Appendix A

Comments and Responses

Table A-1. Topics and Associated Codes.

[To be completed after public review of Draft Plan-EA]

Table A-2. Responses to Comments Received During the Public Comment Period for Go to File > Info > Properties > Advanced > Summary --> Fill in Name Irrigation District Watershed Plan-EA

[To be completed after public review of Draft Plan-EA]

Appendix B

Project Maps

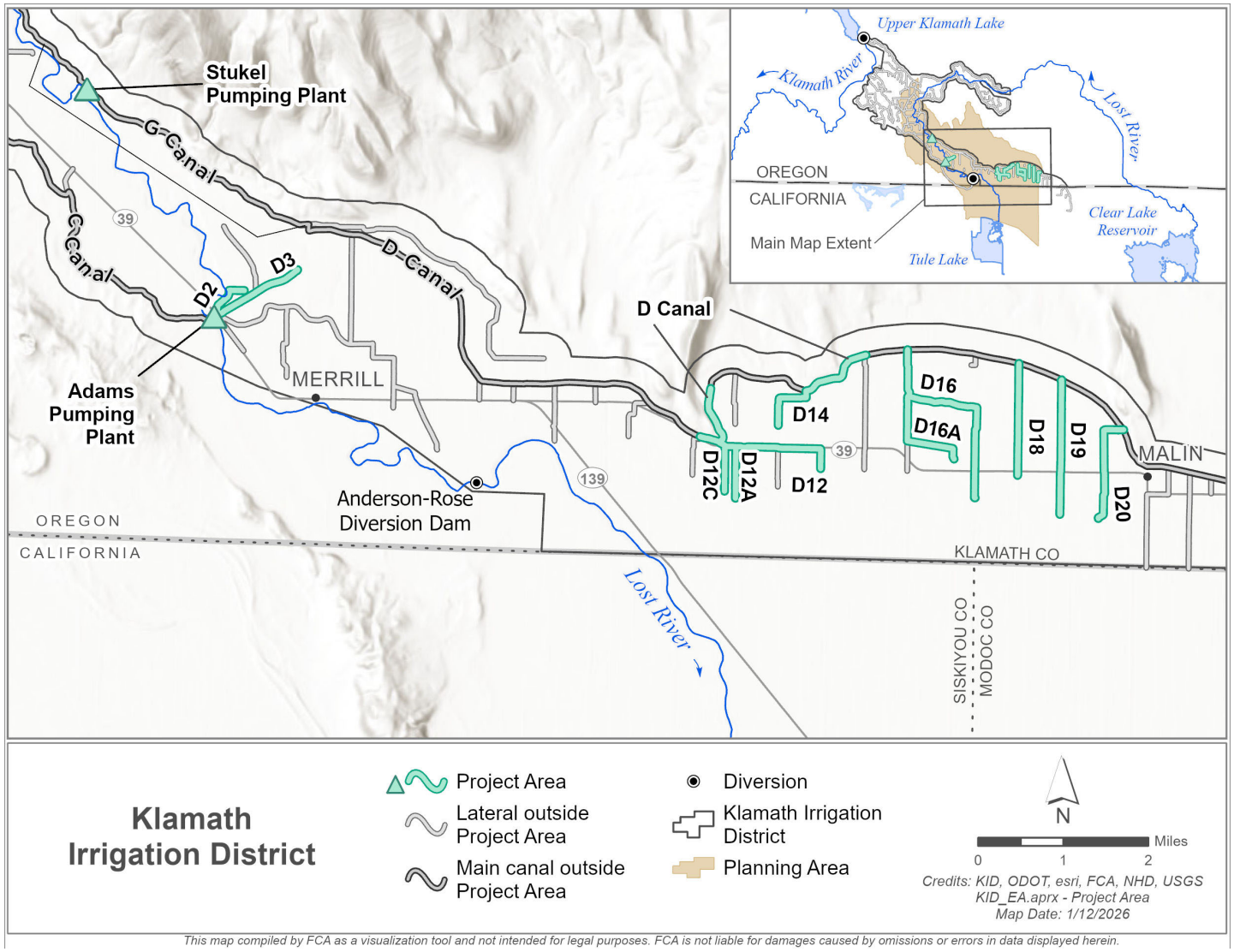

Figure B-1. Klamath Irrigation District Planning Area and Project Area.

