

# RECLAMATION

*Managing Water in the West*

## Klamath Irrigation District – C-Drop Hydroelectric Project

Klamath Project, Oregon  
Mid Pacific Region

### Draft Finding of No Significant Impact



FONSI No.: KBAO-FONSI-11-006



Prepared by GeoSense, Idaho Falls, ID for the  
U.S. Department of the Interior  
Bureau of Reclamation

August 2011

## **FINDING OF NO SIGNIFICANT IMPACT**

### **Klamath Irrigation District C-Drop Hydroelectric Project**

#### **INTRODUCTION**

The United States Department of Interior Bureau of Reclamation (Reclamation) has prepared an Environmental Assessment (EA), dated June 2011 entitled *Klamath Irrigation District – C-Drop Hydroelectric Project*. This EA describes the environmental effects of granting a Lease of Power Privilege (LOPP) to construct a hydroelectric power generating facility on the Klamath Project's C-Canal. The EA was prepared to satisfy the procedural requirements of the National Environmental Policy Act (NEPA) (P.L. 91-190, as amended).

#### **PROPOSED ACTION**

The Bureau of Reclamation proposes to grant a LOPP to Klamath Irrigation District (KID) for development of a new hydroelectric generating plant at C-Crop on C-Canal. KID is located within Reclamation's Mid-Pacific Region, Klamath Project, in Klamath Falls, Oregon (Exhibit A). A LOPP is a congressionally authorized alternative to Federal Energy Regulatory Commission (FERC) licensing for hydroelectric power development. A LOPP grants to a non-Federal entity the right to utilize, consistent with Klamath Project purposes, water power head or storage at and/or operationally in conjunction with the C-Drop, for non-Federal electric power generation and sale by the entity. The general authority for LOPP under Reclamation law includes, among others, the Town Sites and Power Development Act of 1906 (43 U.S.C. 522) and the Reclamation Project Act of 1939 (43 U.S.C. 485h(c)) (1939 Act). A Reclamation Site Map for the project is included as Exhibit A. The proposed funding would be provided under the Drought Program which was established after the Reclamation States Emergency Drought Relief Act of 1991 was enacted.

The purpose of the Project is to grant a LOPP to construct, operate, maintain and produce power from a hydroelectric power generating facility at the C-Drop structure located on the Klamath Project's C-Canal. The facility is needed to promote development of clean and renewable energy sources for public utilization.

The proposed hydroelectric plant will consist of an intake structure, forebay, powerhouse containing generating equipment, and a 150 ft transmission line. The Project involves no new water diversion or water storage and does not modify the timing of water diversion or storage within the Klamath Project in any way. The facility is needed to promote development of clean and renewable energy sources for public utilization.

#### **MITIGATION MEASURES INCOPORTATED INTO THE PROPOSED ACTION**

The following mitigation measures would be implemented as part of the proposed action in order to minimize impacts to resources:

- Ground disturbing construction activities will be limited to the area within 100 ft of the C-Drop structure in order to avoid disturbance to known wetlands and to minimize disturbance of existing vegetation.

- The project will employ standard erosion control measures to prevent erosion and sedimentation. Measures would include dust abatement which would be achieved by applying a fine spray of water at rates sufficient to settle dust but not to cause runoff.
- Use of heavy equipment or other equipment with the potential to cause excessive noise disturbance would be limited to normal working hours unless prior approval has been obtained from Reclamation.
- All areas disturbed by construction would be re-contoured and re-seeded using a seed mixture beneficial to wildlife; the seed mixture would be approved by Reclamation prior to revegetation activities.
- The potential for hazardous material release from the project transformer would be minimized by locating the transformer on a concrete pad designed to contain the entire volume of cooling oil.
- If any previously undetected historic or archeological resources are discovered during construction all work potentially affecting the resource would cease immediately and Reclamation would be contacted for further direction.

## **SUMMARY OF EFFECTS**

The environmental impacts described and analyzed in the EA are not anticipated to have any significant adverse impacts on the human or natural environment. The effects and consequences to environmental categories with the potential to impact the human and natural environment were analyzed in the EA. Evidence of coordination with the appropriate Federal, state, and local agencies and their comments are also included in the EA and its appendices. The Finding of No Significant Impact is based upon the following:

**Surface Water Resources** – The Proposed Action would result in development of a hydroelectric facility that would be operated in a run-of-canal mode, meaning that power generation would utilize the water as currently delivered into C-Canal; the turbines would automatically adjust to any change in flow. Water releases into C-Canal would continue to be made based on irrigation demand only, as specified by KID's existing contracts. There would be no water storage structures associated with the plant. Because the proposed project does not create any new impoundment of water it would have no effect on water temperature, nutrients, pH or any other water quality parameters commonly modified by lake environments. The water quality downstream of the powerplant will be the same as the water quality entering the plant. Since the C-Drop project will eliminate water turbulence generated by free-falling water under existing conditions, the Project will have the potential to temporarily lower dissolved oxygen (DO) levels, which can adversely affect aquatic species. However, the existing fish screen on A-Canal, upstream of the proposed project site, prevents fish from entering C-Canal. The proposed project will employ small quantities of hydraulic and lubricating oils to operate the powerhouse turbines. The facility design will incorporate industry standard containment measures to prevent the release of any oils to the environment in the event of equipment leakage or failure. The final design plans will be reviewed by Reclamation to assure that containment measures are adequate.

In summary, the Proposed Action would not increase or decrease surface water flows compared with existing conditions. With industry standard design measures to contain any accidental

release of oils within the powerhouse, the Proposed Action would have no effects on water quality that could adversely affect aquatic resources. Overall, the Proposed Action would have no adverse impacts to surface water resources.

**Biological Resources** – The Proposed Action area is located within a disturbed context. Based on an analysis of current information on known existing populations and habitat requirements, no protected terrestrial species are expected to occur at the Project Site. Any impacts to botanical or wildlife resources that may occur would be temporary in nature and/or limited to the project area. Since canals exist and extend all around the project vicinity, any wildlife disrupted by temporary construction activities could relocate to nearby water sources.

The Project will not alter water flows from present conditions and will therefore not cause loss of any wetlands that depend on water leakage from canals. The closest wetland is approximately 900 ft from the C-Drop structure. Since construction activities will not extend this far from the structure, no existing wetlands would be disturbed.

The Proposed Action Alternative does not include activities at the proposed sites that could have an effect on migratory birds. Further, the proposed site possesses no habitat that would be conducive to use by migratory birds and the nearest documented bald eagle site is approximately 3.5 miles away.

The proposed Project would include a turbine that could potentially harm fish entrained in C-Canal. However, since the A-Canal fish screen prevents most fish from entering the canal the turbine represents little additional hazard to fisheries resources including shortnose sucker, Lost River sucker, and bull trout. This action and the operations of the facility are also covered under the 2008 U.S. Fish and Wildlife Service Biological Opinion that includes incidental take coverage for operations of the Klamath Project. Overall, no significant impacts to botanical or wildlife resources are expected as a result of the Proposed Action.

**Noise** – The Proposed Action would reduce the long term ambient noise level by eliminating cascading water at C-Drop. Water exiting the powerhouse would be energy depleted and would create little or no noise disturbance. Construction noise would be temporary in nature and would not significantly impact the human environment. The Project turbine/generator represents a new potential noise source. Turbine/generator noise analysis indicates that turbine/generator noise would become indistinguishable above background sound levels at a distance of about 100 – 200 ft from the powerhouse wall. At C-Drop, the nearest dwellings to the powerhouse site are located from 225 – 400 ft away from the proposed powerhouse location and have existing vegetative screening. On this basis turbine/generator noise is expected to be inaudible from any nearby dwellings. Therefore, with the elimination of cascading water, the overall project effect would be to reduce noise levels compared to existing conditions.

**Utilities and Infrastructure** – The Proposed Action would be constructed on a Reclamation canal that is used to deliver irrigation water to Klamath Irrigation District water users. The C-Canal is part of the Reclamation Klamath Project that supplies water to irrigated land within Klamath Irrigation District. The C-Canal is an essential element of the irrigation conveyance system of the Klamath Project. The proposed project design will preserve the full water conveyance capabilities of C-Canal and would therefore not result in any impacts to utilities or infrastructure.

**Cultural Resources** – The Proposed Action is the type of activity that has the potential to affect cultural resources within the project area. As a result, Reclamation must complete the process outlined in Section 106 of the National Historic Properties Act. Reclamation is continuing its consultation efforts with the Oregon State Historic Preservation Officer (SHPO). The project will not be implemented until receipt of concurrence from the Oregon SHPO or conclusion of the Section 106 process as outlined in the regulations at 36 CFR Part 800. If in consultation with the SHPO, an adverse effect determination is made, construction, including mobilization, may not proceed until Reclamation can resolve adverse effects to National Register eligible or listed cultural resources. SHPO concurrence on Reclamation's finding of no adverse effect to National Register eligible or listed cultural resource or resolution of adverse effects through avoidance, project modification, or mitigation will complete the Section 106 process and result in a Finding of No Significant Impact to cultural resources.

When construction activities are authorized, the project shall follow the inadvertent discovery process where, in the event of inadvertent discovery of cultural resources, Reclamation must be contacted immediately to conduct a post review discovery analysis as outlined in the Section 106 regulations at 36 CFR Part 800.13.

**Indian Trust Assets** - Reclamation is required to consider the impacts of project activities on Indian Tribal Trust Assets. The proposed project was reviewed by Reclamation's Mid-Pacific Regional Office, Indian Trust Assets Coordinator, Patricia Rivera, on June 9, 2011 and a "no impacts to Indian Tribal Trust Assets" concurrence was received.

**Climate Change** – Energy produced by the Proposed Action would potentially displace combustion of 350 – 475 tons of coal or 11 – 14 billion cubic ft of natural gas in fossil fuel based power plants. Carbon emission from fossil-fuel based power plants is a known contributor to climate change. Thus, the Proposed Action would have a beneficial effect on climate change.

**Environmental Justice** – The Proposed Action would not disproportionately affect minorities or low-income populations and communities. There would not be significant impacts to human health or environmental effects associated with the Proposed Action.

**Socioeconomics** – The Proposed Action would create a short term demand for construction related products and services, creating short-term jobs and supporting local vendors. Once operational, the project would create approximately 0.5 full time jobs and would continue to require miscellaneous demand for maintenance-related products and services. KID, which has been exploring the potential for developing the facility as a means to offset annual O&M costs assessed on its water users, would benefit from the long-term revenue produced by the sale of electricity. Overall, the project would produce a beneficial impact on socioeconomic conditions in the project region.

**Hazards and Hazardous Materials** – The Proposed Action includes installation of a 12.47 kV transformer in a switchyard near the powerhouse. Leakage of cooling oil from the transformer could release hazardous materials to the local environment with potential adverse impacts to vegetation, wildlife and humans. Potential adverse effects could also occur downstream of the project site if transformer oil were to leak into the flowing C-Canal. The potential for hazardous material release from the project transformer would be minimized by locating the transformer on a concrete pad designed to contain the entire volume of cooling oil. The transformer will be shipped with the oil already in place and offloaded directly onto the containment pad. The oil

reservoir will be topped off if necessary after the transformer is in place, but no on-site bulk loading of transformer oil will be necessary. The transformer and electrical switch yard would also be enclosed behind a security fence to prevent human access. With these measures in place, the potential for release of hazardous materials to the environment is judged to be minimal.

## **FINDING**

Based on the analysis of the environmental impacts as described in the EA and on thorough review of public comments received, Reclamation has determined that the proposed federal actions would not significantly affect the quality of the human environment and does not require the preparation of an Environmental Impact Statement. Further, the proposed federal actions are consistent with existing national environmental policies and objectives and do not otherwise include any condition requiring consultation pursuant to Section 102(2)(c) of NEPA.

## **DECISION**

It is Reclamation's decision to grant a LOPP to KID to develop the C-Drop Hydroelectric Project. Implementation of the proposed action may take place once the appropriate permits have been obtained and compliance processes completed as described in this Finding of No Significant Impact and Environmental Assessment. Reclamation believes that the Proposed Action Alternative best meets the purpose and need of the proposal.

FONSI Prepared By: Nicholas Josten Date: August 19, 2011  
GeoSense (Idaho Falls, ID) for the  
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Bureau of Reclamation

# RECLAMATION

*Managing Water in the West*

## Draft Environmental Assessment

# Klamath Irrigation District – C-Drop Hydroelectric Project

Klamath Project  
Mid-Pacific Region



KBAO-EA-11-006



Prepared by GeoSense, Idaho Falls, ID for the  
U.S. Department of the Interior  
Bureau of Reclamation

August 2011

### **Mission Statements**

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitment to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water related resources in an environmentally and economically sound manner in the interest of the American public.



