emphasizes the need for more streamlined procedures.

State Water Right Processes

Expedited Applications

For the projects that reuse the existing water right of the entity and are approved by FERC as "exemptions", Oregon provides an exception to the state's licensing process through specific legislation enacted in 2007 for that purpose. ORS 543.765 (H.B. 2785) allows the use of an existing certificated water right to be reused for creating hydropower when the following assurances or documents are provided to the Oregon Water Resources Department:

- Project is within an artificial delivery system
- Project qualifies for a FERC exemption and applicant provides a copy of the application to FERC to the department
- Schedule of annual water use for power project and estimate of the maximum power generation provided
- Statement that no more water will be used for the hydro project than for the underlying water use
- Assurance that the applicant owns or controls the water conveyance system
- Maps, drawings and data provided by applicant as determined to be needed
- Statement from a public entity providing water that such water is deliverable if the applicant is other than the water provider
- Evidence of use over last 5 year period
- Use of water for power limited to same period of use as underlying water right, with no enlargement

- Fishscreens, by-pass or passage requirements of Oregon Department of Fish and Wildlife met
- Provisions of water right are not exceeded: rate, duty, and other conditions of right
- Measurement and reporting required
- Same priority date issued as original right
- Subject to review after 50 years
- FERC exemption approval due prior to final certification of right; project use of power right canceled if FERC approval rescinded at anytime
- Certificate to be used within 5 years or less to remain valid

All of the projects evaluated represent exemption applications before FERC and would be able to apply for reuse of the water under this statute.

Applicants for exemptions that are not public entities would have to measure and report water use. Currently public entities are already required to measure and report but the private entities, such as ditch companies, do not have that requirement unless they have been reorganized as public corporations or districts.

Two projects have been authorized by the department under this statute. Swalley Irrigation District was the first project to be approved by final order PC 888 in December of 2009. Central Oregon Irrigation District's project was approved as PC 890 in January of 2010.

There are currently projects with water rights that are not certificated because they pre-date current water right laws (known as "registrations"). There are also water rights that are "withdrawn" from further development that cannot take advantage of the statute as it is currently written. If a water right for a municipality, for example, is in a "withdrawn" basin (no new rights can be issued) it is not currently eligible to use the expedited process, regardless of whether or not the project would have additional impacts. Legislation to allow this statute to encompass "withdrawals" and "registrations" would add benefit at those existing facilities.

So far this statute has been used only for conduit exemptions, but it could be used for any exemption that is applicable to FERC's exemption process, including existing diversions under 5 MWs. All of the projects identified in this evaluation could apply for reuse of the water right under this statute.

Fish Passage Issues

Some recent projects have encountered serious difficulties in the state permitting process due to differing interpretations of fish passage requirements. The Oregon Department of Fish and

Wildlife (ODFW) has interpreted the application for a hydroelectric water right anywhere on an existing conduit as triggering the requirement for fish passage at the conduit's existing dam or diversion. Project proponents have argued that the fish passage requirement should not be triggered unless there is a major change in the existing facility's dam or diversion, or an enlargement of its water right. FERC's view of conduit exemption project components differs from the state's. In FERC's proceedings only the generation equipment, powerhouse and associated features are considered to be part of a project's boundary during an application's review. The diversion structure, the transmission lines, the pipeline and the diversion structure are not part of the project boundary to be reviewed.

In Oregon, the Fish Passage Task Force worked for 6 years to reach compromise agreements on many fish passage issues, and specifically when passage could be required at an existing facility. Although the fish passage statute was in place very early in Oregon's history, ODFW and its predecessor, the Oregon Fish Commission, allowed most diversions and dams to be built in Oregon without passage for close to a century, using hatcheries or other mitigation in place of ladders and fish passage structures. The cost to implement fish passage at most existing dams is now very high. For most conduit exemption proposals, adding the costs of fish passage is crippling to the project's financial viability.

In the case of Swalley and Central Oregon Irrigation District conduit projects, an agreement was negotiated with ODFW to add fish passage in order to proceed with the projects. That was a somewhat unusual circumstance in that 4 districts share the North Canal Dam and were able to agree to come up with their share of the cost of fish passage over the next 10 year period. Many conduit exemptions or small projects at existing reservoirs could not afford to sign off as an individual entity on a major fish passage project. All of the projects evaluated in this review would be subject to the fish passage requirement. The cost of fish passage has not been included in the cost figures of these evaluations as fish passage is so specific to each project and each project is subject to ODFW standards yet to be determined.

Interconnection

The interconnection process can also be very challenging for project proponents. In the case of Swalley Irrigation District, the district had its electrical engineering consultant attend the first meeting with the utility engineering and interconnection policy staff. That made the process easier in that everyone could speak the appropriate technical language and get right down to the issues. Project proponents should not hold such a meeting without adequate technical support as it extends the process unnecessarily.

Project proponents should also be aware that it can often be difficult to secure some basic types of information about interconnection prior to signing a study contract with the interconnecting utility. In an ideal world, there would be an opportunity to approach a local utility engineer with a pole number close to the proposed project to get some beginning information about how far from the nearest 3-phase line (if necessary for the project size) the proposed project is located. This information could help determine if an interconnection point would be cost-prohibitive without engaging in a time consuming and costly interconnection study.

Project proponents should also be conscious of the complexity of interconnection and ongoing maintenance agreements for small projects. A standardized agreement with straight forward language and intent would be helpful for small, exempt projects. There was a request at the Public Utility Commission to consider such an agreement, but the PUC has not yet proceeded with any work in that area. Utilities indicate that they need to follow very specific procedures due to transmission requirements with FERC. Other legal counsel has indicated that certain exemptions fall under that threshold. While it is easier for a utility to have only one interconnection process, small projects could proceed more efficiently under simpler rules tailored to the project's scale.

Power Sales Agreements

Most projects under 10MW sign standardized power sales agreements at published "avoided cost" rates. Generally speaking, it is helpful to have standardized rates for power sales agreements. However, the periodic fluctuation of the avoided cost rate for small projects can make it difficult to bring new small renewable resources on line. There was a recommendation brought to the PUC to consider a more stable rate for projects under 1 MW. Such a rate would assure that small renewables could come on line, helping to supplant the need for thermal facilities or larger renewables that would have a significant impact on ratepayers and the utility.

Current avoided cost rates are quite low at this time. In 2013 the rates currently offered return to a much higher level, more easily supporting project development.

Land Use Siting

There are no consistent siting ordinances in Oregon's counties or cities for small hydro. In fact, there is not an existing ordinance that specifically addresses small hydro in any of the counties. As a result, each project has to go forward under special use provisions.

A generic, statewide ordinance could expedite these projects. In the 1980s the Oregon Department of Energy developed a geothermal siting ordinance that was adopted by some local governments. A similar effort for small hydro development could be very helpful.

In the case of two recent Deschutes County projects (Swalley and COID), the applicants had to go through a 9-month process to create a text amendment to the county's existing ordinances. An additional 6 months were required to address local site plan and building requirements.

Even after the Deschutes County ordinance was developed, the site plan development was fraught with conditions that generally apply to buildings and not generation sites. Some of the conditions that were applied were difficult and time consuming. Others did not appear relevant to hydroelectric projects.

One-Stop Permitting

Early in the 1980s the Oregon Department of Energy contemplated the development of a one-stop permitting process for small renewable energy projects. While that idea had significant support and interest, the one-stop process envisioned was never developed. The idea still has significant merit. Given the need for green, renewable energy, the Governor's Natural Resources Office could be instrumental in finding a method to implement such a process now to expedite renewable resources.

Finance

The Oregon Department of Energy instituted a Small Scale Energy Loan Program (SELP) by initiative of the voters, amending the Oregon Constitution in 1980. SELP has been successfully used, based on the state's borrowing authority, since that time. The loan program supported the development of almost all of the irrigation district hydro plants that were constructed in the early 1980s and the loan fund was repaid over the intervening years.

Recently, SELP curtailed construction financing activities and now only provides "take out" funding after construction is complete. SELP's unwillingness to provide construction financing diminishes the value of the program for project proponents. Limiting the program to payment after construction makes it generally unusable for most small hydro project proponents.

Business Energy Tax Credit

The Business Energy Tax Credit (BETC) implemented through the Oregon Department of Energy is due to sunset in 2012. Loss of that program would have significant impact on projects. Public entities cannot use a tax credit directly, but the program's pass-through process allows a portion of the renewable energy credit to be applied against project cost.

FIELD RECONNAISSANCE RESULTS OF ENERGY EFFICIENCY PROJECTS

A secondary goal of the evaluation was to identify potential energy efficiency upgrades, either within the irrigation water provider delivery system or within the operational systems of individual water user customers of the provider. Some providers use large pumps to transfer water from their source facilities into delivery canals. In other instances, individuals pump water that has been delivered to a pond or there is a pump that withdraws water from the provider's delivery system. In some cases there are efficiency upgrades through retrofitting or replacing pumps that would result in energy savings and reduction of electricity use within the service districts of PacifiCorp or Portland General Electric. During the field analysis for hydropower potential, Black Rock sought to identify these efficiency upgrades as part of the field-truthing process with the applicable irrigation water providers. Energy Trust has the ability to offer incentives for projects that can be identified to provide energy conservation and efficiency.

One district (Central Oregon Irrigation District) of those visited in the field within PacifCorp or PGE territories had a significant number of water-user owned and operated pumps in place. As this District has a significant service territory and patrons, Black Rock worked closely with the District to develop a chart that provides general guidance regarding private pressure systems within the District. The District itself has no pumping. The chart below provides the results of the joint Black Rock/Central Oregon Irrigation District efforts in determining the pressurized pumping within the District. Generally speaking, all such pumping is either from a private lateral or private pond beyond the District's delivery point.

CENTRAL OREGON CANAL				
Method	**# Patrons**	**# Acres**	**PacifiCorp Customers**	**CEC Customers**
Flood	293	8565	74	219
Sprinkle	1719	11067	509	1210
Spr/Flood	180	5105	28	152
Unknown	84	453	19	65
WR by Size	**< 5 AC**	**5-20 AC**	**20-100 AC**	**100-500 AC**
Flood	52 WR/133 AC	97 WR/1064 AC	134 WR/5883 AC	10 WR/1484 AC
Sprinkle	1297 WR/1775 AC	278 WR/2673 AC	136 WR/5416 AC	8 WR/1203 AC
Spr./Flood	52 WR/144 AC	67 WR/659 AC	50 WR/2339 AC	11 WR/1961 AC
Unknown	61 WR/117 AC	17 WR/141 AC	6 WR/196 AC	0 WR/0 AC

PILOT BUTTE CANAL					
Method	**# Patrons**	**# Acres**	**PacifiCorp Customers**	**CEC Customers**	
Flood	787	6030	52	735	
Sprinkle	1077	7300	64	1013	
Spr/Flood	311	4033	19	292	
Unknown	130	1678	4	126	
WR by Size	**< 5 AC**	**5-20 AC**	**20-100 AC**	**100-500 AC**	**>500 AC**
Flood	49 WR/1177 AC	215 WR/2080	79 WR/2661 AC	1 WR/114 AC	0 WR/0 AC
Sprinkle	747 WR/1452 AC	241 WR/2433 AC	86 WR/2945 AC	3 WR/470 AC	0 WR/0 AC
Spr./Flood	168 WR/369 AC	83 WR/758 AC	54 WR/2186 AC	6 WR/720 AC	0 WR/0 AC
Unknown	85 WR/150 AC	36 WR/323 AC	7 WR/288 AC	1 WR/150 AC	1 WR/767 AC

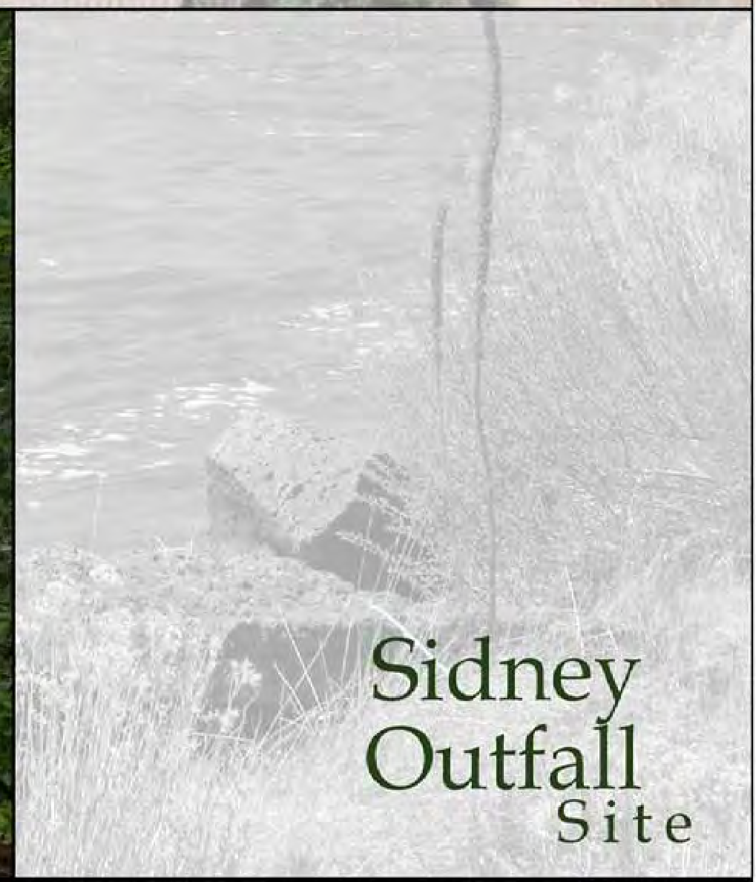
In addition to the Central Oregon Irrigation District, the Sidney Irrigation District and Santiam Water Control District both lie within Pacificorp and/or PGE service territories. The following information was obtained from those Districts:

QUESTION POSED	Santiam WCD	Sidney
1. Pumped or Pressurized Acres?	Appx. 17,000 30% Low Pressure Pivot 70% high Pressure/Big Gun	Appx. 7,000 Guns Pivots/Wheel Few Handlines
2. District Owned Pumps?	2-10HP Pumps Constant Speed Older Pumps	None
3. How is Rate to Patrons Controlled?	By Proper Pump Sizing No Meters	By Proper Pump Sizing No Meters
4. What is Interest in Moving to More Efficient Irrigation Technology?	High	Unknown
5. What Utility Serves Patron Pumps?	Pacificorp	Pacificorp, possibly some PGE
6. How Many Users in District?	Appx. 800 Parcels 600 Pump	Appx. 220 Patrons
7. Start and End of Irrigation Season?	April through October	April through October
8. Fraction of Acreage Served at >70 PSI Fraction of Acreage Served at <70 PSI Flood Irrigation	70% 30% <1%	Believes none 100% (40 PSI-60PSI) None Known
9. How is District Incoming Flow Measured?	Water Level Gauge Without Current Rating (Could be much better)	Water Level Gauge and Weir System
10. Is Flow Measurement on All or Part of Canals?	Very Little Measurement	Just Main Canal Gauge
11. Last Performance Check on District Pumps?	Not Within Last 5 Years	N/A
12. Do Most Users Have Dedicated Meters or Shared?	Dedicated	Unknown
13. Does District Have a List of User Pumps?	No. District is Working on GIS Locations and Map	No
14. How Does District Track Annual Water Use?	Reading at Main Gauge	Reading at Main Gauge

Irrigation Water Providers of Oregon

Western Oregon Districts

Sidney Irrigation District



Sidney Irrigation District

Project Details

Water Provider:	Sidney Irrigation District
Contact:	Mike Piesker P.O. Box 736 Jefferson, Oregon 97352 (541)327-3065
Interest Level:	Fair
Financial/Technical Ability for Project:	Fair-Would Need Technical Consulting Assistance and Possible Grant Participation
Powerhouse Location:	lat: N44° 48' 13.18" long: W123° 05' 29.93"
Interconnect Utility Company:	Pacificorp
Interconnect Pole Location:	lat: N44° 48' 09.00" long: W123° 05' 02.78"
Interconnect Pole Tag Number:	81400
Project Type:	New Capacity at Canal Outfall
Powerhouse Location Description:	Existing Outfall Energy Dissipation Structure at Coordinates Shown Above.

Resource Estimates

Head:	Gross Head= 34 ft Net Head= 30 ft
Flow:	Flow Rate Range = 50 cfs to 90 cfs Average Flow Rate = 70 cfs (Estimate, No Data)
Flow Annual Availability	October through April

Power Potential Estimates

Capacity:	0.17 MW Peak
Annual Output:	575 MWh

Project Development/Cost Estimates

Pipe:	Length=NA Diameter=NA Cost=NA
Powerhouse:	$400,000.00
Civil Works:	$200,000.00
Turbine/Generator/Controls:	$675,000.00
Transmission:	Length=730 LF Cost=$142,132.00
Design/Permitting	$85,028.00
10% Contingency:	$150,216.00
Total:	$1,652,376.00

Potential Fatal Flaws or Issues of Concern

No Noted Fatal Flaws

Riverbank Outfall Permitting Process.

No Existing Fish Screen on Main Canal

Sidney Outfall Data

Santiam Water Control District

Aerial View

E. Water Street

Stayton-Scio Road

Existing Inlet

Existing Powerhouse

Existing Transmission Connection Point

Powerhouse Site

Main Canal Existing Plant Site

Santiam Water Control District

Project Details

Water Provider:	Santiam Water Control District
Contact:	Brent Stevenson, Manager 284 E. Water Street Stayton, Oregon 97383 (541)769-2669
Interest Level:	Good
Financial/Technical Ability for Project:	Good-Would Need Technical Consulting Assistance and Possible Grant Participation
Forebay Location:	lat: N44° 47' 43.16" long: W122° 47' 32.88"
Powerhouse Location:	lat: N44° 47' 43.16" long: W122° 47' 32.88"
Interconnect Utility Company:	Pacificorp
Interconnect Pole Location:	lat: N44° 47' 43.16" long: W122° 47' 32.88"
Interconnect Pole Tag Number:	NA - Existing Pole w/Connection
Project Type:	Existing Plant on Canal Needs Refurbish and Permitting
Powerhouse Location Description:	Coordinates Shown Above

Resource Estimates

Head:	Gross Head= 12ft Net Head= 10ft
Flow:	Flow Rate Range = 50 cfs to 780 cfs Average Flow Rate = 780 cfs
Flow Annual Availability	October through May

Power Potential Estimates

Capacity:	0.6 MW Peak
Annual Output:	Pending Permitting

Project Development/Cost Estimates

Pipe:	NA
Powerhouse:	Refurbishment Will Need Consultant Evaluation
Civil Works:	NA
Turbine/Generator/Controls:	Unknown
Transmission:	NA - Connected
Design/Permitting:	Unknown

Potential Fatal Flaws or Issues of Concern

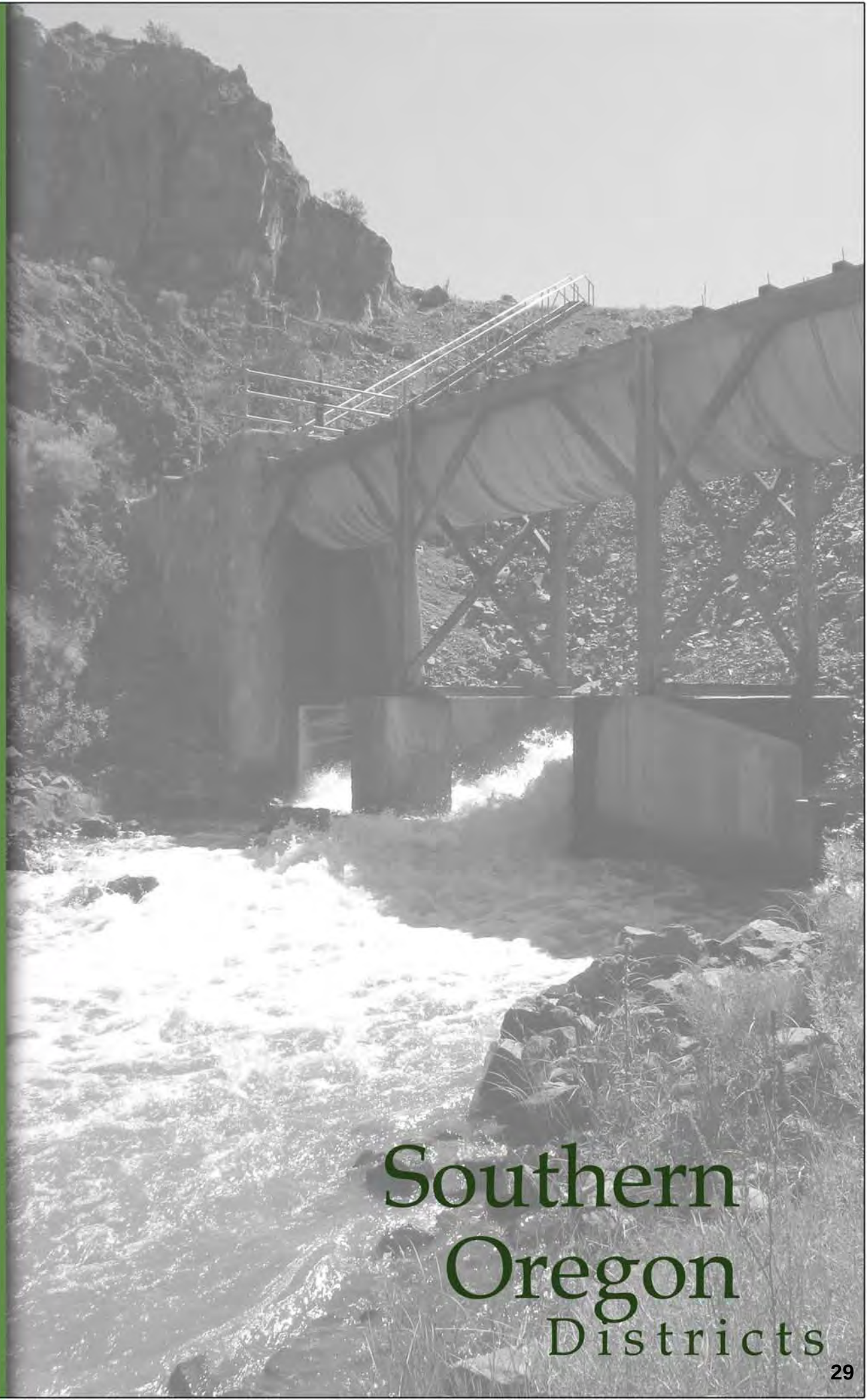
No Noted Fatal Flaws

Permitting to Restart Diversion Flows Down Main Canal

FERC License Pending

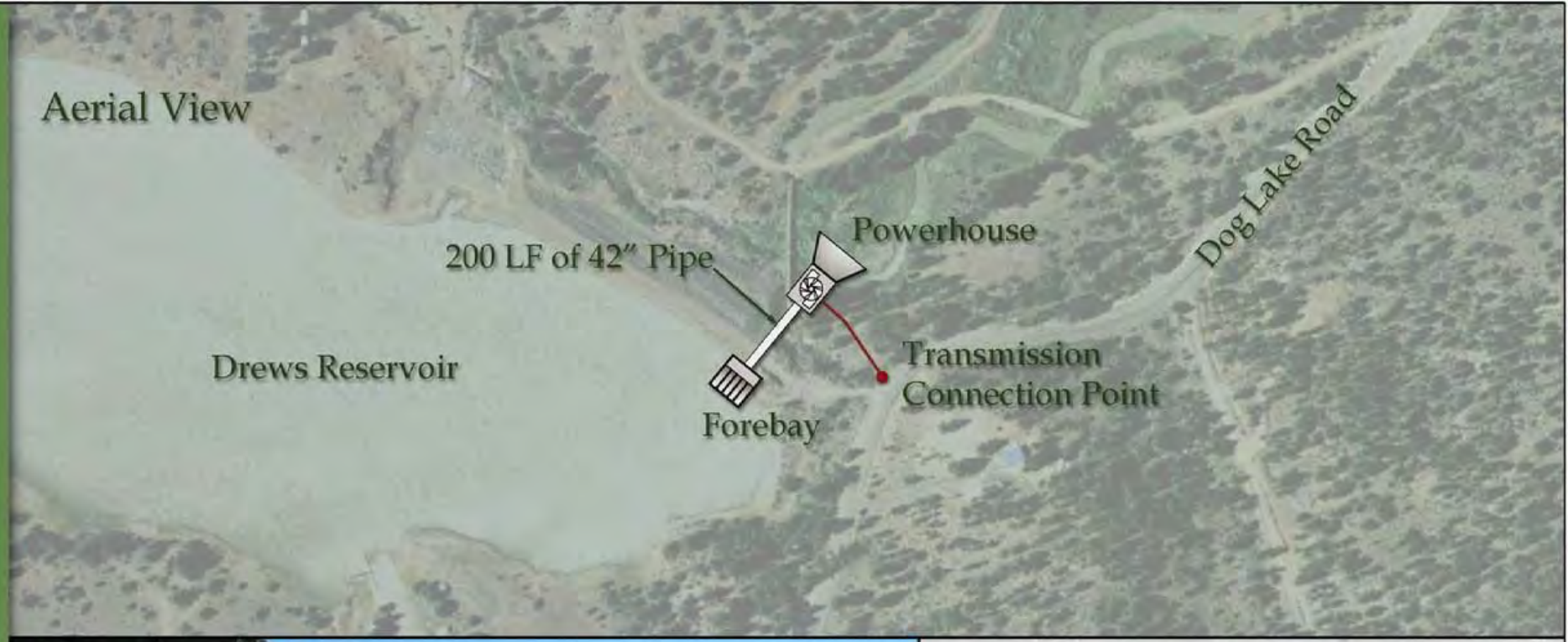
Main Canal Existing Plant Data

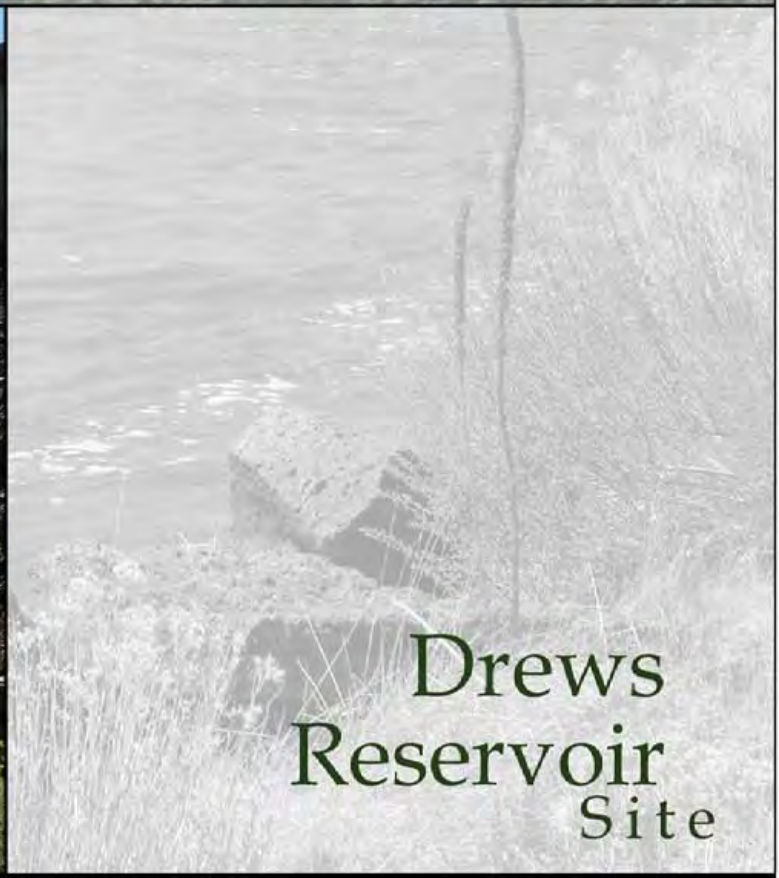
Irrigation Water Providers of Oregon



Southern Oregon Districts

Lakeview Water Users, inc.





Lakeview Water Users, inc.

Project Details	
Water Provider:	Lakeview Water Users, inc.
Contact:	Jorge Cobian 91164 Water Users Lane Lakeview, Oregon 97630 (541)947-3003
Interest Level:	Good
Financial/Technical Ability for Project:	Fair-Would Need Technical Consulting Assistance and Possible Grant Participation
Forebay Location:	lat: N42° 07' 16.66" long: W120° 37' 0.55"
Powerhouse Location:	lat: N42° 07' 18.25" long: W120° 36' 58.58"
Interconnect Utility Company:	Surprise Valley Electric Coop
Interconnect Pole Location:	lat: N42° 07' 16.38" long: W120° 36' 56.52"
Interconnect Pole Tag Number:	15S 447
Project Type:	New Capacity at Reservoir Outlet
Powerhouse Location Description:	Dam Outlet at Coordinates Shown Above

Resource Estimates	
Head:	Gross Head= 54ft to 35ft Net Head= 46ft to 27ft
Flow:	Flow Rate Range = 30 cfs to 90 cfs Average Flow Rate = 75 cfs (1980s OWRD Data)
Flow Annual Availability	April through October

Power Potential Estimates	
Capacity:	0.28 MW Peak
Annual Output:	850 MWh

Project Development/Cost Estimates	
Pipe:	Length=200 LF Diameter=42 in. Cost=$15,423.00
Powerhouse:	$400,000.00
Civil Works:	$200,000.00
Turbine/Generator/Controls:	$400,000.00
Transmission:	Length=280 LF Cost=$83,756.00
Design/Permitting:	$65,951.00
10% Contingency:	$116,513.00
Total:	$1,281,643.00

Potential Fatal Flaws or Issues of Concern

No Noted Fatal Flaws

Permitting at Drews Creek

No Fish Screen at Reservoir

Drews Reservoir Data

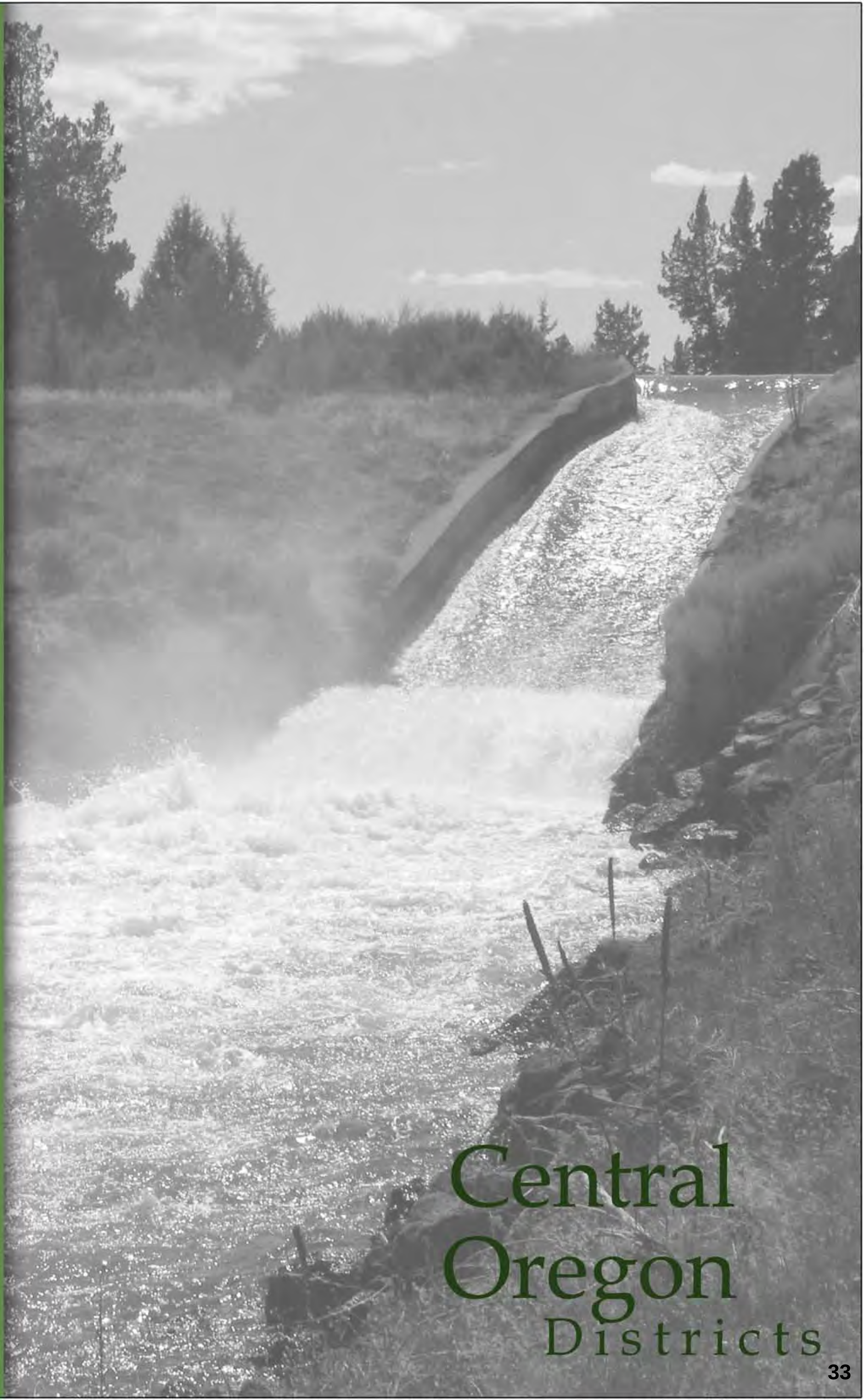
Talent Irrigation District

Preliminary Evaluation of Micro-Hydro Generation See Appendix E

(Report Created by HDR)