Appendix C

Supporting Maps

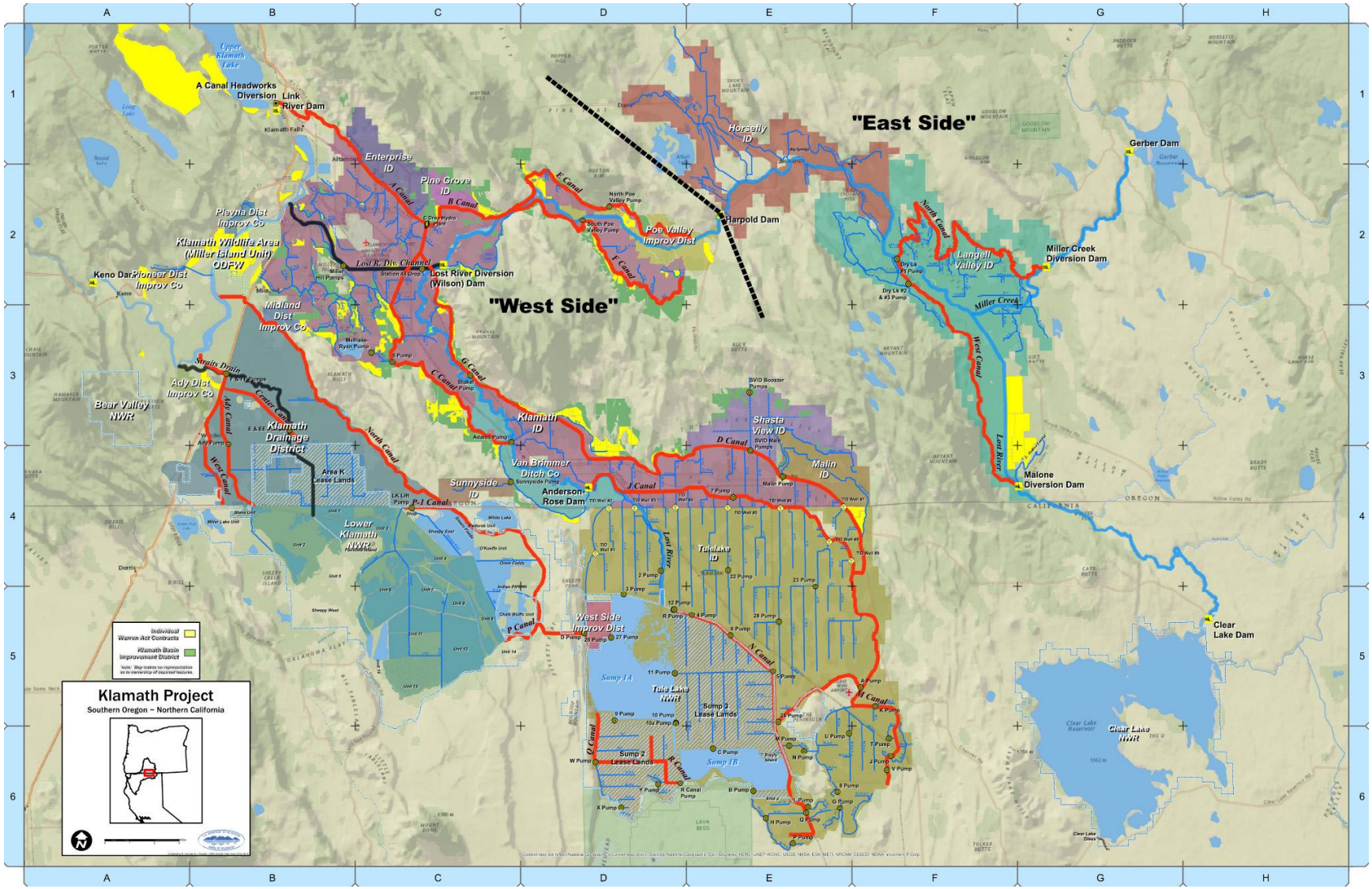

Figure C-1. Klamath Project Irrigation Districts.

Appendix D

Investigation and Analyses Reports

D.1 National Economic Efficiency Analysis

Klamath Irrigation District

Barbara Wyse and Winston Oakley

November 21, 2025

D.1.1 Introduction

This appendix provides a National Economic Efficiency (NEE) analysis that evaluates the costs and benefits of the Klamath Irrigation District (KID or District) Infrastructure Modernization Project (Project). The analysis uses Natural Resources Conservation Service (NRCS) guidelines for evaluating NEE benefits as outlined in the NRCS Natural Resources Economics Handbook and the U.S. Department of Agriculture's (USDA) Guidance for Conducting Analyses Under the Principles, Requirements, and Guidelines (PR&Gs) for Water and Land Related Resources Implementation Studies and Federal Water Resource Investments (DM 9500-013).

The Modernization Alternative represents the potential future with federal funding through PL 83-566. The Future Without Federal Investment (No Action) Alternative (FWOFI) represents the future if the District does not receive federal funding through PL 83-566.

This NEE analysis is divided into three sections. This first section provides a general overview of the project, location, purpose and need, and analysis parameters. The second section describes the conditions under the Future Without Federal Investment (No Action) Alternative. The third section presents the costs and benefits of the Modernization Alternative compared to the Future Without Federal Investment (No Action) Alternative). The last section provides a summary of the benefits and costs of the Modernization Alternative.

D.1.1.1 Project Location

KID is located south and southeast of Klamath Falls in Klamath County, Oregon. The District encompasses nearly 60,000 acres (Souza, 2022). The District diverts natural flow from the Klamath River and its tributaries, and also diverts stored water released from Upper Klamath Lake. The project area is located in the District's D-system and makes up only a small portion of the District's total system (see Figure 1-2 in the Watershed Plan). It consists of the District infrastructure to be modernized, areas where new infrastructure would be built, and associated ROWs and/or easements where construction would take place.

D.1.1.2 Existing Conditions & Challenges

KID is one of several irrigation districts in the Klamath Project. The Klamath Project, developed and administered by the U.S. Bureau of Reclamation (Reclamation), provides water to a service area of approximately 230,000 acres in Klamath County, Oregon; Siskiyou County, California; and Modoc County, California (Bureau of Reclamation, 2020). Klamath Project reservoirs store the snow-fed winter and spring runoff, which is released during the spring/summer and fall/winter operating periods (Bureau of Reclamation, 2020).

Average annual precipitation in the area ranges from about 10 to 13 inches per year. This precipitation falls mainly in the winter months as snow (i.e., outside the primary crop growing season). In general, crops grown in the region require at least 20 inches of water to meet their evapotranspiration (ET) needs in an average year. Given the low level of rainfall during the growing season, irrigation plays a critical role in crop production in the study area. In addition to irrigators, water in the Upper Klamath River Basin is vital to many interests and supports diverse economic, cultural, social, and environmental values. These include values related to the agricultural economy, endangered species, and tribal treaty rights. All these values have been affected in recent years when the Basin has faced recurring and severe water shortages.

The Klamath Basin has experienced prolonged drought conditions in recent years that have reduced water allocations to the Klamath Project and left an insufficient water supply for aquatic habitats in Upper Klamath Lake, the Klamath River, the Lower Klamath National Wildlife Refuge (NWR), and the Tule Lake NWR. These habitats, and the fish and wildlife species they support, are valued by the Klamath Tribes, Yurok Tribe, Karuk Tribe, and other stakeholders in the basin.

In response to the recent history of surface water supply curtailments from the Klamath Project, irrigators in the Klamath Basin have invested in developing groundwater wells and have increased their pumping capacity to try to partially offset the reduced surface water supplies. However, groundwater extraction has exceeded sustainable yield, and groundwater levels have declined in the Basin in recent years, and many wells have gone dry.[1] Increased groundwater pumping to compensate for shortages in surface water is not sustainable in the long-term.

Ecosystem restoration and enhanced water reliability in the Klamath Basin is a federal priority. In February 2024 the U.S. Department of the Interior reached a landmark agreement with Klamath Basin Tribes and Klamath Project irrigators to collaborate on Klamath Basin restoration goals, one of which is improving water and irrigation supply stability and reliability (U.S. Deparmtent of Interior, 2024). The Department announced $72 million in new investments in ecosystem restoration and agricultural infrastructure modernization to address resource and water management challenges in the Klamath Basin.

KID faces several water management challenges. First, the reductions in surface water allocations from the Klamath Project in recent years have impacted KID's operations, resulting in a less reliable water supply for District patrons and fallowing of an average of 14,000 acres of farmland in the last five years. The District's options to enhance supply are very limited due to many competing demands and a shortage of both groundwater and surface water supplies relative to demand in the Klamath Basin.

Second, KID has a very extensive conveyance system with two hundred miles of District-operated canals and laterals. Water shortages are exacerbated by the district's earthen canal system that loses water to evaporation, seepage, and unintended operational spills. Because it is geographically situated at the end of KID's system, the D-system presents particularly high-water management and operational challenges. These can include fluctuations in available water depending on the time of day, slowed response times to irrigators' water demands, and inconsistent spill to District drains. Water losses in the D-Canal and its laterals (the Project Area in the Modernization Alternative) are estimated to be approximately 53 acre-feet (AF) per day. Seepage from the canals makes it challenging for the District to manage and deliver water reliably.