## EXECUTIVE SUMMARY

This Environmental Assessment (EA) for the Klamath Irrigation District C-Drop Hydroelectric Project (Project) has been prepared by GeoSense of Idaho Falls, Idaho for the Bureau of Reclamation (Reclamation), Klamath Basin Area Office. The EA was prepared to fulfill the requirements of the National Environmental Policy Act of 1969 (NEPA) and the associated implementing regulations found under Title 40 of the Code of Federal Regulations, Part 1500-1508 (40 CFR 1500-1508). Reclamation's action is to grant a Lease of Power Privilege (LOPP) as authorized under the Town Sites and Power Development Act of 1906 (43 U.S.C. 522) and the Reclamation Project Act of 1939 (43 U.S.C. 485h(c)). The purpose of this document is to inform the public and any other interested stakeholders about the proposed project and alternatives and the associated potential environmental impacts.

### Proposed Action and Purpose and Need

The purpose of the Project is to grant a LOPP to construct, operate, maintain and produce power from a hydroelectric power generating facility at the C-Drop structure located on the Klamath Project's C-Canal. The facility is needed to promote development of clean and renewable energy sources for public utilization.

The Project would consist of construction, operation, maintenance, and power production from a water intake and bypass structure, a powerhouse containing a turbine and generator, an electrical transmission line, and related appurtenances. The C-Drop Hydroelectric Project would have the following specifications:

<u>Parameter</u>	<u>Current Proposal</u>	<u>Potential Future Development</u>
Hydraulic Capacity:	550 cfs	700 cfs
Vertical Drop:	22.5 ft	22.5 ft
Turbine:	1 Vertical Kaplan	1 Vertical Kaplan
Generation Capacity:	900 kW	1,100 kW
Transmission Line length:	150 ft	150 ft
Average Annual Generation:	2,900 MWh	3,600 MWh

The environmental impact associated with the potential future development proposal is also considered in this EA.

### Public Involvement

A 3 week public review and comment period was provided for the Draft EA. A postcard and press release providing notice of the availability of the draft EA was distributed on August 29, 2011. The notices advised stakeholders that the draft EA would be available either on the Reclamation website or a copy could be obtained at Reclamation's Klamath Basin Area Office. The press release was prepared and submitted to the local news organizations. Copies of the draft EA and draft Finding of No Significant Impact (FONSI) were also posted at the following locations around Klamath Falls, Oregon: Oregon Institute of Technology, Klamath Community

College, Klamath County Government Center, the Klamath County Library, and Klamath Irrigation District Headquarters.

## **Environmental Impact Analysis**

Implementation of the Project could result in impacts to the human and natural environment. The potential environmental consequences resulting from the proposed project were evaluated in the EA. Based on scoping and independent evaluation of resource impacts, the following resources were analyzed in detail in the EA:

- Surface Water Resources
- Biological Resources
- Noise
- Cultural Resources
- Indian Trust Assets
- Climate Change
- Environmental Justice
- Socioeconomics
- Hazards and Hazardous Materials

The potential cumulative impacts related to other past, present, and reasonably foreseeable actions in the project area were also considered in the analysis.

## **Alternatives Considered**

The alternatives considered in this EA were the action and no action alternatives. The proposed action did not warrant additional alternative analysis because of the straightforward nature of the proposed project activities and the limited options available to meet the purpose and need of the proposal.

## **Major Conclusions**

The conclusion reached after analyzing the proposed action in the EA was that the Project would not result in significant impacts to the natural or human environment. In fact, most of the Project's environmental impacts would be negligible. Further, any impacts that would result from implementing the proposed project would be limited and temporary in nature. The primary reasons for the decision are:

- Granting of a Lease of Power Privilege is authorized under the Town Sites and Power Development Act of 1906 (43 U.S.C. 522), the Reclamation Project Act of 1939 (43 U.S.C. 485h(c)) as well as other Reclamation laws.
- All necessary federal, state, and local permits, approvals, and authorization would be obtained prior to implementation.
- Best Management Practices would be implemented to protect natural resources to avoid or limit environmental impacts.

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# **Chapter 1 Introduction and Background Information**

## ***1.1 Introduction***

The Bureau of Reclamation proposes to grant a Lease of Power Privilege (LOPP) to Klamath Irrigation District (KID) for development of a new hydroelectric generating plant at the C Drop transition structure between the A-Canal and C-Canal. KID is located within Reclamation's Mid-Pacific Region, Klamath Project, in Klamath Falls, Oregon (Figure 1). A Reclamation Site Map for the project is included as Exhibit A.

This Environmental Assessment (EA) includes discussion of the purpose and need for the proposed action, alternatives, environmental consequences of the alternatives, and a listing of agencies and persons consulted (40 CFR 1508.9). The EA was prepared to satisfy the procedural requirements of the National Environmental Policy Act (NEPA) (P.L. 91-190, as amended) and to determine if an Environmental Impact Statement or Finding of No Significant Impact should be prepared.

## ***1.2 Background***

The Secretary of the Interior authorized development of the Klamath Project on May 15, 1905, pursuant to the Reclamation Act of 1902. As part of the Klamath Project, the United States constructed A, B, and C-Canals, which carry water south from the Link River Dam to the vicinity of Henley, OR. The C-Drop is a transition structure between the A-Canal and the C-Canal. It is a drop structure which produces the head needed to drive a powerplant. There has been previous development of hydropower resources by a Klamath Project water district at the C-Drop. This development, the Enterprise Hydroelectric Project, was decommissioned about 50 years ago after sustaining fire damage. New hydroelectric development at this location is now being considered by Klamath Irrigation District and would require acquisition of a LOPP from Reclamation. The facility would take advantage of the existing potential energy of falling water at C-Drop, which is an undeveloped source of clean, renewable energy.

## ***1.3 Purpose and Need***

The purpose of the Project is to construct, operate, maintain, and produce power from a hydroelectric power generating facility at the C-Drop structure located on the Klamath Project's C-Canal. The facility is needed to promote development of clean and renewable energy sources for public utilization.

## ***1.4 Reclamation's Authority for the Proposed Action***

A LOPP is a congressionally authorized alternative to Federal Energy Regulatory Commission (FERC) licensing for hydroelectric power development. A LOPP grants a non-Federal entity the right to utilize, consistent with Klamath Project purposes, water power head or storage at and/or operationally in conjunction with Reclamation facilities, for non-Federal electric power generation and sale by the entity. Leases of power privilege have terms not to exceed 40 years. The general authority for LOPP under Reclamation law includes, among others, the Town Sites and Power Development Act of 1906 (43 U.S.C. 522) and the Reclamation Project Act of 1939 (43 U.S.C. 485h(c)) (1939 Act).

### ***1.5 Scope of Analysis***

This EA addresses the construction and operation of all components of the proposed hydroelectric facility required to generate power and transmit the power to the electrical grid for use by power consumers. The water that would be used for power generation is delivered through Reclamation's existing conveyance facilities and is intended to be used for permanent crops, pastures, and other irrigation practices within the irrigation district. Any LOPP at C-Drop would accommodate existing contractual commitments for this intended use of water. The hydroelectric facility would only operate during the irrigation season, from April to October, when the C-Canal is in use for irrigation water delivery.

### ***1.6 Permits and Authorizations Needed***

The grantee (KID) would be responsible for obtaining any required Federal or State permits to install and operate the proposed hydroelectric facility. Under Oregon law, all water is publicly owned. With some exceptions cities, farmers, factory owners, and others must obtain a permit or water right from the State of Oregon Water Resources Department (OWRD) to use water from any source. The permitting process generally takes approximately eight months to two years to complete. Since KID has a primary surface water right for the water flowing past C-Drop they would likely qualify for a supplemental power generating permit. KID has made a preliminary filing for this water permit.

Due to the confinement of the staging and construction areas to existing parking areas and canal facilities, permits normally required in waters of the United States or State are not required. These areas do not qualify as jurisdictional water bodies based on the definitions and limits of jurisdiction contained in 33 CFR 328.

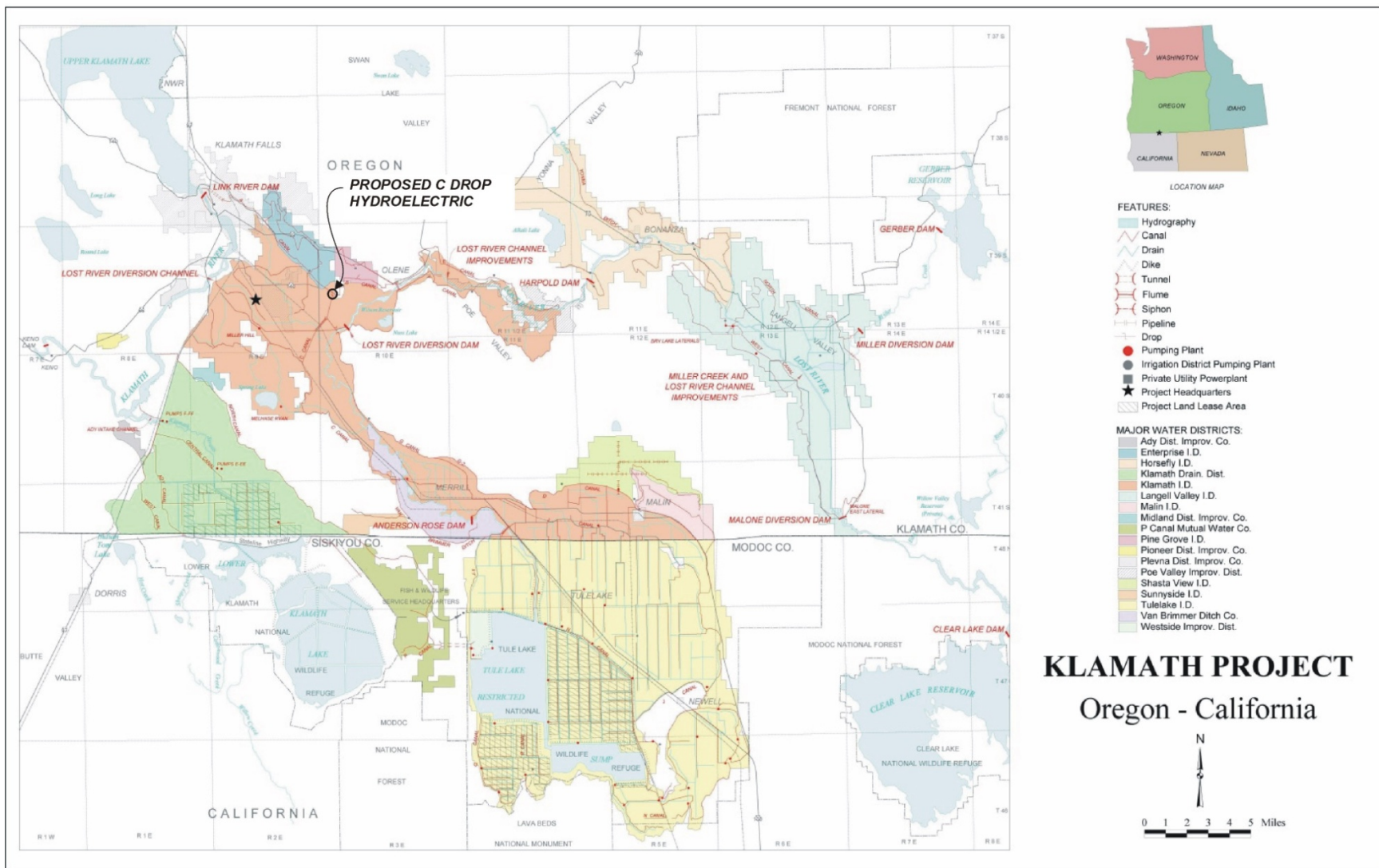


Figure 1. Map of Klamath Project and Irrigation District



## Chapter 2 Alternatives

### 2.1 Introduction – Alternative Development

As described in Chapter 1, Reclamation is congressionally authorized to grant a LOPP for hydropower development at C-Drop as an alternative to Federal FERC licensing for hydroelectric power development. Since the C-Drop site has been specifically identified as the location for potential development, the only alternative that meets the Project purpose involves constructing new generating facilities at C-Drop. Therefore, only the No Action Alternative and the Proposed Action are evaluated in this EA (Section 102(2)(E) [NEPA]).

### 2.2 No Action Alternative

Under the No Action Alternative, Reclamation would not grant a LOPP for development of a hydroelectric facility at C-Drop. The renewable energy potential of C-Drop would not be utilized, a new supply of renewable power would not be made available to electricity consumers, and KID would not obtain revenue from the sale of electricity.

### 2.3 Proposed Action

The proposed action would include Reclamation granting a LOPP for construction, operation, maintenance, and power production from hydroelectric facilities as described in this section. The hydroelectric plant will consist of an intake structure, forebay, powerhouse containing generating equipment, and a 150 ft transmission line. The Project involves no new water diversion or water storage and does not modify the timing of water diversion or storage within the Klamath Project in any way.