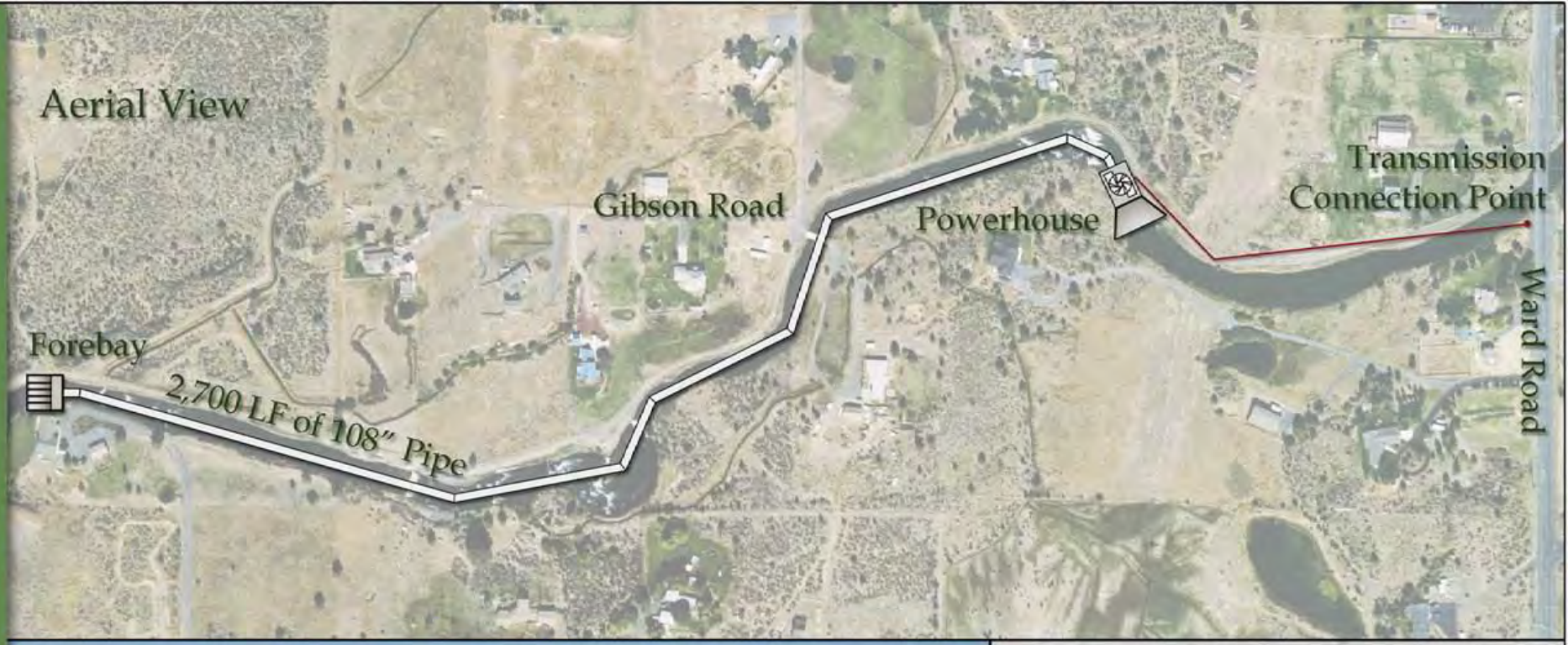
District Wide Report

Irrigation Water Providers of Oregon



Central Oregon Districts

Central Oregon Irrigation District



Ward
Road
Site

Central Oregon Irrigation District

Project Details

Water Provider:	Central Oregon Irrigation District
Contact:	Steve Johnson, Manager 1055 SW Lake Court Redmond, Oregon 97756
Interest Level:	High
Financial/Technical Ability for Project:	High (2 Existing Projects, 1 Under Construction)
Forebay Location:	lat: N44° 02' 29.04" long: W121° 15' 21.96"
Powerhouse Location:	lat: N44° 02' 33.60" long: W121° 14' 49.38"
Interconnect Utility Company:	Central Oregon Coop / Pacificorp
Interconnect Pole Location:	lat: N44° 02' 32.58" long: W121° 14' 37.36"
Interconnect Pole Tag Number:	Central Oregon-116158 Pacificorp-1812 029341
Powerhouse Location Description:	In Main Canal at Coordinates Shown Above

Resource Estimates

Head:	Gross Head=31ft, Net Head=25ft
Flow:	Flow Rate Range = 200 cfs to 460 cfs Average Flow Rate = 330 cfs
Flow Annual Availability	Irrigation Season (April-October Possible 4 Winter Stock Runs

Power Potential Estimates

Capacity:	0.8 MW Peak
Annual Output:	2,480 MWh

Project Development/Cost Estimates

Pipe:	Length=2,700 LF Diameter=108 in. Cost=$3,207,600.00
Powerhouse:	$500,000.00
Civil Works:	$300,000.00
Turbine/Generator/Controls:	$600,000.00
Transmission	Length=950 LF Cost=$253,807.00
Design/Permitting:	$486,141.00
10% Contingency:	$534,755.00
Total:	$5,882,303.00

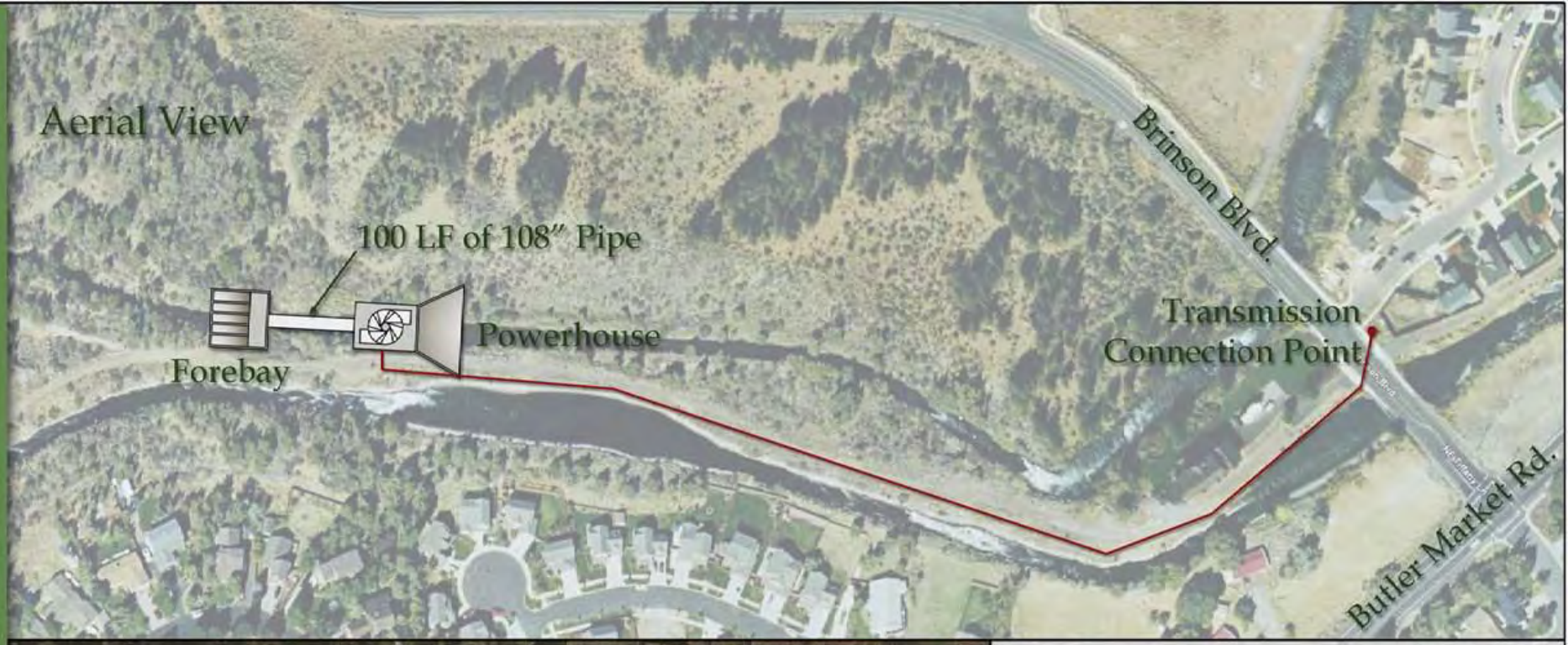
Potential Fatal Flaws or Issues of Concern

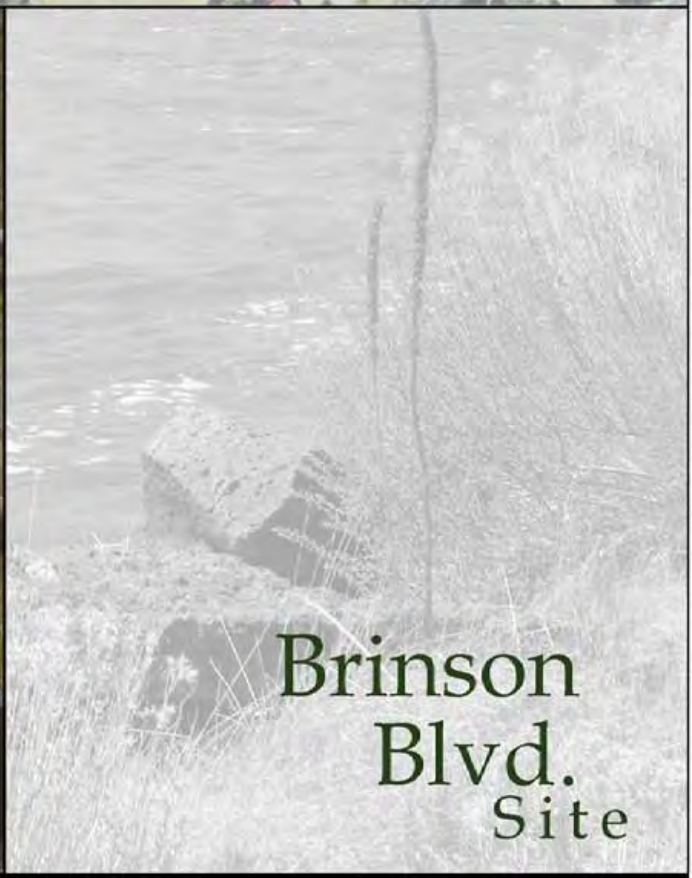
No known fatal flaws.

Issues of concern would be site approval through local jurisdiction and ACOE exemption.

Ward Road Data

Central Oregon Irrigation District





Central Oregon Irrigation District

Project Details

Water Provider:	Central Oregon Irrigation District
Contact:	Steve Johnson, Manager 1055 SW Lake Court Redmond, Oregon 97756 (541)548-6047
Interest Level:	High
Financial/Technical Ability for Project:	High (2 Existing Projects, 1 Under Construction)
Forebay Location:	lat: N44° 04' 57.49" long: W121° 17' 13.74"
Powerhouse Location:	lat: N44° 04' 57.32" long: W121° 17' 10.38"
Interconnect Utility Company:	Pacificorp
Interconnect Pole Location:	lat: N44° 04' 57.24" long: W121° 16' 51.60"
Interconnect Pole Tag Number:	17-12 221103 (1920)
Project Type:	In Main Canal, Conduit Project
Powerhouse Location Description:	In Main Canal at Coordinates Shown Above

Resource Estimates

Head:	Gross Head=20ft, Net Head=17ft
Flow:	Flow Rate Range = 200 cfs to 470 cfs Average Flow Rate = 370 cfs
Flow Annual Availability	Irrigation Season (April through October) Possible 4 Winter Stock Runs

Power Potential Estimates

Capacity:	0.5 MW Peak
Annual Output:	2,000 MWh

Project Development/Cost Estimates

Pipe:	Length=100 LF Diameter=108 in. Cost=$118,800.00
Powerhouse	$500,000.00
Civil Works:	$200,000.00
Turbine/Generator/Controls	$600,000.00
Transmission	Length=1,525 LF Cost=$215,736.00 Possible Split with NUID
Design/Permitting:	$98,072.00
10% Contingency:	$173,261.00
Total:	$1,905,869.00

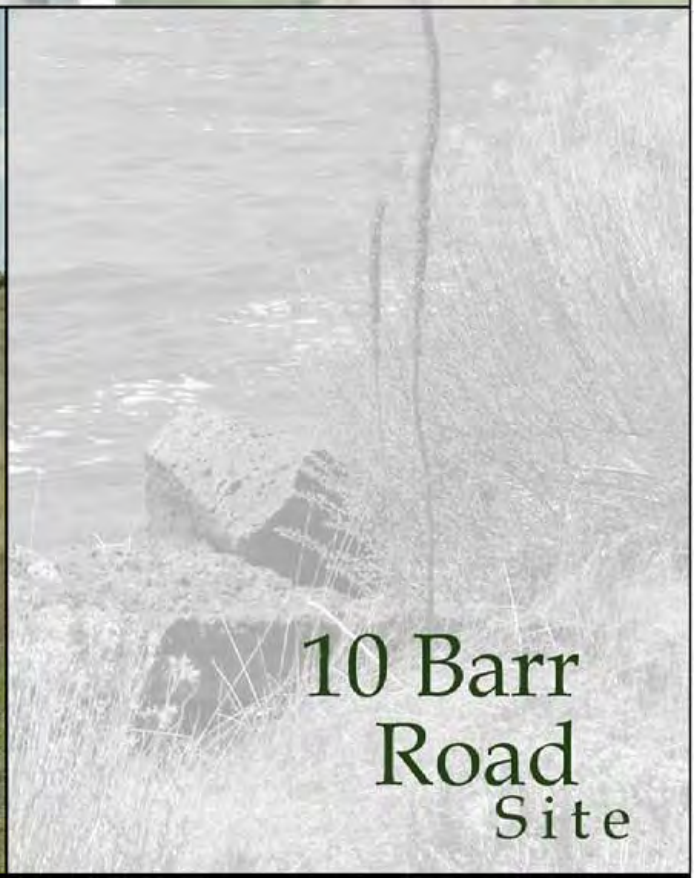
Potential Fatal Flaws or Issues of Concern

No known fatal flaws.

Issues of concern: Land Use Permitting.

Brinson Blvd. Data

Central Oregon Irrigation District



Central Oregon Irrigation District

Project Details

Water Provider:	Central Oregon Irrigation District
Contact:	Steve Johnson, Manager 1055 SW Lake Court Redmond, Oregon 97756 (541)548-6047
Interest Level:	High
Financial/Technical Ability for Project:	High (2 Existing Projects, 1 Under Construction)
Forebay Location:	lat: N44° 02' 13.38" lon: W121° 09' 37.22"
Powerhouse Location:	lat: N44° 02' 13.99" lon: W121° 09' 34.77"
Interconnect Utility Company:	Central Oregon Coop
Interconnect Pole Location:	lat: N44° 02' 14.52" lon: W121° 09' 10.08"
Interconnect Pole Tag Number:	118645
Project Type:	In Main Canal. Conduit Project
Powerhouse Location Description:	In Main Canal at Coordinates Shown Above

Resource Estimates

Head:	Gross Head=31ft, Net Head=27ft
Flow:	Flow Rate Range = 150 cfs to 360 cfs Average Flow Rate = 260 cfs
Flow Annual Availability	Assume 185 Days per Year for Irrigation Season Possible 4 Winter Stock Runs

Power Potential Estimates

Capacity:	0.65 MW Peak
Annual Output:	2,100 MWh

Project Development/Cost Estimates

Pipe:	Length=195 LF Diameter=96 in. Cost=$205,920.00
Powerhouse:	$500,000.00
Civil Works:	$300,000.00
Turbine/Generator/Controls:	$600,000.00
Transmission:	Length=1,820 LF Cost=$237,563.00
Design/Permitting:	$110,609.00
10% Contingency:	$195,409.00
Total:	$2,149,502.00

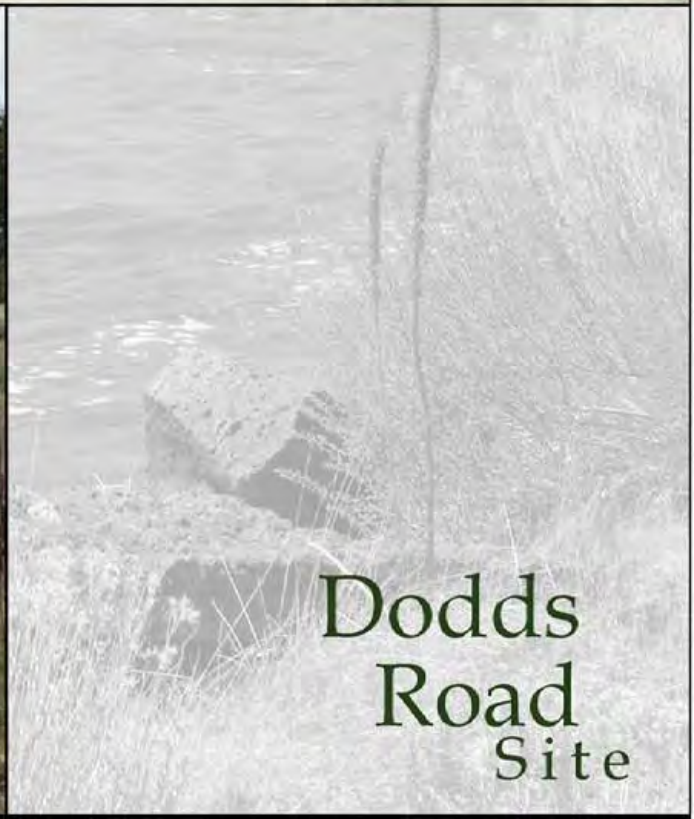
Potential Fatal Flaws or Issues of Concern

No known fatal flaws.

Issues of concern: Zoning/Site Plan Approval

10 Barr Road Data

Central Oregon Irrigation District



Central Oregon Irrigation District

Project Details

Water Provider:	Central Oregon Irrigation District
Contact:	Steve Johnson, Manager 1055 SW Lake Court Redmond, Oregon 97756 (541)548-6047
Interest Level:	High
Financial/Technical Ability for Project:	High (2 Existing Projects, 1 Under Construction)
Forebay Location:	lat: N44° 02' 07.91" long: W121° 08' 30.05"
Powerhouse Location:	lat: N44° 01' 54.04" long: W121° 06' 40.79"
Interconnect Utility Company:	Central Oregon Coop
Interconnect Pole Location:	lat: N44° 01' 46.14" long: W121° 06' 14.88"
Interconnect Pole Tag Number:	118668
Project Type:	In Main Canal. Conduit Project
Powerhouse Location Description:	In Main Canal at Coordinates Shown Above

Resource Estimates

Head:	Gross Head=88ft, Net Head=79ft
Flow:	Flow Rate Range = 150 cfs to 345 cfs Average Flow Rate = 245 cfs
Flow Annual Availability	Irrigation Season (April through October) Possible 4 Winter Stock Runs

Power Potential Estimates

Capacity:	1.85 MW Peak
Annual Output:	5,800 MWh

Project Development/Cost Estimates

Pipe:	Length=8,433 LF Diameter=96 in. Cost=$8,905,248.00
Powerhouse:	$3,000,000.00
Civil Works:	$300,000.00
Turbine/Generator/Controls:	$3,375,000.00
Transmission:	Length=2,440 LF Cost=$654,992.00
Design/Permitting	$1,623,524.00
10% Contingency:	$1,785,876.00
Total:	$19,644,640.00

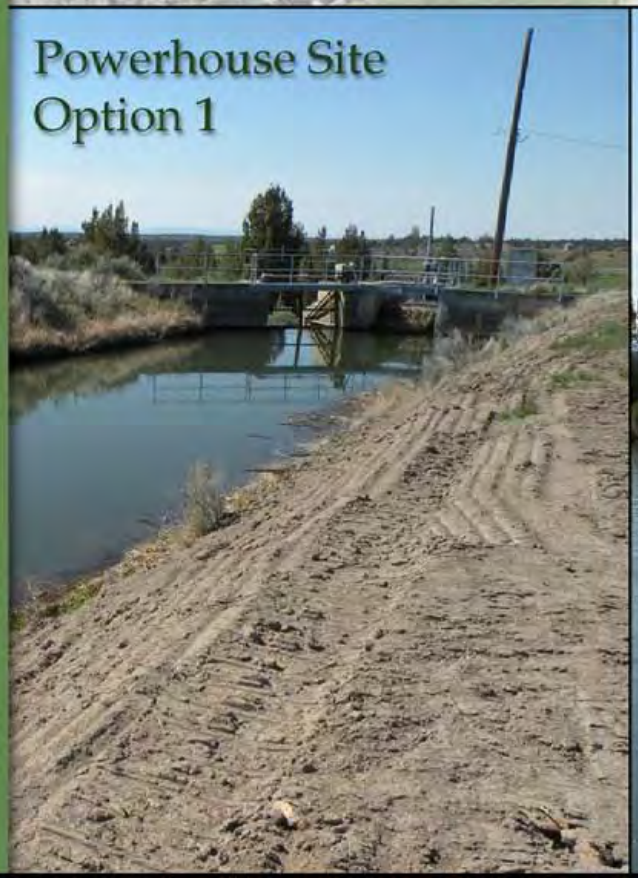
Potential Fatal Flaws or Issues of Concern

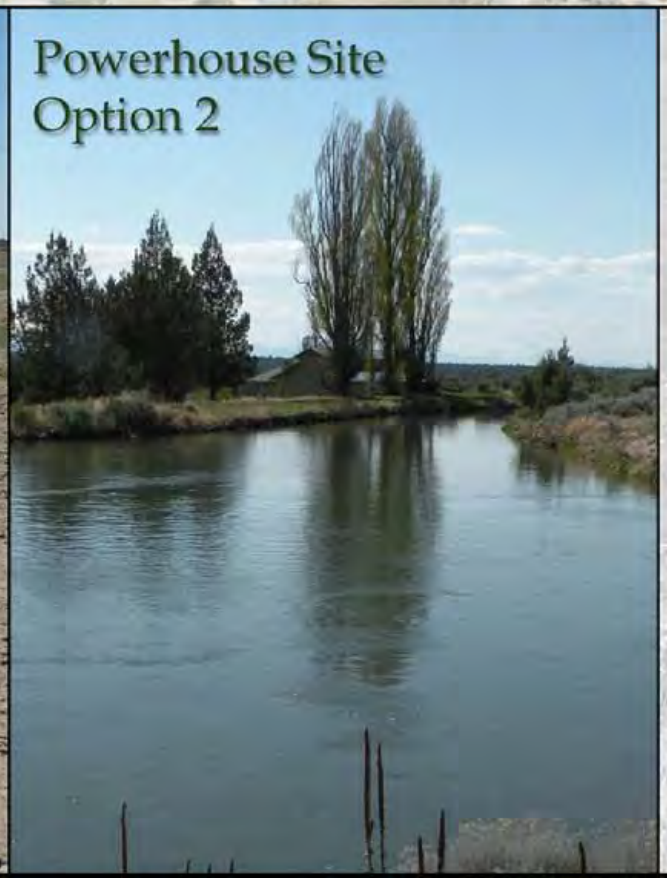
No known fatal flaws.

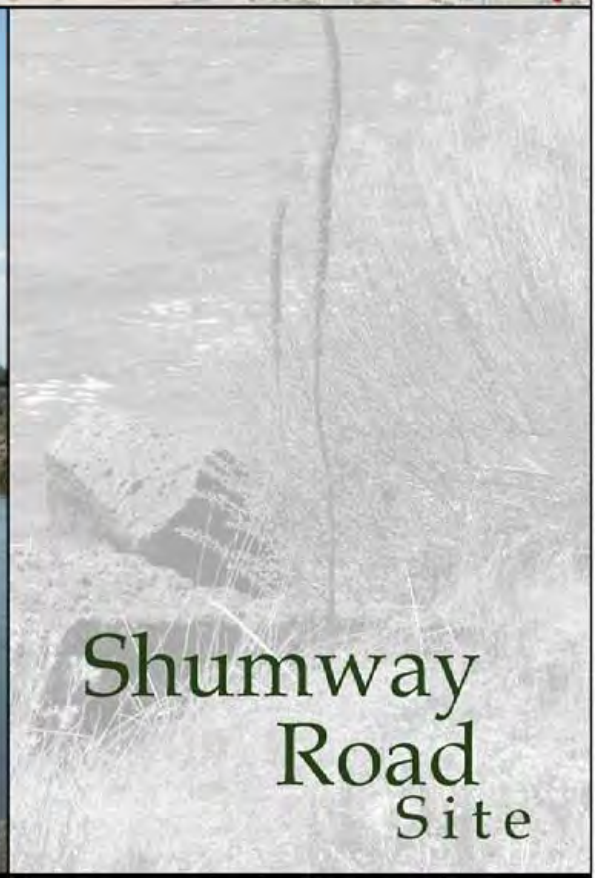
Issues of concern: Zoning/Site Plan Approval

Dodds Road Data

Central Oregon Irrigation District







Central Oregon Irrigation District

Project Details

Water Provider:	Central Oregon Irrigation District
Contact:	Steve Johnson, Manager 1055 SW Lake Court Redmond, Oregon 97756 (541)548-6047
Interest Level:	High
Financial/Technical Ability for Project:	High (2 Existing Projects, 1 Under Construction)
Forebay Location:	lat: N44° 07' 21.22" long: W121° 01' 55.65"
Powerhouse Location Option 1:	lat: N44° 08' 55.94" long: W121° 02' 50.08"
Powerhouse Location Option 2:	lat: N44° 09' 32.02" long: W121° 03' 13.94"
Interconnect Utility Company:	Central Oregon Coop
Interconnect Pole Location Option 1:	lat: N44° 08' 56.76" long: W121° 02' 43.80"
Interconnect Pole Tag Number Option 1:	113164
Interconnect Pole Location Option 2:	lat: N44° 09' 35.64" long: W121° 03' 06.00"
Interconnect Pole Tag Number Option 2:	113151
Project Type:	In Main Canal. Conduit Project
Powerhouse Location Description:	In Main Canal at Coordinates Shown Above

Resource Estimates

Head:	Gross Head=89 or 104ft, Net Head=79 or 89ft Gross and Net Head Vary Based on Siphon Rating and Powerhouse Location.
Flow:	Flow Rate Range = 90 cfs to 220 cfs Average Flow Rate = 150 cfs
Flow Annual Availability:	Irrigation Season (April through October) Possible 4 Winter Stock Runs

Power Potential Estimates

Capacity:	1.2 MW or 1.36 MW Peak Varies Based on Powerhouse Location.
Annual Output:	3,650 MWh or 4,000 MWh Varies Based on Powerhouse Location.

Project Development/Cost Estimates

Pipe:	Length=11,438 LF Diameter=84 in. Cost=$10,568,712.00
Powerhouse:	$3,000,000.00
Civil Works:	$300,000.00
Turbine/Generator/Controls:	$2,025,000.00
Transmission:	Option 1Length=465 LF Option 1 Cost=$401,015.00 Option 2 Length=680 LF Option 2 Cost=$440,000.00
Design/Permitting:	$1,629,473.00
10% Contingency:	$1,792,420.00
Total Range:	$19,716,620.00-$19,750,000.00

Potential Fatal Flaws or Issues of Concern

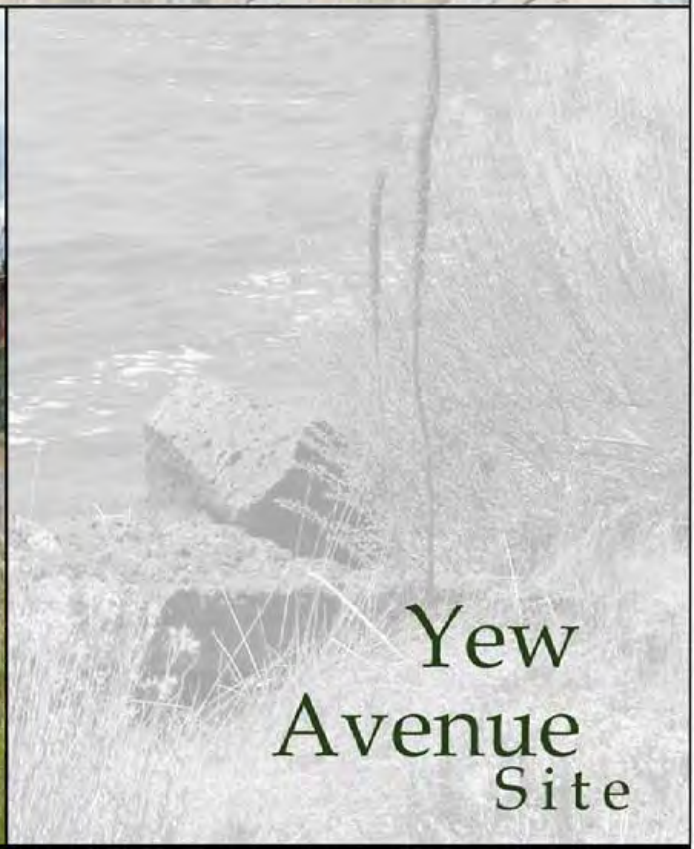
No known fatal flaws.

Evaluate Shumway Siphon for Pressure.

Site Plan Approval Process.

Shumway Road Data

Central Oregon Irrigation District



Central Oregon Irrigation District

Project Details

Water Provider:	Central Oregon Irrigation District
Contact:	Steve Johnson, Manager 1055 SW Lake Court Redmond, Oregon 97756 (541)548-6047
Interest Level:	High
Financial/Technical Ability for Project:	High (2 Existing Projects, 1 Under Construction)
Forebay Location:	lat: N44° 14' 30.99" long: W121° 12' 05.96"
Powerhouse Location:	lat: N44° 14' 39.89" long: W121° 11' 34.99"
Interconnect Utility Company:	Pacificorp
Interconnect Pole Location:	lat: N44° 14' 38.00" long: W121° 11' 37.02"
Interconnect Tag Number:	298703
Project Type:	In Main Canal, Conduit Project
Powerhouse Location Description:	In Main Canal at Coordinates Shown Above

Resource Estimates

Head:	Gross Head=52ft, Net Head=45ft
Flow:	Flow Rate Range = 120 cfs to 300 cfs Average Flow Rate = 190 cfs
Flow Annual Availability	Irrigation Season (April-October) Possible 4 Winter Stock Runs

Power Potential Estimates

Capacity:	0.94 MW Peak
Annual Output:	2,600 MWh

Project Development/Cost Estimates

Pipe:	Length=2,550 LF Diameter=84 in. Cost=$2,356,200.00
Powerhouse:	$600,000.00
Civil Works:	$300,000.00
Turbine/Generator/Controls:	$800,000.00
Transmission:	Length=215 LF Cost=$304,569.00
Design/Permitting:	$436,077.00
10% Contingency:	$479,685.00
Total:	$5,276,530.00

Potential Fatal Flaws or Issues of Concern

No known fatal flaws.

Land Use Approvals.

Yew Avenue Data

Three Sisters Irrigation District

Three Sisters Irrigation District

Project Details

Water Provider:	Three Sisters Irrigation District
Contact:	Mark Thalaker, Manager 68000 Highway 20 Sisters, Oregon 97759 (541)549-8815
Interest Level:	High
Financial/Technical Ability for Project:	Good- One Additional Project Under Consideration. Technical Consulting and Grant Participation Will Be Needed.
Forebay Location:	lat: N44° 15' 57.90" long: W121° 29' 36.12"
Powerhouse Location:	lat: N44° 18' 39.12" long: W121° 25' 25.56"
Interconnect Utility Company:	Central Oregon Coop
Interconnect Pole Location Opt. 1:	lat: N44° 18' 34.80" long: W121° 25' 32.52"
Interconnect Pole Tag Number Opt. 1:	100379
Interconnect Pole Location Opt. 2:	lat: N44° 18' 47.94" long: W121° 25' 58.26"
Interconnect Pole Tag Number Opt. 2:	131597
Project Type:	In Main Canal, Conduit Project
Powerhouse Location Description:	In Main Canal at Coordinates Shown Above

Resource Estimates

Head:	Gross Head=125ft, Net Head=96ft
Flow:	Flow Rate Range = 20 cfs to 40 cfs Average Flow Rate = 30 cfs (Dist. Estimate)
Flow Annual Availability	Irrigation Season (April-October)

Power Potential Estimates

Capacity:	0.28 MW Peak
Annual Output:	907 MWh

Project Development/Cost Estimates

Pipe:	Length=27,750 LF Diameter=42 in. Cost=$2,139,872.00
Powerhouse:	$500,000.00
Civil Works:	$300,000.00
Turbine/Generator/Controls:	$675,000.00
Transmission:	Opt. 1 Length=585 LF Opt. 1 Cost=$97,462.00 Opt. 2 Length=2,725 LF Opt. 2 Cost=$197,500.00
Design/Permitting:	$222,740.00
10% Contingency:	$393,507.00
Total Range:	$4,328,581.00-$4,428,619.00

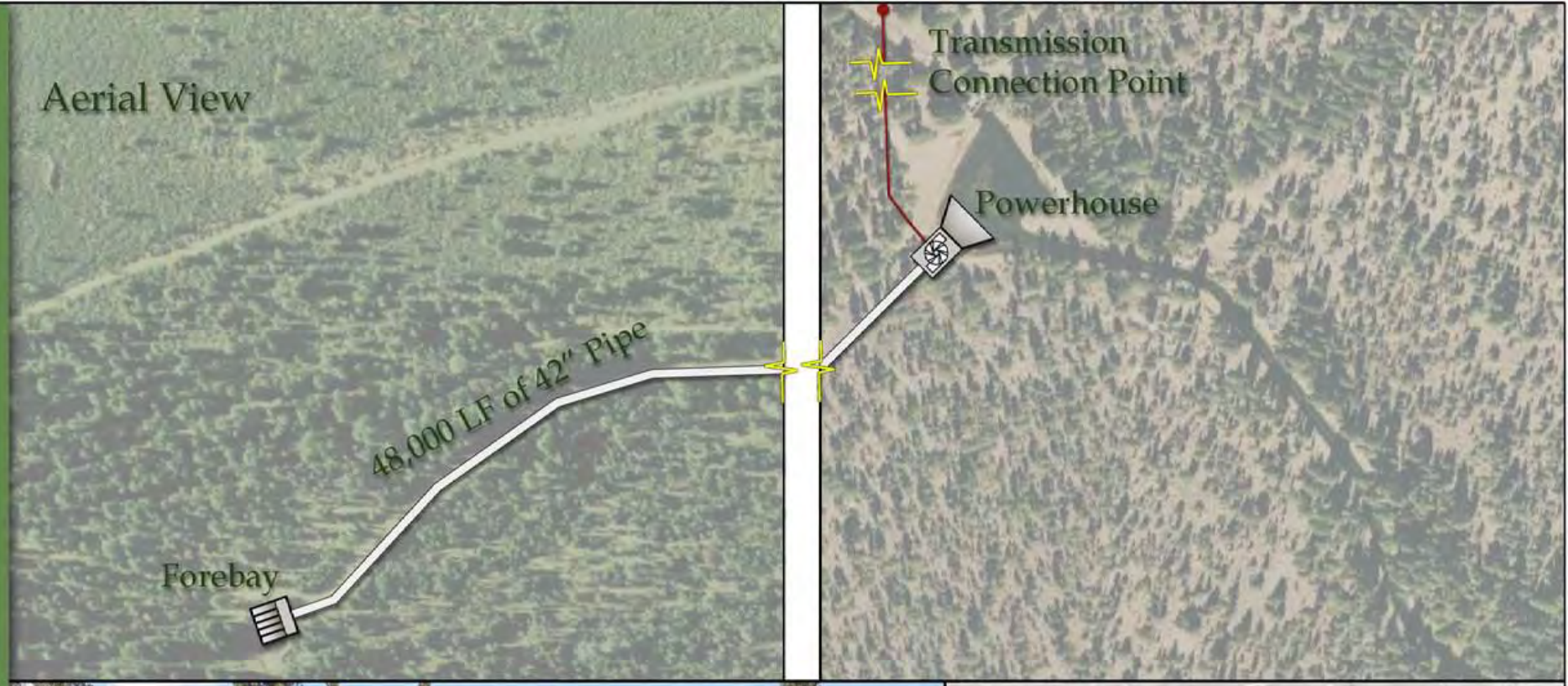
Potential Fatal Flaws or Issues of Concern

No Known Fatal Flaws

Land Use Process

McKenzie Reservoir Data

Tumalo Irrigation District



Columbia So. Main Site

Tumalo Irrigation District

Project Details

Water Provider:	Tumalo Irrigation District
Contact:	Elmer McDaniels, Manager 64697 Cook Avenue Bend, Oregon 97701 (541)382-3053
Interest Level:	Good
Financial/Technical Ability for Project:	Good-Would Need Technical Consulting Assistance and Possible Grant Participation
Forebay Location:	lat: N44° 2' 29.82" long: W121° 29' 38.16"
Powerhouse Location:	lat: N44° 7' 55.44" long: W121° 23' 46.56"
Interconnect Utility Company:	Central Oregon Coop
Interconnect Pole Location:	lat: N44° 08' 17.28" long: W121° 23' 41.70"
Interconnect Pole Tag Number:	131231
Project Type:	New Capacity at Existing Irrigation Canal
Powerhouse Location Description:	Existing Division Pond at Coordinates Shown Above.