Infrastructure in KID is also aging, resulting in high operations and maintenance (O&M) costs and risk of failure. The Adams Pump is past its useful life and the Stukel Pump will be past its useful life in the next five years. These pumps have a high likelihood of failure in the near future, which would result in 12,000 acres losing access to a full supply of water.

Further, canals in the project area regularly fail (canal banks break and are blocked by debris), which require costly repairs and can result in flooding of adjacent land and damage to nearby property and

[1] The amount of groundwater extraction is different every year. Based on publicly available information and input from local water managers, the maximum in-season groundwater production to meet irrigation demand within the Klamath Project is also estimated to not exceed 144,000 acre-feet per year. However, the U.S. Geological Survey estimates that the average sustainable yield (i.e., the level of withdrawal that can be maintained without over-drafting the aquifer and adversely affecting groundwater levels) is 54,000 acre-feet per year (US Geological Survey, 2016).

infrastructure. Previous failures have flooded neighboring crops and roadways, disrupting transportation and creating public safety hazards. The District manager estimates that the D-Canal system averages about 10 failures per year currently, and the rate has been increasing due to fallowing of lands (which increases the production and transport of tumbleweeds and other debris into canals which can contribute to failures).

D.1.1.2.1 Future Conditions in KID

If left unaddressed, water supply reliability (provisioning services), flood risk (regulating services), and maintenance and operations costs are expected to worsen in the future. The frequency and severity of droughts in the Klamath Basin is expected to increase, leading to more frequent and severe water shortages for the Klamath Project and KID. Earthen canals will deteriorate over time, resulting in more frequent canal failures, which will increase the likelihood and potential severity of flooding surrounding areas, associated property damage, and impacts to transportation. Further, as the District infrastructure ages, additional O&M will be needed to keep the infrastructure functioning at its current level, which will increase District O&M costs. The pumps will eventually fail and result in interrupted water deliveries and possibly flooding of adjacent property.

Due to limited financial resources, in the Future Without Federal Project condition the District will face ongoing and likely increasingly frequent and costly water reliability shortages, O&M expenses, threats to public safety, and flood damages.

D.1.1.2.2 Project Area Challenges and Opportunities

Modernizing the D-Canal infrastructure offers the opportunity to address water seepage and management problems on the D-Canal and save water, which will increase the quantity and reliability of water deliveries to KID patrons (thereby improving agricultural yields and income). The Modernization Alternative will also provide efficiency benefits by reducing District O&M costs and will reduce flood damages (by preventing future canal failures) to property, transportation, and public safety. In terms of ecosystem services, the Modernization Alternative will enhance:

- Provisioning services (by enhancing irrigation, which in turn supports the provisioning service of agricultural production and the economic benefit of increased agricultural income), and
- Regulating services (enhanced control and regulation of flood/seepage water, which provides the economic benefit of decreased flood damages).

Water supply enhancement may also support cultural services if the conserved water is used to benefit fish and wildlife populations (in this analysis it is modeled to benefit irrigated agriculture, but it may also benefit fish and wildlife), with associated potential benefits to cultural and recreational values. In the absence of federal funding, the opportunity to enhance these ecosystem services and associated values is constrained by the District's limited ability to fund the modernization of its infrastructure.

D.1.1.3 Project Purpose and Need

To address agricultural water management challenges noted above, the District has identified that water conservation and improving operational efficiencies through the modernization of District conveyance systems is a high priority.

To better manage available water under current and anticipated drought conditions and with limited water availability in the Klamath Project, the District aims to minimize water losses through its conveyance system to transport and deliver water more precisely, accurately, and efficiently.

Implementation of the project would contribute to the project's objectives and the Federal Objective and Guiding Principles as follows:

- Improve irrigation water management and irrigation water delivery to irrigators within KID's D-system through improved conveyance efficiencies. - Healthy and Resilient Ecosystems; Sustainable Economic Development
- Support and maintain existing agriculture through enhanced water supply reliability and improved water management within the District's D-system. - Healthy and Resilient Ecosystems; Sustainable Economic Development
- Reduce the District's O&M involved in delivering irrigation water to KID patrons in the D-system. - Sustainable Economic Development

The purpose of the Project is to enhance Agricultural Water Management by upgrading District infrastructure to improve water conveyance efficiency, achieve operational efficiency benefits (reduce District O&M costs), avoid flood damages to property due to failure of District canals, and improve agricultural yields and agricultural income for the local agricultural community in the face of drought and other water supply challenges. The District has identified the need to reduce District infrastructure failures and the associated property damage, lower O&M costs, and conserve water for Klamath Project water users and water-dependent wildlife.

D.1.1.4 Alternative Formulation & Evaluation

The formulation of alternatives followed Center on Environmental Quality regulations for implementing the National Environmental Policy Act, as well as the requirements of the PR&Gs. Scoping comments were also incorporated into the alternative formulation process. During the formulation phase, each alternative was evaluated for whether it met the project purpose and need and the PR&G requirement of achieving the Federal Objective and Guiding Principles. Each alternative was further analyzed using four criteria: completeness, effectiveness, efficiency, and acceptability (see discussion in Section D.5).

As summarized in Table D-26 in Appendix D.2, six action alternatives, including the Modernization Alternative, were evaluated based on the formulation criteria. All action alternatives included lining or piping of District canals to address water reliability. Several alternatives also include replacement of aging district pumping plants to address high O&M costs and improve water supply reliability. The formulated action alternatives differed in extent (i.e., the entire district or portions of the district) and type of canal/lateral modernization (lining, gravity piping, pressurized piping).

Alternatives were removed from consideration if they did not address the purpose and need for action, did not achieve the Federal Objective and Guiding Principles, or became unreasonable because of cost, logistics, existing technology, or environmental reasons. Alternatives eliminated from detailed study and the rationale for dismissing these alternatives is discussed in further detail in Appendix D.2 and Section 5 of the EA and is summarized below.

Two alternatives were eliminated in the formulation process such that four action alternatives and one Future Without Federal Investment (No Action) Alternative were initially considered for detailed study. Three action alternatives were eliminated from detailed study, leaving two alternatives

fully evaluated in the Plan-EA and in this NEE: Future Without Federal Investment (No Action) Alternative and the Modernization Alternative.

D.1.1.4.1 Alternatives Removed During Formulation

One alternative (Lining and Piping Whole District) was not selected for further evaluation as the scale and cost of the project was logistically infeasible for the District to implement (did not meet the acceptability criterion) and would not address the project purpose and need cost efficiently (did not meet the efficiency criterion). Another alternative (Line the Entire D-Main Canal and D-system Laterals) was not selected for further evaluation as it is not as effective in reducing water loss and would pose increased risk to public safety by making canal sides slippery and a threat to anyone who may fall into the canal/laterals. Further, lining the canals would not address operational challenges.