The Project anticipates a maximum water flow of 550 cfs, but would utilize a turbine with a 700 cfs hydraulic capacity. The oversized turbine offers two advantages. First, turbine efficiency is greater at flows below maximum capacity resulting in highly efficient generation at the expected flows of 550 cfs. Second, KID contemplates the potential for rearranging flows in its system to increase flows through C-Drop in the future up to a total of about 700 cfs, which is just below the canal capacity.

The C-Drop Hydroelectric Project would have the following specifications:

<u>Parameter</u>	<u>Current Proposal</u>	<u>Potential Future Development</u>
Hydraulic Capacity:	550 cfs	700 cfs
Vertical Drop:	22.5 ft	22.5 ft
Turbine:	1 Vertical Kaplan	1 Vertical Kaplan
Generation Capacity:	900 kW	1,100 kW
Transmission Line length:	150 ft	150 ft
Average Annual Generation:	2,900 MWh	3,600 MWh

### **2.3.1 Physical Location**

The Project would be located at the intersection of the A, B, and C-Canals approximately 8 miles below the origin of the A-Canal (Figure 2). The new plant would be located immediately below the existing Reclamation check structure at the head of C-Canal. The site is located at the former Enterprise Hydroelectric Plant, which burned and was taken out of service approximately 50 years ago. Figure 3 is a plan drawing showing the location of principal project features.

DRAFT



Figure 2. C-Drop Hydroelectric Project site area map.

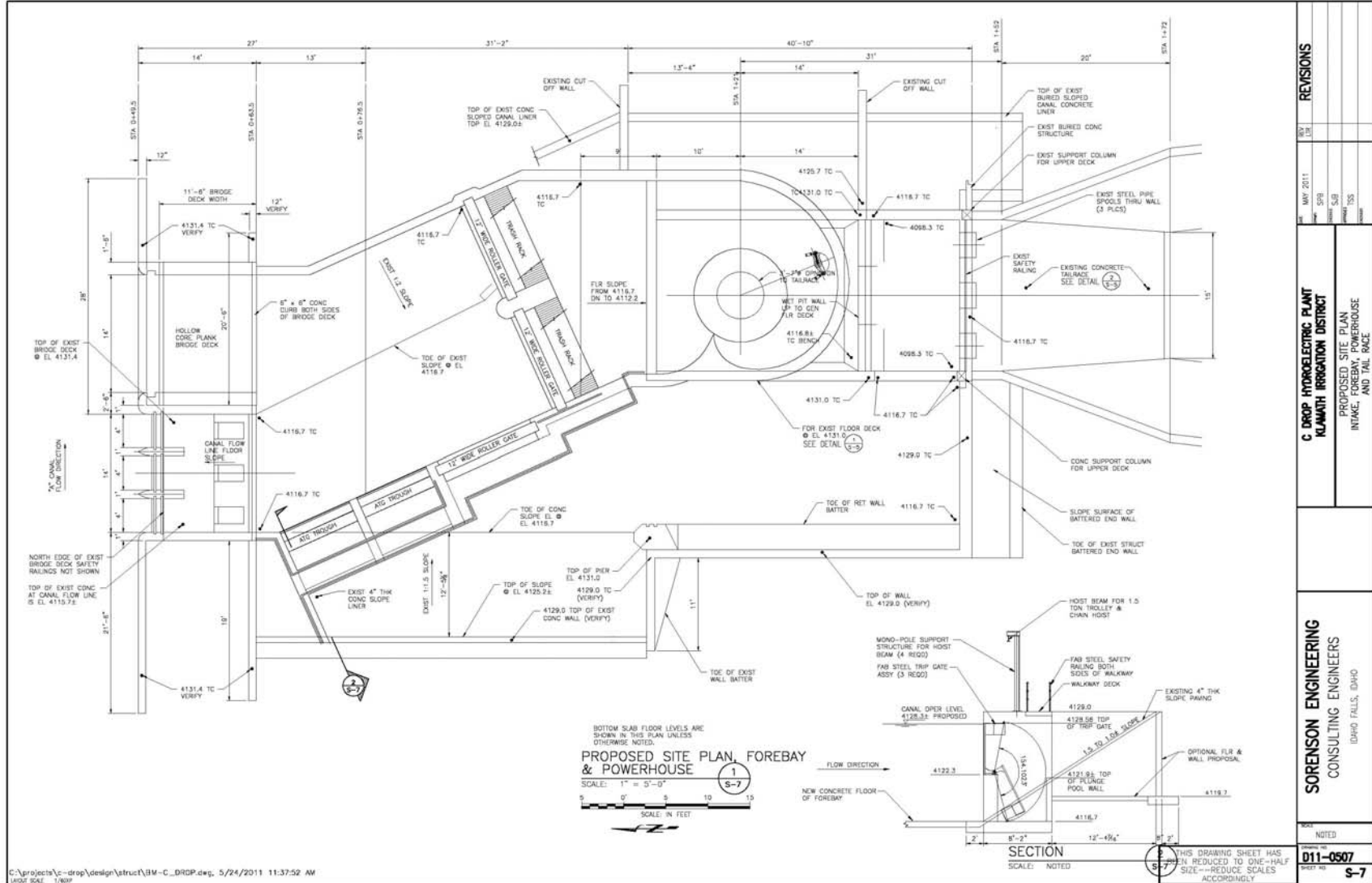


Figure 3. Project plan drawing showing principal project features.



### 2.3.2 Canal Intake Structure

The intake structure would utilize the existing C-Canal check/intake structure. The existing C-Canal intake consists of three sluice gates that re-direct water flowing in A-Canal into C-Canal (Figure 4). Under the proposed project the existing C-Canal intake sluice gates would be removed allowing free flow from A-Canal into C-Canal.



a) Photo from upstream of existing C-Canal intake structure showing three sluice gates



b) Photo from downstream of existing C-Canal intake structure

**Figure 4. Photos of existing C-Canal intake control structure.**

### 2.3.3 Forebay

Just downstream from the upper C-Canal intake gates is an existing forebay that will be modified by the new Project (Figure 5). The forebay modifications will consist of new concrete floors, walls, support and access platform. The water entering the forebay from A-Canal would go one of 3 places: (1) through two 12-ft wide turbine isolation roller gates into the powerhouse turbine and continue on the normal course of C-Canal, (2) through a 12-ft wide bypass roller gate, or (3) over one or both of two 9-ft wide automatic trip gates (ATGs in Figure 3). Examples of typical roller gates and automatic trip gates are shown in Figure 6. The turbine wicket gates would control the flow through the turbines and would be automatically adjusted to maintain a constant water level in the forebay. The wicket gates are located within the penstock (Figure 3). The operating water elevation in the forebay is estimated at 4,128.3 ft ASL (Reclamation Datum).



a) Looking upstream across existing forebay to intake gates.



b) Looking downstream across existing forebay to old Enterprise hydro turbine intakes (on left) and bypass (on right).

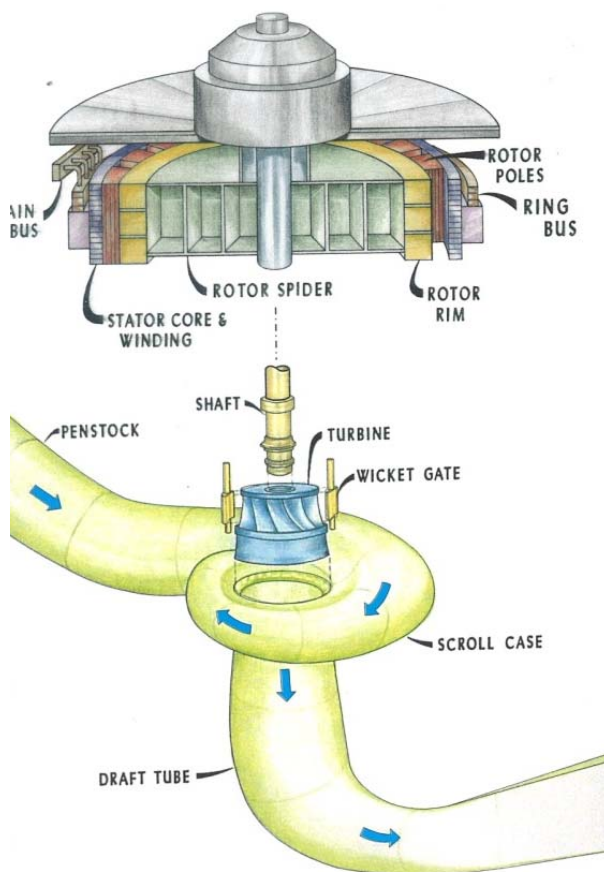
**Figure 5. Photos of existing forebay area.**



a) Typical roller gate in open position.



c) Typical automatic trip gates (one closed, one open).



b) Typical wicket gate.

**Figure 6. Photos of typical gates.**



### 2.3.4 Powerhouse and Generating Equipment

The existing decommissioned powerhouse foundation (Figure 7a) would house the new turbine generator and mechanical/electrical auxiliaries. The existing draft tube would be utilized. The existing top slab would be modified to provide generator support. A new wall would be constructed for directing flow to the turbine. Concrete would be repaired as necessary. The powerhouse would include a 20 ft x 40 ft x 20 ft high pre-manufactured metal building above ground level (Figure 7b). The powerhouse would contain one vertical Kaplan turbine with maximum hydraulic capacity of 700 cfs and one synchronous generator with rated output of 1,100 kW. Water would exit the powerhouse into the C-Canal at an approximate tailrace elevation of 4,105.0 ft ASL (Reclamation Datum). The new plant would use as many elements of the original Enterprise facility as are feasible to rehabilitate.



a) Existing powerhouse foundation.



b) Typical powerhouse building.

**Figure 7. Powerhouse photos.**

With anticipated maximum flows of 550 cfs, the actual peak generation would be 900 kW at 22.5 ft of head. The estimated average annual generation at current average flow rates would be about 2,900 MWH. Future increase of project capacity to 700 cfs would increase peak generation to 1,100 kW and average annual generation to about 3,600 MWH.

### 2.3.5 Substation and Transmission Line

The Project would interconnect to a PacifiCorp 12.47 kV powerline. The interconnect substation would be located about 50 ft southwest of the powerhouse. An alternate location for the substation is about 100 ft southeast of the powerhouse. A short powerline would connect the powerhouse to the substation and the substation to the PacifiCorp transmission line that crosses C-Canal about 100 ft south of the powerhouse location. The substation would include a 12.47 kV step-up transformer containing approximately 400 gallons of highly refined cooling oil under operating conditions. See Figure 2 for facility locations. Figure 8 shows a photo of a typical interconnect substation.





**Figure 8. Example of interconnect substation.**

### **2.3.6 Construction Activities**

Typical construction equipment would include excavators, cranes, concrete trucks, and various utility vehicles. The proposed construction site is accessible by existing roadways and all equipment and construction materials would be staged adjacent to the construction site in an area that has been previously disturbed. Construction activities would take place beginning about October when irrigation season ends and the C-Canal is dewatered. Construction would be completed and the facility would have an expected in service date coinciding with the 2012 irrigation season (March – April).

As part of construction, the concrete walls used in a decommissioned algae harvesting facility would be removed (Figure 2). These walls are located at the bottom of C-Canal and extend down the canal for about 250 ft just below the powerhouse discharge.

### **2.3.6 Operations**

The Klamath Project, of which the A-, B- and C-Canals are part, was constructed as an irrigation project and irrigation remains its primary purpose with all other uses playing secondary roles. Diversion into A-Canal (and subsequent diversion into C-Canal) is determined by the need for and the availability of irrigation water. As such, the power generation Project would have no control over operation of the canals and would be operated as a run-of-canal plant.

## ***2.4 Mitigation Measures Incorporated Into the Proposed Action***

The following mitigation measures would be implemented as part of the proposed action in order to minimize impacts to resources:

- Ground disturbing construction activities will be limited to the area within 100 ft of the C-Drop structure in order to avoid disturbance to known wetlands and to minimize disturbance of existing vegetation.

- The project will employ standard erosion control measures to prevent erosion and sedimentation. Measures would include dust abatement which would be achieved by applying a fine spray of water at rates sufficient to settle dust but not to cause runoff.
- Use of heavy equipment or other equipment with the potential to cause excessive noise disturbance would be limited to normal working hours unless prior approval has been obtained from Reclamation.
- All areas disturbed by construction would be re-contoured and re-seeded using a seed mixture beneficial to wildlife; the seed mixture would be approved by Reclamation prior to revegetation activities.
- The potential for hazardous material release from the project transformer would be minimized by locating the transformer on a concrete pad designed to contain the entire volume of cooling oil.
- If any previously undetected historic or archeological resources are discovered during construction all work potentially affecting the resource would cease immediately and Reclamation would be contacted for further direction.