Resource Estimates

Head:	Gross Head= 1060 ft Net Head= 1005 ft
Flow:	Flow Rate = 30 cfs (Assumed Irrigation Season Flow Rate)
Flow Annual Availability:	Irrigation Season (April through October)

Power Potential Estimates

Capacity:	2.1 MW Peak
Annual Output:	9,040 MWh

Project Development/Cost Estimates

Pipe:	Length=48,000 LF Diameter=42 in. Cost=$3,701,400.00
Powerhouse:	$3,000,000.00
Civil Works:	$600,000.00
Turbine/Generator/Controls:	$1,260,000.00
Transmission:	Length=2,240 LF Cost=$1,428,426.00
Design/Permitting:	$998,983.00
10% Contingency:	$1,098,881.00
Total:	$12,087,690.00

Potential Fatal Flaws or Issues of Concern

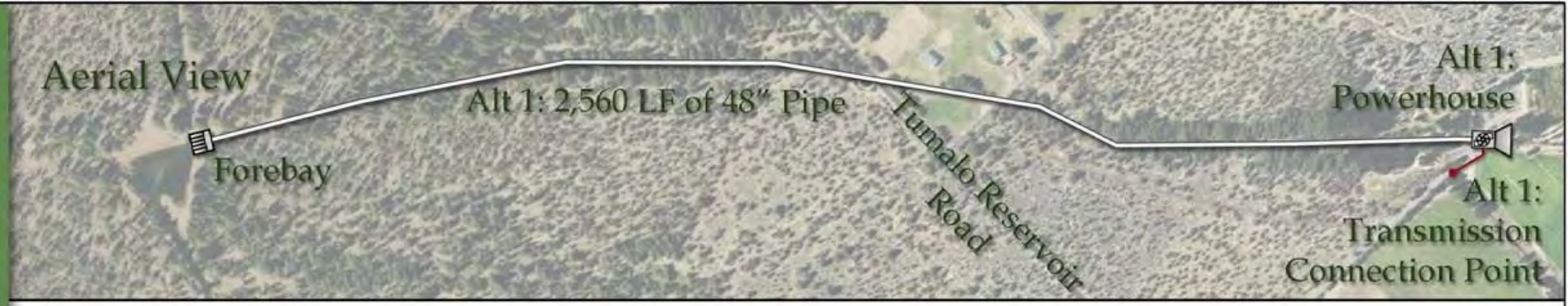
No Noted Fatal Flaws

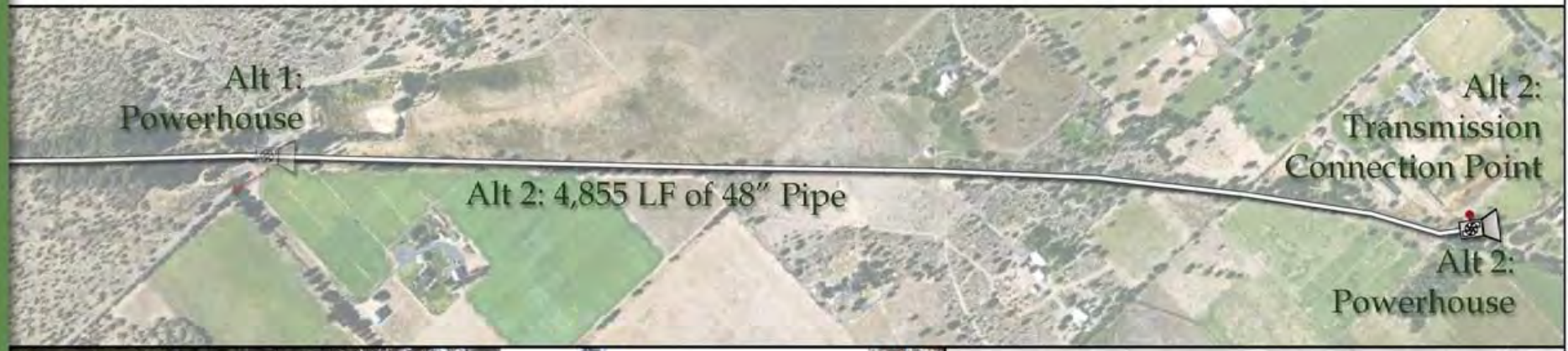
Diversion and Fish Screen Restoration at Tumalo Creek

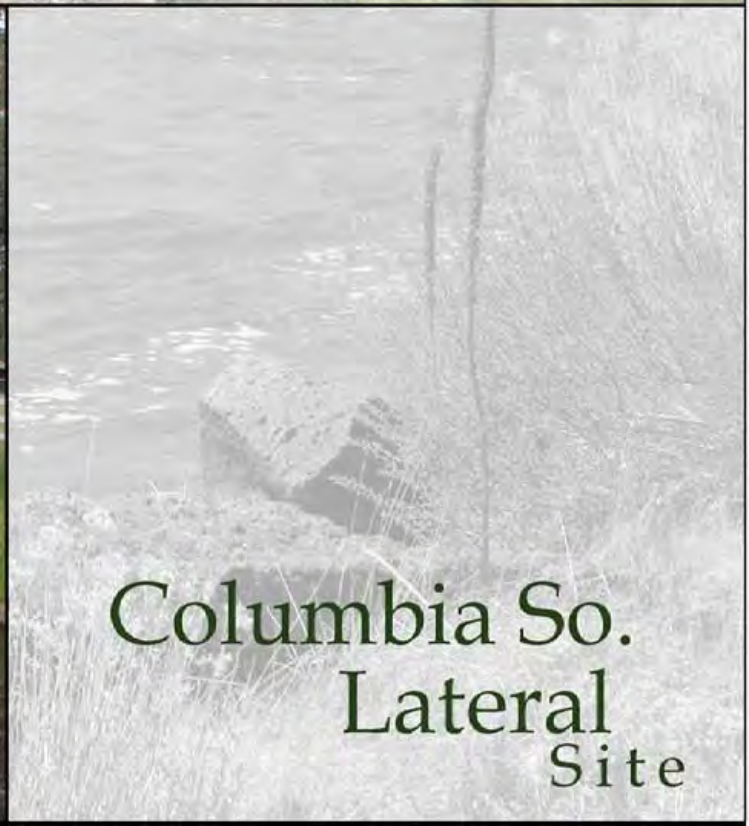
Basin Interests

Columbia So. Main Data

Tumalo Irrigation District







Tumalo Irrigation District

Project Details

Water Provider:	Tumalo Irrigation District
Contact:	Elmer McDaniels, Manager 64697 Cook Avenue Bend, Oregon 97701 (541)382-3053
Interest Level:	Good
Financial/Technical Ability for Project:	Good-Would Need Technical Consulting Assistance and Possible Grant Participation
Forebay Location:	lat: N44° 7' 58.10" long: W121° 23' 45.67"
Powerhouse Location:	Alternative 1: lat: N44° 8' 32.34" long: W121° 23' 1.20" Alternative 2: lat: N44° 9' 3.42" long: W121° 22' 15.60"
Interconnect Utility Company:	Central Oregon Coop
Interconnect Pole Location:	Alternative 1: lat: N44° 08' 30.72" long: W121° 23' 1.20" Alternative 2: lat: N44° 09' 3.42" long: W121° 22' 16.32"
Interconnect Pole Tag Number:	Alternative 1: 13120 Alternative 2: 106822
Project Type:	New Capacity at Existing Irrigation Canal
Powerhouse Location Description:	At Coordinates Shown Above

Resource Estimates

Head:	Alternative 1: Gross Head= 81 ft Net Head= 68 ft Alternative 2: Gross Head= 128 ft Net Head= 111 ft
Flow:	Flow Rate = 35 cfs to 80 cfs Average Flow Rate = 65 cfs
Flow Annual Availability:	April through October

Power Potential Estimates

Capacity:	Alternative1: 0.38 MW Peak Alternative2: 0.61 MW Peak
Annual Output:	Alternative1: 1,325 MWh Alternative1: 2,160 MWh

Project Development/Cost Estimates

Pipe:	Alternative1: Length=2,560 LF Alternative1:Diameter=48 in. Alternative1: Cost=$860,160.00 Alternative2: Length=4,855 LF Alternative2:Diameter=48 in. Alternative2: Cost=$1,631,280.00
Powerhouse:	$500,000.00
Civil Works:	$300,000.00
Turbine/Generator/Controls:	$1,080,000.00
Transmission:	Alternative1: Length=0 LF Alternative1: Cost=$244,162.00 Alternative2: Length=170 LF Alternative2: Cost=$244,162.00
Design/Permitting:	$225,327.00
10% Contingency:	$398,077.00
Total Range:	$3,607,726.00-$4,378,846.00

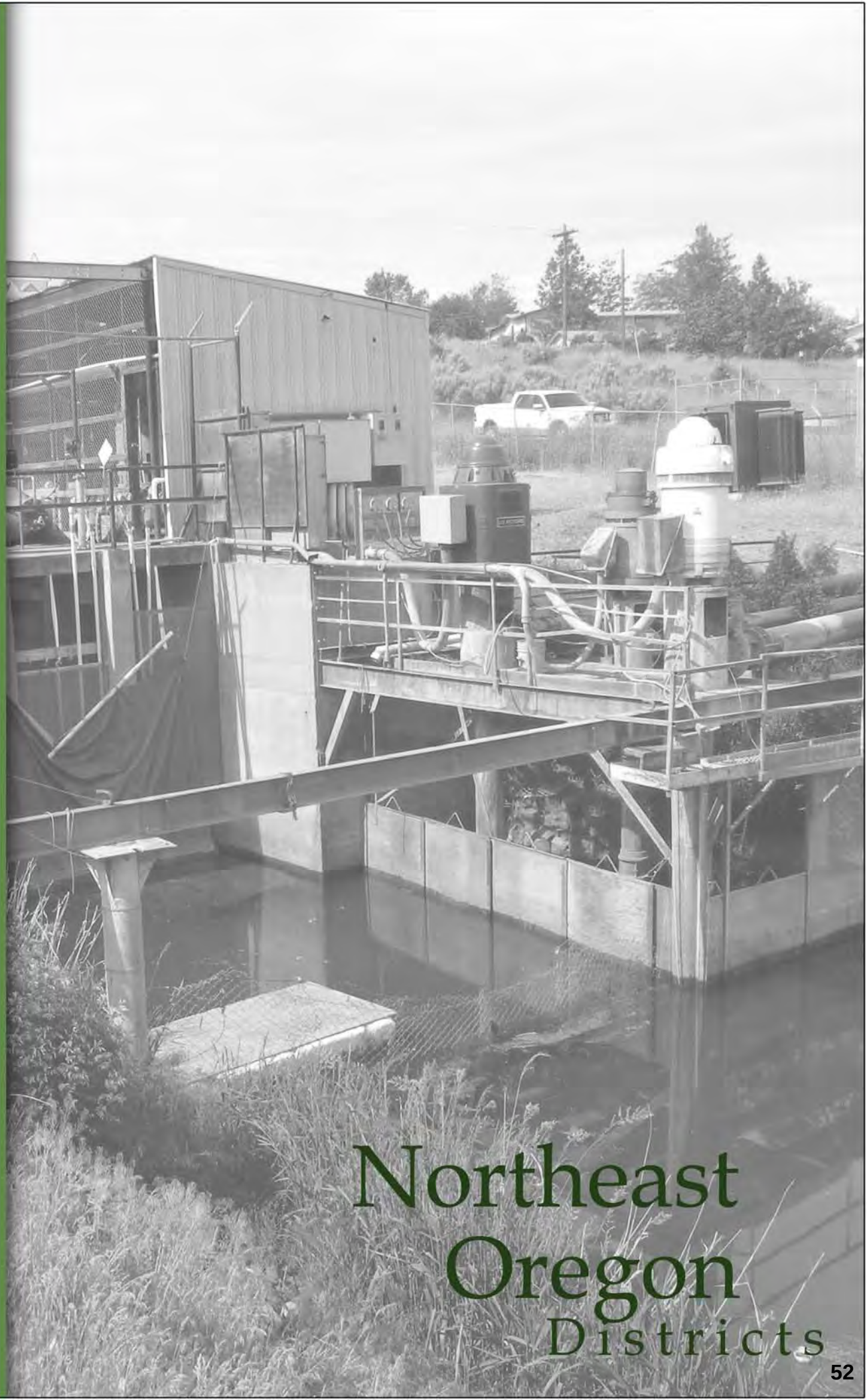
Potential Fatal Flaws or Issues of Concern

No Noted Fatal Flaws

Securing Powerhouse Site and Land Use Approval Process for Powerhouse

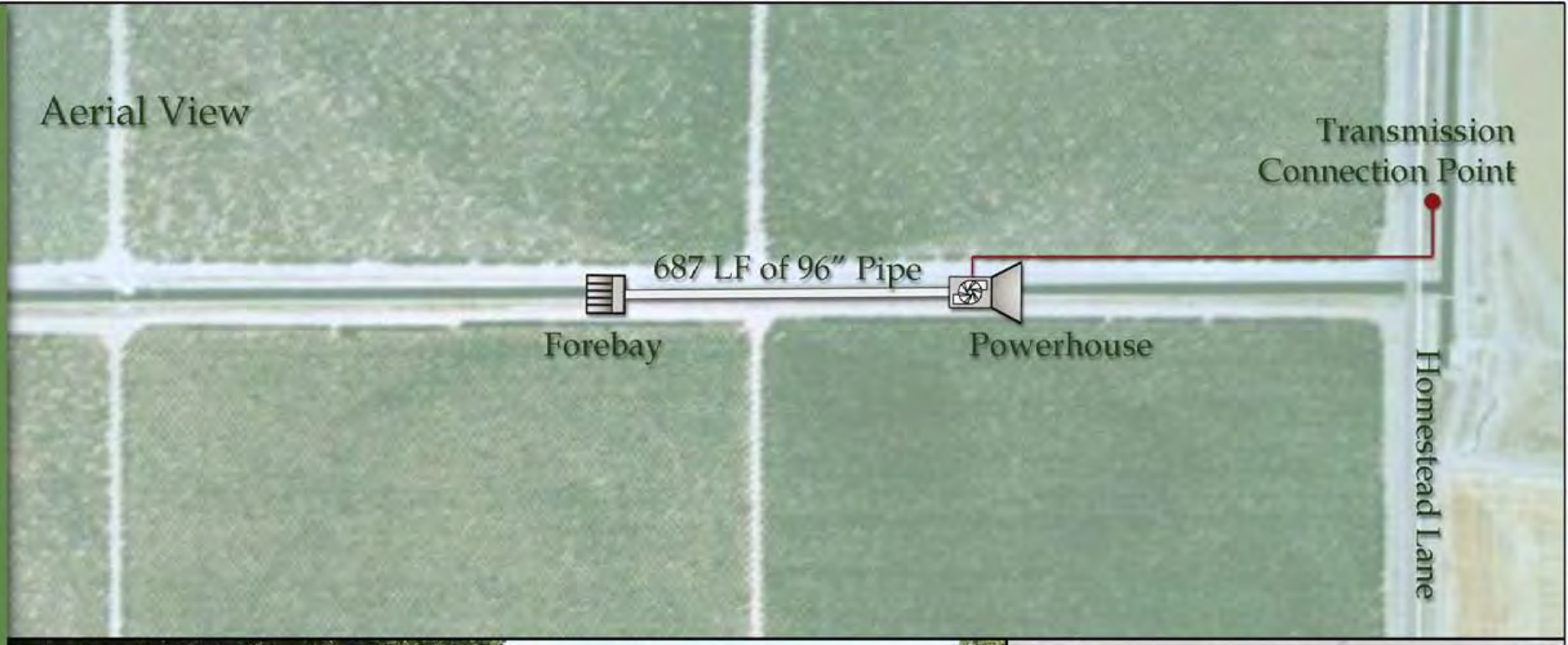
Columbia So. Lateral Data

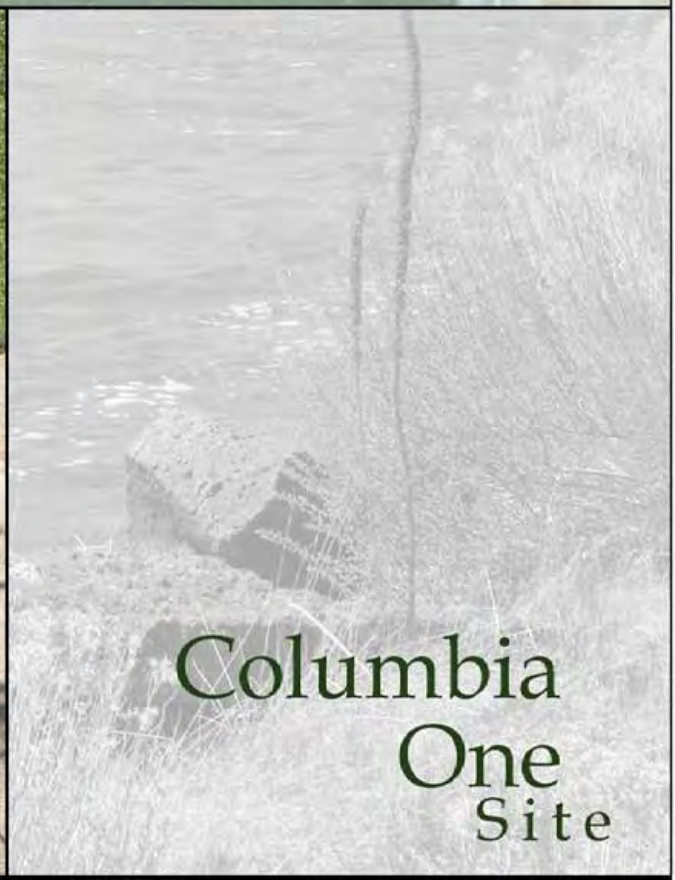
Irrigation Water Providers of Oregon



Northeast Oregon Districts

Columbia Improvement District





Columbia Improvement District

Project Details

Water Provider:	Columbia Improvement District
Contact:	Larry Sandlin, Manager PO Box 47 Boardman, Oregon 97818 (541)481-9454
Interest Level:	Good
Financial/Technical Ability for Project:	Good-Would Need Technical Consulting Assistance and Possible Grant Application
Forebay Location:	lat: N45° 45' 10.14" long: W119° 36' 6.36"
Powerhouse Location:	lat: N45° 45' 3.36" long: W119° 36' 6.30"
Interconnect Utility Company:	Umatilla Electric Coop
Interconnect Pole Location:	lat: N45° 44' 54.00" long: W119° 36' 03.42"
Interconnect Pole Tag Number:	189901
Project Type:	In Main Canal, Conduit Project.
Powerhouse Location Description:	In Main Canal at Coordinates Shown Above

Resource Estimates

Head:	Gross Head=7.4ft, Net Head=5ft
Flow:	Flow Rate Range = 29 cfs to 312 cfs Average Flow Rate = 180 cfs
Flow Annual Availability:	Irrigation Season (March through October)

Power Potential Estimates

Capacity:	0.1 MW Peak
Annual Output:	260 MWh

Project Development/Cost Estimates

Pipe:	Length=687 LF Diameter=96 in. Cost=$725,472.00
Powerhouse:	$200,000.00
Civil Works:	$200,000.00
Turbine/Generator/Controls:	$300,000.00
Transmission:	Length=1,153 LF Cost=$121,827.00
Design/Permitting:	$92,838.00
10% Contingency:	$164,014.00
Total:	$1,804,151.00

Potential Fatal Flaws or Issues of Concern

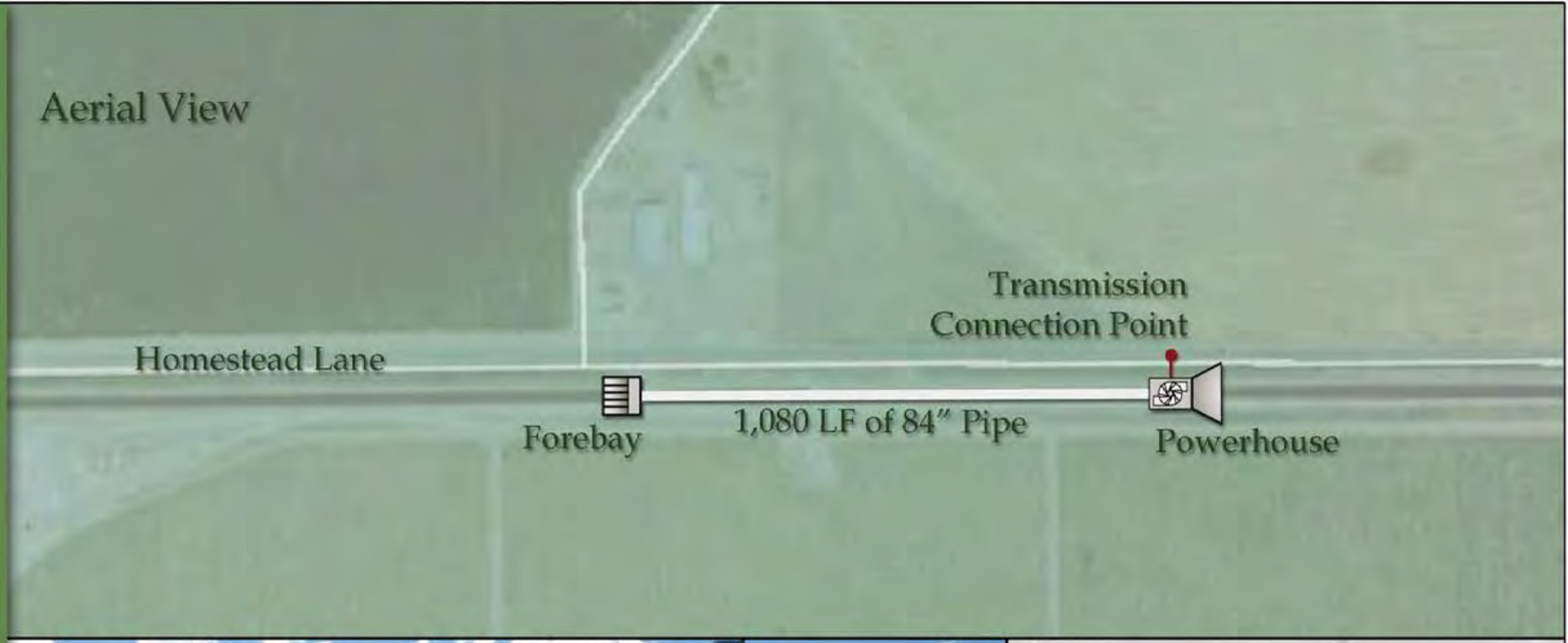
No Known Fatal Flaws

Land Use Process

Columbia One Data

Columbia Improvement District

Aerial View



Powerhouse Site

Columbia Two Site

Columbia Improvement District

Project Details

Water Provider:	Columbia Improvement District
Contact:	Larry Sandlin, Manager PO Box 47 Boardman, Oregon 97818 (541)481-9454
Interest Level:	Good
Financial/Technical Ability for Project:	Good-Would Need Technical Consulting Assistance and Possible Grant Application
Forebay Location:	lat: N45° 44' 52.44" long: W119° 33' 39.9"
Powerhouse Location:	lat: N45° 44' 52.44" long: W119° 33' 24.66"
Interconnect Utility Company:	Umatilla Electric Coop
Interconnect Pole Location:	lat: N45° 44' 52.62" long: W119° 33' 25.08"
Interconnect Pole Tag Number:	151900
Project Type:	In Main Canal. Conduit Project
Powerhouse Location Description:	In Main Canal at Coordinates Shown Above

Resource Estimates

Head:	Gross Head=12.5ft, Net Head=9.5ft
Flow:	Flow Rate Range = 18 cfs to 200 cfs Average Flow Rate = 115 cfs
Flow Annual Availability:	Irrigation Season (March through October)

Power Potential Estimates

Capacity:	0.13 MW Peak
Annual Output:	320 MWh

Project Development/Cost Estimates

Pipe:	Length=1,080 LF Diameter=84 in. Cost=$997,920.00
Powerhouse:	$200,000.00
Civil Works:	$200,000.00
Turbine/Generator/Controls:	$300,000.00
Transmission:	Length=50 LF Cost=$73,942.00
Design/Permitting:	$106,312.00
10% Contingency:	$187,817.00
Total:	$2,065,992.00

Potential Fatal Flaws or Issues of Concern

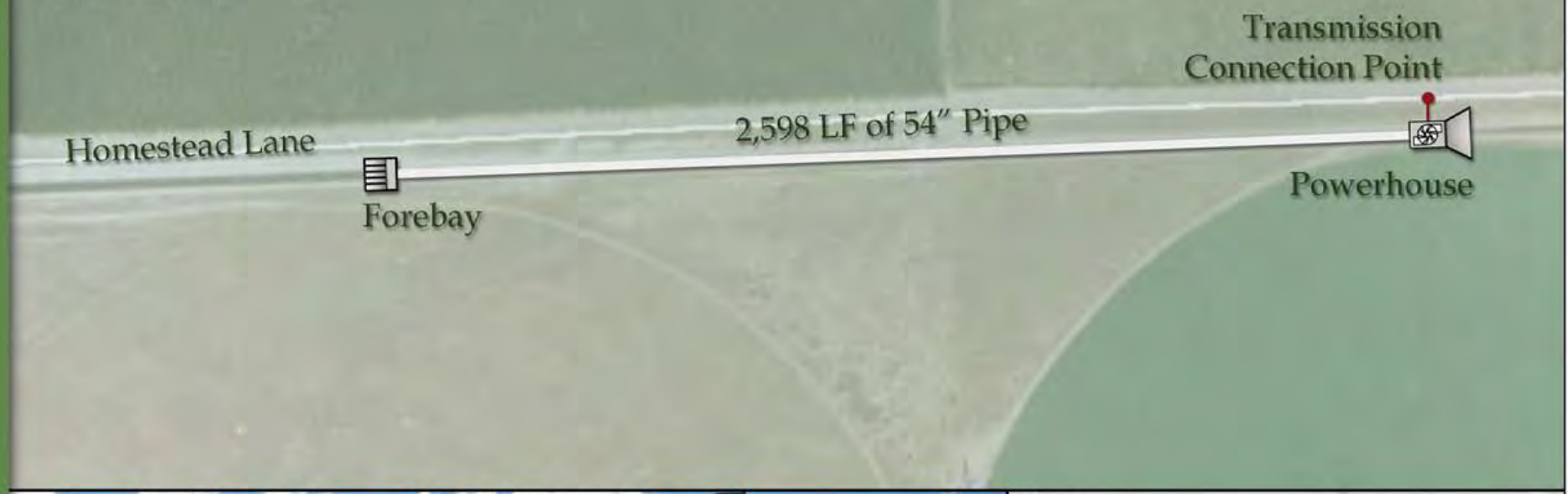
No Known Fatal Flaws

Land Use Process

Columbia Two Data

Columbia Improvement District

Aerial View



Powerhouse Site

Columbia Three Site

Columbia Improvement District

Project Details

Water Provider:	Columbia Improvement District
Contact:	Larry Sandlin, Manager PO Box 47 Boardman, Oregon 97818 (541)481-9454
Interest Level:	Good
Financial/Technical Ability for Project:	Good-Would Need Technical Consulting Assistance and Possible Grant Application
Forebay Location:	lat: N45° 44' 52.26" long: W119° 32' 3.3"
Powerhouse Location:	lat: N45° 44' 52.86" long: W119° 31' 28.08"
Interconnect Utility Company:	Umatilla Electric Coop
Interconnect Pole Location:	lat: N45° 44' 53.61" long: W119° 31' 28.22"
Interconnect Pole Tag Number:	147900
Project Type:	In Main Canal, Conduit Project.
Powerhouse Location Description:	In Main Canal at Coordinates Shown Above

Resource Estimates

Head:	Gross Head=18ft, Net Head=15ft
Flow:	Flow Rate Range = 10 cfs to 110 cfs Average Flow Rate = 64 cfs (District Estimate)
Flow Annual Availability	Irrigation Season (March through October)

Power Potential Estimates

Capacity:	0.11 MW Peak
Annual Output:	280 MWh

Project Development/Cost Estimates

Pipe:	Length=2,598 LF Diameter=54 in. Cost=$982,044.00
Powerhouse:	$200,000.00
Civil Works:	$200,000.00
Turbine/Generator/Controls:	$540,000.00
Transmission:	Length=50 LF Cost=$64,975.00
Design/Permitting:	$119,221.00
10% Contingency:	$210,624.00
Total:	$2,316,864.00

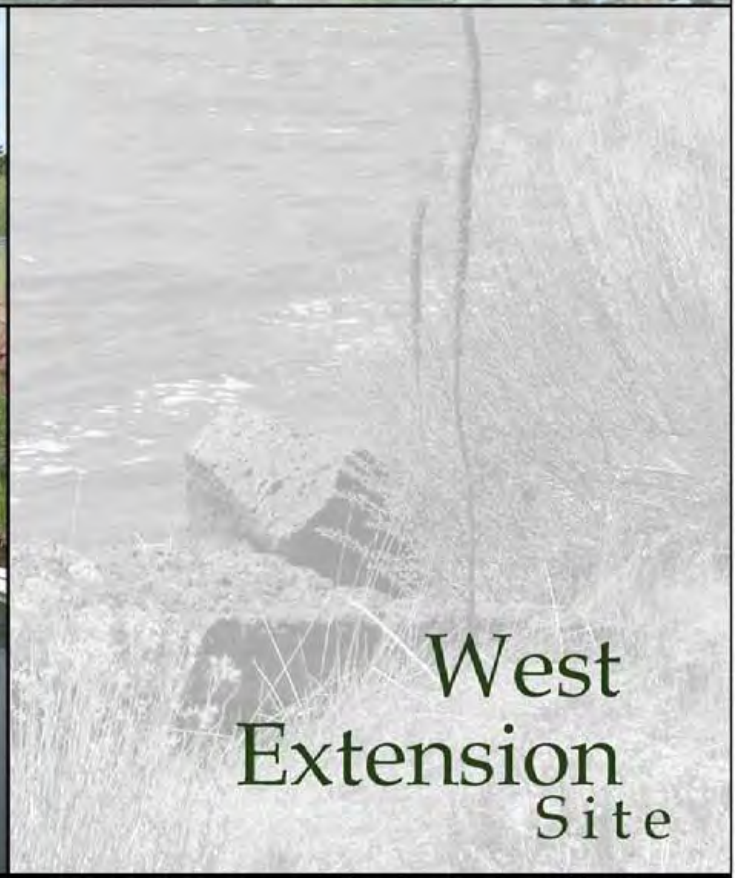
Potential Fatal Flaws or Issues of Concern

No Known Fatal Flaws

Land Use Process

Columbia Three Data

West Extension Irrigation District



West Extension Irrigation District

Project Details

Water Provider:	West Extension Irrigation District
Contact:	Beverly Bridgewater, Manager PO Box 100 Irrigon, Oregon 97844 (541)922-3814
Interest Level:	Good
Financial/Technical Ability for Project:	Good-Would Need Technical Consulting Assistance and Possible Grant Participation
Forebay Location:	lat: N45° 54' 39.97" long: W119° 20' 56.19"
Powerhouse Location:	lat: N45° 54' 48.40" long: W119° 20' 53.92"
Interconnect Utility Company:	Pacificorp
Interconnect Pole Location:	lat: N45° 54' 47.10" long: W119° 20' 54.54"
Interconnect Pole Tag Number:	35 560 750
Project Type:	In Main Canal. Conduit Project Utilizing Piping System in Reverse
Powerhouse Location Description:	In Main Canal at Coordinates Shown Above