D.1.1.4.2 Alternatives Eliminated from Detailed Study

One alternative (D-Main Canal and D-1 Canal Lining and Lateral Piping) was eliminated from further evaluation because it only partially met the project purpose and need of conserving water and improving water delivery reliability, and it had high capital costs. Another alternative (D-Main Canal and Lateral Pressurized Piping) was deemed infeasible due to exceedingly high capital costs ($464 million). The District considered a third action alternative (D-Main Canal Gravity Piping) too large a project for them to implement and was also deemed infeasible due to high costs, and it was therefore eliminated from further evaluation.

D.1.1.5 Project Overview

The KID Infrastructure Modernization Project is an agricultural water conveyance efficiency project. The Modernization Alternative would line the District's D-Canal at Adams Point; line the D-Canal from McKoen to Paygr Road; line the D-3 canal; pipe laterals D-2, D-12, D-14, D-16, D-16A, D-18, D-19, and D-20; and replace the District's Adams and Stukel pumping plants.

D.1.1.6 Watershed Plan-EA Alternatives

D.1.1.6.1 Future Without Federal Investment (No Action) Alternative

Under the Future Without Federal Investment (No Action) Alternative, federal funding through PL 83-566 would not be available to implement the Project. The District would continue to operate and maintain infrastructure consistent with past and current operations. There would be no reduction in canal failures and associated flood damage to property and transportation would continue and worsen over time as canals age and failures become more frequent and severe (a worsening of regulating services). The District's conveyance system would continue to have seepage losses, leaving less water in the Klamath Project to support irrigation and food production (provisioning services) and fish and wildlife habitat (cultural services).

Under the Future Without Federal Investment (No Action) Alternative, the District would continue to replace aging infrastructure as needed and as available funding allows. Replacing Adams and Stukel pumps is expected to occur in Year 5, which will provide cost savings and water

conservation benefits compared to current conditions).[2] While the pumps would be replaced, no canal infrastructure would be replaced, such that in the Future Without Federal Investment (No Action) Alternative, modernization of the District's system would not occur and the purpose and need of the Project would not be met.

D.1.1.6.2 Modernization Alternative

The Modernization Alternative is KID's desired alternative. Under this alternative, federal funding through PL 83-566 would be available. The District would perform the following actions:

- Line: D-Canal at Adams Point, D-Canal from McKoen to Paygr Road, and D-3 canal;
- Pipe: laterals D-2, D-12, D-14, D-16, D-16A, D-18, D-19, and D-20; and
- Replace the Adams and Stukel pumping plants.

Although the exact timeline of Project construction is uncertain, this analysis models the start of Project construction (Year 0) in 2025.

D.1.1.7 Analysis Parameters

All economic values are presented in 2023 dollars rounded to the nearest $1,000. Unless otherwise noted, all NEE values are presented in average annual values (following the approach described in the NRCS Water Resources Handbook for Economics) using the 2.75-percent federal discount rate for federal water projects for fiscal year 2024, (US Bureau of Reclamation, 2023). Under this method, all costs and benefits are evaluated at the 2023 price level. Future benefits and costs are discounted to a present value using the 2.75-percent federal discount rate.[3] Finally, each present value is amortized to average annual values over the evaluation period using the 2.75-percent rate.[4]

D.1.1.7.1 Funding

In the Future Without Federal Investment (No Action) Alternative, the District would continue operations, maintenance, and replacement (OM&R) of current infrastructure.

Under the Modernization Alternative, PL 83-566 funding would be awarded. PL 83-566 funds would cover $17,187,000 (75 percent) of the total project installation/construction cost, and the remaining $5,611,000 (25 percent) would be funded by KID (through their own funds or other outside funding sources).

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2 Note that the replacement of Adams and Stukel pumps also occurs in the modernization Alternative, but would occur earlier (Year 0 vs. Year 5), with more immediate operations and maintenance cost savings and water conservation benefits.

3 As directed in DM 9500-13 (Section 9a and 9f(5)), the National Resource Economics Handbook (Part 611 Water Resources Handbook for Economics, Section 611.0103), the Principles and Guidelines (Sections 1.4.11, 1.7.1(h), 2.1.3, 2.4.11, 2.4.14, and 8), and in Chapter III of the Principles, Guidelines, and Recommendations (Section v).

4 As directed in DM 9500-13 (Section 9a and 9f(5)), the National Resource Economics Handbook (Part 611 Water Resources Handbook for Economics, Section 611.0103), the Principles and Guidelines (1.7.1(h), 2.1.3, and 2.4.14), and in Chapter III of the Principles, Guidelines, and Recommendations (Section v).

D.1.1.7.2 Evaluation Unit

The Modernization Alternative has 13 project groups which are the evaluation units for this analysis. Each of the project actions noted above under Section D.1.6.2 is an evaluation unit. Specifically, the project groups are:

1. PG1 Line D-Canal AP: Line the D-Canal at Adams Point with a high-density polyethylene (HDPE) liner
2. PG2 Line D-Canal M2P: Line the D-Canal from McKoen to Paygr Road with an HDPE liner
3. PG3 Pipe D-2: Pipe lateral D-2
4. PG4 Line D-3: Line lateral D-3 with an HDPE liner
5. PG5 Pipe D-12: Pipe lateral D-12
6. PG6 Pipe D-14: Pipe lateral D-14
7. PG7 Pipe D-16: Pipe lateral D-16
8. PG8 Pipe D-16A: Pipe lateral D-16A
9. PG9 Pipe D-18: Pipe lateral D-18
10. PG10 Pipe D-19: Pipe lateral D-19
11. PG11 Pipe D-20: Pipe lateral D-20
12. PG12 Adams Pump: Replace the Adams pump
13. PG13 Stukel Pump: Replace the Stukel pump.

An important note for the incremental analysis is that the costs for constructing any given project group would not change if it were the only project group to be constructed.

D.1.1.7.3 Implementation Timeline

Under the Modernization Alternative, District staff predict that, if PL 83-566 funds are made available, construction of the 13 project groups would likely be completed over approximately four years, with some overlap in construction timing between project groups. For each project group, this analysis assumes that full benefits would be realized the year after construction is completed (e.g., for PG1 Line Adams Point, which would be constructed in Year 1, full benefits would be realized in Year 2). This information is summarized in Table D-1 below.

Table D-3. Construction Timeline and Project Life for the Modernization Alternative, Klamath River Watershed, Oregon.