## **Chapter 3 Affected Environment and Environmental Consequences**

### ***3.1 Resources Considered***

Evaluation of the Proposed Action indicates the following resources could be affected by the project:

- Surface Water Resources
- Biological Resources
- Noise
- Cultural Resources
- Indian Trust Assets
- Climate Change
- Utilities and Infrastructure
- Environmental Justice
- Socioeconomics
- Hazards and Hazardous Materials

### ***3.2 Resources Not Analyzed in Detail***

Evaluation of the Proposed Action indicates that there would be little to no indirect, direct, or cumulative effects on several resources. The resources include:

- Groundwater Resources
- Air Quality
- Geology and Soils
- Mineral Resources
- Traffic and Transportation
- Recreation
- Land Use
- Public Services

These resources are not discussed further in this EA.

### ***3.3 Surface Water Resources***

#### **3.3.1 Affected Environment**

The major surface water resources in the vicinity of the Proposed Action include Upper Klamath Lake, Klamath River, Lost River, and various conveyance features associated with the Klamath Project. Upper Klamath Lake is a large, shallow lake fed by the Williamson River, Wood River, and several smaller streams (USGS 2010). Upper Klamath Lake provides water for several competing resources including irrigation deliveries, regulation for power generation, and endangered species downstream flows and lake level requirements.

Currently, KID's primary water supply is delivered from Upper Klamath Lake via A-Canal. A-Canal is 8.7 miles long, has a capacity of 1,150 cfs, passes through a 3,300 ft long tunnel beneath the city of Klamath Falls, and conveys irrigation water to serve approximately 63,000 acres of crop and pasture land. A-Canal ends and divides its flow into the B- and C-Canals immediately upstream of the proposed C-Drop Hydroelectric Project. Water entering the C-Canal at this junction would be utilized for power generation under the proposed Project. Flows in C-Canal are measured at the Upper C headworks located at the head of C-Canal approximately 100 ft upstream from the proposed powerhouse site. Flow duration curves were prepared for year-round flows and for the normal seven month irrigation season. The flow duration curves are shown in Figure 9.

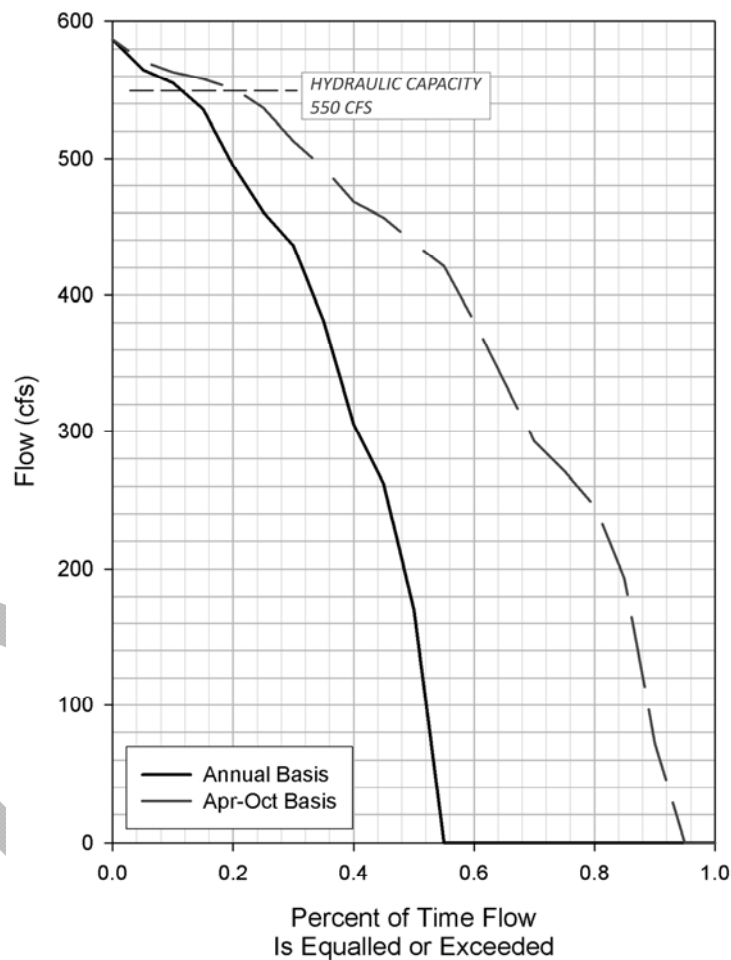
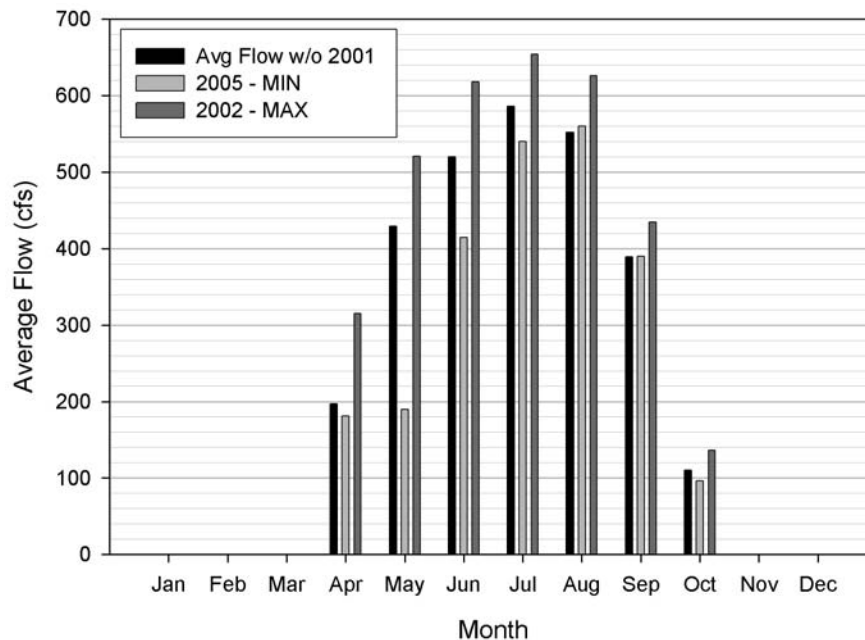


Figure 9. C-Canal flow exceedance curves, 1986 – 2007.

Monthly flow data through the C-Canal at the Project location from 1986-2007 are summarized in Figure 10.<sup>1</sup> In general, the flow season runs from April to October, with peak flows occurring in June and July. Historically, releases made during high water years and low water years have varied both in the duration of the release as well as the amount of water released. The plant will only operate when there is sufficient water in the canal and will shut down when there is not.



**Figure 10. Average monthly flows for high, low, and average water years, 1986-2007**

### Water Quality

Water passing through the project inherits its water quality characteristics from Upper Klamath Lake. ODEQ has identified Upper Klamath Lake as a water body which violates Section 303(d) water quality standards of the Clean Water Act. Upper Klamath Lake was 303(d) listed for low dissolved oxygen (DO), high chlorophyll-a, and high pH in 1998 (ODEQ, 2002).

Reclamation measured water quality at five sites along A-canal and in upper C-canal between 27-Aug and 27-Nov, 2001 (Piaskowski, 2002). Overall, temperatures ranged from a high of 26.8 °C on August 27 to 2.3 °C on November 27, dissolved oxygen ranged from 0.13 mg/L on August 28 to 11.89 mg/L on October 16, and pH ranged from 6.73 on August 28 to 10.12 on September 4 (see Table 1).

<sup>1</sup> Water year 2001 has been excluded from the average flow analysis due to a curtailment of irrigation flows during most of the irrigation season

**Table 1. Summary of water quality conditions measured between August 28 and November 27, 2001 along A- and C-Canal, Klamath Project, OR.**

WQ Parameter	Average	Minimum	Maximum
Temperature (C)			
Surface	18.7	2.3	26.8
> 0.2m	19.7	11.4	24.4
Overall	18.9	2.3	26.8
Dissolved Oxygen			
Surface	5.6	0.2	11.9
> 0.2m	3.0	0.1	8.6
Overall	5.0	0.1	11.9
pH			
Surface	7.8	6.7	10.1
> 0.2m	7.4	6.7	8.8
Overall	7.7	6.7	10.1

Dissolved oxygen varied between the start of A-canal and the beginning of C-canal (Table 2). Sampling occurred at five sites along A- and C-canal between August 28 and October 16. In A-canal above C-drop, dissolved oxygen levels decreased going downstream on 4 out of 7 dates. Dissolved oxygen levels usually were higher below C-drop compared to above. Temperature and pH varied little between the upper and lower sites (Piaskowski, 2002).

**Table 2. Water quality as measured at five sites along A- and C-canals, Klamath Project, OR, in 2001.**

Sample Site	2	3	4	5	14/15
Distance below A-Canal intake (mi)	1.6	3.8	5.1	6.5	8.0 – 10.1
Dissolved oxygen (mg/L)					
28-Aug-01	5.7	3.9	1.7	0.2	4.8
4-Sep-01	8.6	5.0	4.5	>15*	6.2
17-Sep-01	7.8	4.1	2.1	3.0	6.7
24-Sep-01	8.8	5.2	1.9	1.9	8.8
1-Oct-01	7.5	4.5	3.2	3.4	8.4
9-Oct-01	6.9	4.6	7.0	9.4	ND
16-Oct-01	7.0	5.7	6.0	11.9	3.7
Temperature (C)					
28-Aug-01	22.6	22.1	21.9	22.1	22.8
4-Sep-01	23.7	23.4	24.5	24.7	22.7
17-Sep-01	20.8	19.4	20.0	19.8	18.5
24-Sep-01	19.2	17.4	17.0	17.1	17.2
1-Oct-01	18.9	19.0	18.7	19.9	17.3
9-Oct-01	16.1	15.8	15.0	15.9	ND
16-Oct-01	14.2	14.4	13.8	13.7	12.8
pH					
28-Aug-01	8.5	8.0	7.1	6.9	6.9
4-Sep-01	9.0	8.4	7.9	9.6	8.2
17-Sep-01	8.9	8.2	7.7	7.6	8.0
24-Sep-01	8.5	7.8	7.2	7.1	7.9
1-Oct-01	8.0	7.2	6.9	6.9	7.9
9-Oct-01	7.4	7.0	7.3	7.9	ND
16-Oct-01	7.2	7.3	7.3	8.3	7.1

\*outside detectable range of hydrolab; ND = no data

### 3.3.2 Environmental Consequences

#### No Action

Under the No Action Alternative, Reclamation would not grant a LOPP for development of a hydroelectric facility at C-Drop and the facility would not be built. The No Action Alternative would not increase or decrease surface water flows and would not change the water quality compared with existing conditions. Therefore, the Proposed Action would have no impacts to surface water resources.

### **Proposed Action**

Under the Proposed Action, Reclamation would grant a LOPP for the development of the Project and KID would build the hydroelectric facility and begin generating electricity. The proposed Project would be operated in a run-of-canal mode, meaning that power generation would utilize the water as delivered into C-Canal; the turbines would automatically adjust to any change in flow. Water releases into C-Canal would continue to be made based on irrigation demand only, as specified by KID's existing water use agreements and contracts. There would be no water storage structures associated with the plant.

Because the proposed project does not create any new impoundment of water it would have no effect on water temperature, nutrients, pH or any other water quality parameters commonly modified by lake environments. The water quality downstream of the powerplant will be the same as the water quality entering the plant. Since the C-Drop project will eliminate water turbulence generated by free-falling water under existing conditions, the Project will have the potential to temporarily lower dissolved oxygen (DO) levels. The proposed project will employ small quantities of hydraulic and lubricating oils to operate the powerhouse turbines. The facility design will incorporate industry standard containment measures to prevent the release of any oils to the environment in the event of equipment leakage or failure. The final design plans will be reviewed by Reclamation to assure that containment measures are adequate.

In summary, the Proposed Action would not increase or decrease surface water flows compared with existing conditions. Industry standard design measures would be used to contain any accidental release of oils within the powerhouse. Therefore, the Proposed Action would have negligible impacts on water quality. Overall, the Proposed Action would have no significant impacts to surface water resources.

### **Cumulative Impacts**

Since the Project would have negligible effects on surface water resources the proposed action would have no significant cumulative impacts on surface water resources.

## ***3.5 Biological Resources***

### **3.5.1 Affected Environment**

A species list was downloaded from the United States Fish and Wildlife Service, Klamath Falls Ecological Services website on April 11, 2011 pursuant to section 7(c) of the Endangered Species Act of 1973 (see Appendix A). The list was last updated September 30, 2010 and is considered the current listing of species that may occur within Klamath County, Oregon.

### **Botanical Resources**

The C-Drop site is within a previously disturbed location. The area was significantly disturbed during original construction of the A, B and C canals. Subsequent disturbances occurred with construction of the Enterprise Hydroelectric Project and a private algae production facility within C-Canal just below C-Drop. An algae processing facility was constructed on private land adjacent to the canal on the west side. A low density housing development is located just north of the A-B-C canal junction.