Resource Estimates

Head:	Gross Head=126ft Net Head=95ft
Flow:	Flow Rate Range = 100 cfs to 300 cfs Average Flow Rate = 250 cfs
Flow Annual Availability:	January Through May per District

Power Potential Estimates

Capacity:	2.0 MW Peak
Annual Output:	4000 MWh

Project Development/Cost Estimates

Pipe:	Length=870 LF Diameter=84 in. Cost=$803,880.00
Powerhouse:	$3,000,000.00
Civil Works:	$400,000.00
Turbine/Generator/Controls:	$1,795,000.00
Transmission:	Length=125 LF Cost=$803,723.00
Design/Permitting:	$680,260.00
10% Contingency:	$748,286.00
Total:	$8,231,149.00

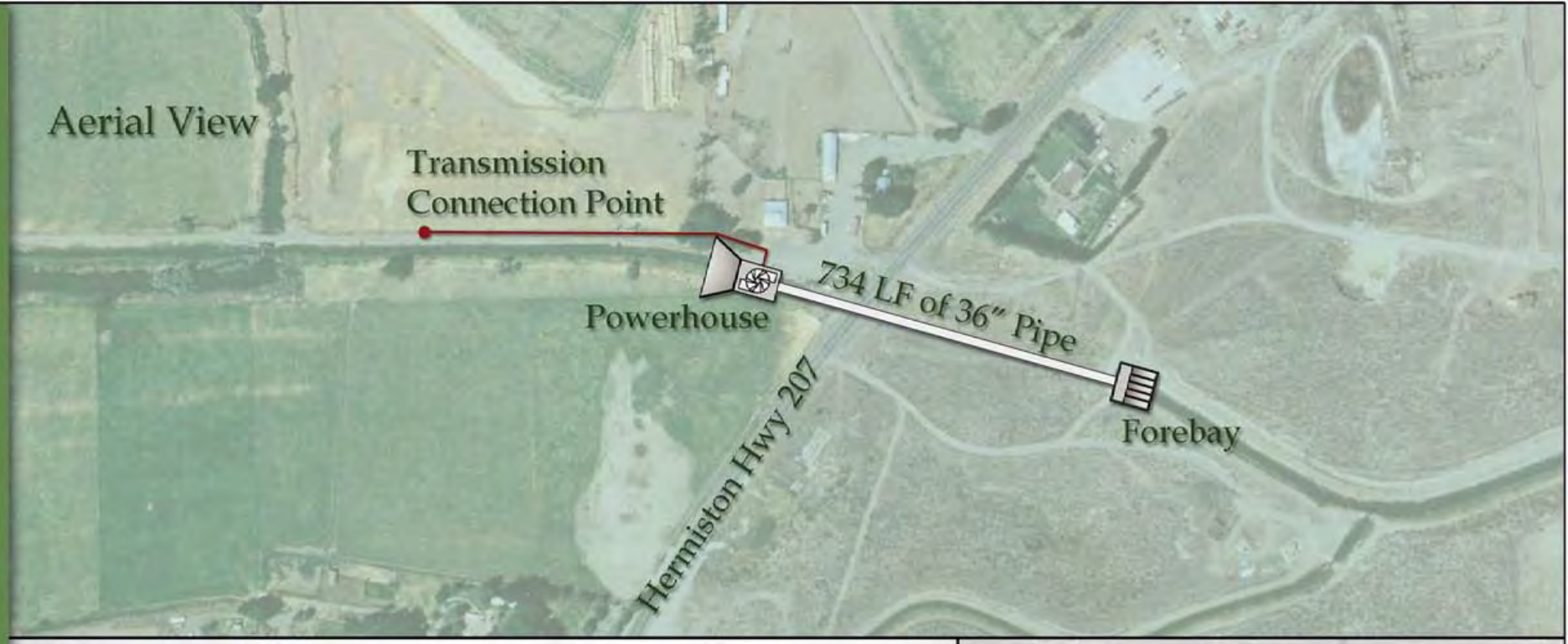
Potential Fatal Flaws or Issues of Concern

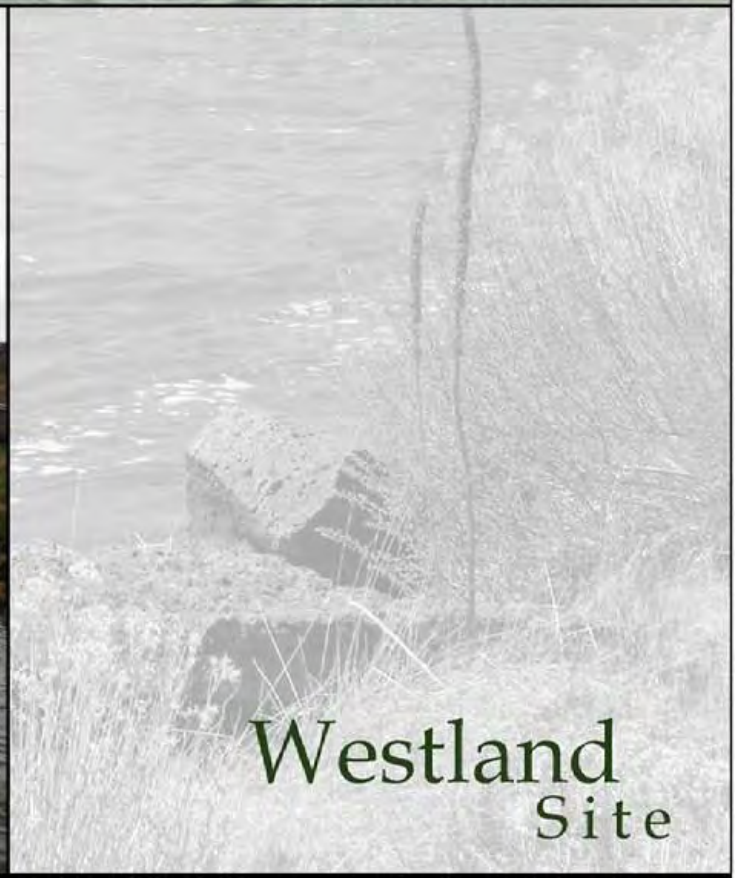
No Known Fatal Flaws
Permitting
Land Use Process

Late Winter and Early Spring Withdrawals from Umatilla River Will be Subject to Environmental Review and Approval Process and Water Right Injury Assessment Prior to Approval for Hydro Water Right Certification.

West Extension Data

Westland Irrigation District





Westland Irrigation District

Project Details

Water Provider:	Westland Irrigation District
Contact:	Mike Wick, Manager PO Box 944 Hermiston, Oregon 97838 (541)667-2030
Interest Level:	Good
Financial/Technical Ability for Project:	Good-Would Need Technical Consulting Assistance and Possible Grant Participation
Forebay Location:	lat: N45° 46' 35.79" long: W119° 19' 46.92"
Powerhouse Location:	lat: N45° 46' 38.00" long: W119° 19' 56.67"
Interconnect Utility Company:	Umatilla Electric Coop
Interconnect Pole Location:	lat: N45° 46' 38.92" long: W119° 20' 06.44"
Interconnect Pole Tag Number:	328000
Project Type:	In Main Canal. Conduit Project
Powerhouse Location Description:	In Main Canal at Coordinates Shown Above

Resource Estimates

Head:	Gross Head=51 ft Net Head=44 ft
Flow:	Flow Rate Range = 25 cfs to 60 cfs Average Flow Rate = 45 cfs
Flow Annual Availability:	April through October per District

Power Potential Estimates

Capacity:	0.18 MW Peak
Annual Output:	590 MWh

Project Development/Cost Estimates

Pipe:	Length=734 LF Diameter=36 in. Cost=$105,696.00
Powerhouse:	$300,000.00
Civil Works:	$200,000.00
Turbine/Generator/Controls:	$675,000.00
Transmission:	Length=710 LF Cost=$67,005.00
Design/Permitting:	$80,862.00
10% Contingency:	$142,856.00
Total:	$1,571,419.00

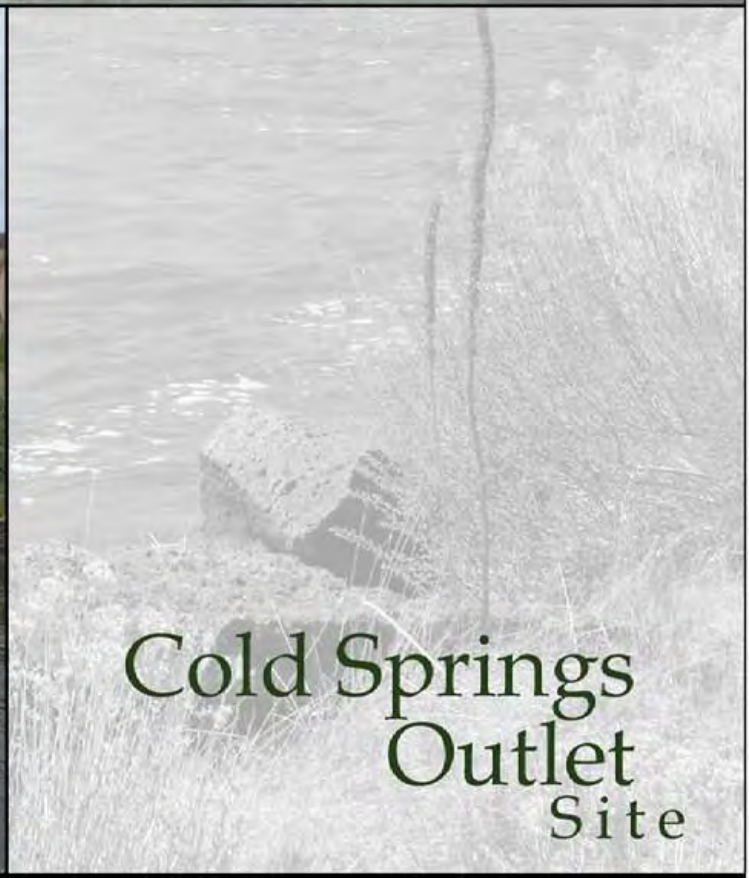
Potential Fatal Flaws or Issues of Concern

No Known Fatal Flaws

No Issues of Concern Noted.

Westland Data

Hermiston Irrigation District



Hermiston Irrigation District

Project Details

Water Provider:	Hermiston Irrigation District
Contact:	Chuck Wilcox, Manager 366 E. Hurlburt Ave. Hermiston, Oregon 97838 (541)567-3024
Interest Level:	Good
Financial/Technical Ability for Project:	Good-Would Need Technical Consulting Assistance and Possible Grant Participation
Forebay Location:	lat: N45° 51' 36.03" long: W119° 10' 20.13"
Powerhouse Location:	lat: N45° 51' 34.50" long: W119° 10' 27.96"
Interconnect Utility Company:	Umatilla Electric Coop
Interconnect Pole Location:	lat: N45° 51' 17.87" long: W119° 11' 03.56"
Interconnect Pole Tag Number:	49300
Project Type:	In Main Canal. Conduit Project
Powerhouse Location Description:	In Main Canal at Coordinates Shown Above

Resource Estimates

Head:	Gross Head= 48 ft to 8 ft Net Head= 42 ft to 4 ft
Flow:	Flow Rate Range = 0 cfs to 166 cfs Average Flow Rate = 129 cfs
Flow Annual Availability	Irrigation Season (April through September)

Power Potential Estimates

Capacity:	0.43 MW Peak
Annual Output:	1,010 MWh

Project Development/Cost Estimates

Pipe:	Length=625 LF Diameter=84 in. Cost=$577,500.00
Powerhouse:	$500,000.00
Civil Works:	$200,000.00
Turbine/Generator/Controls:	$400,000.00
Transmission:	Length=4,420 LF Cost=$436,548.00
Design/Permitting:	$126,843.00
10% Contingency:	$224,089.00
Total:	$2,464,980.00

Potential Fatal Flaws or Issues of Concern

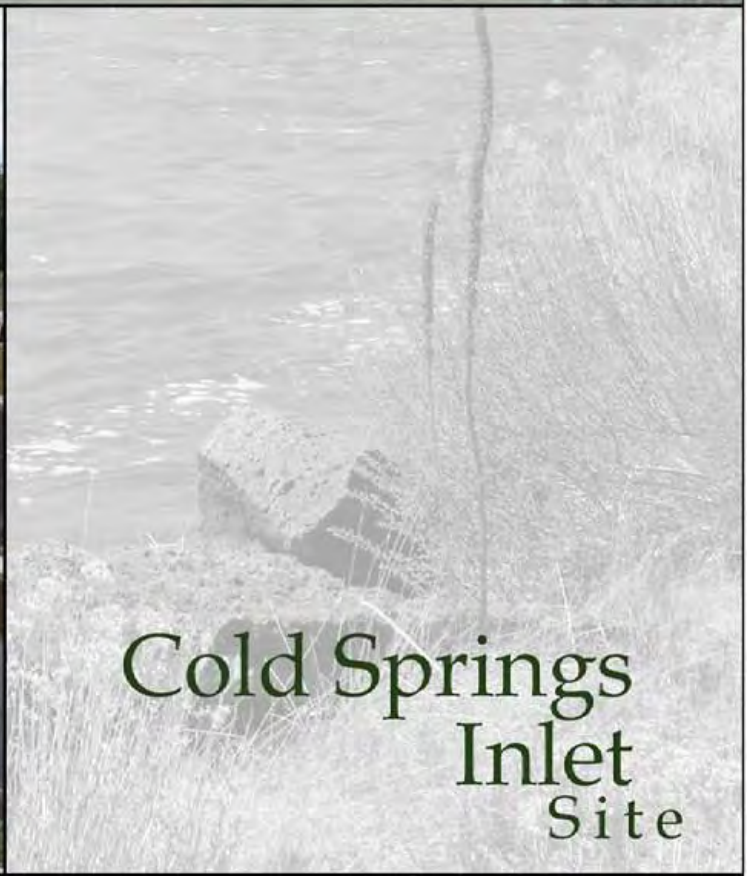
No Noted Fatal Flaws

Full FERC License Process Likely Invoked Due to USBR Dam.

Subject to USBR Data Requests and Design Processing

Cold Springs Outlet Data

Hermiston Irrigation District



Hermiston Irrigation District

Project Details

Water Provider:	Hermiston Irrigation District
Contact:	Chuck Wilcox, Manager 366 E. Hurlburt Ave. Hermiston, Oregon 97838 (541)567-3024
Interest Level:	Good
Financial/Technical Ability for Project:	Good-Would Need Technical Consulting Assistance and Possible Grant Participation
Forebay Location:	lat: N45° 51' 13.61" long: W119° 10' 23.00"
Powerhouse Location:	lat: N45° 51' 14.60" long: W119° 10' 21.31"
Interconnect Utility Company:	Umatilla Electric Coop
Interconnect Pole Location:	lat: N45° 51' 17.87" long: W119° 11' 03.56"
Interconnect Pole Tag Number	49300
Project Type:	In Main Canal. Conduit Project
Powerhouse Location Description:	In Main Canal at Coordinates Shown Above

Resource Estimates

Head:	Gross Head= 37 ft to 5 ft Net Head= 33 ft to 2 ft
Flow:	Flow Rate Range = 0 cfs to 205 cfs Average Flow Rate = 174 cfs
Flow Annual Availability	December through May

Power Potential Estimates

Capacity:	0.34 MW Peak
Annual Output:	360 MWh

Project Development/Cost Estimates

Pipe:	Length=150 LF Diameter=96 in. Cost=$158,500.00
Powerhouse:	$500,000.00
Civil Works:	$200,000.00
Turbine/Generator/Controls:	$400,000.00
Transmission:	Length=3,750 LF Cost=$588,832.00
Design/Permitting:	$110,834.00
10% Contingency:	$195,807.00
Total:	$2,153,873.00

Potential Fatal Flaws or Issues of Concern

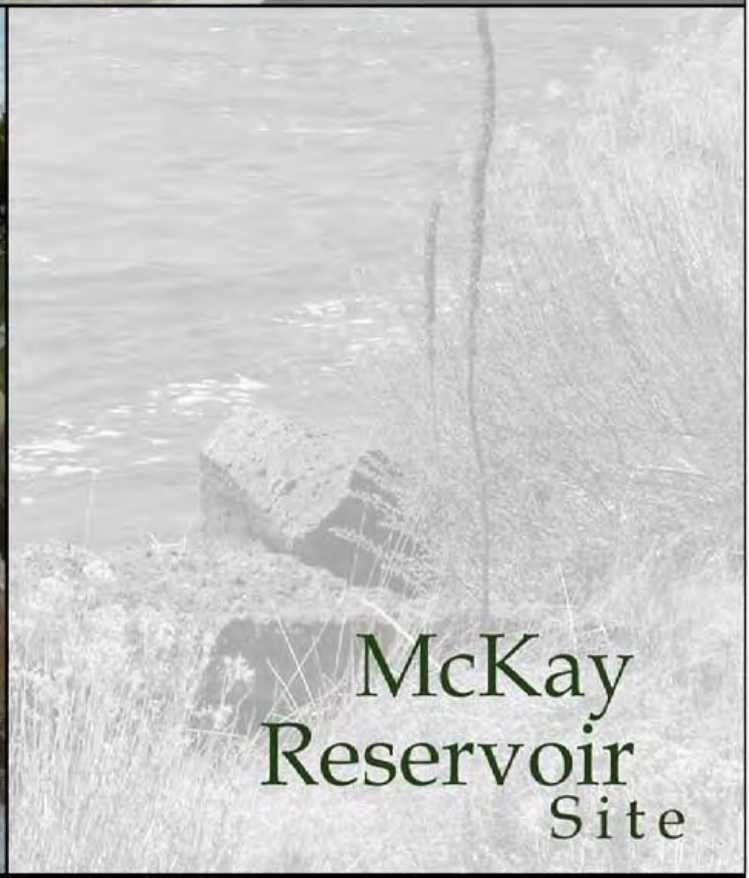
No Noted Fatal Flaws

Full FERC License Process Likely Invoked Due to USBR Dam.

Subject to USBR Data Requests and Design Processing

Cold Springs Inlet Data

Westland/Stanfield Irrigation Districts



Westland/Stanfield Irrigation Districts

Project Details

Water Provider:	Westland & Stanfield Irrigation Districts
Contact:	Mike Wick, Westland Irrigation Dist. Manager PO Box 944 Hermiston, Oregon 97838 (541)667-2030 Ray Kopacz, Stanfield Irrigation Dist. Manager PO Box 416 Stanfield, Oregon 97875 (541)449-3272
Interest Level:	Good
Financial/Technical Ability for Project:	Good-Would Need Technical Consulting Assistance and Possible Grant Participation
Forebay Location:	lat: N45° 36' 24.57" long: W118° 47' 33.81"
Powerhouse Location:	lat: N45° 36' 28.03" long: W118° 47' 33.81"
Interconnect Utility Company:	Pacificorp
Interconnect Pole Location:	lat: N45° 36' 26.94" long: W118° 47' 42.00"
Tag Number:	345300
Project Type:	Site Related to Reservoir. USBR Dam New Capacity at Existing Reservoir
Powerhouse Location Description:	In Main Canal at Coordinates Shown Above At Existing Reservoir Outlet

Resource Estimates

Head:	Gross Head= 140ft to 50ft Net Head= 130ft to 40ft
Flow:	Flow Rate Range = 100cfs to 320cfs Average Flow Rate = 150cfs
Flow Annual Availability:	May through November

Power Potential Estimates

Capacity:	2.6 MW Peak
Annual Output:	4,500 MWh

Project Development/Cost Estimates

Pipe:	Length=150 LF Diameter=84 in. Cost=$138,600.00
Powerhouse:	$3,000,000.00
Civil Works:	$300,000.00
Turbine/Generator/Controls:	$1,320,000.00
Transmission:	Length=120 LF Cost=$380,711.00
Design/Permitting:	$513,931.00
10% Contingency:	$565,324.00
Total:	$6,218,566.00

Potential Fatal Flaws or Issues of Concern

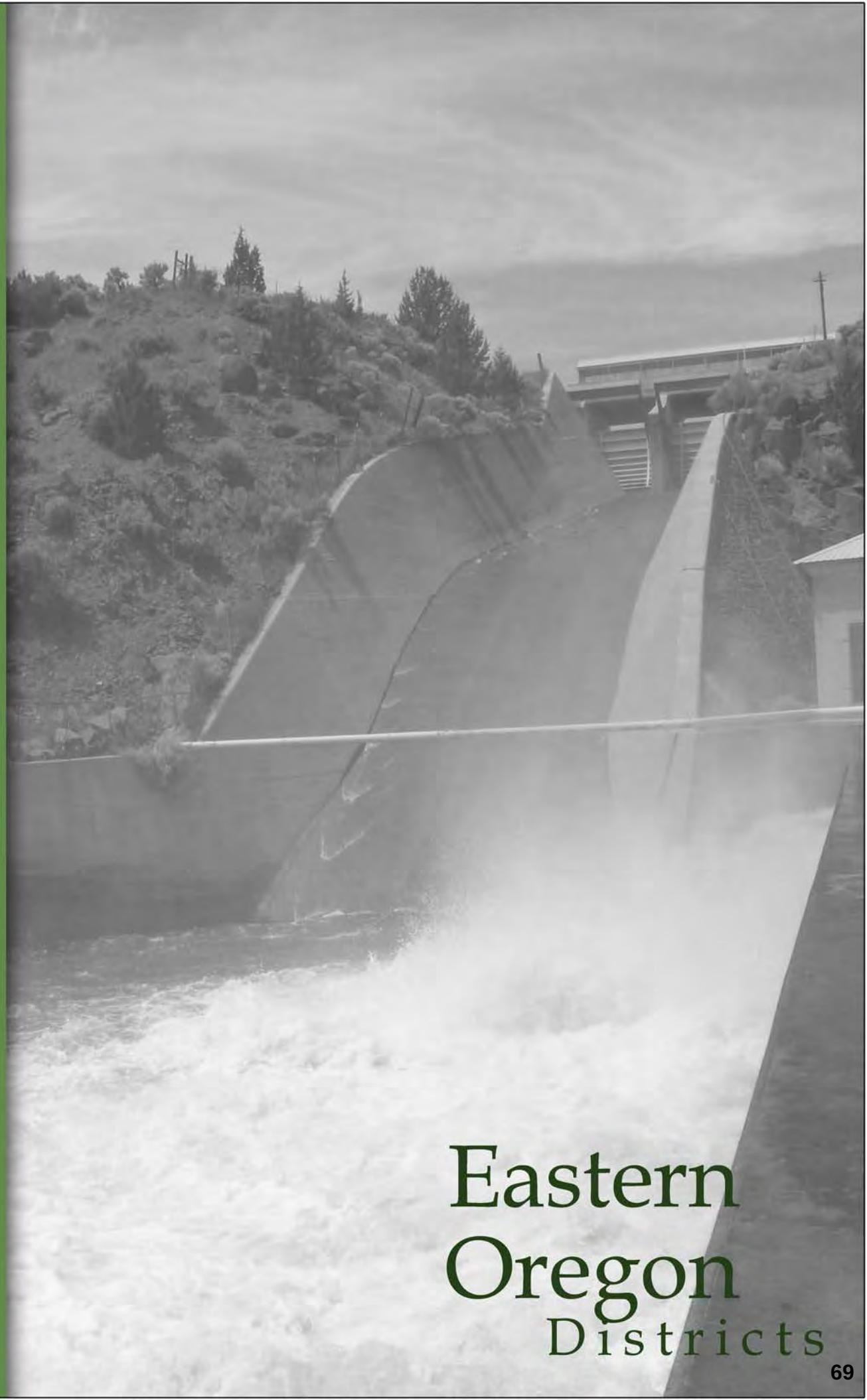
No Noted Fatal Flaws

Full FERC License Process Likely Invoked Due to USBR Dam.

Subject to USBR Data Requests and Design Processing

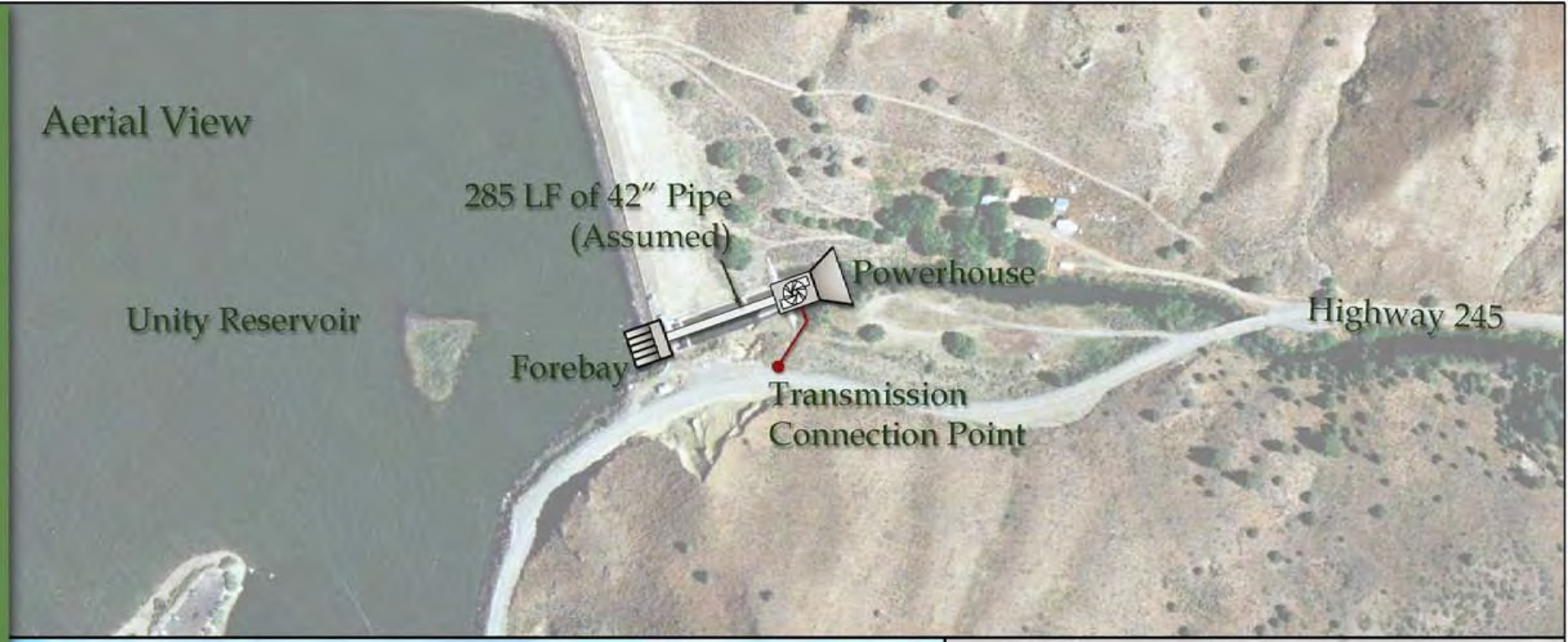
McKay Reservoir Data

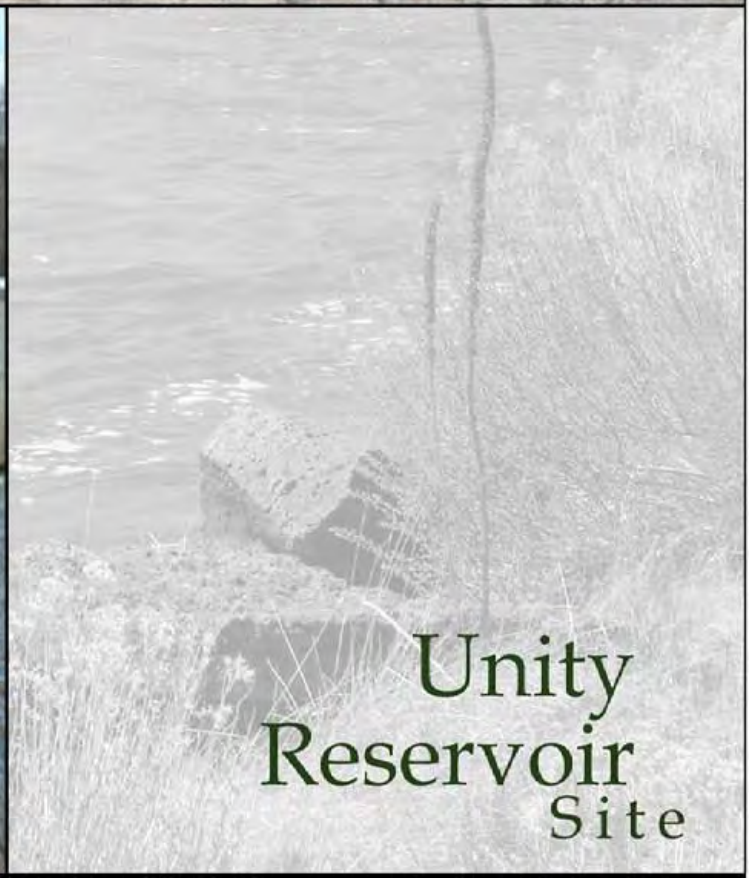
Irrigation Water Providers of Oregon



Eastern Oregon Districts

Burnt River Irrigation District





Burnt River Irrigation District

Project Details

Water Provider:	Burnt River Irrigation District
Contact:	Jerry Franke, Manager 19498 Highway 245 Hereford, Oregon 97837 (541)446-3313
Interest Level:	Good
Financial/Technical Ability for Project:	Good-Would Need Technical Consulting Assistance and Possible Grant Participation
Forebay Location:	lat: N44° 30' 12.21" long: W118° 10' 49.10"
Powerhouse Location:	lat: N44° 30' 12.89" long: W118° 10' 44.50"
Interconnect Utility Company:	Idaho Power
Interconnect Pole Location:	lat: N44° 30' 11.60" long: W118° 10' 46.19"
Interconnect Pole Tag Number:	35244
Project Type:	New Capacity at Existing USBR Reservoir
Powerhouse Location Description:	Dam Outlet at Coordinates Shown Above

Resource Estimates

Head:	Gross Head= 60ft to 30ft Net Head= 48ft to 18ft
Flow:	Flow Rate Range = 20 cfs to 700 cfs Average Flow Rate = 78 cfs
Flow Annual Availability	April through September

Power Potential Estimates

Capacity:	0.75 MW Peak
Annual Output:	1,170 MWh

Project Development/Cost Estimates

Pipe:	Length=285 LF Diameter=42 in. Cost=$21,977.00
Powerhouse:	$500,000.00
Civil Works:	$300,000.00
Turbine/Generator/Controls:	$400,000.00
Transmission:	Length=150 LF Cost=$65,990.00
Design/Permitting:	$77,278.00
10% Contingency:	$136,525.00
Total:	$1,501,769.00

Potential Fatal Flaws or Issues of Concern

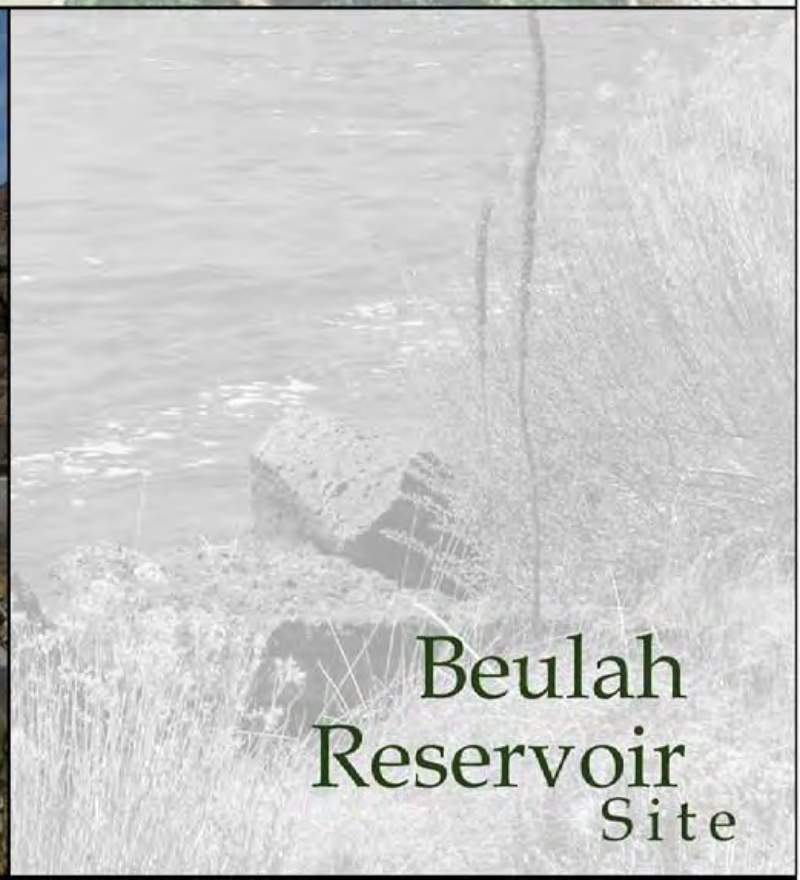
No Noted Fatal Flaws

Full FERC License Process Likely Invoked Due to USBR Dam

Subject to USBR Data Requests and Design Processing

Unity Reservoir Data

Vale Oregon Irrigation District



Vale Oregon Irrigation District

Project Details

Water Provider:	Vale Oregon Irrigation District
Contact:	Dan Fulwyler 521 A Street West Vale, Oregon 97918 (541)473-3243
Interest Level:	Good
Financial/Technical Ability for Project:	Good-Would Need Technical Consulting Assistance and Possible Grant Participation
Forebay Location:	lat: N43° 54' 39.92" long: W118° 9' 28.30"
Powerhouse Location:	lat: N43° 54' 37.62" long: W118° 9' 22.79"
Interconnect Utility Company:	Idaho Power
Interconnect Pole Location:	lat: N43° 54' 39.12" long: W118° 09' 23.94"
Interconnect Pole Tag Number:	23885
Project Type:	New Capacity at Reservoir Site
Powerhouse Location Description:	Dam Outlet at Coordinates Shown Above