Works of Improvement	Construction Start Year	Construction End Year	Project Life Start Year	Project Life End Year
PG1 Line D-Canal AP	1	1	2	101
PG2 Line D-Canal M2P	1	1	2	101
PG3 Pipe D-2	2	2	3	102
PG4 Line D-3	2	2	3	102
PG5 Pipe D-12	2	2	3	102
PG6 Pipe D-14	3	3	4	103
PG7 Pipe D-16	2	2	3	102
PG8 Pipe D-16A	2	2	3	102
PG9 Pipe D-18	3	3	4	103
PG10 Pipe D-19	3	3	4	103
PG11 Pipe D-20	3	3	4	103
PG12 Adams Pump	0	0	1	100
PG13 Stukel Pump	0	0	1	100

Prepared November 2025

D.1.1.7.4 Analysis Period

The analysis period is defined as the implementation period plus the period of time over which any alternative would have meaningful beneficial or adverse effects (up to a maximum of 100 years). The analysis period for this NEE is 104 years, which includes four years of project construction/installation and 100 years of project life, based on the expected life of the HDPE pipe (during which time it is expected to bring significant project benefits). Accordingly, the study period extends from Year 0 (construction start) to Year 103 (last year of potential useful life for the project).

D.1.2 Future Without Federal Investment Alternative

This section describes conditions under the Future Without Federal Investment (No Action) Alternative and the associated costs and benefits of these conditions. Conditions under the Future Without Federal Investment (No Action) Alternative include O&M activities and costs, agricultural damages from inadequate water supply, and flood damages from seepage and canal failures.

D.1.2.1 OM&R

Under the Future Without Federal Investment (No Action) alternative, current standard OM&R activities are performed, including replacement of existing infrastructure such as the Adams and Stukel pumps. This section describes the OM&R actions, some of which also happen under the Modernization Alternative (e.g., pump replacement).

The District expects that, in the absence of PL 83-566, these plants under the Federal Without Project (No Action) Alternative are expected to be replaced in Year 5. After replacement, the O&M costs are expected to be lower than current costs. Other OM&R costs to maintain and operate infrastructure in the Project area that will continue under the Future Without Federal Funding (No

Action) Alternative including costs to repair canal failures, perform routine canal maintenance, and replace headgates. These costs are described in this section.

Regarding canal failure, the District estimates that, on average for most project groups, each failure costs approximately $25,000 to repair (including labor, materials, and equipment) (Souza, 2023). However, for the D-16A, each failure costs roughly $4,000 in repair costs.[5] The breakdown of average failures by project group and the associated average annual costs are shown in below Table D-2.

Table D-4. Costs to Repair of Canal Failures under the Future Without Federal Investment Alternative, Klamath River Watershed, Oregon, 2023 dollars[1]

Project Group	Canal Repair Costs per Incident	Average Incidents per Year	Average Annual Cost of Canal Repairs	Annualized Canal Failure Damage[2]
D-Canal AP	N/A	N/A	$0	$0
D-Canal M2P	$25,000	1.0	$25,000	$24,000
D-2	$25,000	0.3	$7,500	$7,000
D-3	$25,000	2.5	$62,500	$59,000
D-12	$25,000	0.07	$1,670	$1,000
D-14	N/A	N/A	N/A	$0
D-16	$25,000	3.5	$87,500	$83,000
D-16A	$4,000	3.2	$12,800	$12,000
D-18	$25,000	0.3	$7,500	$7,000
D-19	$25,000	1.5	$37,500	$35,000
D-20	$25,000	1.0	$25,000	$23,000
Adams Pump	N/A	N/A	N/A	$0
Stukel Pump	N/A	N/A	N/A	$0
Total	**N/A**	**N/A**	**$266,550**	**$251,000**

Note: Totals may not sum due to rounding. Prepared November 2025
1/ Price Base: 2023 dollars amortized over 100 years at a discount rate of 2.75 percent.
2/ Piping is not completed immediately, and due to discounting of future costs and benefits, the annualized cost is less than the sum of average annual costs of canal repairs and property damage.

Further, the D-12 headgate will need to be replaced regularly over the period of analysis under the Future Without Federal Investment (No Action) Alternative. The headgate has a useful life of 10 years and was recently replaced and would need to be replaced again around Year 8. The cost to replace the headgate is roughly $23,000 (Souza, 2023). Accordingly, this analysis models a cost of $23,000 every 10 years throughout the period of analysis beginning in Year 8 under the Future Without Federal Investment (No Action) Alternative. When discounted and annualized, the cost of replacing the headgate throughout the period of analysis is $2,000.

[5] This includes the cost of one excavator ($162.85/hour), one to three dump trucks (we assume two trucks at $96.03/truck/hour), one backhoe ($91.69/hour), and two pickup trucks ($16.68/truck/hour). Each piece of equipment also incurs a labor cost of $36/hour. Each failure event requires three to eight hours of repair, which we model at an average of 5.5 hours (Souza, 2023). We adopt the equipment costs used by the Federal Emergency Management Agency's Schedule of Equipment Rates (Federal Emergency Management Agency, 2023).

Replacing the Adams and Stukel pumping plants in Year 5 would cost roughly $650,000 and $550,000, respectively (Souza, 2023).[6] The replacement plants are expected to have useful lives of approximately 50 years, so this analysis models costs of $650,000 and $550,000 (for Adams and Stukel, respectively) every 50 years after their initial installation.[7] When discounted and annualized, the costs of replacement for Adams plant are approximately $21,000 and for the Stukel plant are $18,000.

Currently, the Adams and Stukel plants cost the District an average of $7,000 and $10,000 per year (respectively) in maintenance costs (Souza, 2023). After replacement, KID estimates that annual pump maintenance costs would total $750 per pumping plant for the first five years and would double every two years afterwards until they reach a maximum cost of $5,000 per year, all in 2023 dollars (Souza, 2023). Following the District's guidance, we model pump maintenance costs of $750 per year in the first five years after replacement, doubling every other year until they reach a maximum of $5,000 per year.

New pumps would reduce electricity usage by an estimated 10 to 15 percent (Adams, 2023). Based on power bill records from May 2017 to May 2019, the annual average power use for Adams and Stukel plants is 30,364 kWh and 32,552 kWh, respectively (Adams, 2023). Assuming average energy savings of 12.5 percent, the annual energy use after replacement would be approximately 26,568 kWh and 28,483 kWh, respectively. The Adams and Stukel plants fall under Pacific Power Schedule 41 rate, which charges a rate of $0.118 per kWh (Pacific Power, 2024). At this rate, replacing the plants would cause annual power costs to fall from roughly $3,600 to $3,100 for Adams and from $3,800 to $3,400 for Stukel. The annualized O&M cost (including maintenance and power) for each pumping plant is about $7,000 (for a total of $14,000 for both plants; see Table D-3 below).

Currently, and forecast under Future Without Project (No Action) Alternative, the annual costs of canal maintenance for the District are approximately $22,462 for each canal (project group) in the Project area. (Souza, 2023). However, current and projected future canal maintenance for D-16A is roughly $3,600 annually in the Future Without Project (No Action) Alternative (Souza, 2023). These are summarized in Table D-3 below.