Permanent or semi-permanent natural vegetation within the proposed construction area is very limited. Uncultivated vegetated areas within the project footprint occur primarily along ditch banks and road edges and within small parcels around buildings or other structures (Figure 6). These small, vegetated areas consist of a mixture of native and non-native grasses and shrubs and noxious weeds. A variety of coniferous and deciduous trees grow at widely scattered locations in the area. Most have been planted for windbreaks and/or ornamental purposes.

Several small freshwater emergent wetlands are located adjacent to A-Canal upstream of the project location (Figure 12). These wetlands are created by water leakage and subsurface flow from A-Canal. Wetland vegetation is present for most of the growing season in most years.

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**a) west bank below Project**



**b) east bank below Project**



**c) Looking northeast across powerhouse site**



**d) looking at powerhouse site from downstream**



**e) transline corridor with algae facility in background**

**Figure 11. Photos showing vegetation in the immediate project vicinity. The area on both sides of the canal is used regularly by KID for canal operation and maintenance.**

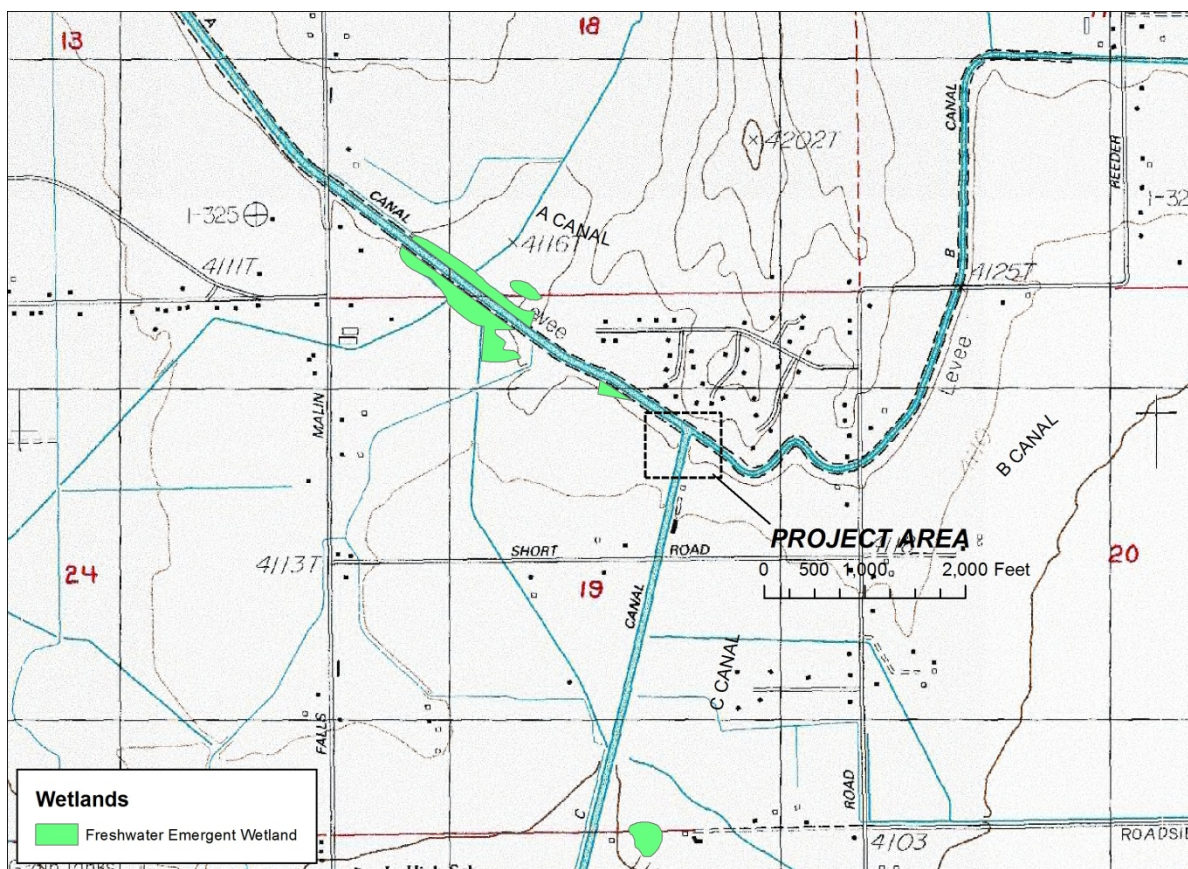


Figure 12. Map of National Wetlands Inventory wetlands in project vicinity.

### Wildlife Resources

The proposed site is a disturbed, agricultural area, with a moderate level of human activity. It would be expected that some wildlife common in the region would use the area, primarily at night when there is reduced human activity. Currently, the steady canal flow and heavy turbulence created by water falling over the C-Drop discourage use of the water by migratory birds as well as other forms of wildlife. According to analysis of the most recent Bald Eagle data available, the nearest bald eagle site is more than 3.5 miles from the proposed action location (see Appendix B). Although no golden eagle data exists for the C-Drop site, the potential for impacts to golden eagles is unlikely based on golden eagle habitat requirements in comparison with habitat available in the project vicinity.

### Aquatic Resources

Because it is dewatered for 5-6 months each year, the C-Canal does not support any permanent fish populations. However, some fish are found in the canal system, including C-Canal, due to entrainment of fish into A-Canal at its entrance on the Link River near the outlet of Upper Klamath Lake. Due to the presence of a fish screen at the entrance to A-Canal, the number of fish that become entrained into A-Canal (and ultimately into C-Canal) is small. Reclamation completed construction of a state-of-the-art fish screen at the entrance to the A-Canal in March



2003. The A-Canal fish screen was designed to satisfy State of Oregon and Federal fish screen criteria. It has a 2.3 mm screen opening that prevents entrainment of salmonids, suckers and other fish species. In addition, the screen is believed to reduce entrainment of larval-stage fish (10 to 20 mm), due to the hydraulic conditions which create positive sweeping flows across the screen surface.

Prior to the installation of the fish screen, fish salvage operations were conducted to determine which species enter the canal system (Table 3). Salvage operations focused on sucker populations, because they represent the only threatened or endangered species likely to enter the canal system. The results (Table 4) indicate a drastic reduction in fish entrainment immediately following the installation of the fish screen in 2003. The screen was so effective that Reclamation discontinued salvage operations after 2004 (USFWS, 2008).

**Table 3. Fish species identified within A-Canal and/or C-Canal during 2001 – 2005 fish salvage operations.**

Common Name	Scientific Name
Lost River sucker	<i>Deltistes luxatus</i>
shortnose sucker	<i>Chasmistes brevirostris</i>
fathead minnow	<i>Pimephales promelas</i>
blue chub	<i>Gila coerulea</i>
Tui chub	<i>Gila bicolor</i>
unidentified sculpin	<i>Cottus</i> spp.
speckled dace	<i>Rhinichthys osculus</i>
brown bullhead	<i>Ictalurus nebulosus</i>
yellow perch	<i>Perca flavescens</i>
green sunfish	<i>Lepomis cyanellus</i>
Sacramento perch	<i>Archoplites interruptus</i>
goldfish	<i>Carassius auratus</i>

**Table 4. Summary of sucker salvage results for C-Canal, 2001 – 2005.**

Year	Suckers Salvaged	Notes	Reference
2001	1	Irrigation water delivery severely reduced due to drought, ESA actions	Piaskowski, 2002
2002	1801	-	Piaskowski, 2003
2003	567	Fish screen on-line March 2003	Bennetts, 2004
2004	5	-	Bennetts, 2005
2005	0	Salvage discontinued by Reclamation	Bennetts and Foster, 2008

Three species of threatened or endangered fish have historically occurred or currently occur in the Upper Klamath Basin: shortnose sucker, Lost River sucker, and bull trout. The two sucker species inhabit waters immediately upstream of the A-Canal. The A-Canal fish screen prevents entrainment of nearly all adults and juveniles, and many larvae. USFWS issued an Incidental Take Statement in 2008 as part of its Biological Opinion for the Reclamation's ongoing operation of the Klamath Project (USFWS, 2008). This Incidental Take Statement covers the entire Klamath Project and includes all sucker life stages that pass into A-Canal, which are assumed lost to the fishery. Bull trout have historically occurred in the Upper Klamath Basin,

but are only currently known to exist in extremely specific habitat types within the creeks and tributaries of northern Upper Klamath Lake.

### **3.5.2 Environmental Consequences**

#### **No Action Alternative**

Under the No Action Alternative, Reclamation would not grant a LOPP for development of a hydroelectric facility at C-Drop and the facility would not be built. As a result there would be no impact to biological resources.

#### **Proposed Action Alternative**

Under the Proposed Action, Reclamation would grant a LOPP for the development of the Project and KID would build the hydroelectric facility and begin generating electricity. The Proposed Action area is located within a disturbed context. Based on an analysis of current information on known existing populations and habitat requirements, no protected terrestrial species are expected to occur at the Project Site. Any impacts to botanical or wildlife resources that may occur would be temporary in nature and/or limited to the project area. Since canals exist and extend all around the project vicinity, any wildlife disrupted by temporary construction activities could relocate to nearby water sources. The Project will not alter water flows from present conditions and will therefore not cause loss of any wetlands that depend on water leakage from canals. The closest wetland is approximately 900 ft from the C-Drop structure. Since construction activities will be limited to the area near the structure, no existing wetlands would be disturbed. Overall, no significant impacts to botanical or wildlife resources are expected as a result of the Proposed Action.

The Proposed Action Alternative does not include activities at the proposed sites that could have an effect on migratory birds. Further, the proposed site possesses no habitat that would be conducive to use by migratory birds and the nearest documented bald eagle site is approximately 3.5 miles away.

The proposed Project would include a turbine that could potentially harm fish entrained in C-Canal. Operation of the power facility could also cause a lower level of dissolved oxygen present in the water after flowing through the facility. However, since the A-Canal fish screen prevents most fish from entering the canal the turbine represents little additional hazard to fisheries resources including shortnose sucker, Lost River sucker, and bull trout. This action and the operations of the facility are also covered under the 2008 U.S. Fish and Wildlife Service Biological Opinion that includes incidental take coverage for operations of the Klamath Project. Overall, no significant impacts to botanical or wildlife resources are expected as a result of the Proposed Action.

#### **Cumulative Impacts**

The Proposed Action would not result in adverse impacts to biological resources. Further, the proposed project is located within an “exclusive farm use” zoning area and no additional projects are planned in the project vicinity. Therefore, the Proposed Action would not contribute to cumulative impacts to biological resources.

## **3.6 Noise**

### **3.6.1 Affected Environment**

The Project site is located within an “exclusive farm use” zoning area. Construction activities would occur within about 100 ft of the boundary of a “rural residential” zoning area. The project site encompasses large irrigation facilities including head gates and the C-Drop structure. Water cascading through C-Drop is currently the most significant persistent noise source in the area during irrigation season. Other ambient noise expected to occur at the site includes cars, horns, construction, voices, small pump motors, and farm-related equipment. Noise from farm equipment such as tractors and bailers can occur over extended use hours.

### **3.6.2 Environmental Consequences**

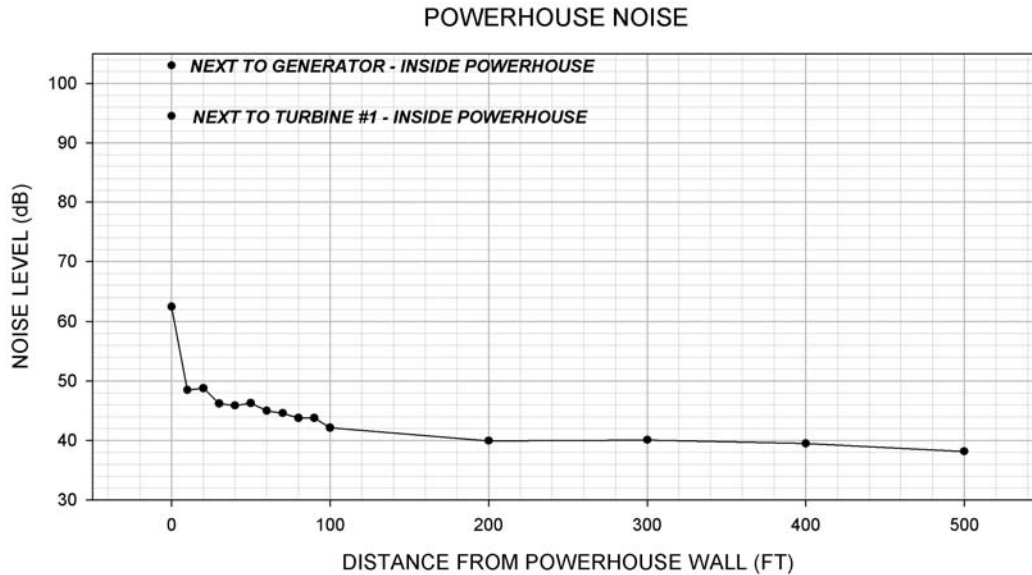
#### **No Action Alternative**

Under the No Action Alternative, Reclamation would not grant a LOPP for development of a hydroelectric facility at C-Drop and the facility would not be built. As a result there would be no noise impacts.