Resource Estimates

Head:	Gross Head= 68ft to 26ft Net Head= 60ft to 18ft
Flow:	Flow Rate Range = 140 cfs to 460 cfs Average Flow Rate = 310 cfs (2008)
Flow Annual Availability	April through October (Until Reservoir Depleted)

Power Potential Estimates

Capacity:	1.65 MW Peak
Annual Output:	3,688 MWh (2008)

Project Development/Cost Estimates

Pipe:	Length=200 LF Diameter=96 in. Cost=$211,200.00
Powerhouse:	$3,000,000.00
Civil Works:	$300,000.00
Turbine/Generator/Controls:	$2,000,000.00
Transmission:	Length=175 LF Cost=$419,628.00
Design/Permitting:	$593,083.00
10% Contingency:	$652,391.00
Total:	$7,176,302.00

Potential Fatal Flaws or Issues of Concern

No Noted Fatal Flaws

USBR Dam and Associated Processing

FERC < 5MW Dam Process

Beulah Reservoir Data

Irrigation Water Providers of Oregon

Appendix A

Irrigation Water Providers of Oregon

Irrigation Related Entities

District	Location	Basin	Further Evaluation	ETO Exclusion	Limiting Factor
Adel Water Improvement District	Adel	Lakeview			S
Ady District Improvement Co.	Klamath Falls	Klamath			K
Alder Creek-Barlow W.C.D.	Sandy	Clackamas			S
Alicel Irrigation Distr. (I.D.)	Cove	Grande Ronde			S
Arnold I.D.	Bend	Deschutes	X		
Ash Creek Water Control Distr. (WCD)	Independence	Willamette			S
Associated Ditch Companies	Joseph	Grande Ronde			S
Badger	Wamic	Deschutes			S
Baker Valley Irrigation District	Baker City	Powder	X		
Bandon W.C.D.	Bandon	Coos			S
Barlow Water Improvement Ditch	Wamic	Deschutes			S
Beaver Creek W.C.D.	Aumsville	Willamette			S
Big Bend Irrigation District	Adrian	Owyhee			S
Birch Creek Ditch Company	Pendleton	Umatilla			S
Black Mountain Water District	Heppner	Umatilla			S
Burnt River I.D.	Unity	Powder	X		
Butter Creek I.D.	Echo	Umatilla			S
Central Oregon I.D.	Redmond	Deschutes	X		
Chaparral W.C.D.	Redmond	Deschutes			S
Columbia Improvement D.	Boardman	Umatilla	X		
Dee I.D.	Hood River	Hood			S
Dee View Water Control District	Hood River	Hood			S
Deschutes Valley Water District	Culver	Deschutes		E	
Eagle Point I.D.	Eagle Point	Rogue	X		
East Fork I.D.	Odell	Hood		E	
East Valley Water District	Silverton	Willamette			S
Echo I.D.	Echo	Umatilla			S
Enterprise I.D.	Klamath Falls	Klamath			K
Farmers I.D.	Hood River	Hood		E	
Ft. Vannoy I.D.	Grants Pass	Rogue			S
Gold Hill I.D.	Gold Hill	Rogue			S
Golden Valley	McMinnville	Willamette			S
Grand Prarie Water Control District	Grants Pass	Rogue			S
Grants Pass I.D.	Grants Pass	Rogue	X		
Greenberry I.D.	Corvallis	Willamette	X		
Harper South Side Irrigation District	Harper	Malheur			S
Heppner W.C.D.	Heppner	Umatilla			S
Hermiston I.D.	Hermiston	Umatilla	X		
Horsefly I.D.	Bonanza	Klamath			K
Hudson Bay District Improvement Co.	Milton-Freewater	Walla Walla			S
James Irrigation Improvement District	Hood River	Hood			S
Jordan Valley I.D.	Jordan Valley	Powder	X		
Junction City W.C.D.	Junction City	Willamette			S
Juniper Canyon W.C.D.	Prineville	Deschutes			S
Juniper Flat I.D.	Maupin	Deschutes			S
Keno Irrigation District	Klamath Falls	Klamath			K
Klamath Basin Improvement District	Klamath Falls	Klamath			K
Klamath Irrigation District	Klamath Falls	Klamath		E	K
Lacomb I.D.	Lacomb	Willamette			S
Lake Labish W.C.D.	Salem	Willamette			S
Lakeview Water Users Association	Lakeview	Lake	X		
Langell Valley Irrigation District	Bonanza	Klamath			K
Little Muddy Creek W.C.D.	Harrisburg	Willamette			S
Lone Pine Irrigation District	Terrebonne	Deschutes			S

Codes:

- S Size of water right too limiting
- E ETO exclusion list
- K Klamath exclusion, per ETO

Master Table

Irrigation Water Providers of Oregon

Irrigation Related Entities

District	Location	Basin	Further Evaluation	ETO LIST	Limiting Factor
Lower Powder River I.D.	Baker City	Powder			S
Malin I.D.	Malin	Klamath			K
Meadows Drainage District	Ft. Klamath	Klamath	X		K
Medford I.D.	Medford	Rogie	X		
Middle Fork I.D.	Parkdale	Hood		E	
Modoc Point I.D.	Chiloquin	Klamath			K
Mt. Hood I.D.	Hood River	Hood			S
North Unit I.D.	Madras	Deschutes		E	
Ochoco I.D.	Prineville	Crooked		E	
Old Owyhee Ditch Improvement District	Ontario	Owyhee			S
Owyhee I.D.	Nyssa	Owyhee/Snake		E	
Owyhee Ditch Company	Nyssa	Owyhee/Snake		E	
Philips-Ingle Ditch Company	Baker City	Powder			S
Pine Grove I.D.	Klamath Falls	Klamath			K
Pioneer Water Control District	Lincoln City	Mid Coast			S
Pochontas Mining & I.D.	Baker City	Powder			S
Poe Valley Improvement District	Klamath Falls	Klamath			K
Powder Valley Water Control District	North Powder	Powder	X		
Queener Irrigation Improvement Co.	Scio	Willamette			S
Ridgeview I.D. - Idaho and Oregon	Homedale, ID	Owyhee/Snake			S
Riverside Mission W.C.D.	Pendleton	Umatilla			S
Rock Creek Water District	Grande Ronde	Grande Ronde			S
Rogue Valley Irrigation District	Medford	Rogue	X		
Salmon River Park W.I.D.	Brightwood	Sandy			S
Santiam Water Control District	Stayton	Willamette	X		
Sauvie Island	Sauvie Island	Willamette	X		
Sidney I.D.	Jefferson	Willamette	X		
Shasta View Irrigation District	Malin	Klamath			K
Silver Lake I.D.	Silver Lake	Goose/Summer	X		
South Santiam River W.C.D.	Jefferson	Willamette			S
Skipanon WCD	Warrenton	North Coast			S
Stanfield I.D.	Stanfield	Umatilla	X		
Summer Lake I.D.	Summer Lake	Klamath			S
Sunnyside Irrigation District	Merrill	Klamath			K
Sutherlin Water Control District	Sutherlin	Umpqua			S
Swalley I.D.	Bend	Deschutes		E	
Talent I.D.	Talent	Rogue	X		
Teel I.D.	Echo	Umatilla	X		
The Dalles I.D.	The Dalles	Hood			C
Three Sisters I.D.	Sisters	Deschutes	X		
Tobin Ditch Improvement Company	Richland	Powder			S
Tualatin Valley I.D.	Forest Grove	Tualatin	X		
Tulelake Irrigation District	Tulelake	Klamath		E	
Tumalo I.D.	Bend	Deschutes	X		
Tygh Valley	Tygh Valley	Deschutes			S
Vale I.D.	Vale	Malheur	X		
Walla Walla I.D.	Milton-Freewater	Walla Walla			S
Wallowa	Wallow	Wallowa	X		
Warm Springs I.D.	Vale	Malheur		E	
West Extension I.D.	Irrigon	Umatilla	X		
Westland I.D.	Hermiston	Umatilla	X		
Wilderville Irrigation Improvement Co.	Grants Pass	Rogue			S
Willow Valley Irrigation District	Klamath Falls	Klamath			K
Wolf Run Irrigation Co-op	Dufur	Deschutes			S

Codes:

- S Size of water right too limiting
- E ETO exclusion list
- K Klamath exclusion, per ETO
- C Columbia River Federal Dam

Master Table

Irrigation Water Providers of Oregon

Appendix B

Water Right Information

The following pages represent the water right records of the irrigation delivery entities included in this report. The terms used in describing the water rights include the following definitions.

DEFINITIONS

Source: The source of the water right for each entity lists the stream or river from which the water is diverted, if the source is "surface water." Surface water is differentiated from groundwater from wells as a type of source. Entities may have water rights from more than one source of water.

Irrigable Acres: The maximum number of acres that may be irrigated under the right are listed as irrigable acres. Often a series of water rights are layered to provide adequate water to irrigate the total number of acres that a district may serve.

Primary Right: The primary right is the underlying water right. Often layers of supplemental rights are layered over the primary to provide a sufficient water supply.

Supplemental Right: When the primary right is not adequate to provide the need of an irrigation water supply entity to fulfill the needs of the landowners, additional storage facilities or groundwater resources provide supplemental use. Generally there is a total duty per acre that cannot be exceeded, regardless of the layers of supply available to each acre.

Rate: Rate refers to the flow in cubic feet per second (cfs) as the maximum amount of flow that is allowed to be diverted under a specific water right. One cubic foot per second is equivalent to 1.98 acre feet of water per day or 646,272 gallons per day.

Duty: Duty is defined by volume and time. The volume of water in capacity applied to land is measured in acre feet. One acre foot is the volume of water which will cover one acre to a depth of one foot and is equal to 43,560 cubic feet or 325,851 gallons.

Seasonal Flows: A water right also has a time component when used for irrigation. The irrigation season described within the water right or administered within a basin by the watermaster limits the number of days each year in which water may be applied at the rate and duty described in the right. In some basins the rate and duty vary within time periods within the season (see for example, the Deschutes Basin water rights). In other basins the rate and duty are consistent throughout the season.

Priority Date: Oregon's water laws are based on the principle of prior appropriation, "first in time, first in right." This means the first person to obtain a water right on a stream is the last to be shut off in times of low streamflows and the water right holder with the oldest date of priority can demand the water specified in their water right before junior priority water rights. The date of application for a permit to use water usually becomes the priority date of the right.

WATER RIGHT RECORDS

Water Right Record Inquiry

To access information for water right records, go to the Oregon Water Resources Department "Water Rights Information System" (WRIS) section of the department website. Rights can be accessed by the

name of the holder of the water right, river basin, or land location: http://apps2.wrd.state.or.us/apps/wr/wrinfo/.

Water Measurement Reports

Measurement of the use of water right by public entities, under Oregon law, must be reported annually to the Oregon Water Resources Department. Those records can be accessed at the following site: http://apps2.wrd.state.or.us/apps/wr/wateruse_report. Irrigation water delivery entities that are not public entities are not required to report and records are not provided on the department's site.

ARNOLD IRRIGATION DISTRICT (AID)
Shawn Gerdes, District Manager
19604 Buck Canyon Road
Bend, Oregon 97702
(541) 382-7664
www.arnoldirrigationdistrict.com

Irrigated Acres: 4,384.05

Primary Certificate 74197

Source:	Deschutes River
Irrigable acres:	4,384.05
Rate:	150 cfs
Duty:	5.4 a.f./acre, net
Seasonal flows:	
4/1-4/30:	1 cfs to 80 acres
5/1-5/14:	1 cfs to 60 acres
5/15-9/15:	1 cfs to 32.4 acres
9/16-9/30:	2 cfs to 60 acres
10/1-10/31:	1 cfs to 80 acres
Priority date:	4/25/05

Supplemental Certificate 76714
Supplemental storage to provide for full use of primary water right

Source:	Deschutes River
Storage facility:	Crane Prairie Reservoir
Irrigable acres:	50,091 split proportionately among Arnold, Line Pine and Central Oregon Irrigation District (COID). COID is the primary user. There is a 1938 contract among the districts providing for pro-rated use.
Rate:	no defined
Duty:	up to 5.4 a.f./acre, net
Seasonal flows:	to provide additional water to meet the allowed duty
Priority date:	2/28/1931

Notes
Average flow year: 33,132 a.f. total
US DOE analysis shows 600 kw capacity or .6 MW facility potential on Crane Prairie Reservoir.

BAKER VALLEY IRRIGATION DISTRICT
Jeff Colton, Manager
P.O. Box 127
Baker, Oregon 97814
(541) 523-5451

Acres irrigated: 18,579.05

Primary Certificate 80460

Source:	Powder River, tributary of Snake River
Irrigable acres:	1686.95
Rate:	42.2 cfs
Duty:	3.5 a.f./acre
Seasonal flows:	consistent throughout season at same rate
Priority date:	3/1905

Supplemental Certificate 73605

Source:	Powder River, tributary of Snake River
Irrigable acres:	3,411.6
Rate:	58 cfs
Duty:	up to 3.5 a.f./acre when combined with primary right
Seasonal flows:	consistent throughout season at same rate
Priority date:	4/19/79

Primary and Supplemental Certificate 73610

Source:	Powder River, tributary of Snake River
Storage facility:	Phillips Lake
Irrigable acres:	2,998.7 primary 14,323.8 acres supplemental
Rate:	74.35 cfs
Duty:	3.5 a.f./acre maximum when combining primary and supplemental storage not to exceed 64,400 a.f.
Seasonal flows:	consistent throughout season at same rate
Priority date:	6/19/58

Primary and Supplemental Certificate 73406

Source:	Powder River, tributary of Snake River
Irrigable acres:	676.9 primary 71.7 supplemental
Rate:	not defined
Duty:	1 cfs to 80 acres
Seasonal flows:	consistent throughout season at same rate
Priority:	1910-1928 based on 10 different canal locations

Primary and Supplemental Certificate 73999

Source:	Powder River, tributary of Snake River
Storage facility:	Mason Dam
Irrigable acres:	2,636.05 primary

	9,644.85 supplemental
Rate:	92.0 cfs
Duty:	up to 3.5 a.f./acre
Seasonal flows:	consistent rate March 1 – July 30
Priority:	4/26/82

Notes

Potential hydropower on Mason Dam, a federally owned facility without power:

Mason Dam - 173' high, crest of 895 feet

Phillips Lake Reservoir behind the dam covers 2,235 acres with a capacity of 95,500 a.f.

Bureau of Reclamation report indicates Mason Dam would provide 2.6 MW if power is added.

The Lilley Pumping Plant (4 vertical-shaft turbine-type pumps operating at 68 cfs serving 3,450 acres of water) and the Lilley Relift Pumping Plant (3 vertical-shaft turbine-type pumps operating at 34 cfs and serving 670 acres) also provide potential for hydropower development.

BURNT RIVER IRRIGATION DISTRICT
Jerry Franke, District Manager
1950 Third Street
Baker City, Oregon 97814
(541) 523-4442

Irrigated acres: 17,134

Supplemental Certificate 51711

Source:	Burnt River, Tributary of Snake River
Storage facility:	Unity Reservoir
Irrigable acres:	8,828.5
Rate:	221.68 cfs
Duty:	4.5 a.f. /acre
Seasonal flows:	consistent at same rate throughout season; no season defined in right; administered by watermaster
Priority date:	9/30/35

Primary and Supplemental Certificate 51709

Source:	Burnt River, tributary of Snake River
Storage facility:	Unity Dam
Irrigable acres:	primary and supplemental storage – number of acres not defined
Rate:	not defined
Duty:	not to exceed 25,220 a.f.; up to 4.5 a.f./acre when primary and supplemental combined
Seasonal flows:	consistent at same rate throughout season
Priority date:	3/18/35

Primary and Supplemental Permit S 50606
This is in permit stage and has not been "proved up" and certificated, but is used consistently.

Source:	Burnt River, tributary of Snake River
Storage facility:	Unity Dam
Irrigable acres:	1,323.1 primary irrigation 371.8 acres supplemental
Rate:	52.2 cfs
Duty:	3.0 a.f./ac
Seasonal flows:	consistent at the same rate throughout season April 1-July 30
Priority date:	5/18/81

Supplemental Permit S 52666

Source:	Burnt River
Storage facility	Unity Dam and Reservoir
Irrigable acres:	62.6 acres
Rate/Duty:	maximum rate/volume: 208.5 a.f.
Seasonal flows:	consistent from April 1 – September 10
Priority date:	3/27/92

Notes

The district holds a contract with the Bureau of Reclamation signed in 1935. All water rights are in the name of the Bureau of Reclamation. Including all sources of water and layered water rights, no acre may receive more than 4.5 a.f. per acre duty. There are also underlying water rights in the names of individuals to which the stored water is appurtenant to, as well as rights of the district as ditches were first developed in this area in 1862 and formerly the lands in the district were formerly served by a private ditch company.

The water rights in permit status (S50606 and S52666) have not yet been certificated by the Oregon Water Resources Department (WRD). This is sometimes the case with older permits which the law requires the WRD to survey and certificate due to the significant cost of completing that process.

A report developed by the Bureau of Reclamation shows the potential energy for a hydropower project at Unity Dam to provide an energy capacity of 4.0 MWs. Unity Dam is an earthfill dam 82' high and 694' long. The spillway has a maximum capacity of 10,000 cfs. There is a concrete lined outlet tunnel through the right abutment, operated with slide gates. The capacity of the outlet works is 620 cfs. The outlet and spillway share a stilling basin. The reservoir has a maximum capacity of 25,800 a.f. and a surface area of 926 acres. The project was completed in 1937. The Bureau of Reclamation contract was paid off by the district in 1979 but title has not been transferred to the district.

CENTRAL OREGON IRRIGATION DISTRICT (COID)
Steve Johnson, District Manager
1055 S.W. Lake Court
Redmond, OR 97756
(541) 548-6047
www.coid.org

Irrigated acres: 43,772.657

Primary Certificate 76358
Total flow divided between two main diversion canals

Source:	Deschutes River
Irrigable acres:	42,794.105
Rate:	1,350.71 cfs
Duty:	5.45 a.f. / acre, net
Seasonal flows:	
4/1 – 4/30:	1 cfs to 80 acres
5/1 – 5/14:	1 cfs to 60 acres
5/15 – 9/15:	1 cfs to 32.4 acres
9/16 – 9/30:	1 cfs to 60 acres
10/1 – 10/31:	1 cfs to 80 acres
Priority date(s):	10/31/1900 - 985 cfs
	12/2/1907 - 365.71 cfs

Supplemental Certificate 76714
Supplemental storage to provide for full use of primary water right

Source:	Deschutes River
Storage facility:	Crane Prairie Reservoir
Irrigable acres:	50,091 acres split proportionally between Arnold, Lone Pine, and COID. COID is primary user. 1938 contract between the districts provides for pro-rated use.
Duty:	up to 5.45 a.f./acre, net
Seasonal flows:	up to 5.45 a.f./acre, including seasonal flows as above
Priority date:	2/28/1913

Notes
Average flow year: Measurement records on line provide information at diversions. There are two main diversion canals; the water right designates allowable flows for each diversion.

COLUMBIA IMPROVEMENT DISTRICT
Larry Sandlin, Manager
P. O. Box 47
Boardman, OR 97818
(541) 481-9454

Irrigated acres: 17,000

Water Right Certificates/Permits

Source:	Columbia River
Irrigable acres:	17,000
Rate:	325 cfs maximum, varies with drainage
Duty:	Varies
Seasonal flows:	April 1 – October 31, varies based on drainage that causes supply to fluctuate

Notes

The number of irrigated acres would bring the district into the size of water right that might accommodate a hydropower project. In discussion with the manager, Larry Sandlin, all of the water rights are in the names of individuals and the rights are not held in the district's name. The number of rights is too voluminous to identify individually. He reported their highest flow in July is in excess of 140,000 gallons per minute. Drainage flows enter the canal system and add and subtract to the need of diverting the water right.

The district has an 8 mile, 72" pipeline and one additional canal of similar length. There would appear to be good prospects for pursuing at least one project. The canal has several drops that may provide necessary elevation. They have been reviewing the option of several small turbines at individual drops that could potentially be considered as one continuous project.

EAGLE POINT IRRIGATION DISTRICT
Hazel Ellefson, Manager
P.O. Box 157
Eagle Point, OR 97524
(541) 826-3411

Irrigated acres: 8,260

Certificate 75429

Source:	Big Butte Creek, tributary of the Rogue River
Irrigable acres:	7,465.2 acres primary 15.8 acres supplemental
Rate:	not to exceed 90.78 cfs
Duty:	4.5 a.f. /acre
Seasonal flows:	consistent throughout season; no season defined in water right; season varies
Priority date:	4/21/15
Water right holder:	in the name of the U.S. Bureau of Reclamation, Boise, Idaho

Certificate 68743

Same information as above, additional 11.1 acres primary

Certificate 68741

Same information as above, additional 714.7 acres primary

Certificate 49921

Source:	Reese Creek, tributary of the Rogue River
Irrigable acres:	12.9
Priority date:	3/4/1965
Remaining data:	as above

Certificate 49920

Source:	Hog Creek, tributary of the Rogue River
Irrigable acres:	5.4
Priority date:	5/18/1966
Remaining data:	as above

Certificate 19643

Source:	Little Butte Creek, tributary of the Rogue River
Irrigable acres:	54.03
Priority date:	3/2/1948
Remaining data:	as above

Notes

The district currently owns an operational hydropower plant with a capacity of .9 MW developed on the Nichols tributary of the Rogue in 1986 (Nichols Gap Hydropower Project). There are some additional sites that are being addressed by a private developer within the vicinity of the district.

GRANTS PASS IRRIGATION DISTRICT
Dan Shepard , District Manager
200 Fruitdale Drive
Grants Pass, OR 97527
(541) 541-476-2582
www.gpid.com

Irrigated acres: 7,761.77

Primary Certificate 80972

Source:	Rogue River
Irrigable acres:	1,879.50
Rate:	36.168 cfs: 23.512 cfs under the priority date of 9/29/16 12.656 cfs under the priority date of 8/21/87
Duty:	6.0 a.f. /acre
Seasonal flows:	April 1 – October 15 at continuous rate
Priority date:	See above

Primary and Supplemental Certificate 80971

Source:	Rogue River
Irrigable acres:	5,810.81 acres primary use and 50.23 acres as supplemental
Rate:	flow not to exceed 112.722 cfs from the Rogue 4.530 cfs from Jones Creek 3.780 cfs from Fruitdale Creek 3.780 cfs from Gilbert Creek 4.530 cfs from Sand Creek 2.260 cfs from Sparrowhawk Creek
Duty:	6.0 a.f. /acre
Seasonal flows:	April 1 – October 15 at continuous rate
Priority date:	76.268 cfs priority of 9/29/16 39.454 cfs priority of 8/21/87
Seasonal flows:	April 1 – October 15 at continuous rate
Priority date:	See above

Between certificates #80971 and #80972, the flow shall not exceed 148.89 cfs.

Notes

The water right had been in permit status since 1916 and the certification process did not begin until 1982. In 1982 the state issued a water right for the 7,761.77 acres in the amount of 96.7 cfs. Prior to that the district's water use was 180-210 cfs per year. In 1990 the Water Resources Department (WRD) issued a temporary permit to continue historic diversions while a conservation study was underway. An agreement occurred in 2001 to remove the dam and replace it with large pumps in the river to divert water in place of the storage facility. There may be potential to use the pumps in an energy-related facility. The district's water right certificates have been replaced under the Consent Decree entered in the Federal District Court under an agreement to complete specific conservation projects to diminish its water use and remove the dam in exchange for state and federal funding of the replacement of the dam with pumps. Certificates #80972 and #80971 replace the district's earlier certificates: #80736, #79556, #79557 and #79548 which are now canceled.

GREENBERRY IRRIGATION DISTRICT
Dan O'Brien, Manager
20742 Venell Place
Corvallis, OR 97333
(541) 752-2446
www.greenberry.org

Irrigated acres: 6,300

Primary Storage Permit S 54573

Source:	Willamette River, direct Hills Creek Reservoir, Middle Fork, Willamette Cougar Reservoir, South Fork McKenzie River Blue River Reservoir, Blue River Fall Creek Reservoir, Fall Creek Green Peter Reservoir, Middle Santiam Cottage Grove Reservoir, Coast Fork, Willamette Dorena Reservoir, Row River Fern Ridge Reservoir, Long Tom River Lookout Point Reservoir, Middle Fork, Willamette Detroit Reservoir, North Santiam
Irrigable acres:	6,300 acres per season (within a 10,988.9 acre area)
Rate:	not to exceed 90.78 cfs
Duty:	2.5 a.f. /acre
Seasonal flows:	March 1 – October 11 consistent
Priority date:	5/18/2000

Supplemental Storage Permit S 87034

Source:	Willamette reservoirs as described above
Irrigable acres:	6,300 acres per season (within a 10,988.9 acre area)
Rate:	not defined
Duty:	2.5 a.f./acre
Seasonal flows:	March 1 – October 11 consistent
Priority date:	12/7/2007

Reservoir Permit R 13201

Source:	Booneville Channel, Willamette River tributary
Storage facility:	Winkle Reservoir
Maximum volume:	199.5 a.f./year
Storage season:	November 1 through June 30
Reservoir size:	38 acres; water 8' deep; dam height 6'
Priority date:	9/11/2000

Reservoir Permit R 13202

Source:	Booneville Channel, Willamette River tributary
Storage facility:	Whitaker Reservoir
Maximum volume:	114.0 a.f. each year
Storage season:	November 1 through June 30

Reservoir size:	16.3 acres with 8' water depth, dam not to exceed 5' high
Priority date:	9/11/2000

Storage Permit S 53881

Source:	Willamette River
Rate:	22.0 cfs
Duty:	2.5 a.f./acre
Season:	September 1 through June 30
Priority date:	5/15/2002

Storage Permit S 54059

Source:	Willamette River
Rate:	52.93 cfs
Duty:	2.5 a.f./acre
Season:	March 1 through October 31
Priority date:	1/3/2003

Storage Permit S 54575

Source:	Willamette River
Irrigable acres:	Supplemental use for 6,300 acres
Rate:	50 cfs
Duty:	2.5 a.f./acre
Season:	March 1 through October 31
Priority:	12/7/2007

Storage Permit 87220

Source:	Willamette River tributary
Irrigable acres:	up to 12,388.4
Rate:	not designated
Duty:	2.5 acre feet per acre
Season:	March 1 through October 31
Priority date:	July 9, 2008

Notes

Measurement reporting not available for all sites.

All irrigable acres are limited to no more than 2.5 a.f. total water delivery, regardless of source.

HERMISTON IRRIGATION DISTRICT
Chuck Wilcox, Manager
366 E. Hurlburt Avenue
Hermiston, OR 97838
(541) 567-3024
www.hermistonid.org

Irrigated acres: 9,416

Primary and Supplemental right: Umatilla River Decree

Source:	Umatilla River and its tributaries and Cold Springs Reservoir
Irrigable acres:	not defined
Rate:	not defined; usual releases from reservoir in range of 100-170 cfs
Duty:	4.5 a.f./acre average (some lands may receive up to 6.0 a.f./acre and some may receive up to 3.0 a.f./acre, depending on location and including both direct flow from the river and stored water in the reservoir)
Seasonal flows:	season not defined (normally April 1 – September 30 due to supply)
Priority date:	primary 2/25/2004 Supplemental 9/6/1905
Water right holder:	Bureau of Reclamation
Storage facility:	decree includes Cold Springs Reservoir storage and release, but no flow rate defined

Notes
Flow records at the Water Resources Department water measurement reporting site are not a good guideline as there are now exchanges in place and in process between the Umatilla and Columbia Rivers. Water Resources Department records do not include the exchange information approved and pending.

The I-Line canal has been replaced with a 3.1 mile pipeline and may have potential for energy production. Pumps are being connected to the pipeline prior to irrigation season.

There is 1.487 potential capacity for a hydropower plant on the Cold Springs Reservoir and the district is interested in pursuing development at that site.

JORDAN VALLEY IRRIGATION DISTRICT
Richard Elguren, Manager
P.O. Box 205
Arock, Oregon 97902
(541) 586-2228

Irrigated acres: 7,986.78

Primary and Supplemental Certificate 75583

Source:	Jordan Creek, tributary to the Owyhee River
Irrigable acres:	primary 7,462.28
	Supplemental 524.5
Rate:	127 cfs
Duty:	2.0 a.f. /per acre prior to June 1
	.5 a.f./acre during remainder of irrigation season
Seasonal flows:	not defined in certificate
Priority date:	9/16/1909

Priority date: September 16, 1909
3 points of diversion: 2 from Jordan Creek; 1 from Antelope Reservoir

Certificate 75584

Source:	Jack Creek, Antelope Creek, Jordan Creek, tributaries of the Owyhee River
Storage facility:	Antelope Reservoir
Priority date:	4/14/1913

Storage of water regulated by certificate 75583 (rate, duty)

Notes
Antelope Reservoir does not have a hydro facility. US DOE analysis shows 1.3 MW capacity potential.

Water measurement reports indicate 57,100 a.f. withdrawn by the district June-September 2008, as an experience factor.

LAKEVIEW WATER USERS, INC.
Jorge Cobian, Manager
91164 Water Users Lane
Lakeview, OR 97630
(541) 947-3003

Irrigated acres: 10,520.09

Certificate 85839

Point of diversion (POD) source:

POD 1:	Drews Creek, tributary of Goose Lake
POD 2:	Drews Creek Reservoir, Drews Creek
POD 3:	Cottonwood Creek, Thomas Creek
POD 4:	Cottonwood Creek Reservoir, Cottonwood Creek
Irrigable acres:	10,520.09
Rate:	386.36 cfs: 203.69 cfs from Drews Creek and Reservoir 182.67 cfs from Cottonwood Creek and Reservoir
Seasonal flows:	not defined
Priority dates:	Drews Reservoir 1/21/1907 Cottonwood Reservoir 7/31/1908

Certificate 47468

Source:	Drews Creek and Cottonwood Creek, tributaries of Goose Lake
Storage facility:	Drews Reservoir and Cottonwood Reservoir
Rate/Duty:	Rate and duty prescribed in other certificates
Seasonal flows:	Not described in certificate
Priority dates:	Drews Reservoir 1/21/1907 Cottonwood Reservoir 7/31/1908

Certificate 81734

Source:	Cottonwood Creek/Thomas Creek
Storage facility:	Cottonwood Reservoir
Storage capacity:	not to exceed 4400 a.f., primary rights
Priority date:	11/4/1960

Goose Lake Decree

Issued to Lakeview Water Users, Inc., as successor in interest to Goose Lake Valley Irrigation Company

Sources:	Cottonwood Creek, Drews Creek, Willow Creek, Antelope Creek, Muddy Creek – tributaries of Goose Lake
Irrigable acres:	59,990.4
Storage facilities:	
Drews Reservoir	80,000 a.f. storage, priority 1/21/1907 reduced to 62,500 usable storage in 1960 decree 54,320 a.f. may be diverted for irrigation
Cottonwood Res.	18,000 a.f. storage, priority 7/31/1908 reduced to usable storage of 4,400 a.f. 4,010 a.f. may be diverted

Direct flow rate	200 cfs from Cottonwood Creek with a priority of 7/31/1908
	direct flows with a priority of 1/21/1907:
	300 cfs from Drew Creek
	100 cfs from Willow Creek – not perfected and removed from decree
	100 cfs from Antelope Creek – not perfected; removed
	50 cfs from Muddy Creek – not perfected; removed
	200 cfs from Thomas Creek – not perfected; removed
	200 cfs from Cottonwood Creek – perfected
Duty:	4.08 a.f./acre maximum after deduction of conveyance losses

Note

Drew Reservoir: outlet conduit is at 4,875.62' above sea level; crest is at 4,914.62' (two outlets)
Cottonwood Reservoir: bottom elevation of outlet 672' and spillway crest at 702'; built in 1921 and extensive upgrade conducted in 1959. Assess reservoirs for potential hydropower.

MEADOWS DRAINAGE DISTRICT
Gerald Hawkins, Manager
P.O. Box 426
Ft. Klamath, OR 97626
(541)381-2211

Irrigated acres: 21,418

Certificate

Source:	Four Mile Creek, Seven Mile Creek, Anna Creek Slough – tributaries of Agency Lake, Klamath Basin
Irrigable acres:	5,340.1 primary
Rate:	67.23 cfs
Duty:	$1/80^{th}$ of 1 cfs per acre
Seasonal flow:	April 1 through September 30
Priority date:	September 13, 1920

Note
145,155 a.f. of use in most current year of record

MEDFORD IRRIGATION DISTRICT
Carol Bradford, Manager
P.O. Box 70
Jacksonville, OR 97530
(541) 899-9913
www.medfordid.org

Irrigated acres: 11,800

Certificate 85876

Sources:	
POD #1:	Four Mile Lake; Four Mile Creek (Klamath Basin)
POD #2:	Fish Lake, North Fork Little Butte Creek (Rogue)
POD #3:	North Fork Little Butte Creek, Little Butte Creek (Rogue)
POD #4:	Little Butte Creek (Rogue)
Irrigable acres:	9,625.5 supplemental
Rate:	49.34 cfs maximum into Hopkins Canal/Bradshaw Drop
Duty:	1/80th of 1 cfs
Season flow:	April 1 – October 15
Priority date:	3/31/1910
Water right holder:	U.S. Bureau of Reclamation

Water is conveyed from Four Mile Lake via the Cascade Canal, held and stored in Fish Lake. It is then re-diverted and released into the North Fork Little Butte Creek, then rediverted into the Main Canal shared by Rogue River Valley and Medford Irrigation Districts. At Bradshaw Drop the water is split between the Hopkins Canal and the Medford Canal.

Certificate 79911

Sources:	15,600 a.f. storage	Four Mile Creek and tributaries of Klamath Lake storage facility - Four Mile Lake allowable storage up to 15,600 a.f.
	7,900 a.f. storage	North Fork Little Butte Creek storage facility – Fish Lake and Four Mile Lake, tributary to the Rogue River storage facility – Fish Lake
Priority date:		3/31/1910

Notes
Medford Irrigation District also has 8,500 a.f. storage in Hyatt, Howard Prairie and Emigrant Reservoirs. Medford has rights to stored water in Four Mile Lake and Fish Lake equal to 2/3 of the capacity. The other 1/3 is allocated to the Rogue River Valley Irrigation District.