The total OM&R costs under the Future Without Federal Investment (No Action) Alternative (including routine canal maintenance, headgate and pump replacement costs, canal failure costs, and pump O&M) are $474,000, as summarized in the table below.

[6] This District's estimated cost of replacing the pumps in 2023 dollars. In addition to a less expensive pump to replace Stukel, the costs are lower than the installation cost under the Modernization Alternative because they do not include costs associated with P.L. 83-566 projects such as engineering, contingency, project administration, technical assistance, and permitting.

[7] Following the methodology illustrated in Example 1-1, Section 611.0103(b), Part 611 - Water Resources Handbook for Economics, National Resource Economics Handbook, replacement costs are based on current installation costs and are expressed in current, 2023 dollars, and then discounted and amortized.

Table D-5. Total OM&R Costs under the Future Without Federal Investment Alternative, Klamath Watershed, Oregon, 2023$[1]

Project Group	Routine Canal Maintenance Costs	Annualized Pump and Headgate Replacement Costs	Annualized Pump OM&R Costs	Annualized Canal Failure Costs	Total Annualized OM&R Costs
PG1 Line D-Canal AP	N/A	$0	$0	$0	$0
PG2 Line D-Canal M2P	N/A	$0	$0	$24,000	$24,000
PG3 Pipe D-2	$22,462	$0	$0	$7,000	$28,000
PG4 Line D-3	$22,462	$0	$0	$59,000	$80,000
PG5 Pipe D-12	$22,462	$2,000	$0	$1,000	$24,000
PG6 Pipe D-14	$22,462	$0	$0	$0	$20,000
PG7 Pipe D-16	$22,462	$0	$0	$83,000	$104,000
PG8 Pipe D-16A	$3,591	$0	$0	$12,000	$16,000
PG9 Pipe D-18	$22,462	$0	$0	$7,000	$27,000
PG10 Pipe D-19	$22,462	$0	$0	$35,000	$55,000
PG11 Pipe D-20	$22,462	$0	$0	$23,000	$43,000
PG12 Adams Pump	N/A	$21,000	$7,000	$0	$28,000
PG13 Stukel Pump	N/A	$18,000	$7,000	$0	$25,000
Total	**$183,507**	**$41,000**	**$14,000**	**$251,000**	**$474,000**

Note: Totals may not sum due to rounding. Prepared November 2025
1/ Price Base: 2023 dollars

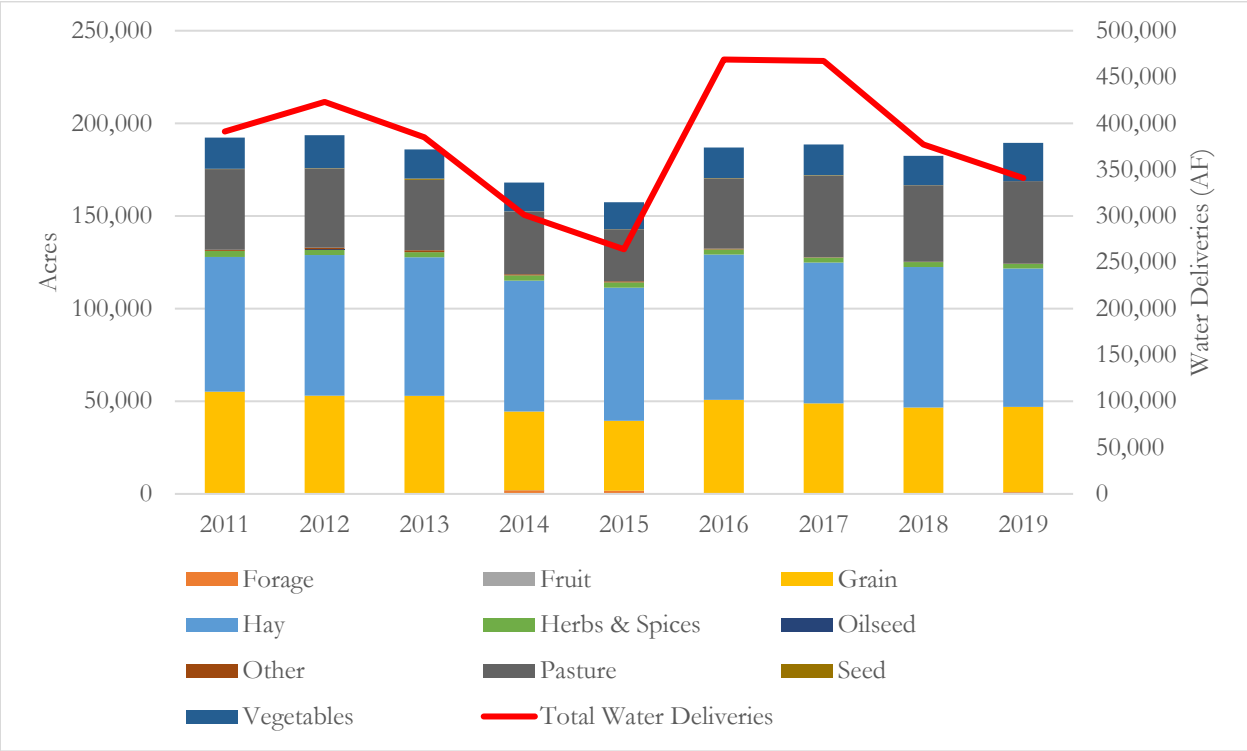
D.1.2.2 Inadequate Water Supply and Agricultural Damages

Currently, KID faces water supply shortages and associated agricultural damages due to reduced agricultural production. Inadequate water supply in KID results in fallowing of cropland, less agricultural production, and less agricultural net income. An analysis of cultivated acres and water deliveries in the Klamath Basin from 2011 to 2019 (see Figure D-1) indicates that growers facing water shortages first fallow their acres of grains and pasture; and conversely, when there is more water, growers convert fallow land into grain and pasture acres (see Figure D-1 below). The costs of inadequate water supplies under the FWOFI (No Action) Alternative are therefore estimated as the reduction in net returns (profit) from fallowing lands compared to cultivating irrigated grain.

Historical runoff in the Klamath River Basin is highly variable (US Bureau of Reclamation, Klamath River Basin Study Technical Working Group, 2016). In addition to this natural variability in hydrology, federal management affects water supplies to the Klamath Project area. Reclamation's foremost operational priority has been to provide, produce, or maintain certain lake levels and river flows to meet requirements under the Endangered Species Act and consistent with tribal trust obligations. Only after ESA and requirements have been met has Reclamation made water available for irrigation to districts and other contractors of the Klamath Project or for wildlife purposes to the

National Wildlife Refuges (US Bureau of Reclamation, 2016). This natural variability, coupled with federal management of water supplies to protect endangered species in the basin and meet tribal trust obligations, has caused Project water supplies to be dramatically curtailed numerous times in recent years, including most recently a 100 percent curtailment (i.e., no authorized water deliveries from the Klamath Project) in 2021.