#### **Proposed Action Alternative**

Under the Proposed Action, Reclamation would grant a LOPP for the development of the Project and KID would build the hydroelectric facility and begin generating electricity. The Proposed Action would reduce the long term ambient noise level by eliminating cascading water at C-Drop. Water exiting the powerhouse would be energy depleted and would create little or no noise disturbance. Construction noise would be temporary in nature and limited to the duration of active construction.

The Project turbine/generator represents a new potential noise source. To evaluate this potential effect, noise measurements were conducted at the Marsh Valley Hydroelectric Project in Idaho to evaluate the attenuation of turbine/generator noise with distance away from the powerhouse. The test site was located in remote rural setting with a background noise level of about 40 dB. The sound measurements were made in an open area with no vegetative or topographic screening. Results (Figure 13) indicate that turbine/generator noise became indistinguishable above background sound levels at a distance of about 100 – 200 ft from the powerhouse wall. At C-Drop, the nearest dwellings to the powerhouse site are located from 225 – 400 ft away from the proposed powerhouse location and have existing vegetative screening. On this basis turbine/generator noise is expected to be inaudible from nearby dwellings. As such, noise would not significantly impact the natural or human environment.



**Figure 13. Turbine/generator noise level measurements at the March Valley Hydroelectric Project.**

### **Cumulative Impacts**

The Proposed Action would not result in long term adverse impacts from noise and, therefore, would not contribute to cumulative impacts from noise.

## **3.7 Utilities and Infrastructure**

### **3.7.1 Affected Environment**

The project would be constructed on a Reclamation canal that is used to deliver irrigation water to Klamath Irrigation District water users. The C-Canal is part of the Reclamation Klamath Project that supplies water to irrigated land within Klamath Irrigation District. The C-Canal is an essential element of the irrigation conveyance system of the Klamath Project.

### **3.7.2 Environmental Consequences**

#### **No Action Alternative**

Under the No Action Alternative, Reclamation would not grant a LOPP for development of a hydroelectric facility at C-Drop and the facility would not be built. As a result, the No Action alternative would not result in any effect upon utilities or infrastructure.

#### **Proposed Action Alternative**

Under the Proposed Action, Reclamation would grant a LOPP for the development of the Project and KID would build the hydroelectric facility and begin generating electricity. The project would generate an average of 2,900 – 3,600 MWH of clean, renewable energy annually. The power will be sold to a public utility under a Power Purchase Agreement and the utility would be in turn sell the power to the public at current state-approved power rates. At its 900 kW capacity, the Project would meet energy demand for 1,600 average households. The proposed project design will preserve the full water conveyance capabilities of C-Canal and would



therefore not result in any impacts to irrigation utilities or infrastructure. No other utilities or infrastructure (such as transportation, drinking water, and telecommunications) would be affected by the project.

### **Cumulative Impacts**

Since the Proposed Action would not result in adverse impacts to utilities and infrastructure it would not contribute to any cumulative impacts.

## ***3.8 Cultural Resources***

Cultural resources is a term used to describe both ‘archaeological sites’ depicting evidence of past human use of the landscape through material culture and the ‘built environment’ which is represented in structures such as dams, roadways, and buildings. The term, ‘cultural resources’ may also apply to other types of resources that are neither archaeological sites or built environments; these include, but are not limited to, traditional cultural properties, sites of religious or cultural significance, and sacred sites. The National Historic Preservation Act (NHPA) of 1966 is the primary Federal legislation which outlines the Federal Government’s responsibility to consider cultural resources. Other applicable cultural resources laws and regulations that could apply include, but are not limited to, the Native American Graves Protection and Repatriation Act (NAGPRA), and the Archaeological Resources Protection Act (ARPA). Section 106 of the NHPA requires the Federal government to take into consideration the effects of an undertaking on historic properties listed or eligible for inclusion in the National Register of Historic Places (National Register). Those resources that are on or eligible for inclusion in the National Register are referred to as historic properties.

The Section 106 process is outlined in the Federal regulations at 36 CFR Part 800. These regulations describe the process that the Federal agency (Reclamation) takes to identify cultural resources and the level of effect that the proposed undertaking will have on historic properties. In summary, Reclamation must first determine if the action is the type of action that has the potential to affect historic properties. If the action is the type of action to affect historic properties, Reclamation must identify the area of potential effects (APE), determine if historic properties are present within that APE, determine the effect that the undertaking will have on historic properties, and consult with the State Historic Preservation Office (SHPO), to seek concurrence on Reclamation’s findings. Although the Section 106 and NEPA process are independent laws Reclamation uses the Section 106 process as its primary effort to identify impacts to cultural resources as they apply to NEPA.

### **3.8.1 Affected Environment**

The Klamath Basin is the ancestral territory of the Klamath, Modoc, and Northern Piute (Yahooskin Band of the Snake People) Native Americans. These three groups are organized under an 1884 treaty between the U.S. government and the above mentioned Native American groupings. The 1884 treaty recognizes these three Native American groups as the Klamath Indian Tribes. The oral histories of these groups describe a long standing presence on the landscape and archaeological evidence stretches well into the early Holocene. The surrounding area also retains many important historic era resources such as the Klamath Project (water delivery system), railroads, and other landmarks and historical buildings of local community significance.

The Federal Klamath Water Project (Klamath Project) itself is considered, in consensus with the Oregon and California State Historic Preservation Office (SHPO), a National Register eligible irrigation project. There are components of the Klamath Project that are considered contributing features to the Klamath Projects National Register eligibility and components that are considered less significant. For example, the contributing elements include but are not limited to the primary lettered canals, water storage dams, and primary diversion dams. The less significant elements include small laterals, sub-laterals, small diversions, and small drains. Since 2006, Reclamation has been working in consultation with Oregon and California SHPO's to determine which features are National Register contributing elements to the Klamath Project.

The contemporary area of consideration related to this environmental document includes two features of the Klamath Project which are the A Canal and the C Canal. The A Canal has previously been determined eligible for inclusion in the National Register, through consensus with the Oregon SHPO as a contributing feature of the Klamath Project under Criterion A as defined by the Federal regulations at 36 CFR Part 60.4 for its contribution to the development of water and irrigation in the Klamath Basin. The C Canal is also considered to be a contributing element of the Klamath Project for the same reasons as A Canal although Reclamation has yet to seek and receive a consensus determination from the Oregon SHPO.

To identify effects to cultural resources, KID hired Frontier Historical Consultants to assist Reclamation in cultural resources identification. Frontier Historical Consultants prepared a report dated July 2011 documenting the identification efforts and recommendations titled: *C-Drop Hydroelectric Project Cultural Resources Inventory and Assessment, Klamath County, Oregon*. The report is on file with Reclamation's cultural resources branch in Sacramento, California under project number 11-KBAO-128. Reclamation also prepared a supplemental report dated August 2011 titled: *Supplemental Cultural Resources Inventory for C-Drop Hydroelectric Powerplant Project*. The supplemental report is intended to clarify recommendations made in the initial report provided by Frontier Historical Consultants. In summary of the combined reports, no archaeological resources were identified during identification efforts. One previously identified National Register eligible property (the A Canal) and one recommended National Register eligible property (the C Canal), were identified. As a result of the recommendations and findings outlined in the cultural resources reports, Reclamation has entered into consultation with the Oregon SHPO seeking their concurrence on Reclamation's finding that the proposed undertaking will have no adverse effect to historic properties.

### **3.8.2 Environmental Consequences**

#### **No Action Alternative**

Under the No Action Alternative, Reclamation would not grant a LOPP for development of a hydroelectric facility at C-Drop and the facility would not be built. The current land use practices would continue at the proposed project location resulting in no adverse impacts to cultural or archaeological resources, or sacred sites. Because Reclamation would not grant a LOPP for development and because Reclamation would have no other nexus, the selection of the No Action Alternative would not constitute an undertaking as defined by Section 301(7) of the NHPA and result in no consideration of historic properties through Section 106.

### **Proposed Action Alternative**

Under the Proposed Action, Reclamation would grant a LOPP for the development of the Project and KID would build the hydroelectric facility and begin generating electricity. The granting of the LOPP constitutes an undertaking as defined by Section 301 of the NHPA which initiates Section 106.

Pursuant to Section 106 of the NHPA, Reclamation is continuing its consultation efforts with the Oregon SHPO seeking their concurrence on Reclamation's finding of no adverse effect to historic properties. Construction of the project will be allowed to proceed following receipt of concurrence from the Oregon SHPO or conclusion of the Section 106 process as outlined in the regulations at 36 CFR Part 800. If in consultation with the SHPO, an adverse effect determination is made, construction, including mobilization, may not proceed until Reclamation can resolve adverse effects to National Register eligible or listed cultural resources. SHPO concurrence on Reclamation's finding of no adverse effect to National Register cultural resources or resolution of adverse effects through avoidance, project modification, or mitigation will complete the Section 106 process and result in a Finding of No Significant Impact to cultural resources.

Pursuant to the Section 106 regulations at 36 CFR Part 800.5(c), the SHPO is allowed 30 days upon receipt of a request to review and comment on a finding. If the SHPO disagrees with the agency findings within 30 days of receipt, Reclamation will seek to resolve the disagreement with the SHPO or request the Advisory Council on Historic Preservation to review the finding.

### **Cumulative Impacts**

Potential cumulative impacts to cultural resources include regular and ongoing maintenance of the A and C Canals and C-Drop Structure. Maintenance is necessary to retain the integrity of the structures and is consistent with the treatment of historic properties as defined by the regulations at 36 CFR Part 68. Because maintenance and associated operation activities are consistent with the treatment of A and C Canals including C-Drop, there would be no foreseeable cumulative impacts to these resources.

## **3.9 Indian Trust Assets**

### **3.9.1 Affected Environment**

Indian Trust Assets (ITAs) are legal interests in property or rights held in trust by the United States for Indian Tribes or individuals. Trust status originates from rights imparted by treaties, statutes, or executive orders. These rights are reserved for, or granted to, tribes.

Reclamation's policy is to protect ITAs from adverse impacts resulting from Reclamation programs and activities whenever possible. Types of action that could affect ITAs include an interference with the exercise of a reserved water right, degradation of water quality where there is a water right or noise near a land asset where it adversely affects uses of the reserved land.

### **3.9.2 Environmental Consequences**

#### **No Action Alternative**

Under the No Action Alternative, Reclamation would not grant a LOPP for development of a hydroelectric facility at C-Drop and the facility would not be built. The current land use practices would continue at the proposed project locations resulting in no adverse impacts to ITAs.

#### **Proposed Action Alternative**

Under the Proposed Action, Reclamation would grant a LOPP for the development of the Project and KID would build the hydroelectric facility and begin generating electricity. The proposed project was reviewed by Reclamation's Mid-Pacific Regional Office, Indian Trust Assets Coordinator, Patricia Rivera, and on June 9, 2011, a "no impacts to Indian Tribal Trust Assets" concurrence was received (see Appendix B).

#### **Cumulative Impacts**

The Proposed Action would not result in adverse impacts to ITAs and, therefore, would not contribute to cumulative impacts to ITAs.

### **3.10 Climate Change**

#### **3.10.1 Affected Environment**

The United Nations Intergovernmental Panel on Climate Change predicts that changes in the Earth's climate will continue through the 21st century and that the rate of change may increase significantly in the future because of human activity. Climate change may be occurring faster than had been anticipated as little as three years ago (GCCIG 2008). Oregon's water resources have the potential to be significantly changed as a result of climate change (GCCIG 2008). Snow pack reductions are already being observed and spring runoff is coming earlier, leaving lower flows in summer months which affect agriculture, among other resources (GCCIG 2008).

#### **3.10.2 Environmental Consequences**

##### **No Action Alternative**

Under the No Action Alternative, Reclamation would not grant a LOPP for development of a hydroelectric facility at C-Drop and the facility would not be built. One result would be the annual loss of 2,900 – 3,600 MWh of renewable energy to meet regional energy demand. This demand would instead most likely be met with conventional fossil-fuel based power generation. The amount of annual energy produced by the C-Drop hydropower plant is equivalent to the combustion of 350 – 475 tons of coal or 11 – 14 billion cubic ft of natural gas in fossil fuel based plants. Carbon emission from fossil-fuel based power plants is a known contributor to climate change. The No Action Alternative would therefore eliminate the potential climate change benefit of the hydroelectric project.