POWDER VALLEY WATER CONTROL DISTRICT
Lyle Umpley, Manager
P.O. Box 189
North Powder, Oregon 97867
(541) 898-2366

Irrigated acres: 25,000

Certificate S 35791 and Reservoir Permit R 5776

Sources: points of diversion

POD #1:	Anthony Creek, North Powder River
POD #2:	Wolf Creek, North Powder River
POD #3:	Wolf Creek Reservoir, Powder River
POD #4:	Wolf Creek Reservoir, Powder River
Irrigable acres:	3,323.4 primary 7,527.8 supplemental
Rate:	170 cfs: 140 cfs from Anthony Creek 30 cfs from Wolf Creek
Priority date	10/31/1963
Storage facility:	Wolf Creek Reservoir – 11,100 a.f. of storage allowable

Permit S 42690

Source:	North Powder River
Storage facility:	Anthony Creek Reservoir
Irrigable acres:	2,716 primary 3,078.1 supplemental acres
Priority date:	4/25/1977

Permit S 50717

Source:	Anthony Fork, North Powder River and Pilcher Creek and Pilcher Creek Reservoir (primarily Anthony Creek)
Storage facility:	Pilcher Creek Reservoir – 5910.0 a.f.
Direct flow:	375.6 cfs total: 25.6 from N. Powder 300.0 from Anthony Creek 50.0 from Pilcher Creek
Duty:	4.0 a.f./acre
Irrigable acres:	2,465.5 primary 15,185.3 supplemental
Priority date:	2/26/1987

Lands listed as supplemental may be used as primary if there is not another source by the time of proof.

Certificate 72350

Source:	Rock Creek, tributary of Powder River
Irrigable acres:	38.0
Rate:	.95 cfs

Priority date: 12/31/1879

Certificates 83310 & 83311

Source: Anthony Creek, tributary of North Powder River
Irrigable acres: 343.5 acres primary
Duty: not to exceed withdrawal of 360 a.f./season
Priority date: 12/31/1898

Permit R 8353

Permit to construct Pilcher Creek Reservoir and store water

Source: Anthony Fork and Pilcher Creek, tributaries of the Powder River
Storage: 5,910 a.f.
Priority dates: 10/31/1963 4,270 a.f.
8/12/1965 1,230 a.f.
3/11/1982 410 a.f.

Notes

Possible hydro sites:

Wolf Creek Reservoir: Dam: 128' high; earth fill dam with concrete chute, spillway on left; 54" conduit from reservoir to existing irrigation distribution system; clay core, free-draining outer shell, separated by a graded filer; rock riprap upstream face; 220 acres; 125' deep; outlet w/30' wide concrete chute and spillway with drop inlet and energy dissipating outlet, left abutment

Pilcher Creek Reservoir: Dam: 110' high, 26' wide at top; 222 acres, dept of 95', earth fill construction; construction began 4/29/1983

ROGUE RIVER VALLEY IRRIGATION DISTRICT
Brian Hampson, Manager
3139 Merriman Road
Medford, OR 97501
(541) 773-6127
www.rrvid.org

Irrigated acres: 8,892.5

Certificate S 38230

Source:	Agate Reservoir, Rogue River
Storage facility:	Agate Reservoir
Irrigable acres:	763.0 supplemental
Priority date	9/6/1915

Certificate 79911

Source:	Four Mile Creek, Four Mile Lake, North Fork Little Butte Creek, Little Butte Creek
Storage facility:	Four Mile Lake Dam
Capacity:	15,600 a.f. 1/3 to Rogue River Valley I.D. (RRVID) – 5,200 a.f. (2/3 to Medford ID)
Storage facility:	Fish Lake
Capacity:	7,900 a.f. 1/3 to RRVID – 2,633 a.f. (2/3 to Medford ID)
Priority date:	3/31/1910

Certificate 79912

Source:	Dry Creek, Antelope Creek, Little Butte Creek – North Fork and South Fork
Storage facility:	Agate Reservoir
Capacity:	4,782 a.f.
Priority date:	9/6/1915

Certificate 80575

Source:	Bear Creek, Rogue River
Irrigable acres:	3,398.6 supplemental
Rate:	42.5 cfs
Duty:	1/80th of 1 cfs per acre
Priority date:	6/24/1913

Certificate 80576

Source:	Dry Creek
Storage facility:	Agate Reservoir
Irrigable acres:	8,578.4 supplemental
Capacity:	4,782 acre feet
Priority date:	1/28/2004

Certificate 80577

Source:	Jackson, Bear and Griffin Creeks
Irrigable acres:	3,032.3 supplemental
Rate:	37.7 cfs
Duty:	1/80th of 1 cfs/acre
Priority date:	May 10, 1916

NOTES

In addition, storage space is assigned in Howard Prairie, Hyatt and Emigrant Reservoirs among Rogue River Valley I.D., Medford I.D. and Talent I.D. RRVID's share is 4,000 a.f. See reservoir storage details on the Talent I.D. water right record.

SANTIAM WATER CONTROL DISTRICT
Brent Stevenson, Manager
284 E. Water Street
Stayton, OR 97383
(503) 769-2669

Irrigated acres: 16,880

Stored water rights released from the Detroit Reservoir, held in the name of the U.S. Bureau of Reclamation:

Certificate 51317

Source:	Willamette River, Detroit Reservoir
Irrigable acres:	280.7
Rate:	3.52 cfs
Duty:	2.5 a.f./ac
Seasonal flows:	during irrigation season, not defined
Priority date:	4/10/1987

Certificate 51818

Source:	Willamette River, Detroit Reservoir
Irrigable acres:	398.42
Rate:	not defined; regulated by duty
Duty:	2.5 a.f./ac
Seasonal flows:	limited to 999.7 a.f.
Priority date:	4/10/1987

Permit 53174

Source:	Willamette River, Detroit Reservoir
Irrigable acres:	194.79
Rate:	not defined; regulated by duty
Duty:	3.5 a.f./ac
Seasonal flows:	limited to 681.76 a.f.
Priority date:	4/18/1996

Rights withdrawn from the Santiam River:

	Priority Date	Irrigable Acres	Rate	Duty
7 certificates	6/24/1911	1,959.2 ac.	21.55 cfs	3.5 a.f./ac
17 certificates	5/14/1909	13,480.26 ac.	148.28 cfs	3.5 a.f./ac
1 certificate	8/28/1924	567.7 ac.	7.50 cfs	3.5 a.f./ac

NOTES

Santiam has an existing hydropower plant (310 thp) based on flows of 185.0 cfs, for which a water right was issued with a priority of June 23, 1983 (165.0 cfs) and August 20, 1984 (20 cfs). The district is currently in the licensing process for another small project sold to the district by PacifiCorp.

SAUVIE ISLAND DRAINAGE DISTRICT
Tim Couch, Manager
29265 N.W. Sauvie Island Road
Portland, OR 97231-6903
(503) 621-3397

Irrigated Acres: 5,083.3 acres

Certificate 49880

Source:	Gilbert River, Multnomah Channel of the Willamette River and Columbia River
Rate:	63.54 cfs
Duty:	2.5 a.f./acre
Seasonal flows:	not defined as drainage combines with diverted flows portions of year
Priority date:	April 5, 1950

Points of diversion from sources:

POD #1:	Multnomah Channel, Columbia River
POD #2:	Gilbert River, Multnomah Channel
POD #3:	Multnomah Channel, Columbia River
POD #4:	Columbia River, Pacific Ocean

SIDNEY IRRIGATION DISTRICT
Heather McGowan, Manager
P.O. Box 736
Jefferson, OR 97352
(541) 928-3354

Contact for survey discussion: Mike Piesker, Board Chair

Irrigated Acres: 6,986.8

Certificate 53344

Source:	POD #1 – North Santiam River, Santiam River
	POD #2 – Detroit Reservoir, North Santiam River
Irrigable acres:	2,003.6 primary
	230.0 supplemental
Rate:	27.92 cfs
Duty:	2233.6 a.f. total volume; not to exceed 2.5 a.f./acre
Season:	March 1 through October 31
Priority date:	2/13/1991

Certificate 53767

Source:	North Santiam River, Santiam River
Irrigable acres:	1,397.7 primary
Rate:	4.68 cfs + 5.0 cfs for livestock
Duty:	duty not defined
Season:	March 1 through October 31
Priority date:	12/31/1870

Certificate 53768

Source:	North Santiam River, Santiam River
Irrigable acres:	715.3
Rate:	1/80th of 1 cfs per acre
Duty:	2.5 a.f./acre
Season:	March 1 through October 31
Priority date:	5/5/1959

Certificate 54310

Source:	North Santiam River, Santiam River
Irrigable acres:	2,000
Rate:	25.0 cfs
Duty:	not defined
Season:	March 1 through October 31st
Priority date:	5/14/1909

Note: on this certificate, to compensate for losses between the points of diversion to the place of use, an additional amount not exceeding 10% is allowed for conveyance loss.

Certificate 75135

Source:	North Santiam River, Santiam River
Irrigable acres:	470.4 acres
Rate:	8.31 cfs
Duty:	not defined
Season:	March 1 through October 31st
Priority date:	12/31/1870

Certificate 83257

Source:	POD #1 North Santiam River, Santiam River
	POD #2 Detroit Reservoir, North Santiam River
Irrigable acres:	698.9
Rate/Priority date:	7.5 cfs – priority of 10/4/1983
	0.20 cfs – priority of 5/22/1987
	1.04 cfs – priority of 6/2/1987
Duty:	not defined
Season:	March 1 through October 31st

SILVER LAKE IRRIGATION DISTRICT
Tom O'Leary, Manager
Silver Lake, Oregon 97638
(541) 576-2568

Irrigated Acres: 3,952.4

Certificate 49856

Source:	POD #1 – Guyer Creek, Silver Creek
	POD #2 – Silver Creek, Silver Lake
	POD #3 – Silver Creek, Silver Lake
	POD #4 – West Fork Silver Creek, Silver Creek
Storage facility:	storage not to exceed 19,000 a.f. in Thompson Valley Reservoir
	Storage not to exceed 460 a.f. in Diversion Dam Reservoir
Rate:	not defined
Duty:	3.0 a.f./acre
Seasonal flows:	not defined
Priority date:	10/11/1915

Certificate 49858

Expansion of Thompson Valley Reservoir (see data above)
Add 2,040 a.f. of storage
Priority date: 8/12/1964

Certificate 53852

Source:	Silver Creek
Storage facility:	"A" Reservoir
Irrigable acres:	40
Storage capacity:	not to exceed 120 a.f.
Rate:	not defined
Duty:	3.0 a.f./ac.
Priority date:	January 21, 1981

Certificate 76377/81396/81659

Source:	POD #1 – Silver Creek, Silver Lake
	POD #2 – A Reservoir, Silver Creek
	POD #3 – A Reservoir, Silver Creek
Irrigable acres:	2,551.1 primary
	1361.3 supplemental
Rate:	44.94 cfs
Duty:	3.5 a.f./ac.
Priority date:	10/11/1915

NOTES:
East Thompson Reservoir: 48' high, rock filled, designed for 6,500 acre delivery system; 9 mile Silver Lake Canal at outlet

STANFIELD IRRIGATION DISTRICT

Ray Kopacz
P.O. Box 416
Stanfield, OR 97875
(541) 449-3272

Irrigated Acres: 10,850

Certificate 11010

Source:	Stanfield Drainage, Stage Gulch
Irrigable acres:	20
Rate:	.20 cfs
Duty:	3.0 a.f./ac
Priority date:	7/26/1932

Certificate 79442

Source:	Umatilla River, Columbia River
Irrigable acres:	6,409.4
Rate:	80.09 cfs
Duty:	$1/80^{th}$ of 1 cfs/acre
Season:	March 1 to November 1
Priority date:	3/8/1905

Certificate 76113

Source:	Umatilla River, Columbia River
Irrigable acres:	4,465.2
Rate:	111.7 cfs
Duty:	4.5 a.f./acre
Priority date:	June 23, 1965

Certificate S 87472

Source:	Columbia River
Irrigable acres:	10,872.4 supplemental
	Construction completed 2000; beneficial use began March 1, 2009
	Backup alternative canal to current system

TALENT IRRIGATION DISTRICT
Jim Pendleton, Manager
P.O. Box 467
Talent, OR 97540
(541) 535-1529
www.talentid.org

Irrigated acres: 16,341

Certificate 79212

Sources:	Emigrant, Bear, McDonald, Little Applegate, Greeley, Neil, Ashland, Wagner, Anderson, Coleman, Kenutchen, Meyer, Butler, Keene, North Tyler, Sampson, Jenny Creeks – Tributaries to the Rogue River; Emigrant Reservoir
Irrigable acres:	13,309.6 primary and supplemental
Rate:	166.5 cfs
Duty:	not defined
Season:	not defined
Priority date:	5/23/1912

Certificate 79213

Sources:	Keene Creek, Hyatt Reservoir (also known as Keene Reservoir) – supplied by Jenny Creek (Klamath Basin)
Storage:	not to exceed 16,200 a.f.
Priority date:	5/23/1912

Certificate 79214

Sources:	Keene Creek (Klamath Basin); Emigrant River, Emigrant Reservoir, Bear Creek (Rogue Basin)
Storage:	not to exceed 8,300 a.f. in Keene (Agency) Reservoir
Priority date:	1/27/1920

Certificate 79215

Sources:	Emigrant, Bear, Conde, Dead Indian, S. Fork Little Butte, Little Butte, Pole Bridge, Daley, Beaver Dam, Grizzly, Jenny, Howard Prairie Reservoir, Soda, Little Beaver, Keene, Hyatt Prairie Reservoir
Storage:	not to exceed 36,200 a.f. in Emigrant Reservoir

Certificate 79216

Source:	Grizzly, Jenny, S. Fork Little Butte, Little Butte, Conde, Pole Bridge, Annie, Dead Indian, Grizzly, Daley, Beaver Dam, Deadwood Creeks
Storage Facility:	Howard Prairie Reservoir
Storage:	not to exceed 62,000 a.f.
Priority date:	9/6/1915

Certificate 80461

Source:	Howard Prairie Reservoir
Storage:	not to exceed 62,000 a.f.

Certificate 83727

Sources:	Emigrant, Bear, S. Fork Little Butte, Little Butte, Conde, Dead Indian, Daley, Beaver Dam, Pole Bridge, Deadwood, Keene, Jenny, Grizzly, Soda, Little Beaver Creeks
Storage facility:	Emigrant Reservoir
Irrigable acres:	4,169.5 supplemental
Rate:	$1/80^{th}$ cfs
Duty:	4.5 a.f./acre
Priority date:	9/16/1915

NOTES

Talent has 94,500 a.f. of the storage in Howard Prairie, Hyatt and Emigrant Reservoirs as "first fill" (Medford has 8,500 a.f. of the storage). Residual capacity is allocated to Medford I.D. from the same 3 reservoirs and 4,000 a.f. is allocated to the Rogue River Valley I.D.

There are 7 reservoirs in the Rogue Basin, the larger ones referenced above. Looking at the reservoirs and their outlets for hydropower potential should identify one or more projects. The reservoir plans and documents can be retrieved through state archives or from district and Bureau of Reclamation records. Emigrant Reservoir is listed as having potential of 1.1 MW capacity on one list and .948 MW on anther.

Howard Prairie Reservoir: potential hydro - Dam of 88' in height; upstream slope 2-1/2 to 1; downstream slope 2 to 1; height of dam above water line – 12'; top width 30'; constructed 1958; title held by U.S. Bureau of Reclamation

TEEL IRRIGATION DISTRICT
Chet Prior, President
3237 Oregon Trail Road
Echo, OR 97826
(541) 376-8444

Irrigated Acres: 9,482.28

Certificate 76050

Source:	Umatilla River
Irrigable acres:	5,011.5
Rate:	60 cfs
Duty:	4.5 a.f./acre
Seasonal flow:	March 1 through October 31
Priority date:	4/22/1955

Certificate 76051

Source:	Umatilla River
Irrigable acres:	4,471.3
Rate:	30 cfs
Duty:	4.5 a.f./acre
Seasonal flow:	March 1 through October 31
Priority date:	6/27/1958

THREE SISTERS IRRIGATION DISTRICT
Marc Thalacker, Manager
P.O. Box 2230
Sisters, Oregon 97759
(541) 549-8815

Irrigated Acres: 7,567.76

Certificate 74135

Source:	Wychus Creek, Deschutes River
Irrigable acres:	7,567.76
Rate:	153.02 cfs
Duty:	1/50th of 1 cfs per acre
Season:	April 1 – October 31
Priority date:	12/31/1895

Instream water rights

Diminish Certificate 74135 for these amounts transferred instream to Wychus Creek:

Certificate 84079	1.20 cfs	04/10/2008
81607	1.5 cfs	10/03/2005
85151	2.0 cfs	06/11/2009
85446	1.2 cfs	03/31/2009

Small storage rights

None of these would have hydro potential:

Certificate 31339	89 a.f. storage
R3902	500 a.f. storage

Supplemental Groundwater Supply: Permit #G-11378

Source:	Wychus Creek
Irrigable acres:	5,821.35 supplemental
Rate:	13.4 cfs
Duty:	3.0 a.f./acre

TUALATIN VALLEY IRRIGATION DISTRICT
Joe Rutledge, Manager
2330 Elm Street
Forest Grove, Oregon 97116
(503) 357-3118
www.tvid.org

Irrigated Acres: 17,000, approx. flow of 170 cfs, two points of diversion

The water right status for TVID is unique, the manager relates. The municipal and industrial portion of the right has not been proved up but the irrigation portion has. As a result, the Water Resources Department issued in 2006 a unique order called "proof to the satisfaction of the director" which validates the irrigation portion. As a result the water rights for the irrigation use could fall under the 2007 law which allows re-use of irrigation water for power purposes. Because of this special status, there are not recorded water right flows in the state's water measurement system.

The district applied for and received approval for an extended irrigation season so that patrons may choose to order water for an early season (March 1 – April 30) or for an extended season (October 1 – November 30). The main irrigation season is May 1 – September 30.

The district has a 33" pipeline installed in 1967 with considerable slope, as part of the original infrastructure development of over 120 miles of piping. There are 3 pumping plants and two reservoirs. Some irrigators pump directly from the river, in addition to the district's own diversion.

Scoggins Dam, built in 1970, is the main reservoir, covering 1,132 acres and storing 59,950 a.f. of water. The Bureau of Reclamation is working with agencies in the basin to raise the height of Scoggins Dam (which forms Hagg Lake); construction of a large pipeline from the dam to the JWC Water Treatment Plant and a large pumping station located below the dam to pump water from the Tualatin River into the lake during the winter. The expansion will add approximately 53,000 acre-feet of water to Scoggins Reservoir (Hagg Lake) per year, almost doubling capacity.

There is potential for hydropower development at the reservoir and within the pipeline facilities and pumps.

TUMALO IRRIGATION DISTRICT
Elmer McDaniels, Manager
64697 Cook Avenue
Bend, Oregon 97701
(541) 382-3053
www.tumalo.org

Irrigated Acres: 8,114.47

Certificate 74146

Source:	Tumalo Creek, tributary of Deschutes River
Irrigable acres:	5,010.9
Rate:	71.571 cfs
Duty:	1.8 a.f./acre as a primary right (to be supplemented by stored water and Deschutes River flows)
Priority dates:	Priority dates vary within this right from September 1900 through May 27, 1907; majority primary date is 9/30/1900

Certificate 74147

Source:	Tumalo Creek, Crater Creek, Little Crater Creek (Deschutes River tributaries) and various springs
Irrigable acres:	6,994.46: 1,583.7 primary 5,010.9 supplemental rights
Rate:	136.0 cfs from Tumalo Creek 40.0 cfs from Crater Creek 34.0 cfs from Little Crater Creek 1.0 cfs from three springs
Duty:	Season 1: 1/80th of 1 cfs/acre Season 2: 1/60th of 1 cfs/acre Season 3: 1/32.4 cfs per acre (maximum of 9.91 a.f. per acre diverted less decreed losses of 45% for net delivery of 5.48 a.f. per acre)
Priority date:	October 29, 1913
	Season 1: April 1-April 30 and October 1-October 31 Season 2: May 1-May 14 and September 15-September 30 Season 3: May 15-September 14

Certificate 74147

Source:	Crescent Lake Reservoir, Crescent Creek
Storage:	up to 35,000 a.f.
Irrigable acres:	6,579.97 supplemental 10.63 primary
Duty:	Season 1: .75 a.f./acre Season 2: .5 a.f./acre Season 3: 7.40 a.f./acre (limited to the total diversion of 35,000 a.f. for any one season)
Priority date:	4/7/1911

Certificate 76637/R2744

Source: Crescent Creek/Crescent Lake
Storage: up to 51,050 a.f.
Priority date: 12/8/1961

Certificate 76683/R102

Source: Crescent Lake
Storage: up to 86,050 a.f., but not more than 35,000 a.f. per year
Priority date: 3/20/1911

Certificate 76684/R2743

Source: Tumalo Creek, Deschutes River
Storage: Tumalo Creek re-regulating reservoir
up to 1100 a.f.
Priority date: December 8, 1961

Certificate 76106/S27840

Source: Tumalo Creek, Deschutes River
Storage: Tumalo Creek Reservoir
Irrigable acres: 790.6
Rate: 11.3 cfs
Priority: 12/8/1961

Certificate 76520

Source: Crescent Lake Reservoir
Irrigable acres: 7,366.57 supplemental
Storage: not to exceed 47,727 a.f. stored water (multiple seasons)
Duty: 9.91 a.f. diverted less decreed losses of 45% for net of 5.48 a.f. acre (see 1928 decree determining overall transportation loss)
Priority date: 12/8/1961

Certificate 74149

Source: Deschutes River
Irrigable acres: 6,483.9 acres supplemental
15.0 primary
Rate: 9.50 cfs from April 1 to November 1 and right to store in Crescent Lake
Priority date: 12/31/1905

Certificates provided for instream water rights

Deduct from irrigation rights

4/18/2005 5.82 cfs Tumalo Creek April 1-November 1
4/18/2005 varying flows by irrigation seasons 1, 2 and 3; high of 7.8 cfs
89.25 a.f. from Crescent Lake Reservoir
6//25/08 2.0 cfs from Tumalo Creek

NOTES

In the past 7 years Tumalo Irrigation District has installed several miles of pipeline which have good potential for hydropower enhancement. There are other pipeline projects pending, as well.

The district has two reservoirs, one from Tumalo Creek water, which is basically a re-regulating reservoir. In addition Tumalo has the rights for water stored in Crescent Lake Reservoir, a facility held in title by the U.S. Bureau of Reclamation.

In the early 1980s the U.S. Department of Energy funded a study for a project on the Bend Feed Canal (3.0 MWs) and a study on the Columbia Southern Canal (7.0 MWs). FERC process on the two filings was not completed. The Bend Feed Canal project would require a new water right as it would operate outside the irrigation season. The Columbia Southern project has been reduced in scope by a change in the point of diversion subsequent to the originally identified project, but there would still be a viable project at the new diversion point. Attempt to obtain the two earlier studies from the U.S. DOE records was not successful.

VALE IRRIGATION DISTRICT
Scott Ward
521 A Street West
Vale, Oregon 97918
(541) 473-3243

Irrigated Acres: 34,993

Certificate 74081

Source:	Malheur River
Storage facility:	Beulah Reservoir (also known as Agency Reservoir) on the North Fork of the Malheur River
Irrigable acres:	32,000 acres supplemental
Rate:	not to exceed 100 cfs for direct flow
Duty:	not to exceed 62,770 a.f. for storage 1/40th of 1 cfs/acre
Priority date:	Stored water – 12/16/1911 Direct flow – 11/29/1945

Certificate S 29882/R4456

Source:	Bully Creek, Malheur River
Storage facility:	Bully Creek Reservoir
Irrigable acres:	not defined
Storage:	31,618 a.f.
Rate:	121.9 cfs
Duty:	4.5 a.f./acre
Priority date;	8/7/1936

Acres: 31,628 a.f. storage

Certificate 74080

Source:	Malheur River, tributary to the Snake River
Storage facility	Warm Springs Reservoir
Irrigable acres:	28,291.2 primary 3,708.8 supplemental
Rate/Priority date:	400 cfs priority of 5/10/1926 200 cfs priority 1/11/1927
Duty:	4.5 a.f./acre

NOTES
The above certificates allot 100% of the flow to Vale Irrigation District and then the drainage and runoff after that – approx. 200 cfs – goes to the Warm Springs Irrigation District. One-half of the stored water each year goes to the Warm Springs Project.

Malheur Decree
The Malheur Decree set aside river diversions for most of the district lands served by the Malheur River, including Vale, Warm Springs and many individuals. These rights were in the names of various ditch companies and predecessors of the districts. The duty in some cases was set at up to 40 miners' inches;

other duties were based on Beulah (Agency) reservoir flow priorities. The decree was completed in 1916.

The measured flows as reported to the state annually average about 28,000 a.f. in the Vale Main Canal alone. There is not hydropower on the reservoirs at this time, but there is potential at these sites.

WALLOWA VALLEY IMPROVEMENT DISTRICT
Michael Coppin, Manager
1102 Engleside Avenue
Joseph, Oregon 97846-8323
(541) 432-1651

Irrigated Acres: 5,163.4

Certificate 9391

Source:	POD #1 – Little Sheep Creek, Big Sheep Creek
	POD #2 – McCully Creek, Little Sheep Creek
Irrigable acres:	5,163.4 primary
Duty:	April 1 – July 31: 1/40th of 1 cfs/acre
	August 1- October 1 1/80th of 1 cfs/acre
Priority date:	1905

Certificate 3890

Source:	Little Sheep Creek, Big Sheep Creek
Storage:	315 a.f. total
Priority date:	5/19/1912

NOTES

Imnaha River Decree: While the decree, referred to in the state's water measurement analysis for the district, lays out the location of all lands to be irrigated, it does not provide any duty or rate, referring to the Wallowa River decree as the determinant.

WARM SPRINGS IRRIGATION DISTRICT
Tony Dixon, Manager
334 Main Street North
Vale, Oregon 97918
(541) 473-3951

Irrigated Acres: 19,950

Certificate

Source:	Malheur River
Storage:	Beulah Reservoir (also known as Agency Reservoir) on the North Fork of the Malheur River
Irrigable acres:	32,000 acres supplemental
Rate:	not to exceed 100 cfs for direct flow
Duty:	not to exceed 62,770 a.f. for storage 1/40th of 1 cfs pr acre
Priority date:	stored water – 12/16/1911 direct flow – 11/29/1945

Certificate S 29882/R4456

Source:	Bully Creek, Malheur River
Storage facility:	Bully Creek Reservoir
Irrigable acres:	not detailed
Rate:	121.9 cfs
Duty:	4.5 a.f.acre capacity to 31,618 a.f.
Water right holder:	U.S. Bureau of Reclamation
Priority date:	8/7/1936

Certificate 74080

Source:	Malheur River, tributary to the Snake River
Storage facility:	Warm Springs Reservoir
Irrigable acres:	28,291.2 primary 3,708.8 supplemental
Rate/priority date:	400 cfs priority 5/10/1926 200 cfs priority 1/11/1927
Duty:	4.5 a.f./acre

NOTES
The above certificates allocate 100% of the flow to Vale Irrigation District and then the drainage and runoff after that – 200 cfs – goes to the Warm Springs Irrigation District. One-half of the stored water each year goes to the Warm Springs Project.

Malheur Decree
The Malheur Decree set aside river diversions for most of the district lands served by the Malheur River, including Vale, Warm Springs and many individuals. These rights were in the names of various ditch companies and predecessors of the districts. The duty in some cases was set at up to 40 miners' inches;

other duties were based on Beulah (Agency) reservoir flow priorities. The decree was completed in 1916.

The measured flows as reported to the state annually average about 28,000 a.f. in the Vale Main Canal alone.

There is no hydropower on the reservoirs at this time.

WEST EXTENSION IRRIGATION DISTRICT
Beverly Bridgewater, Manager
P.O. Box 100
Irrigon, OR 97844
(541) 922-3814

Irrigated Acres: 10,379

Permit S 45999

Source:	Columbia River Water
Irrigable acres:	1,144.0 acres primary and supplemental
Rate:	28.59 cfs
Duty:	3.0 a.f./acre
Priority date:	6/15/1981

Certificate 68323

Source:	Umatilla River
Irrigable acres:	3,249.01 primary
Rate:	82.22 cfs
Duty:	4.5 a.f./acre
Priority date:	9/12/1968

Certificate 79924

Source:	Umatilla River
Irrigable acres:	1,369.9 primary
Rate:	17.12 cfs
Duty:	4.5 a.f./acre
Priority date:	4/14/1893

Certificate 79925

Source:	Umatilla River
Irrigable acres:	347.1 primary
Rate:	4.34 cfs
Duty:	4.5 a.f. per acre
Priority date:	12/31/1906

Certificate 79928

Source:	Umatilla River
Irrigable acres:	3,248.1 primary
Rate:	81.2 cfs
Duty:	4.5 a.f./acre
Priority:	9/12/1968

Certificate 79929

	Point of Diversion:
Source:	POD #1 - Umatilla River
	POD #2 – Columbia River
Irrigable acres:	8,516.6 supplemental

Rate:	90 cfs
Duty:	4.5 a.f./acre (including all other sources per acre)
Priority date:	9/12/1968

Certificate 79932

Source:	Umatilla River
Irrigable acres:	46.25
Rate:	.58 cfs
Duty:	4.5 a.f./acre
Priority date:	4/14/1893

WESTLAND IRRIGATION DISTRICT
Mike Wick, Manager
P.O. Box 944
Hermiston, OR 97838
(541) 667-2030

Irrigated Acres: 14,680

Certificate 76715

Source:	Umatilla River
Irrigable acres:	2,649.6 primary
Rate:	33.1 cfs
Duty:	1/80th of 1 cfs per acre
Season flows:	March 1 to November 1
Priority date:	3/14/1903

Certificate 76717

Source:	Umatilla River
Irrigable acres:	4,151.2 primary
Rate:	51.9 cfs
Duty:	1/80th of 1 cfs per acre
Seasonal flows:	March 1 to November 1
Priority date:	7/31/1907

Certificate 76799

Source:	Umatilla Reservoir; and McKay Reservoir, McKay Creek
Irrigable acres:	1,416.8 primary
Rate:	35.12 cfs
Duty:	4.5 a.f./acre
Season:	March 1 to November 1
Priority date:	4/12/1961

Certificate 79439

Source:	Umatilla Reservoir; and McKay Reservoir, McKay Creek
Irrigable acres:	12,832.6 supplemental
Storage facility:	McKay Reservoir, up to 73,250 a.f.
Duty:	1/80th of 1 cfs per acre
Priority date:	7/1/1924

Miscellaneous smaller certificated rights (8 small certificates)

Primary	3.8 acres	Supplemental	173.7	Priority	4/15/1970
	17.0				5/19/1963
	61.6				3/14/1903
	160.0				2/23/1976
	67.0				7/31/1981
	117.0				12/31/1900
	101.2				7/31/1907
	2.7				7/31/1907

NOTES

The U.S. Department of Energy shows a potential hydropower project on McKay Reservoir of 1.55 MW capacity. The reservoir application filed for the development of the reservoir is available in the record providing height, outlet works dimensions, etc.

Irrigation Water Providers of Oregon

Appendix C

BLACK ROCK
CONSULTING

March 24, 2010

Baker Valley Irrigation District
3895 10th Street
Baker City, Oregon 97814-1424

RE: PRELIMINARY EVALUATION OF HYDROELECTRIC POWER GENERATION POTENTIAL
Energy Trust of Oregon

Dear Manager:

Jan Lee and I are working on behalf of Energy Trust of Oregon to identify which Districts in Oregon may have hydroelectric power generation potential. This program has been established to provide incentives and to assist you with developing your potential energy site(s). Following our review of water right records from the Oregon Water Resources Department, your district has been short-listed for further review.

Included in this package are:

1) Details of the Energy Trust of Oregon program for Irrigation related entities
2) ETO Support of Irrigation Districts and Agricultural Irrigators
3) Questionnaire to support analysis of your hydropower project(s) potential
4) Analysis of your water rights as obtained from state records

What we would like you to do:

1) Please take a few minutes to review this information and provide any answers that are at your fingertips for the questions in the attached questionnaire. We understand the value of your time and would not ask you to fill this out if it was not imperative in determining your hydro potential.
2) Fax or mail the answered questionnaire back to the fax number or address shown on the questionnaire.

What we will do:

1) Follow-up within 10 days to assist you with answering any remaining questions or to respond to any other questions that you may have about this project.
2) Upon receipt of your completed questionnaire, we will make a secondary evaluation of the potential for hydroelectric power generation and may call for a second interview if needed.
3) We will schedule a site visit for locations that appear to have the potential for 1MW or more of power generation.
4) We will prepare a report to Energy Trust in June, 2010 summarizing our findings on potential irrigation hydropower generation projects across Oregon.

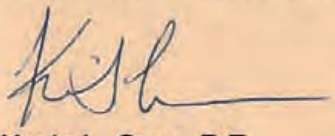
20380 Halfway Road Suite #1
Bend, Oregon 97701
(541) 480-6257 (866) 591-1513 Fax

Energy Trust plans to review our findings and encourage further feasibility work and development activities on the potential projects that are identified.

Thank you for your input in completing the questionnaire and returning it to us by April 12.
We look forward to talking with you in the near future.