Figure D-1. Cropped Acres and Water Deliveries in the Klamath Basin



Source: (U.S. Bureau of Reclamation, 2020)

To model the difference in net returns between fallow and irrigated wheat, this analysis uses a crop budget approach, which estimates the costs and revenues from production on a typical farm in the study area. This method is described in detail in Section D.6.1. The results of the crop budget approach indicate that fallowing incurs variable costs of around $89 per acre, while irrigated wheat generates revenues of roughly $161 per acre above operating costs. Consequently, moving from fallow to irrigated wheat increases net returns by roughly $250 per acre ($89 in avoided variable costs of fallowing plus $161 in net revenues from wheat). Since wheat consumes just over 1.8 AF of water per acre per year (U.S. Bureau of Reclamation, 2015), the additional water generates estimates net returns $136 per AFY. This is the cost per AFY of inadequate water supply. The amount of water supply shortages and associated agricultural damages in KID and other Klamath Project districts varies by water year.

This value may be conservative given data from the 2024 Klamath Project No-Irrigation Program, in which the Klamath Project Drought Response Agency provides payments to local farmers in the Klamath Project who agree to not irrigate acreage during the entire irrigation season from March 1 through October 1 (Klamath Water Users Association, 2024). The Program expects to offer payments for 2024 up to $450 per acre to landowners for not irrigating during this irrigation season;

assuming 2.5 to 3 AF per acre, this equates to $150 to $180 per AFY. Further, because wheat is a relatively low-value crop, modeling value of water in terms of the loss of wheat likely underestimates the value of water. The Klamath Basin grows higher value crops such as onions, hay, and potatoes. If these crops are being impacted by water shortages, the economic value of additional water would likely be higher than the value modeled in this analysis.

Agricultural water shortages would be exacerbated in the future if Adams and Stuckel pumps were to fail if they were not replaced. Both pumps are either at or beyond their useful lives. By replacing these pumps in the Future Without Project Alternative, water delivery is maintained on 12,000 acres of agricultural land.

Specifically, Adams pump provides irrigation water for 2,600 acres on the D-1 subsystem (Rasmussen, 2025). Stukel pump provides roughly 40 percent of the water for 23,500 acres supported by the D-Canal, or the equivalent of roughly 9,400 acres (Rasmussen, 2025; Souza, 2023). Following the estimates described above, the additional net revenues from irrigated wheat due to access to water (versus fallowing) are roughly $250 per acre. At this rate, Adams pump supports total net revenues of around $650,000 per year (2,600 acres times $250 per acre); Stukel (supporting 9,400 acres) supports roughly $2,350,000 in annual net revenues. In total, water deliveries by the two pumps support approximately $3 million per year.

This is likely a conservative estimate as the water delivered from these pumps likely also supports higher value crop production such as potatoes and onions. In summary, under the Future Without Federal Investment (No Action) Alternative, the District would continue to maintain and operate the aging Adams and Stukel pumps until they must be replaced due to failure or extremely costly repair, which is projected occur in Year 5. The replacements would maintain the current level of agricultural production (and avoid agricultural damages compared to failure that would otherwise be expected to occur under current conditions with the existing pumps) estimated to have a net economic value of at least $3 million per year, or $2.7 million in average annual value after discounting

Additionally, replacing the Adams and Stukel pumping plants (under both alternatives) would allow KID to conserve water by avoiding uncontrolled spills and increasing usable return flows. In an average year, the District expects that a new Adams pumping plant would reduce by 80 percent the 1,783 acre-feet per year (AFY) in uncontrolled spills currently experienced in the D-1 canal (reduction of 1,427 AFY), and that a new Stukel pumping plant would avoid 75 percent of 733 AFY in uncontrolled spills (550 AFY) compared to current conditions (Souza, 2023). Furthermore, the new pumping plants would allow roughly 1,200 AFY of additional return flows to be used in the District compared to current conditions, with about 70 percent of water pumped by Stukel (840 AFY) and the remaining 30 percent by Adams (360 AFY). In total, replacing Adams plant is expected to save roughly 1,787 AFY (360 AFY plus 1,427 AFY) and replacing Stukel plant is expected to save around 1,390 AFY (550 AFY plus 840 AFY).

As described above, additional water to agriculture would generate additional net revenues of around $136 per AF starting in Year 5 when the pumps are expected to be replaced under the FWOFI (No Action) Alternative. At this value, replacing Adams pump would provide additional net revenues of $243,000 per year above current conditions and Stukel would generate $189,000. When discounted to account for the fact that benefits do not start until Year 5, the annualized value of conserved water from the two pumps would be approximately $374,000. Table D-4 summarizes the value of conserved water as well as the value of preserving agricultural production on the 12,000 acres of land served by Adams and Stukel pumps ($2.67 million). Replacing these pumps in the FWOFI

Alternative sustains agricultural production value of $3.040 million, this the annualized average annual avoided agricultural damages of the FWOFI Alternative compared to current conditions.

Table D-6. Agricultural Damage Reduction Benefits from Increased Agricultural Production Value under the Future Without Federal Investment Alternative, Klamath River Watershed, Oregon, 2023 dollars[1]

Project Area	Conserved Water (AF/year)	Annualized Value of Conserved Water[2]	Annualized Value of Avoided Pump Failure of the FWOFI Alternative	Annualized Agricultural Damage Reduction Benefits of the FWOFI Alternative
D-Canal AP	0	$0	$0	$0
D-Canal M2P	0	$0	$0	$0
D-2	0	$0	$0	$0
D-3	0	$0	$0	$0
D-12	0	$0	$0	$0
D-14	0	$0	$0	$0
D-16	0	$0	$0	$0
D-16A	0	$0	$0	$0
D-18	0	$0	$0	$0
D-19	0	$0	$0	$0
D-20	0	$0	$0	$0
Adams Pump	1,787	$210,000	$578,000	$788,000
Stukel Pump	1,390	$164,000	$2,088,000	$2,252,000
Total	**3,176**	**$374,000**	**$2,666,000**	**$3,040,000**

Note: Totals may not sum due to rounding. Prepared November 2025
1/ Price Base: 2023 dollars amortized over 100 years at a discount rate of 2.75 percent.
2/ The undiscounted values are $243,000 for Adams and $189,000 for Stukel.

D.1.2.3 Flood Damage Costs

Canals fail in the project area on a regular basis, with some project groups failing multiple times per year. These canal failures (plugs or bank collapse) can cause flood damage to the surrounding property, including agricultural lands, residences, and other structures. KID has identified two canals in the Project area that pose particular flood risks: D-2 and D-12. A 2024 site study by the engineering firm SHN found that "there is a significant risk to structures and other infrastructure at both the D-2 and D-12 canals in case of a breach" (SHN, 2024).