##### **Proposed Action Alternative**

Under the Proposed Action, Reclamation would grant a LOPP for the development of the Project and KID would build the hydroelectric facility and begin generating electricity. Energy

produced by the C-Drop plant would potentially displace combustion of 350 – 475 tons of coal or 11 – 14 billion cubic ft of natural gas in fossil fuel based power plants. Carbon emission from fossil-fuel based power plants is a known contributor to climate change. Thus, the Proposed Action would have a beneficial effect on climate change.

### **Cumulative Impacts**

The renewable energy produced by the Proposed Action would contribute to cumulative efforts currently being encouraged throughout the U.S. to replace fossil fuel based power generation with renewable energy sources.

## ***3.11 Environmental Justice***

### **3.11.1 Affected Environment**

Pursuant to Executive Order 12898 (dated February 11, 1994), Reclamation is required to consider any potential effects to minority or low-income populations resulting from its actions. There are no known low-income populations in the immediate vicinity of the project that would be impacted by the proposed action.

### **3.11.2 Environmental Consequences**

#### **No Action Alternative**

Under the No Action Alternative, Reclamation would not grant a LOPP for development of a hydroelectric facility at C-Drop and the facility would not be built. As a result, the No Action alternative would not result in a disproportionate effect upon those populations.

#### **Proposed Action Alternative**

Under the Proposed Action, Reclamation would grant a LOPP for the development of the Project and KID would build the hydroelectric facility and begin generating electricity. The proposed action would not result in a disproportionate impact to economically disadvantaged or minority populations.

### **Cumulative Impacts**

The Proposed Action would not result in adverse impacts to economically disadvantaged or minority populations and, therefore, would not contribute to cumulative impacts to those groups.

## ***3.12 Socioeconomics***

### **3.12.1 Affected Environment**

The project is located in Klamath County, OR which, according to 2007 US Census data, has a total population of 66,512 (Table 4). With a total area of 5,944 square miles, the overall population density of Klamath County is approximately 11.2 persons/mi<sup>2</sup>. From 2000 – 2007 the average annual population growth in the county was 0.6% per year. Klamath Falls, which is the major population center in Klamath County, shows a similar population trend (Table 5).

**Table 5. Population growth, 1960 – 2007.**

<b>Year</b>	<b>Klamath County</b>	<b>Klamath Falls</b>
1960	47,475	-
1970	50,021	-
1980	59,117	-
1990	57,702	17,737
2000	63,982	19,462
2007	66,512	19,662

Employment statistics from 1970 – 2000 for Klamath County show that services, manufacturing and retail accounted for nearly 86% of jobs in the county and approximately 8.2% of the population was engaged in the agricultural industry. In the period from 1970 to 2000, the services and professional sector had the greatest increase in employment, and manufacturing had the greatest decrease. The number of people engaged in agriculture remained relatively constant from 1970 to 2000.

### **3.12.2 Environmental Consequences**

#### **No Action Alternative**

Under the No Action Alternative, Reclamation would not grant a LOPP for development of a hydroelectric facility at C-Drop and the facility would not be built. The No Action Alternative would have no impact on employment or population in the project area or Klamath County.

#### **Proposed Action Alternative**

Under the Proposed Action, Reclamation would grant a LOPP for the development of the Project and KID would build the hydroelectric facility and begin generating electricity. Project construction would create a short term demand for construction related products and services, creating short-term jobs and supporting local vendors. Once operational, the project would create approximately 0.5 full time jobs and would continue to require miscellaneous demand for maintenance-related products and services. KID, which has been exploring the potential for developing the facility as a means to offset annual O&M costs assessed on its water users, would benefit from the long-term revenue produced by the sale of electricity.

#### **Cumulative Impacts**

The Proposed Action would create demand for both short- and long-term products and services, thus contributing to the cumulative beneficial impact of local and county government efforts to promote economic development in the area.

### **3.13 Hazards and Hazardous Materials**

#### **3.13.1 Affected Environment**

The C-Drop site is within a previously disturbed location. Permanent or semi-permanent natural vegetation within the proposed construction area is very limited and confined mainly to the edge of flowing water. Human activity in the vicinity of the project facilities would be common, but

would not be intensive, consisting mainly of driving or walking nearby to access irrigation facilities. It would be expected that some wildlife common in the region would use the area, primarily at night when there is reduced human activity. The C-Canal, which flows through the project area for about 6 months each year, contains few fish due to the presence of a fish screen upstream. The water in C-Canal is used for irrigation and is not a drinking water source.

### **3.13.2 Environmental Consequences**

#### **No Action Alternative**

Under the No Action Alternative, Reclamation would not grant a LOPP for development of a hydroelectric facility at C-Drop and the facility would not be built. The No Action Alternative would have no impact on the presence of hazards or the potential for release of hazardous materials in the project area.

#### **Proposed Action Alternative**

Under the Proposed Action, Reclamation would grant a LOPP for the development of the Project and KID would build the hydroelectric facility and begin generating electricity. The electrical substation would be located on the ditch bank about 50 ft from water flowing in the C-Canal. The substation would include a 12.47 kV step-up transformer containing approximately 400 gallons of highly refined cooling oil under operating conditions. Leakage of cooling oil from the transformer could release hazardous materials to the local environment with potential adverse impacts to vegetation, wildlife and humans. Potential adverse effects could also occur downstream of the project site if transformer oil were to leak into the flowing C-Canal.

The potential for hazardous material release from the project transformer would be minimized by locating the transformer on a concrete pad designed to contain the entire volume of cooling oil (Figure 14). The transformer will be shipped with the oil already in place and offloaded directly onto the containment pad. The oil reservoir will be topped off if necessary after the transformer is in place, but no on-site bulk loading of transformer oil will be necessary. The transformer and electrical switch yard would also be enclosed behind a security fence to prevent human access. With these measures in place, the potential for release of hazardous materials to the environment is judged to be minimal.



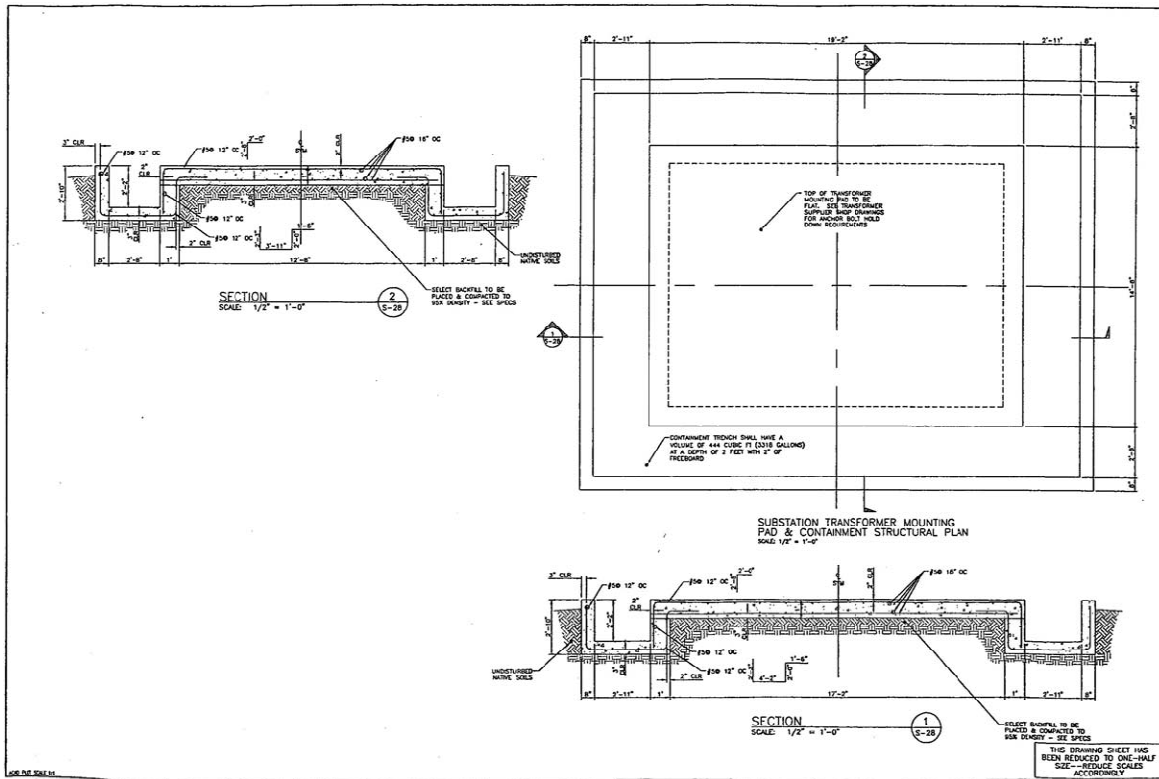


Figure 14. Generalized drawing of transformer pad.

### Cumulative Impacts

With the proposed mitigation measures, the Proposed Action would not cause significant increased risk of hazardous material release to the environment and, therefore, would not contribute to any cumulative impacts.

### **3.14 Summary of Environmental Effects**

The environmental effects of the Proposed Action Alternative are summarized in the Table below.

<b>Summary of Environmental Effects Enterprise Irrigation District Well Development</b>	
<b>Resource/Issue</b>	<b>Potential Effects</b>
Surface Water Resources	No significant effect.
Biological Resources	No significant effect to botanical, wildlife or aquatic resources. No effect to Endangered Species Act protected species.
Noise	No significant long-term affects; No significant construction noise affects (temporary in nature).
Utilities and Infrastructure	No effect.
Cultural Resources	No significant effect.
Indian Trust Assets	No effect.
Climate change	No significant effect.
Environmental Justice	No effect.
Socioeconomics	No significant effect.
Hazardous Materials	No significant effect with proposed mitigation measures.

## **Chapter 4 Consultation and Coordination**

### ***4.1 Federal Laws***

The following federal laws were considered during the preparation of this EA and the evaluation of the potential impacts from the Proposed Action.

#### **4.1.1 Endangered Species Act (16 USC. 1521 et seq.)**

Section 7 of the Endangered Species Act (ESA) requires Federal agencies to ensure that all federally associated activities within the United States do not jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of the critical habitat of these species. When a proposed action is likely to impact listed species, action agencies must consult with the U.S. Fish and Wildlife Service, which maintains current lists of species that have been designated as threatened or endangered, to determine the potential impacts a project may have on protected species.

Reclamation has determined that the proposed action alternative would have *no effect* on federally proposed or listed threatened and endangered species or their proposed or designated critical habitat. No further consultation is required under Section 7 of the Endangered Species Act.

#### **4.1.2 Migratory Bird Treaty Act (16 USC § 703 ET SEQ.)**

The Migratory Bird Treaty Act implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Unless permitted by regulations, the Act provides that it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not. Subject to limitations in the Act, the Secretary of the Interior (Secretary) may adopt regulations determining the extent to which, if at all, hunting, taking, capturing, killing, possessing, selling, purchasing, shipping, transporting or exporting of any migratory bird, part, nest or egg would be allowed, having regard for temperature zones, distribution, abundance, economic value, breeding habits and migratory flight patterns.

The Proposed Action Alternative does not include activities at the proposed sites that could have an effect on migratory birds. Further, the proposed site possesses no habitat that would be conducive to use by migratory birds.

### ***4.2 State Laws***

#### **4.1.1 State of Oregon Water Resources Department**

OWRD conducts a variety of functions critical to the management of Oregon's water resources. Under Oregon law, all water is publicly owned. With some exceptions, cities, farmers, factory

owners, and other water users must obtain a permit or water right from the Water Resources Department to use water from any source - whether it is underground, or from lakes or streams. A permit is the authorization from the Department necessary to begin constructing a water system and begin using water. Once the Department issues a permit, if the user complies with the conditions of the permit and develops their water right, the Department cannot later decide to revoke or change the permit or impose new standards for the use.

Reclamation consulted with OWRD relating to the proposed project to determine the permitting process, timing for completion of permitting, and potential permitting requirements. The information obtained paired with data from the OWRD website was used as part of the analysis in this EA particularly in Section 1.6 Permits and Authorizations Needed and Section 3.2 Surface Water Resources.

### ***4.3 Irrigation District Involvement***

#### **4.3.1 Klamath Irrigation District**

KID is a contracted irrigation district with Reclamation for water delivery. In response to a Reclamation solicitation published in the Federal Register, KID submitted a proposal to obtain a LOPP with Reclamation for development of the C-Drop Hydroelectric Project. KID had been exploring the potential for developing the facility as a means to offset annual O&M costs assessed on its water users. They recognized the C-Drop, which they have been maintaining for many years, as an unused energy resource.

During the preparation of this EA, Reclamation coordinated with the KID Manager on a regular basis. KID was instrumental in providing information relating to the proposed action, permitting process, and providing public involvement contacts.