Sincerely,

BLACK ROCK CONSULTING



Kevin L. Crew, P.E.
Principal
(541) 480-6257

Survey Questions

General Information

1) Number of water users in your district _____ ***Users***

Canals

1) Please review our analysis of your water rights and confirm any differences and advise if the Numbers are not correct. (Enclosure)

2) What is the flow at your main point of diversion or main canal, the point where you have the largest water flow available? _____ ***cfs***

3) Is there a gauging station at that point of diversion? If so, what is the USGS number of the station? _____ ***Gauging Station #***

4) From that point where the highest flow is diverted, what is the approximate elevation drop between the diversion and the lowest point of that canal? If this is not evident or available from a topography map of your district, we can work with you to make that determination. _____ ***Elevation drop***

5) What is the approximate length of your main canal or the canal coming off your point of diversion with greatest flow? _____ ***Canal length***

6) What are the flows in your other canals or major laterals? ***Please list on reverse or on an attached page.***

7) Approximately how close are the nearest power poles to the largest diversion canal? _____ ***Feet or miles***

8) What utility or utilities provide power within your district boundaries? In some cases there will be more than one utility providing service.
_____***Utility(s)***

9) Is there a fishscreen on your main canal or other canals with a direct diversion from the river? ***Yes___ NO___***

Reservoirs

1) If you have a reservoir, what is the flow at the outlet? If there is a gauging station at the outlet and you can provide the station number, we can calculate that information.
Flow in cfs_____ (average)
Gauging Station No._____

2) What is the approximate elevation difference from the average water surface to the outlet?
Elevation_____

3) Does the reservoir have a fish passage structure? ***Yes____ No____***

4) What is the average diversion per year from your storage facility(s)? ***Acre feet_____***

Federal Contract

1) Do you have a contract with the Bureau of Reclamation for operation of your delivery system?
Yes____ No____

2) Do you have a reservoir to which Reclamation holds title? ***Yes____ No____***

3) Does your contract provide subsidized power rates from the federal government from either a federal facility or BPA? ***Yes____ No____***

4) Has Reclamation performed any hydropower review on your facilities or reservoir to your knowledge? ***Yes____ No____***

Existing Studies or Information

1) Are you aware of any studies developed on your district facilities for potential power projects? ***Yes____ No____***

Project Constraints

1) If you had financial assistance to develop a hydropower project in your district, would you have an interest in pursuing a project? ***Yes____ No____***

2) Do you have staff that could assist in project development, such as permitting, field analysis, etc.,? ***Yes____ No____***

3) Would you be willing to proceed with a project if assistance is provided? ***Yes____ No____***

4) What constraints do you envision that would impact your proceeding with a project on your system?

5) Are there species present which are listed under the Endangered Species Act? ***Yes____ No____***

Please contact us if you have questions that need to be answered:

BLACK ROCK CONSULTING: Kevin Crew (541) 480-6257 Jan Lee (503) 545-9420

SUPPORT FOR IRRIGATION DISTRICTS AND AGRICULTURAL IRRIGATORS

Energy Trust of Oregon is working with Oregon's farming and ranching communities on projects that can deliver energy and jobs while preserving an important part of our state's rural heritage.

Energy Trust provides resources and cash incentives to help irrigators install hydroelectric systems utilizing existing irrigation and water delivery infrastructure. Hydroelectric installations are an excellent renewable energy option. The systems are capable of functioning in tandem with water conservation measures and can provide significant revenue opportunities.

Energy Trust support for hydroelectricity

1. Project development assistance:
Energy Trust may provide support for expert project development assistance including, but not limited, to the following: grant writing assistance, feasibility studies, final design, permitting, utility interconnection, construction management, etc. Energy Trust may pay up to 50 percent of the cost of hiring a consultant to provide expert assistance for these activities, up to a maximum of $40,000.

2. Cash incentives for hydroelectric system installations:
Energy Trust may provide financial support for a project's "above-market costs." Above-market costs are the difference between a project's revenues and costs, both upfront and ongoing. Energy Trust attempts to help project developers earn a reasonable rate of return on their investments, and expects that sound projects should achieve payback periods of seven to 10 years.

To be eligible, projects must be less than 20 megawatts in nameplate capacity and must deliver power to either Portland General Electric or Pacific Power. Hydroelectric projects cannot be located in an environmentally protected area as defined by the Northwest Power and Conservation Council or any other federal or State entity.

EXAMPLE OF ENERGY TRUST SUPPORT FOR HYDROELECTRIC DEVELOPMENT:

Central Oregon Irrigation District:
3.27 MW hydro system

The Central Oregon Irrigation District manages the Pilot Butte Canal, which runs for 22 miles from Bend to Terrebonne. COID is in the process of piping more than two miles of canal and installing two, 2.5 MW hydroelectric turbines that will operate together at 3.27 MW capacity.

The piping project will eliminate water loss through the canal and place 20 cubic feet per second of water permanently in the Deschutes River. The generator will run for 180 days during the irrigation season, from mid-April to mid-October. The project's total costs of $22.3 million will be reduced by $7 million in grants related to water conservation and a $1 million Energy Trust incentive.

The project is scheduled for completion in October 2010 and is expected to sell 13,435 megawatt hours of electricity to Pacific Power each year.

Energy Trust of Oregon

More examples:

Spaur Ranch 11-kilowatt irrigation system hydro feasibility study

The Spaur Ranch irrigates 160 acres outside of Wallowa, Oregon. The ranch's primary products are cattle and hay. The agricultural income is also supplemented by operating a vehicle renovation business on-site. This study examined the financial and technical feasibility of using the potential hydropower available at the ranch to generate electricity.

The study determined that irrigation water flowing through a 10-inch pipeline could operate an 11 kW Pelton wheel turbine. The flow of irrigation water through the pipe varies between 0.5 and 2 cfs over the course of the year. The amount of power that could be produced would offset approximately 70 percent of the electrical consumption at the ranch.

The total cost of the feasibility study, which included a resource assessment, technology review, financial analysis and permitting requirements, was $7,500. Energy Trust co-funded 66 percent of the study's costs—slightly more than the usual 50 percent share—providing $5,000 to reduce costs to the ranch.

SWALLEY IRRIGATION DISTRICT 750 KW HYDRO SYSTEM

The Swalley Irrigation District transports water in a canal from Bend to south of Redmond. The district is piping five miles of the 12 mile canal for conservation purposes, permanently returning 27 cfs to the Deschutes River. The pipe will produce enough pressure to engage a 750 kW turbine, generating 2,752 MWh of electricity each year. The turbine will run during the irrigation season, from April 1 to October 31.

The project's total cost of $10.4 million was reduced through $4.2 million in grants related to its watershed benefits, a $916,000 incentive from Energy Trust and pass-through funds from an Oregon Business Energy Tax Credit. The project is expected to be completed in April 2010.

WE'RE HERE TO HELP

For more informaiton, visit **www.energytrust.org** or contact Jed Jorgensen at 503.445.7611 or email jed.jorgensen@energytrust.org.

Energy Trust of Oregon 851 SW Sixth Avenue, #1200, Portland, Oregon 97204 1.866.368.7878 503.546.6862 *fax* **energytrust.org**

Evaluation of Irrigation Water Provider Hydropower Potential and Energy Savings

Energy Trust of Oregon is an independent nonprofit organization dedicated to helping Oregonians benefit from saving energy and tapping renewable resources. Our services, cash incentives and solutions have helped customers of Portland General Electric, Pacific Power, NW Natural and Cascade Natural Gas save more than $440 million in energy costs. Our work keeps energy costs as low as possible and builds a sustainable energy future for Oregon.

Energy Trust of Oregon is now conducting an evaluation of the potential for hydropower project development and energy efficiency upgrades at irrigation districts, ditch companies, and other similar entities holding irrigation water rights in Oregon. Black Rock Consulting and Jan Lee were selected to perform this evaluation through a competitive RFP process.

Energy Trust wants to enable the development of additional hydropower projects greater than 1MW and less than 20MW in capacity. Our research indicates many potential projects may exist within irrigation water systems owned by entities that may need assistance to adequately study and develop them. Hydropower systems can represent significant revenue opportunities for irrigation districts.

The primary goal of this evaluation is a “scoping” level study of the state’s largest irrigation water users to enable future detailed feasibility work and subsequent development of hydropower projects greater than one megawatt (MW) in capacity, and capable of delivering power to Portland General Electric or PacifiCorp. Scoping, in this context, means identifying potentially viable generation projects, creating estimates of capacity in MW and power output potential in MWh, based upon available head and flow data, and creating rough estimates of project development costs.

Energy Trust seeks to identify the project sites with the greatest hydropower potential, whether new projects or incremental increases in an existing project’s capacity or availability. Following this evaluation, as budget allows, Energy Trust expects to make funds available to encourage further feasibility refinement and project development. Future efforts will be targeted to the best sites identified from the study that are able to deliver power to Portland General Electric or Pacific Power, either directly or through power wheeling.

Energy Trust is primarily interested in irrigation conduit projects that would be eligible for Federal Energy Regulatory Commission conduit exemptions. However, Energy Trust recognizes that the water providers participating in this evaluation may also utilize storage reservoirs. In those circumstances, the reservoir may also be evaluated for its hydropower potential or, if the reservoir is already powered, for a capacity or generation system efficiency upgrade. Energy Trust is not interested in existing system rehabilitation that will not result in additional generation or capacity, or in studying aquifer storage and recovery systems, pumped storage, or any new potential projects not utilizing existing irrigation water rights.

The secondary goal of this evaluation is to identify potential energy efficiency upgrade projects, either in delivery systems or in end-user equipment, but only among the water users participating in this evaluation whose electricity is provided by Portland General Electric or PacifiCorp. Energy Trust currently supports irrigation efficiency through standardized and custom incentives for projects resulting energy savings from upgrades to pumping systems or other equipment replacements.

Energy Trust looks forward to and thanks you for your participation in this study. Any questions can be directed to Jed Jorgensen at 503.445.7611 or jed.jorgensen@energytrust.org.

Sincerely,

Jed Jorgensen

BAKER VALLEY IRRIGATION DISTRICT
Jeff Colton, Manager
P.O. Box 127
Baker, Oregon 97814
(541) 523-5451

Acres irrigated: 18,579.05

Primary Certificate 80460

Source:	Powder River, tributary of Snake River
Irrigable acres:	1686.95
Rate:	42.2 cfs
Duty:	3.5 a.f./acre
Seasonal flows:	consistent throughout season at same rate
Priority date:	3/1905

Supplemental Certificate 73605

Source:	Powder River, tributary of Snake River
Irrigable acres:	3,411.6
Rate:	58 cfs
Duty:	up to 3.5 a.f./acre when combined with primary right
Seasonal flows:	consistent throughout season at same rate
Priority date:	4/19/79

Primary and Supplemental Certificate 73610

Source:	Powder River, tributary of Snake River
Storage facility:	Phillips Lake
Irrigable acres:	2,998.7 primary 14,323.8 acres supplemental
Rate:	74.35 cfs
Duty:	3.5 a.f./acre maximum when combining primary and supplemental storage not to exceed 64,400 a.f.
Seasonal flows:	consistent throughout season at same rate
Priority date:	6/19/58

Primary and Supplemental Certificate 73406

Source:	Powder River, tributary of Snake River
Irrigable acres:	676.9 primary 71.7 supplemental
Rate:	not defined
Duty:	1 cfs to 80 acres
Seasonal flows:	consistent throughout season at same rate
Priority:	1910-1928 based on 10 different canal locations

Primary and Supplemental Certificate 73999

Source:	Powder River, tributary of Snake River
Storage facility:	Mason Dam
Irrigable acres:	2,636.05 primary

	9,644.85 supplemental
Rate:	92.0 cfs
Duty:	up to 3.5 a.f./acre
Seasonal flows:	consistent rate March 1 – July 30
Priority:	4/26/82

Notes

Potential hydropower on Mason Dam, a federally owned facility without power:

Mason Dam - 173' high, crest of 895 feet

Phillips Lake Reservoir behind the dam covers 2,235 acres with a capacity of 95,500 a.f.

Bureau of Reclamation report indicates Mason Dam would provide 2.6 MW if power is added.

The Lilley Pumping Plant (4 vertical-shaft turbine-type pumps operating at 68 cfs serving 3,450 acres of water) and the Lilley Relift Pumping Plant (3 vertical-shaft turbine-type pumps operating at 34 cfs and serving 670 acres) also provide potential for hydropower development.

Irrigation Water Providers of Oregon

Appendix D

Irrigation Water Providers of Oregon

IRRIGATION WATER PROVIDER	Number of Users	Main Diversion Flow/cfs	Gauging Station No.	Elevation Drop Main Canal/Ft.	Main Canal Length Miles	Utility Service Area	Fishscreen	Reservoir Data	Federal Contract	Existing Studies	Interest to Pursue	Staff Support	Proceed w/support	ESA Listings	Notes/Decision to Perform Site Visit
Arnold Irrigation Dist	690	150			12	Central Elec. & PacifiCorp	Yes	Federal	No	No	Yes	Yes	Yes	Yes	No appreciable head in system Below MW target Site visit not performed
Baker Valley Irrigation Dist	178	70		80				Mason Dam	Yes	Yes	Yes	No	Yes	Yes	Mason dam only potential project already under development. Site visit not performed
Burnt River Irrigation Dist	75	100-350	13273000 at reservoir			Idaho Power	No	350 cfs 50' high 40,000 a.f.	Yes	No	Yes	Yes	Yes	No	Potential Project Performed site visit
Central Oregon Irrigation Dist	3,600	520		800/PBC 400/CO	32/PBC 45/CO	Central Elec. & PacifiCorp	Yes	Crane Prairie 200 cfs/20' hi	Yes reservoir	Yes	Yes	Yes	Yes	HCP*	Several potential projects Performed site visit
Columbia Improvement Dist	6	312	none	20	1.25	Umatilla Coop	No			No	Yes	No	Yes	Not sure	Several potential projects Performed site visit
Eagle Point Irrigation Dist										Yes					All potential developed in district Private landowner project previously evaluated Site visit not performed
Grants Pass Irrigation Dist	8,500	59			15	PacifiCorp	No			No	Yes	Yes	Yes	Yes	Small potential projet under study Review by district. Below MW target. Site visit not performed
Greenberry Irrigation Dist	3	70													No head available All system water pumped Site visit not performed
Hermiston Irrigation Dist	1,170	135			8	Umatilla Coop	Yes	135 cfs/40' 44,000 a.f.	Yes	No	Yes	No	Yes	No	Several potential projects Performed site visit
Jordan Valley Irrigation Dist	20	1000 a.f./day	Yes	100		Idaho Power	No	Yes - USBR	Yes	No	Yes	No	Yes	No	District chose to not allow site visit Believed storage too erratic Site visit not performed
Lakeview Water Users, Inc.	128	200	No	30	20	Surprise Valley Elec.	No	200 cfs 40,000 a.f.	No	Yes	Yes	No	Yes	Unknown	Potential project Performed site visit
Meadows Drainage Dist									No	No	No				System supplied by pumps No appreciable head Site visit not performed
Medford Irrigation Dist															Manager indicated that previous evaluations performed. No feasible hydro potential exists Site visit not performed
Powder Vly. Wtr. Con. Dist	80	90	No	90	6	Oregon Trail	No	40 cfs/80'	No	No	Yes	Yes	Yes	Yes	Potential below study threshold. Site visit not performed

Survey Results Table

Irrigation Water Providers of Oregon

IRRIGATION WATER PROVIDER	Number of Users	Main Diversion Flow/cfs	Gauging Station No.	Elevation Drop Main Canal/Ft.	Main Canal Length Miles	Utility Service Area	Fishscreen	Reservoir Data	Federal Contract	Existing Studies	Interest to Pursue	Staff Support	Proceed w/support	ESA Listings	Notes/Decision to Perform Site Visit
Rogue River Valley Irrig. Dist	901	30			1.5	PacifiCorp	Yes	30 cfs/4300 af	Yes	No	Yes	Yes	Yes	Yes	Potential below study threshold Site visit not performed
Santiam Water Control Dist	425	1100	No	14-50	4.5	PacifiCorp/PGE	Yes	fedl. COE	Yes	No	Yes	Yes	Yes	Yes	Existing plant needs renovation Performed site visit
Sauvie Island	varies/yr	60	No	pretty flat	1	PacifiCorp	Yes	No	No	No	Yes	No	Yes	Yes	No appreciable head and inconsistent flows Site visit not performed
Sidney Irrigation Coop	109	53	No			PacifiCorp/PGE	No	fedl. COE	Yes	No	Yes	No	Yes	Yes	Potential project at outfall Performed site visit
Silver Lake	5	45	No	50	9.5	Coop	No	35 cfs/50' 15,000 a.f.	No	No	Yes	No	Yes	Not sure	Potential below study threshold Site visit not performed
Stanfield Irrigation Dist	270			flat		PacifiCorp & Umatilla Coop	Yes	90 cfs	Yes	No	Yes	Yes	Yes	Yes	Visited district to discuss joint Mckay Reservoir Project.
Talent Irrigation Dist	2,900	120		300	18	PacifiCorp	Yes	Yes/several	Yes	Yes	Yes	No	Yes	Yes	Previously evaluated HDR report included in study appendix
Teel Irrigation Dist	3 (9500 ac)	90	No			Umatilla Coop	Yes	pump from Westland	No	Yes Reservoir	Yes	No	Yes	Yes	Potential below study threshold Site visit not performed
Three Sisters Irrigation Dist	175	160	Yes	194	5	Central Elec.	Pending	No	No	Yes	Yes	Yes	Yes	Yes	Potential project identified Performed site visit
Tualatin Valley Irrigation Dist	360							raising reserv	Yes	Yes	No	No	No	Yes	Already pursing raising dam potential hydro Site visit not performed
Tumalo Irrigation Dist	655	175	TFC1/2			PacifiCorp and	Yes	28,000 a.f.	No	No	Yes	No	Yes	Yes	Potential sites identified Performed site visit
Vale Oregon Irrigation Dist	440	600		130	60	Central Elec. Idaho Power	No	120 cfs 400 cfs 60,000 a.f.	Yes	No	Yes	No	Yes	Yes	Potential site identified Performed site visit
Wallowa	41	40	No	150	0.2	PacifiCorp	No	No	No	No	Yes	No	Yes	Yes	Potential below study threshold Site visit not performed
West Extension Irrigation Dist	970	175	Hydromet			PacifiCorp &	Yes		Yes	Yes	Yes	No	Yes	Yes	Potential site identified Performed site visit
Westland Irrigation Dist	251	180	Yes		15	Umatilla Coop Umatilla Coop	Yes	McKay 150 cfs 142' hi	Yes	Yes	Yes	Yes	Yes	Yes	In district and Mckay reservoir projects identified Performed site visit

Survey Results Table

Irrigation Water Providers of Oregon

Appendix E

PRELIMINARY EVALUATION OF MICRO-HYDRO GENERATION IN THE TALENT IRRIGATION DISTRICT

EXECUTIVE SUMMARY

This report summarizes the results of the preliminary evaluation of hydropower generation in the Talent Irrigation District (TID). The purpose of the study was to determine the potential for micro-hydro generation at selected sites throughout the district. Site evaluation was based on flow, head, kW, hours of operation, and kWH. Where possible, the proximity of 3-phase power from PacifiCorp was also included in the evaluation.

Working with TID staff, HDR Engineering selected seven sites for evaluation. Cost escalation estimates for Emigrant Dam were also provided. Sites located on laterals along both the east and west sides were eliminated during conversations with TID staff. These sites provided minimal head, minimal flow, or had difficulties in irrigation flow management.

To evaluate the potential costs of site development, a series of assumptions were made[1]. Based on the assumptions and conditions at the site, four sites merit further in-depth evaluation: Howard Prairie, Ashland Canal, Dead Indian Siphon, and Payne Creek (see Table 1). At this time, three of the sites do not appear to represent viable cost-effective options for micro-hydro generation. The startup costs of Hyatt are high due to the cost of developing a penstock through the dam. These costs, coupled with the low power generation potential, make it unfavorable for further evaluation . Keene Creek also generates a small amount of power that, coupled with the low head and difficulty in site management, make it unfavorable for further evaluation. The West Canal site has significant head but low flows. Until the upper reaches of the West Canal are piped, this site will not represent a cost effective location for micro-hydro generation.

Power generation at Emigrant Dam was previously evaluated in 1983[2]. The parameters for the site included two penstocks. One penstock, with a 54 inch diameter, allows for flows of 180 cfs and would produce 1710 kW. The rated net head for this penstock is 125 feet. The smaller penstock, with a 24 inch diameter, allows for 20 cfs and would produce 270 kW. The rated net head for this penstock is 175 feet. The average annual energy production is 6,317,981 kWH. Most of the power would be generated between April and October.

[1] Assumptions are detailed in the Results section of the report introduction. See table 2.

[2] Emigrant Dam Hydroelectric Project. Ferc NO. 7829-000.

Table 1: Summary of power generation information at micro-hydro generation sites.

Site[3]	Flow (cfs)	Head (ft)	kW	Hours of Operation	kWH
Howard Prairie Reservoir	23 to 52	40	126	8,424	731,924
Ashland Canal	15, 40	130	308	8,424	1,751,827
Dead Indian Siphon	10	118	70	4,344	304,080
Payne Creek	20	100	119	4,392	521,085
Hyatt Reservoir	3 to 19	30	34	6,552	122,012
Keene Creek Reservoir	28 to 50	14	41	8,424	138,958
West Canal	4	245	58	4,392	255,332

[3] Sites in bold font represent those with excellent potential for micro-hydro generation.

PRELIMINARY EVALUATION OF MICRO-HYDRO GENERATION IN THE TALENT IRRIGATION DISTRICT

INTRODUCTION

Talent Irrigation District (TID) is interested in determining the feasibility of developing micro-hydro generation within their existing infrastructure and using existing water rights. This report is a preliminary evaluation of power benefits to determine if detailed examination at the selected sites is merited.

A general range of costs for each site examined has been determined as well as the power generation potential for each site. This information has been used to provide a preliminary estimate for capital and operation and management costs (O&M) as well as the amount of funds that could be generated at each site. This information has been used to develop a schedule for project payback (how long it will take for each site to pay for itself). This is based on the above calculated costs as well as the opportunities for tax and "green energy" incentives.

HDR worked with TID staff to select a series of potential locations to examine for potential power generation. Flow, hours of operation, amount of hydraulic head, land ownership, power interconnection potential, and irrigation operations were determined for each site to determine the feasibility of micro-hydro generation. Some sites, including laterals on the east and west sides, were eliminated from consideration due to limited flows, limited head or difficulties in managing irrigation flows. Seven locations were selected for evaluation: Howard Prairie Outlet Works, Ashland Canal near the upper reaches of Emigrant Reservoir, Dead Indian Siphon on the East Canal, the East Canal at Payne Creek, Hyatt Reservoir Outlet Works, Howard Prairie Delivery Canal at Keene Creek Reservoir, and a connection between the West Canal and the Talent Canal at the outlet of the Bear Creek Siphon (see Figure 1).

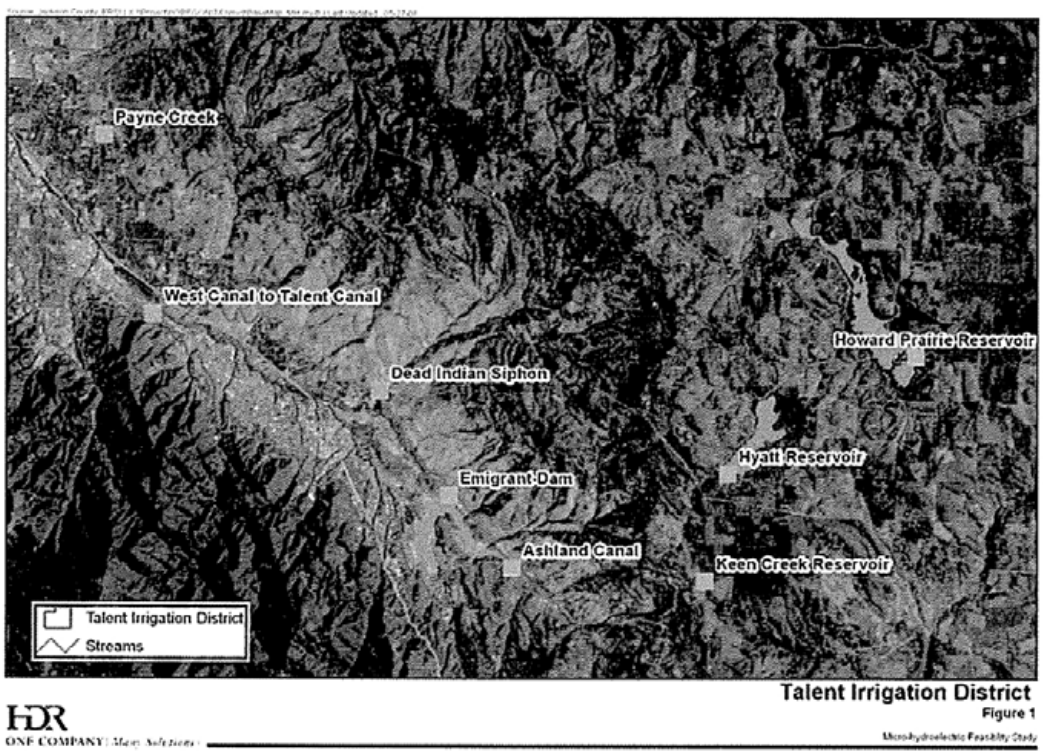


Figure 1: Location of sites evaluated for micro-hydro generation potential.

CREDITS AND INCENTIVES

The following information is the most current available but is subject to change each year. For a business energy tax credit from the state of Oregon, renewable resource projects that use hydroelectric must replace at least 10 percent of the electricity, oil, or gas used. The project must be under 10 MW or $20 million in costs. The energy can be used on site or sold. The project owner can be a public entity that partners with an Oregon business or resident using the pass-through option, with the partner receiving a lump sum payment. This allows an entity with no tax liability to take advantage of the business energy tax credit. The partner in this case could be TID's electricity provider, Pacific Power. The pass-through partner pays the project owner a lump sum payment, then receives a tax credit certificate. This tax credit was 35% of eligible project costs but is expected to increase up to 50%. The project owner must apply for the tax credit before the project starts.

The federal Renewable Electricity Production Tax Credit provided 10% or a maximum of $200 per kW generated using microturbines in 2007, but the credit changes yearly. If the project is financed in whole or in part by subsidized energy financing or by tax-exempt private activity bonds, the basis on which the credit is calculated must be reduced. This applies to small irrigation hydropower from 150 kW to 5 MW.

There are also funding options for development and construction of micro-hydro generation sites, including the Energy Trust. These funding sources can provide much

of the capital needed to develop and construct power generation facilities. For these funds, tax credits will not be available to the client.

For the purposes of this study, funding opportunities, incentives, and credits are assumed to range between 35% and 50%. These numbers will be used to determine a range of startup costs for each site. Please see appendix A for additional information.

POWER INTERCONNECTION

There are two options for how to use the power generated at the micro-hydro generation sites: power generation facility and net metering facility. With a power generation facility the generated power is sold back to PacifiCorp at the wholesale price. For this study, $0.07/kWhr was used. With net metering, the power is used by the client for their own purposes. The benefit of this is that you are effectively selling it at the retail rate, which for this study has been assumed to be $0.09 kWhr. There is the potential to receive higher rates for the sale of power to PacifiCorp if a site is registered as a licensed facility by the Federal Energy Regulation Commission (FERC). A FERC license is not required for micro-hydro generation sites. For more detailed information see Appendix B.

For the sites examined in this study, only Howard Prairie Outlet Works currently has the potential of using some of the generated power on site. The Howard Prairie Base is located within 0.25 miles of the outlet works and uses approximately 35,000 kWhr/yr. The site would generate over 700,000 kWhr/yr; therefore, the benefit of net metering would be limited.

Once a site has been selected for further study, the PacifiCorp area engineer would be contacted, at which time an initial Generation Interconnection Study would be conducted to determine the necessary site conditions, including line extension, transformers, relaying, and protection system modification. The cost of this study is approximately $500 - $2,000 per site. It will provide detailed costs for interconnection at the site. Each site will need to have 3 phase power available. Because of this, there will be a significant cost for sites with single phase power to upgrade to 3 phase power. PacifiCorp was contacted to get a rough cost estimate for connecting these sites to their grid. PacifiCorp is unable to provide a cost estimate without doing a Generation Interconnection Study for each site. The only cost estimate provided was a wide range of $50,000 to $500,000.

To complete an interconnection at a micro-hydro site, TID will need to develop multiple agreements with PacifiCorp, including interconnection, maintenance, and inspection agreements. Additionally, easements for PacifiCorp will need to be acquired for their access to the line extension. Access to the transformer will also need to be provided.

CONSTRUCTION COSTS

There are multiple costs that are involved in the construction and O&M of a micro-hydro generation site. It is assumed that each site will require a 15' x 15' concrete building for a control structure with no inside finishes, a basic metal roof, concrete slab, and double door entry. A cost of $45,000 has been assumed for the construction of this structure.

A generator and controls will be needed for each site. The generator will be sized for each site. Vendor information has been used for this.[4] A unit cost has been assumed for the installation of the generator and equipment, as well as a cost for a foundation, facility piping, and power wiring. For the cost of penstock pipe and any additional pipe needed for the construction of a generation system, TID has provided a unit cost per foot. The cost of the installation of the penstock is assumed to be the same as the cost of the penstock. These costs are detailed in the following site evaluation sections. TID staff provided approximate penstock length for each site.

It is assumed that operations and routine maintenance will be provided by TID staff. For the purposes of this study the cost of O&M is based on 1.5% of project costs with a 5% annual escalation.

PERMITS AND WATER RIGHTS

For all sites studied, the water to be used for generation is already being diverted for irrigation purposes. Each of these sites would be constructed within the existing irrigation infrastructure; therefore, it is possible that no new water rights will be needed. In locations where additional water would be diverted upstream from where it is currently diverted (thus reducing flows through a stream reach) Oregon Water Resources Department (OWRD) and Oregon Department of Fish and Wildlife (ODFW) will require a review and may require a new water right application. TID will be able to argue that they are using existing water rights appropriately as water used for power generation is still being used for irrigation. The potential for agency review is noted for each site in the following site evaluation sections.

SUMMARY OF RESULTS

Assumptions

Micro-hydropower generation was evaluated at seven sites within the TID infrastructure. Hydropower generation was also re-evaluated at Emigrant Dam. For these evaluations, a series of assumptions were made and applied to the analyses (see Table 2).

[4] Canyon Hydro - www.canyonhydro.com

Table 2: Assumptions used to determine economic feasibility of micro-hydro generation.

Assumption	Unit
Cost of building power control structure	$45,000
Cost of power interconnection	$50,000[5]
Rate ($/kWh) if used by TID	$0.09
Cost of Generation Equipment Connection	$50,000[6]
Rate ($/kWh) if sold to PacifiCorp	$0.07
Incentive rate	50%
O&M	1.5% of startup costs
O&M inflation	5%/year
Power rate inflation	5%/year
Power generation efficiency	70%
Interest rate on loans	0%
Easements	$0
Power generation equation	kW = (cfs * head (ft) * 0.7)/11.8

Results

Of the seven micro-hydro sites that were evaluated, four appear to be economically feasible and merit further investigation: Howard Prairie Reservoir, Ashland Canal, Payne Creek, and Dead Indian Siphon (see Table 3). The first two appear to be the most favorable options although there may be water right issues at the Ashland Canal site. Two of the sites, Hyatt Reservoir and Keene Creek, do not generate enough power to merit further study at this time. Additionally, the high cost of developing a penstock through the Hyatt Reservoir Dam further limits the feasibility of the Hyatt location. The feasibility of the West Canal location depends on the economic ability of TID to pipe the first 9,000 feet of the West Canal. Until the West Canal is piped, this site does not appear to be economically feasible. Power generation at Emigrant Dam appears economically feasible although a more in-depth revision of the economic aspects of the existing report should be conducted.

For this preliminary evaluation, the number of years to pay back the costs of the system is based on 0% interest loans. The costs of O&M and electricity have an assumed inflation rate of 5% annually. The replacement cost for the power generation equipment is assumed to be zero. Based on conversations with the vendor, with proper maintenance the generator and controls will function properly for decades.

[5] Except for the Howard Prairie site for which the interconnection cost is assumed to be $250,000.

[6] Includes Facility piping, installation of generation equipment, foundation, and power wiring.

Table 3: Cost and payback summary for potential hydro power generation sites.

Site	Startup Costs[7]	Power (kWH/yr)	Income (yr 1)	Years to Pay Back
Howard Prairie Reservoir	$420,498	731,924	$51,235[8]	9
Ashland Canal	$314,893	1,751,827	$122,628[9]	3
Dead Indian Siphon[10]	$194,391	304,080	$21,286	10
Payne Creek	$277,803	521,085	$36,476	8
Hyatt Reservoir	$153,985	122,012	$8,541	N/A[11]
Keene Creek	$146,019	138,958	$9,727	N/A[12]
West Canal	$193,631[13]	255,332	$17,873	12[14]
Emigrant Dam[15]	$8,064,960	6,317,981	$442,259	15

[7] Includes incentives.

[8] Based on all power being sold to PacifiCorp.

[9] Based on power generation for the entire year.

[10] Based on penstock parallel to siphon generating 118 feet of head.

[11] Startup costs do not include cost of generator and controls. This equipment is not available.

[12] Startup costs do not include cost of generator and controls. This equipment is not available.

[13] Does not include cost of piping first 9,000 feet of West Canal.

[14] Does not include cost of piping first 9,000 feet of West Canal.

[15] Based on multiplier applied to previously determined costs.

Howard Prairie Reservoir

Site Description

Power generation at this site would occur at the Outlet Works (see Figure 2). The existing pipe through the dam would be used as the penstock. The existing control structure would need to be modified to include the power generation equipment. The water would exit from the turbine into the Howard Prairie Delivery Canal. Flows would vary based on releases from the reservoir that are driven by flow requirements at the Greensprings Power Plant and irrigation demands.