### ***4.4 Public Involvement***

A postcard and press release providing notice of the availability of the draft EA and draft FONSI for a 3 week public review was distributed on August 29, 2011. The notices advised that the draft EA and draft FONSI would be available either on the Reclamation website or a copy could be obtained at Reclamation's Klamath Basin Area Office. The postcard notice was provided to approximately 65 individuals/entities including all landowners within .25 miles of the proposed project location, the heads of Enterprise Irrigation District and Pine Grove Irrigation District, Klamath County, the City of Klamath Falls, and Oregon Water Resources Department. The press release was prepared and submitted to the local newspaper and news organizations. Copies of the draft EA were also posted at the following locations around Klamath Falls, Oregon: Oregon Institute of Technology, Klamath Community College, Klamath County Government Center, Klamath County Library, and KID Headquarters.

## Chapter 5 List of Preparers and Reviewers

### Preparers

Nicholas Josten, GeoSense, Idaho Falls, Idaho

### Reviewers and Contributors

Jennie Land, Sr./Lead Environmental Specialist, Klamath Basin Area Office

Ryan Madsen, Chief, Engineering Division, Klamath Basin Area Office

Brandee Bruce, Architectural Historian, Mid-Pacific Region

Jennifer Birri, Water and Lands Specialist, Klamath Basin Area Office

Bud Zangger, Project Engineer, Klamath Basin Area Office

Stan Mattingly, Engineer, Klamath Basin Area Office

Adam Nickels, Archaeologist, Mid-Pacific Region

Kristen Hiatt, Environmental Specialist/Natural Resources Specialist, Klamath Basin Area Office

## References

- Bennetts, D., and K. Foster, 2008, *Klamath Project Endangered Sucker Salvage Report, Annual Report 2005*. US Bureau of Reclamation, Klamath Falls, OR.
- Bennetts, D., 2005, *Klamath Project Endangered Sucker Salvage Report, Annual Report 2004*. U.S. Bureau of Reclamation, Klamath Falls, Oregon.
- Bennetts, D., 2004, *Klamath Project Endangered Sucker Salvage Report, Annual Report 2003*. U.S. Bureau of Reclamation, Klamath Falls, Oregon.
- Bennetts, D., and C. Korson, 2005, *A-Canal Fish Screen Monitoring and Evaluation Activities in 2004*. U.S. Bureau of Reclamation, Klamath Falls, Oregon.
- Cowardin et al., 1979, *Classification of Wetlands and Deepwater Habitats of the United States*. US Fish and Wildlife Service Publication FWS/OBS-79/31, US Fish and Wildlife Service, Jamestown, ND.
- The Governor's Climate Change Integration Group (GCCIG). 2008. Final Report to the Governor – A Framework for Addressing Rapid Climate Change. State of Oregon, January 2008. Access at:  
<http://www.oregon.gov/ENERGY/GBLWRM/docs/CCIGReport08Web.pdf?ga=t>
- ODEQ. 2002, *Upper Klamath Lake Drainage Total Maximum Daily Load and Water Quality Management Plan*. Oregon Department of Environmental Quality, Bend, Oregon.
- ODFW, 2009. Website accessed 4-Mar-2009: [http://www.oregonstateparks.org/park\\_230.php](http://www.oregonstateparks.org/park_230.php))
- ORNHIC, 2004, *Rare, Threatened and Endangered Species of Oregon*. Oregon Natural Heritage Information Center, Institute for Natural Resources, Oregon State University, Portland, OR.
- ORNHIC, 2008, *Oregon Ecological Systems 2008*. Oregon Natural Heritage Information Center, Forest Sciences Lab, Oregon State University, Corvallis, OR. Website accessed 6-Mar-2009:  
<http://www.oregon.gov/DAS/IRMD/GEO/sdlibrary.shtml>
- Piaskowski, R., 2002, *Klamath Project Endangered Sucker Salvage Report, Annual Report 2001*. U.S. Bureau of Reclamation, Klamath Falls, Oregon.
- Piaskowski, R., 2003, *Klamath Project Endangered Sucker Salvage Report, Annual Report 2002*. U.S. Bureau of Reclamation, Klamath Falls, Oregon.
- Reclamation, 2007, *Upper Klamath Lake Fish Screen Program Draft Environmental Assessment*. US Bureau of Reclamation, Klamath Falls, OR.
- Reclamation, 2009. Website accessed Feb 2009: Source:  
(<http://www.usbr.gov/dataweb/html/klamath.html>)

USFWS, 2008, *Biological/Conference Opinion Regarding the Effects of the U.S. Bureau of Reclamation's Proposed 10-Year Operation Plan (April 1, 2008 – March 31, 2018 for the Klamath Project and its Effects on the Endangered Lost River and Shortnose Suckers*. USFWS, Klamath Falls, OR.

USGS, 2010. Ground- Water Hydrology of the Upper Klamath Basin, Oregon and California. Scientific Investigations Report 2001-5050 Version 1.1. April 2010. Access at:  
<http://pubs.usgs.gov/sir/2007/5050/pdf/sir20075050.pdf>

DRAFT



Exhibit A  
Project Site Map

EA No. KBAO-2011-006  
KID Alt Permit No. O-KLA-2011-08

CRA No. 11-LC-20-0180  
LOPP No. 11-LC-20-0181



**RECLAMATION**  
Managing Water in the West

**EXHIBIT A**

## Appendix A – USFWS Endangered Species List

### United States Department of the Interior



FISH AND WILDLIFE SERVICE  
Klamath Falls Fish and Wildlife Office  
1936 California Avenue, Klamath Falls, Oregon 97601  
(541) 885-8481 FAX (541) 885-7837  
[kfalls@fws.gov](mailto:kfalls@fws.gov)



#### LISTED, PROPOSED, AND CANDIDATE SPECIES THAT MAY OCCUR IN KLAMATH COUNTY, OREGON

##### Status: **Endangered**

Phylum	Common Name	Scientific Name	Critical Habitat
Fish	Lost River sucker	<i>Deltistes luxatus</i>	Proposed
Fish	Shortnose sucker	<i>Chasmistes brevirostris</i>	Proposed
Plant	Applegate's milk-vetch	<i>Astragalus applegatei</i>	

##### Status: **Threatened**

Phylum	Common Name	Scientific Name	Critical Habitat
Bird	Northern spotted owl	<i>Strix occidentalis caurina</i>	Designated
Fish	Bull trout (Klamath River DPS)	<i>Salvelinus confluentus</i>	Designated
Mammal	Canada lynx	<i>Lynx Canadensis</i>	

##### Status: **Candidate**

Phylum	Common Name	Scientific Name
Amphibian	Oregon spotted frog	<i>Rana pretiosa</i>
Bird	Yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>
Bird	Greater Sage-grouse	<i>Centrocercus urophasianus</i>
Invertebrate	Mardon skipper butterfly	<i>Polites mardon</i>
Mammal	Fisher	<i>Martes pennanti</i>

Updated September 30, 2010

## Appendix B – Consultation Documents

### Land, Jennie M

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**From:** Rivera, Patricia L.  
**Sent:** Thursday, June 09, 2011 1:33 PM  
**To:** Land, Jennie M  
**Subject:** RE: ITA Review/Concurrence Request - C Drop Hydroelectric

Jennie,

I reviewed the proposed action to grant a LOPP for construction of hydroelectric facilities as described in this section. The hydroelectric plant will consist of an intake structure, forebay, powerhouse containing generating equipment, and a 150 ft transmission line. The Project involves no new water diversion or water storage and does not modify the timing of water diversion or storage within the Klamath Project in any way.

The Project anticipates a maximum water flow of 550 cfs, but will utilize a turbine with a 700 cfs hydraulic capacity. The oversized turbine offers two advantages. First, turbine efficiency is greater at flows below maximum capacity resulting in highly efficient generation at the expected flows of 550 cfs. Second, KID contemplates the potential for rearranging flows in its system to increase flows through C-Drop in the future up to a total of about 700 cfs, which is just below the canal capacity.

The C-Drop Hydroelectric Project would have the following specifications:

Parameter	Current Proposal	Potential Future Development
Hydraulic Capacity:	550 cfs	700 cfs
Vertical Drop:	22.5 ft	22.5 ft
Turbine:	1 Vertical Kaplan	1 Vertical Kaplan
Generation Capacity:	900 kW	1,100 kW
Transmission Line length:	150 ft	150 ft
Average Annual Generation:	2,900 MWh	3,600 MWh

The Project would be located at the intersection of the A, B, and C-Canals approximately 8 miles below the origin of the A-Canal (Figure 2). The new plant will be located immediately below the existing Reclamation check structure at the head of C-Canal. The site is located at the former Enterprise Hydroelectric Plant, which burned and was taken out of service approximately 50 years ago.

The intake structure would utilize the existing C-Canal check/intake structure. The existing C-Canal intake consists of three sluice gates that re-direct water flowing in A-Canal into C-Canal (Figure 4). Under the proposed project the existing C-Canal intake sluice gates would be removed allowing free flow from A-Canal into C-Canal. Just downstream from the upper C-Canal intake gates is an existing forebay that will be modified by the new Project. The forebay modifications will consist of new concrete floors, walls, support and access platform. The water entering the forebay from A-Canal would go one of 3 places: (1) through two 12-ft wide turbine isolation roller gates into the powerhouse turbine and on down C-Canal, (2) through a 12-ft wide bypass roller gate, or (3) over one or both of two 9-ft wide automatic trip gates (ATGs in Figure 3). Examples of typical roller gates and automatic trip gates are shown in Figure 6. The turbine wicket gates would be controlled by head level control so that flow through the turbines would be automatically adjusted to maintain a constant water level in the forebay. The operating water elevation in the forebay is estimated at 4,128.3 ft ASL (Reclamation Datum).

The existing decommissioned powerhouse foundation will house the new turbine generator and mechanical/electrical auxiliaries. The existing draft tube would be utilized. The existing top slab would be modified to provide generator support. A new wall will be constructed for directing flow to the turbine. Concrete will be repaired as necessary. The powerhouse will include a 20 ft x 40 ft x 20 ft high pre-manufactured metal building above ground level. The powerhouse will contain one vertical Kaplan turbine with

maximum hydraulic capacity of 700 cfs and one synchronous generator with rated output of 1,100 kW. Water will exit the powerhouse into the C-Canal at an approximate tailrace elevation of 4,105.0 ft ASL (Reclamation Datum). The new plant will use as many elements of the original Enterprise facility as are feasible to rehabilitate. With anticipated maximum flows of 550 cfs, the actual peak generation would be 900 kW at 22.5 ft of head. The estimated average annual generation at current average flow rates would be about 2,900 MWH.

The Project would interconnect to a PacifiCorp 12.47 kV powerline. The interconnect substation would be located about 50 ft southwest of the powerhouse. An alternate location for the substation is about 100 ft southeast of the powerhouse. A short powerline would connect the powerhouse to the substation and the substation to the PacifiCorp transmission line that crosses C-Canal about 100 ft south of the powerhouse location.

Typical construction equipment would include excavators, cranes, concrete trucks, and various utility vehicles. The proposed construction site is accessible by existing roadways and all equipment and construction materials would be staged adjacent to the construction site in an area that has been previously disturbed. Construction activities would take place beginning about October when irrigation season ends and the C-Canal is dewatered. Construction would be completed and the facility would be placed in service at the start of the next year's irrigation season (March – April).

As part of construction, the concrete walls used in a decommissioned algae harvesting facility would be removed. These walls are located at the bottom of C-Canal and extend down the canal for about 250 ft just below the powerhouse discharge.

The Klamath Project, of which the A-, B- and C-Canals are part, was constructed as an irrigation project and irrigation remains its primary function with all other uses playing secondary roles. Diversion into A-Canal (and subsequent diversion into C-Canal) is determined by the need for and the availability of irrigation water. As such, the power generation Project will have no control over operation of the canals and will be operated as a run-of-canal plant.

The proposed action does not have a potential to affect Indian Trust Assets. The nearest ITA is the location designated for hunting, gathering, fishing for the Klamath Tribes of Oregon.

Patricia

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You are always a delight! How very kind of you to send the messages you do. You brighten my day and make it well worthwhile.

Weather wise-the cold and rain has gone as of yesterday. Now we will be complaining of the heat. Funny huh?

Patricia

---

**From:** Land, Jennie M  
**Sent:** Thursday, June 09, 2011 1:42 PM  
**To:** Rivera, Patricia L  
**Cc:** Williams, Mary D (Diane); Robbins, Eleanor J (Ellie)  
**Subject:** ITA Review/Concurrence Request - C Drop Hydroelectric



Hi Patricia,

Attached is the ITA request form for the C Drop Hydroelectric Project for your review and concurrence.

I hope this finds you well! We are enjoying the nicer weather we are finally getting up here (high 60s-low 70s). Keeping very busy as usual, but I think we will get some good rides in this summer ☺.

Thanks,  
Jenn

***Jennie M. Land***

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