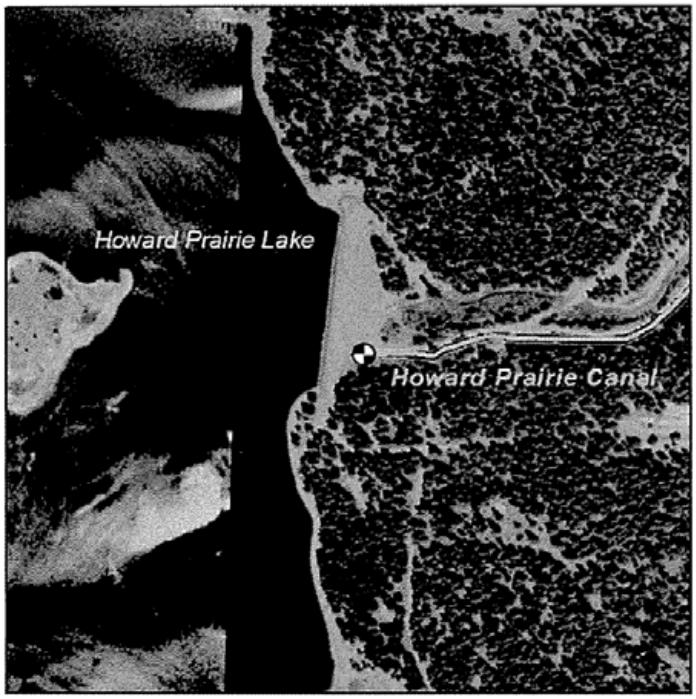


Figure 2: Howard Prairie power generation site location.

Flows

When flows are released the monthly average ranges from 27.6 cfs to 52.6 cfs (see Table 4). The system is shut down annually during maintenance activities at the Greensprings Power Plant; however, maintenance at Greensprings does not always occur at the same time every year.

Table 4: Summary of power generation at Howard Prairie.

Howard Prairie Outlet Works												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flows (cfs)	28.1	23.8	28.5	29.1	31.5	48.9	52.6	52.5	49.7	28.5	27.6	32.7
kW	67	57	68	70	75	117	126	126	119	68	66	78
kWh	49993	38245	50705	50102	56042	84192	93581	93403	85535	50705	47519	31903
Retail	$4,499	$3,442	$4,563	$4,509	$5,044	$7,577	$8,422	$8,406	$7,698	$4,563	$4,277	$2,871
Wholesale	$3,500	$2,677	$3,549	$3,507	$3,923	$5,893	$6,551	$6,538	$5,987	$3,549	$3,326	$2,233

Head

The Howard Prairie Reservoir outlet has a fixed elevation at 4,467.5 feet. The canal invert at the outlet is 4,472.5 feet. For this study, the canal invert elevation was used to determine head at this site; however, the surface elevation of the reservoir varies throughout the year. The average monthly reservoir elevation of 4,513 was used to calculate power generation potential for the entire year. The effective head used was 40.31 feet.

Power Interconnection

There is power available for interconnection within 0.25 miles; however, at this location, there is the potential of using some of the generated power at the Howard Prairie base.

Power Development Costs

Although there is already a control station at the canal head, it would need to be expanded to fit the needs for power generation. For this study it was assumed the same material and construction costs for the structure as if constructing a new building solely for power generation. For this site there will be no penstock cost as the existing pipe through the dam would be used (see Table 5).

Table 5: Cost for development of Power generation facilities at Howard Prairie.

Item	Cost
Operations Structure	$45,000
Penstock Connection	$15,000
Generation Equipment	$250,000
Equipment Connection	$50,000
Interconnection	$250,000
Screening	$100,000
Design and Permitting	$106,500
Subtotal	$816,500
Incentives (50%)	$408,250
O&M (first year)	$12,248
Total	$420,498

Economic Feasibility

Power generation at the Howard Prairie Outlet would generate up to $65,873/yr if all the power was used; however, the Howard Prairie Base uses approximately 35,000 kW/year, which means that most of the power generated would have to be sold back to PacifiCorp (see Table 6). If all of the power is sold to PacifiCorp, it will take 9 years before the system pays for itself (see Table 7)

Table 6: Summary of power generation at Howard Prairie.

Item	Total
kW	126
kWhr/yr	731924
$$/yr if used	$65,873
$$/yr if sold	$51,235
Base kW/yr usage	35000
Remaining kW/yr	696924
$$/yr if used @ Base	$3,150
$$/yr if remaining sold	$48,785

Table 7: Economic payback analysis based on all power generated being sold to PacifiCorp.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Startup Costs	$408,250	$0	$0	$0	$0	$0	$0	$0
O&M	$12,248	$12,860	$13,503	$14,178	$14,887	$15,631	$16,413	$17,233
Income	$51,235	$53,796	$56,486	$59,311	$62,276	$65,390	$68,659	$72,092
Total	$369,263	$328,326	$285,343	$240,210	$192,821	$143,063	$90,816	$35,957

Permitting and Easements

Existing water rights should be appropriate for this site. The water will not leave the control of TID and no streamflows will be modified.

The proposed location of the power generation site is on Bureau of Reclamation property. It should be possible to acquire easements for the penstock and control structure.

Ashland Canal

Site Description

Power generation at this site would occur approximately 1.5 miles down canal from the headworks (see Figure 3). The penstock would run from the canal down to Emigrant Creek downstream of the intersection of Hwy. 66 and Buckhorn Springs Road. The exact location is not required for this study as the elevation difference is minimal from the road intersection to where Emigrant Creek empties into Emigrant Reservoir.

Figure 3: Ashland Canal power generation site location.

Flows

The flows at this site will be released from the Greensprings Power Plant and carried to the Ashland Canal. The flows will be carried approximately 1.5 miles down the canal where the micro-hydro generation penstock inlet will be located. The control structure will be located near the intersection of Hwy 66 and Buckhorn Springs Road. Flows will be available throughout the entire year except when the Greensprings Power Plant is not operating. From April 1st through October 1st flows will be 15 cfs. From October 1st through March 31st flows will be 40 cfs (see Table 8). When power generation is down during the irrigation season flows will either continue down the Ashland Canal or be bypassed via a spillway to Emigrant Creek. During the non-irrigation season, flows will not be diverted into the Ashland Canal when power generation is down. Flows will be bypassed to Emigrant Creek until the canal can be shut down.

Table 8: Summary of power generation at Ashland Canal.

Ashland Canal to Emigrant Creek												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flows (cfs)	40	40	40	15	15	15	15	15	15	40	40	40
kW	308	308	308	116	116	116	116	116	116	308	308	308
kWh	229505	207295	229505	83288	86064	83288	86064	86064	83288	229505	222102	125858
Retail	$20,655	$18,657	$20,655	$7,496	$7,746	$7,496	$7,746	$7,746	$7,496	$20,655	$19,989	$11,327
Wholesale	$16,065	$14,511	$16,065	$5,830	$6,025	$5,830	$6,025	$6,025	$5,830	$16,065	$15,547	$8,810

Head

The head for this site is 130 feet based on 5- foot contour maps provided by TID staff.

Power Interconnection

There is power available for interconnection within 0.5 miles. There are no likely options for selling the power at this location so it is assumed all power will be sold to PacifiCorp.

Power Development Costs

The estimate of power development costs assumes that generator and controls will be sized for both winter and irrigation season flows (see Table 9).

Table 9: Cost for development of power generation facilities at Ashland Canal.

Item	Cost
Operations Structure	$45,000
Penstock	$18,345
Penstock Installation	$18,345
Generation Equipment	$250,000
Equipment Installation	$50,000
Interconnection	$50,000
Screening	$100,000
Design and Permitting	$79,754
Subtotal	$611,444
Incentives (50%)	$305,722
O&M (first year)	$9,172
Total	$314,893

Economic Feasibility

Power generation at the Ashland Canal site could generate $157,664 per year if operated year-round (see Table 10), and pay for itself in 3 years (Table 12). Due to the potential difficulty of obtaining a water right to operate the plant during the non-irrigation season, this site might operate only during the irrigation season. If this occurs, it will generate $45,725 (see Table 11) per year and pay for itself in 10 years (Table 13).

Table 10: Summary of power generation for entire year at Ashland Canal.

Item	Total
kW	308
kWhr/yr	1751827
$$/yr if used	$157,664
$$/yr if sold	$122,628

Table 11: Summary of power generation during irrigation at Ashland Canal.

Item	Total
kW	116
kWhr/yr	508058
$$/yr if used	$45,725
$$/yr if sold	$35,564

Table 12: Economic payback analysis based on all power generated being sold to PacifiCorp (year-round operation).

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Startup Costs	$305,722	$0	$0	$0	$0	$0	$0	$0
O&M	$9,172	$9,630	$10,112	$10,617	$11,148	$11,706	$12,291	$12,905
Income	$122,628	$128,759	$135,197	$141,957	$149,055	$156,508	$164,333	$172,550
Total	$192,266	$73,136	$51,949	$183,289	$321,196	$465,998	$618,040	$777,684

Table 13: Economic payback analysis based on all power generated being sold to PacifiCorp (operated during irrigation season).

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Startup Costs	$305,722	$0	$0	$0	$0	$0	$0	$0
O&M	$9,172	$9,630	$10,112	$10,617	$11,148	$11,706	$12,291	$12,905
Income	$35,564	$37,342	$39,209	$41,170	$43,228	$45,390	$47,659	$50,042
Total	$279,329	$251,617	$222,520	$191,967	$159,887	$126,203	$90,835	$53,698

Permitting and Easements

At this site a new water right application may be necessary. Currently flows released from the Greensprings Power Plant spill into Emigrant Creek. With the construction of an Ashland Canal micro-hydro site, flows will be diverted past a reach of Emigrant Creek approximately 1.5 miles long. It may be possible to argue that the existing water right confirms that TID maintains control of the water after it is released; however, most of the power will be generated at this site during the non-irrigation season. This means that flows in Emigrant Creek from the Ashland Canal headworks to the micro-hydro generation site will be reduced by 40 cfs. OWRD and ODFW will likely require a review of water rights at this site and potentially require a new water right for power generation during the nonirrigation season.

The proposed location of the power generation site is on Bureau of Reclamation property. It should be possible to acquire easements for the penstock and control structure.

Dead Indian Siphon

Site Description

Power generation at this site would occur at the East Canal siphon under Walker Creek (see Figure 4). There are two options for locating the penstock: It could begin at the blowoff valve located on the invert of the siphon generating and effective head of 40 feet; or it could begin at the entrance to the siphon and exit down into Walker Creek, generating at least 118 feet of head.

Figure 4: Dead Indian siphon power generation site location. (Penstock originating at blowoff valve is shown in red.)

Flows

The flows at this site will be released into the East Canal and carried to the Dead Indian Siphon. The flows will be released through the existing 6" blowoff valve and carried to an adjacent power generation structure. The power generation flows are 10 cfs and are determined by the size of the blowoff valve and effective head of the siphon design. If the alternate penstock parallel to the siphon is used, flows exceeding 10 cfs would be available, limited only by the capacity of the East Canal above this site. Flows will be available April 1st through October 1st (see Table 14). When power generation is down, flows will either continue down the East Canal or will not be released to the East Canal.

Table 14: Summary of power generation at Dead Indian Siphon, based on 118 feet of head.

Dead Indian Siphon												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flows (cfs)	0	0	0	10	10	10	10	10	10	10	0	0
kW	0	0	0	70	70	70	70	70	70	70	0	0
kWh	0	0	0	30660	52080	50400	52080	52080	50400	16380	0	0
Retail	$0	$0	$0	$2,759	$4,687	$4,536	$4,687	$4,687	$4,536	$1,474	$0	$0
Wholesale	$0	$0	$0	$2,146	$3,646	$3,528	$3,646	$3,646	$3,528	$1,147	$0	$0

Head

The elevation difference for this site is 118 feet based on engineering drawings of the Dead Indian Siphon provided by TID staff. If the siphon is used as the penstock, losses due to the design of the siphon and blowoff valve reduce the effective head to approximately 40 feet. However, if a penstock is placed parallel to the siphon then entire 118 feet of head would be available.

Power Interconnection

There is power available for interconnection within 0.5 miles. There are no likely options for selling the power at this location; therefore, it is assumed all power will be sold to PacifiCorp.

Power Development Costs

The estimate of power development costs assumes that the penstock will be placed parallel to the existing siphon(see Table 15).

Table 15: Cost for development of power generation facilities at Dead Indian Siphon, based on 118 feet of head.

Item	Cost
Operations Structure	$45,000
Penstock	$4,112
Penstock Installation	$4,112
Generation Equipment	$100,000
Equipment Installation	$50,000
Interconnection	$50,000
Screening	$75,000
Design and Permitting	449,234
Subtotal	$377,458
Incentives (50%)	$188,729
O&M (first year)	$5,662
Total	$194,391

Economic Feasibility

Power generation at the Dead Indian Siphon site would generate up to $27,367 the first year based on 118 feet of head (see Table 16). If all power is sold to PacifiCorp, it will take 10 years before the system pays for itself (see Table 17).

Table 16: Summary of power generation at Dead Indian Siphon, based on 118 feet of head.

Item	Total
kW	70
kWhr/yr	304080
$$/yr if used	$27,367
$$/yr if sold	$21,286

Table 17: Economic payback analysis based on all power generated being sold to PacifiCorp, based on 118 feet of head.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Startup Costs	$188,729	$0	$0	$0	$0	$0	$0	$0
O&M	$5,662	$5,945	$6,242	$6,554	$6,882	$7,226	$7,587	$7,967
Income	$21,286	$22,350	$23,467	$24,641	$25,873	$27,166	$28,525	$29,951
Total	$173,105	$156,700	$139,475	$121,389	$102,398	$82,458	$61,520	$39,536

Permitting and Easements

At this location a new water right might be necessary. Flows from the control structure will be released into Walker Creek. Currently these flows are released into Bear Creek at Emigrant Dam to be collected at the Oak Street Diversion. This means that Bear Creek will effectively have reduced flows from Emigrant Dam to the mouth of Walker Creek. OWRD and ODFW may require a review of this site and eventually require a new water right.

The proposed location of the power generation site is on private property. It should be possible to acquire easements for the penstock and control structure.

Payne Creek

Site Description

Power generation at this site would occur on the East Canal where the canal intersects Payne Creek (see Figure 5). The penstock inlet would be located in the canal at the location closest to the current headworks in Payne Creek. The penstock outlet would be located at the headworks in Payne Creek.

Figure 5: Payne Creek power generation site location.

Flows

For the Payne Creek site, the flows are assumed to be 20 cfs from April 1st through October 1st based on conversation with TID staff (see Table 18). All of the water in the East Canal will pass through the penstock except for that needed to irrigate lands upstream of the power generation control building. When power generation is down, flows will continue down the East Canal and spill into Payne Creek using the existing configuration.

Table 18: Summary of power generation at Payne Creek.

Payne Creek												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flows (cfs)	0	0	0	20	20	20	20	20	20	0	0	0
kW	0	0	0	119	119	119	119	119	119	0	0	0
kWh	0	0	0	85424	88271	85424	88271	88271	85424	0	0	0
Retail	$0	$0	$0	$7,688	$7,944	$7,688	$7,944	$7,944	$7,688	$0	$0	$0
Wholesale	$0	$0	$0	$5,980	$6,179	$5,980	$6,179	$6,179	$5,980	$0	$0	$0

Head

The head for this site is 100 feet based on 5-foot contour maps provided by TID staff.

Power Interconnection

There is power available for interconnection within 0.5 miles. There are no likely options for selling the power at this location; therefore, it is assumed power will be sold to PacifiCorp.

Power Development Costs

The total estimated power development cost without incentives is $539,424 (see Table 19).

Table 19: Cost for development of power generation facilities at Payne Creek.

Item	Cost
Operations Structure	$45,000
Penstock	$19,532
Penstock Installation	$19,532
Generation Equipment	$185,000
Equipment Installation	$50,000
Interconnection	$50,000
Screening	$100,000
Design and Permitting	$70,360
Subtotal	$539,424
Incentives (50%)	$269,712
O&M (first year)	$8,091
Total	$277,803

Economic Feasibility

Power generation at the Payne Creek site would generate up to $46,898 the first year (see Table 20). If all power is sold to PacifiCorp, it will take 8 years before the system pays for itself (see Table 21).

Table 20: Summary of power generation at Payne Creek.

Item	Total
kW	119
kWhr/yr	521085
$$/yr if used	$46,898
$$/yr if sold	$36,476

Table 21: Economic payback analysis based on all power generated being sold to PacifiCorp.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Startup Costs	$269,712	$0	$0	$0	$0	$0	$0	$0
O&M	$8,091	$8,496	$8,921	$9,367	$9,835	$10,327	$10,843	$11,385
Income	$36,476	$38,300	$40,215	$42,225	$44,337	$46,554	$48,881	$51,325
Total	$241,327	$211,523	$180,229	$147,371	$112,869	$76,642	$38,604	$1,336

Permitting and Easements

Existing water rights should be appropriate for this site.

The proposed location of the power generation site is on private property. It should be possible to acquire easements for the penstock and control structure.

Hyatt Reservoir

Site Description

Power generation at this site would occur at the Hyatt Reservoir Outlet Works (see Figure 6). The penstock would be placed through the existing tunnel in the dam. Head at the site would be determined by the reservoir elevation. The existing structure would need to be modified to include the generation and control facilities.

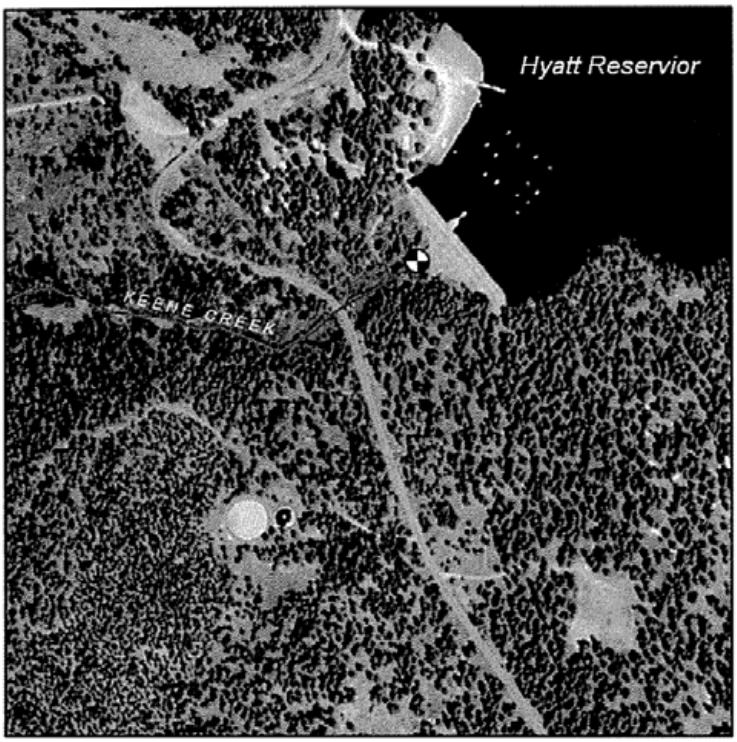


Figure 6: Hyatt Reservoir power generation site location.

Flows

Hyatt Reservoir operates at full capacity April through September, discharging water into Keene Creek. When flows are released, the monthly average (from April through September) ranges from 10.8 cfs to 15.8 cfs (see Table 22). There are no releases during the rest of the year due to either limited storage supplies or the reservoir filling.

Table 22: Summary of power generation at Hyatt Reservoir.

Hyatt Outlet Works												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flows (cfs)	3.6	3.9	6.2	10.8	15.6	12.9	19.0	15.8	5.0	0.7	0.2	0.2
kW	6	7	11	19	28	23	34	28	9	1	0	0
kWh	4776	4688	8138	13802	20529	16468	24988	20821	6420	952	268	162
Retail	$430	$422	$732	$1,242	$1,848	$1,482	$2,249	$1,874	$578	$86	$24	$15
Wholesale	$334	$328	$570	$966	$1,437	$1,153	$1,749	$1,457	$449	$67	$19	$11

Head

The Hyatt Reservoir outlet has a fixed elevation at 4,981 feet. The canal invert at the outlet is 4,979 feet. For this study, the canal invert elevation was used to determine head at this site; however, the surface elevation of the reservoir varies throughout the year. The average monthly reservoir elevation of 5,009 was used to calculate power generation potential. This gives an effective head of 30 feet.

Power Interconnection

There are no likely options for selling the power at this location; therefore, it is assumed all power will be sold to PacifiCorp.

Power Development Costs

Although there is already a control station at the canal head, it would need to be expanded to fit the needs for power generation. For this study, the same material and construction costs for the structure was assumed as if constructing a new building solely for power generation. *The amount of power generated at this site is not large enough for Canyon Hydro to design and build a generator and controls. Because of this and the extremely small amount of power that would be generated, it is not advisable to evaluate this site further.* Additionally, for this site a pipe would need to be installed through the existing horseshoe-shaped tunnel (200 feet long and 3 feet in diameter) to provide pressure rating. It would be possible, due to the horseshoe shape of the existing tunnel, to install one or more small pipes above the 3-foot-diameter pipe.

Economic Feasibility

Because of the limited potential for power generation at this site, it should not be considered for further evaluation at this time (see Table 23).

Table 23: Summary of power generation at Hyatt Reservoir.

Item	Total
kW	34
kWhr/yr	122012
$$/yr if used	$10,981
$$/yr if sold	$8,541

Permitting and Easements

Existing water rights should be appropriate for this site. The water will not leave the control of TID and no streamflows will be negatively impacted.

The proposed location of the power generation site is on Bureau of Reclamation property. It should be possible to acquire easements for the penstock and control structure.

Keene Creek Reservoir

Site Description

Power generation at this site would occur at the outlet of the Howard Prairie Delivery Canal where it spills into Keene Creek Reservoir (see Figure 7). Head would be determined by the elevation of the reservoir. The penstock inlet would be located in the Delivery Canal.

Figure 7: Keene Creek Reservoir power generation site location.

Flows

The flows to be used for power generation at Keene Creek Reservoir are those from the Howard Prairie Delivery Canal. Flows are available year-round and range from 28.1 cfs to 49.9 cfs (see Table 24).

Table 24: Summary of power generation at Keene Creek Reservoir.

Keene Creek Reservoir												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flows (cfs)	33.2	30.6	37.2	41.5	42.5	47.7	49.9	48.2	45.8	35.42	28.1	32.6
kW	28	25	31	34	35	40	41	40	38	29	23	27
kWh	20514	17078	22986	24816	26261	28523	30833	29783	27387	21886	16803	11046
Retail	$1,846	$1,537	$2,069	$2,233	$2,363	$2,567	$2,775	$2,680	$2,465	$1,970	$1,512	$994
Wholesale	$1,436	$1,195	$1,609	$1,737	$1,838	$1,997	$2,158	$2,085	$1,917	$1,532	$1,176	$773

Head

For the Keene Creek Reservoir site, the Howard Prairie Delivery Canal outlet has a fixed elevation at 4,407 feet. For the operation at this site, the head would be the difference between the canal outlet and the surface elevation of the reservoir. Assuming the generator would need to be above the surface elevation of the reservoir, power generation could only occur when the reservoir elevation was lower than the generator. For this site the mean reservoir elevation was used (approximately 4,393). This would provide 14 feet of head; however, whenever the reservoir elevation exceeds 4393, the generator would have to be sealed, power generation would have to cease and Howard Prairie Delivery Canal water would have to bypass the penstock into the reservoir. *At this time, this site is unlikely to merit consideration due to the above details.* The potential power generation and costs are provided using a head of 14 feet.

Power Interconnection

There is available power for interconnection within 0.25 miles. There are no likely options for selling the power at this location; therefore, it is assumed that net metering will occur.

Power Development Costs

Because of the modicum of kW generated, Canyon Hydro cannot build a generator and controls for this site.

Economic Feasibility

Power generation at this location is not economically feasible due to the limited amount of power generated at the site (see Table 25).

Table 25: Summary of power generation at Keene Creek Reservoir.

Item	Total
kW	21
kWhr/yr	138958
$$/yr if used	$12,506
$$/yr if sold	$9,727

Permitting and Easements

Existing water rights should be appropriate for this site. The water will not leave the control of TID and no streamflows will be modified.

The proposed location of the power generation site is on Bureau of Reclamation property. It should be possible to acquire easements for the penstock and control structure.

West Canal to Talent Canal

Site Description

Power generation at this site would occur approximately 9,000 feet down the West Canal from the outlet of the Billings Siphon. The penstock inlet would be located in the West Canal and run downhill to the Talent Canal just down-canal from the outlet of the Bear Creek Siphon (see Figure 8).

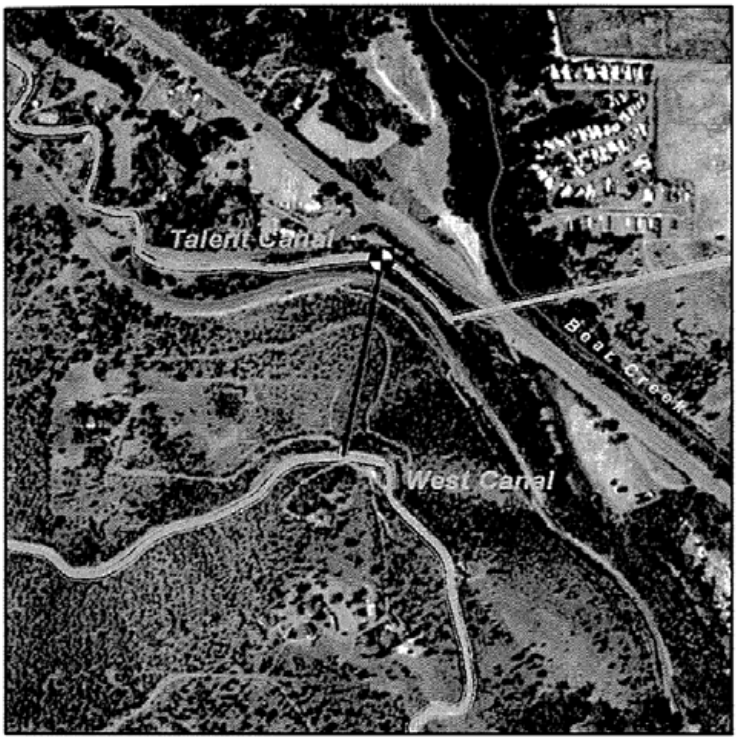


Figure 8: West Canal to Talent Canal power generation site location.

Flows

For the West Canal to Talent Canal site, the available flows are assumed to be 4 cfs from April 1st through October 1st based on conversation with TID staff (see Table 26). When power generation is down, additional flows would either continue down the West Canal or would not be delivered to the West Canal via the Billings Siphon. The control structure would be located adjacent to the outlet of the Bear Creek Siphon.

Table 26: Summary of power generation at the West Canal.

West Canal to Talent Canal												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flows (cfs)	0	0	0	4	4	4	4	4	4	0	0	0
kW	0	0	0	58	58	58	58	58	58	0	0	0
kWh	0	0	0	41858	43253	41858	43253	43253	41858	0	0	0
Retail	$0	$0	$0	$3,767	$3,893	$3,767	$3,893	$3,893	$3,767	$0	$0	$0
Wholesale	$0	$0	$0	$2,930	$3,028	$2,930	$3,028	$3,028	$2,930	$0	$0	$0

Head
The head for this site is 245 feet based on 5-foot contour maps provided by TID staff.

Power Interconnection
There is power available for interconnection within 0.25 miles. There are no likely options for selling the power at this location; therefore, it is assumed all power will be sold to PacifiCorp.

Power Development Costs
For the 4 cfs to be delivered to the penstock inlet, the West Canal would need to be piped from the outlet of the Billings Siphon to the penstock inlet (9,000 feet) to carry the additional flow. For this site the cost to develop power has been calculated for two scenarios: (1) the piping of the first 9,000 feet of the West Canal is part of the micro-hydro project (see Table 27), and (2) the piping of the West Canal is not part of the micro-hydro project (see Table 28). The O&M estimate does not include the cost of the pipe for the West Canal.

Table 27: Cost for development of power generation facilities at the West Canal, including piping of West Canal

Item	Cost
Operations Structure	$45,000
Penstock	$8,471
Penstock Installation	$8,471
Pipe (canal)	$333,810
Pipe (canal) Installation	$333,810
Generation Equipment	$90,000
Equipment Installation	$50,000
Interconnection	$50,000
Screening	$75,000
Design and Permitting	$149,184
Subtotal	$1,143,746
Incentives (50%)	$571,873
O&M (first year)	$12,149
Total	$584,022

Table 28: Cost for development of power generation facilities at the West Canal, not including piping of West Canal

Item	Cost
Operations Structure	$45,000
Penstock	$8,471
Penstock Installation	$8,471
Pipe (canal)	N/A
Pipe (canal) Installation	N/A
Generation Equipment	$90,000
Equipment Installation	$50,000
Interconnection	$50,000
Screening	$75,000
Design and Permitting	$49,041
Subtotal	$375,983
Incentives (50%)	$187,992
O&M (first year)	$5,640
Total	$193,631

Economic Feasibility
Power generation at the West Canal site would generate up to $22,980 the first year (see Table 29). If the piping of the West Canal is part of the startup costs, it will take 37 years before the system pays for itself (see Table 30). If it is not considered part of the startup costs, it will take 12 years for the system to pay for itself (see Table 31). Because the O&M and income rates are the same under both scenarios, the total income will always be larger in the West Canal non-piping scenario.

Table 29: Summary of power generation at West Canal.

Item	Total
kW	58
kWhr/yr	255332
$$/yr if used	$22,980
$$/yr if sold	$17,873

Table 30: Economic payback analysis based on all power generated being sold to PacifiCorp, including the piping of the West Canal as part of the micro-hydro project.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Startup Costs	$571,873	$0	$0	$0	$0	$0	$0	$0
O&M	$12,149	$12,756	$13,394	$14,064	$14,767	$15,506	$16,281	$17,095
Income	$17,873	$18,767	$19,705	$20,690	$21,725	$22,811	$23,952	$25,149
Total	$566,149	$560,138	$553,828	$547,201	$540,243	$532,938	$525,267	$517,212

Table 31: Economic payback analysis based on all power generated being sold to PacifiCorp, not including the piping of the West Canal as part of the micro-hydro project.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Startup Costs	$187,992	$0	$0	$0	$0	$0	$0	$0
O&M	$5,640	$5,922	$6,218	$6,529	$6,855	$7,198	$7,558	$7,936
Income	$17,873	$18,767	$19,705	$20,690	$21,725	$22,811	$23,952	$25,149
Total	$175,758	$162,913	$149,426	$135,264	$120,394	$104,781	$88,387	$71,173

Permitting and Easements

At this location a new water right might be necessary. Flows from the control structure will be released into Talent Canal; however, the flows for power generation will come from the West Canal via the East Canal. This means that Bear Creek will effectively have reduced flows from Emigrant Dam to Oak Street Diversion. OWRD and ODFW may require a review of this site and eventually require a new water right.

The proposed location of the power generation site is on private property. It should be possible to acquire easements for the penstock and control structure.

Emigrant Dam

Power generation at Emigrant Dam has previously been analyzed in 1986 by CH2MHill Inc. For this study, the information provided in the document, "Emigrant Dam Hydroelectric Project FERC No. 7829-000," is assumed to still be accurate; however, the costs and payback rates are out of date and must be updated. This site power production exceeds 350 kW and therefore does not qualify as micro-hydro. For this study, a very basic economic feasibility was conducted using the information from the existing document for this site.

Based on the ENR Construction Cost Index, the cost today vs. 1986 would be an increase of 186%. This percentage actually comes from an index they track, which was 4,295 in 1986 and 8,109 in March of 2008. The construction costs for the site were $4,336,000 in 1986. For the purposes of this study the construction cost for the site were assumed to be approximately $8,065,000 (see Table 32). O&M costs are estimated at 1.5% of direct costs and are estimated to increase 5% annually.

Table 32: Cost escalation estimations for Emigrant Dam power generation facilities.

Year	Cost of Construction	Direct Costs	O&M (at 1.5% of Direct Costs)
1986	$4,336,000	$2,376,000	$35,640
2008	$8,064,960	$4,419,360	$66,290

The estimated average annual power production for Emigrant Dam is 6,317,981 kW per year. Using a payback rate of $0.05/kWhr and interest on any loans for the construction of the power generation facility, it would take 20 years before the system was paid off (see Table 33). In year 20, the income generated at the site, less the O&M costs, would be $630,000.

Table 33: Economic payback analysis based on all power generated being sold to PacifiCorp.

Year		1	2	3	4	5	6
O&M		$66,290	$69,605	$73,085	$76,739	$80,576	$84,605
Income		$315,899	$331,694	$348,279	$365,693	$383,977	$403,176
Total		$249,609	$262,089	$275,194	$288,953	$303,401	$318,571
Debt	$8,064,960	$7,815,351	$7,553,262	$7,278,069	$6,989,116	$6,685,715	$6,367,144

APPENDIX A – TAX CREDIT INFORMATION

From http://www.fwee.org/news/getStory?story=1556

The state currently offers businesses energy tax credits for hydropower projects under 1 MW and $10 million. Once a project is approved for the program, the districts can enter into an agreement with the state and a private company. The company gets a tax credit in return for giving money back to the district, which can't take the tax credit itself since it doesn't pay taxes.

"It's somewhat a partnership between private and public sectors, Johnson said.

But limiting the program to projects under 1 MW excludes a lot of projects, especially small wind or biomass facilities, he said. Under new legislation that passed unanimously in the Oregon House last week and will be considered by the Senate, the size of eligible projects will increase to 10 MW and $20 million in costs. The size of the tax credit would also increase to between 35 percent and 50 percent, depending on the size of the project, he said.

For the Central Oregon Irrigation District's $20 million project, about $7 million would come from the business energy tax credit, he said, and then the revenue from selling the hydropower to a power company is expected to pay for 60 percent of the remainder.

"Twenty million, because it's hydro, has all of a sudden become five, so that's a much more doable thing, Johnson said. If things go smoothly, he said he hopes to staff the project in fall 2008 and complete it in spring 2009, however it could also be pushed back a year.

Swalley – which will start its piping project either later this month or in the fall, and should have the hydropower facility up and running in spring 2008 – already has a tax credit agreement with the Bank of the Cascades, Lee said.

In addition to the tax credit legislation, another bill would make it cheaper and quicker for organizations that already have a water right to get a permit for using water to generate power, she said. While it currently takes about two to three years to get a $4,000 permit, the legislation would shrink that to several months and $500.