In D-2, the canal is at risk of being obstructed and failing at a railroad crossing, which could cause flooding of an adjacent property with a 3,896-square-foot (sqft) house.[8] The condition of the canal banks, as well as other factors, contribute to the danger of flooding at this site. The D-2 canal has failed multiple times in the past five years and required emergency repairs in 2019, 2020, and 2023. One previous incident caused flooding at the neighboring house of 3 to 4 inches (SHN, 2024). Large amounts of vegetation along the banks of the canal have the potential to plug the canal at the

[8] The size of the house was obtained from Zillow (Zillow.com, 2024).

railroad crossing and cause overtopping. The recent increase in fallow land has created more tumbleweeds in the area, which, along with other debris and trash, are carried by the area's strong winds and are more frequently ending up in the canals where they contribute to plugging. In 2020, a windstorm brought debris into the canals, causing several blockages, and requiring emergency repair by the District. Because of these factors, the District estimates that there is a 50 percent chance in the next five years that a failure or plug of the canal will cause the adjacent property to flood up to one foot of water (Souza, 2023). While typically flood damages are estimated based on recurrence intervals of hydrologic events (100 year-storm, 50-year storm, etc.), in this case, the flooding would result from infrastructure failure, so the analysis does not include probabilities of different storm events. Further, quantitative modeling of the risk of canal infrastructure failure was not available.

To estimate the potential damage to the residence, we use data from the Federal Emergency Management Agency's (FEMA) Hazus 6.0 model and the U.S. Army Corps of Engineers' Hydrologic Engineering Center's Flood Impact Analysis (HEC-FIA), which are both software tools used to estimate flood damages. HEC-FIA uses a depth-damage relationship to estimate the portion of the total replacement cost of the structure that will incur damages at specific flood depths (for example, 1 foot of flooding would cause damages equal to 5 percent of the total replacement cost of a structure, 2 feet of flooding would cause damages equal to 20 percent of the total replacement cost of a structure, etc.). We adopt total replacement costs from the Hazus model and apply the depth-damage relationships from the HEC-FIA software to estimate the potential flood damages.

According to Hazus, the total replacement cost of a house (two-story with no basement) is approximately $136 per sqft (Federal Emergency Management Agency, 2022).[9] Given the size of the structure (cited above), the total replacement value would be roughly $532,000. The HEC-FIA models depth-damage relationships indicate that flooding of less than 1 foot would cause damages equal to 5 percent of replacement cost to the house (US Army Corps of Engineers, 2022). At these rates and the estimated total replacement costs, flooding under 1 foot would cause approximately $26,600 in damage to the house.

Given the District's estimated probability of flooding occurring (approximately 50 percent chance in the next five years, or roughly 10 percent annually),[10] the annual avoided damages to the house would be roughly $2,658, rounded to approximately $3,000 under the Future Without Federal Investment (No Action) Alternative. There is an unknown level of uncertainty in these damage estimates given that it is not known when another infrastructure failure event will occur, nor what the severity of the associated flooding will be. The estimate is based on recent history and assumes similar failure in the future as has been experienced in the recent past. There has been a canal failure at this location within the last five years, and that failure is expected to be increasing due to land fallowing; as such, it is likely that the annual average failure rate may be higher than estimated here, in which case the annualized average damages in the future would be higher. However, it is also

[9] The original values in 2022 dollars were adjusted for inflation to 2023 dollars using the Engineering News-Record construction cost index (Engineering News-Record, 2023). We used the Specific Occupancy category "RES1" costs for an average, two-story residence with no basement. There is uncertainty regarding the accuracy of the HAZUS estimates. The HAZUS estimates were generated using data from buildings and flood conditions that may differ from the structures and conditions in the study area. This could lead to bias in the estimates used in this analysis.

[10] Assuming the probability of flooding over the next 5 years is exactly 50%, then the exact annual probability of flooding would be 12.94 percent. However, since that this is an approximate estimate of probability over the next five years, we use the rough estimate of 10 percent to be conservative and to reflect that this is an approximate estimate of the odds of flooding.

feasible that the estimated damages used in this analysis are too high if the canal does not failure in the next five years.

The project group with a relatively high flood damage risk in the Project area is the D-12 canal, which runs adjacent to a residential property and the Lost River High School. This section of the D-12 canal also runs immediately adjacent to Highway 50, which increases the frequency of interference with the canal and contributes to the risk of flooding. In recent years there have been at least five incidents involving vehicles, debris, or cargo that have impacted the canal. In one recent incident, a truckload of potatoes overturned at Adams Point Road and dumped into the canal. There was no water in the canal at the time, but if there had been, the culvert would have been plugged and the water would have overtopped the canal banks, potentially flooding parts of the Lost River High School property. The SHN site study found that both the nearby residence and the high school's track and field were at flood risk under a D-12 failure.

The District estimates that there is a 50 percent chance that in the next 10 years there will be an incident on the D-12 that causes flooding to the residence and the high school property (Souza, 2023). Using the same approach described above, we apply a replacement value of $136 per sqft to the 1,854-sqft house[11] to derive a total replacement value of approximately $253,000. At a depth-damage relationship of 5 percent for flooding under 1 foot, the potential damage to the house would be roughly $13,000. We do not model damages to the high school property since it is uncertain how flooding might impact the track and field. Given the District's estimated probability of such a flood event occurring (a 50-percent chance in the next 10 years, or an annual average of roughly 7 percent),[12] the annual expected damage to the house is approximately $633, rounded to approximately $1,000.

As noted above, there is an unknown level of uncertainty in this damage estimate given that it is not known when another overtopping or canal failure event will occur, nor what the severity of the associated flooding will be. The estimate is based on recent history and assumes similar failure in the future as has been experienced in the recent past. Actual future damages under the Future Without Federal Investment (No Action) Alternative may be higher or lower than this estimate.

Table D-5 below summarizes the costs of flood damage under the Future Without Federal Investment (No Action) Alternative. While other canals in the District experience failures, some of which could damage nearby property (structures or crops), we focus on these two project groups because discussions with the District indicate that these are the most likely to experience flood damages in the Project area.

[11] The size of the house was obtained from Zillow (Zillow.com, 2024).

[12] While the probability would be slightly higher if properly calculated, we use the rough probability in order to be conservative and reflect the uncertainty in the estimated odds of flooding.

Table D-7. Annualized Average Flood Costs under the Future Without Federal Investment Alternative, Klamath River Watershed, Oregon, 2023 dollars[1]

Project Group	Annualized Annual Property Damage[2]
PG1 Line D-Canal AP	N/A
PG2 Line D-Canal M2P	N/A
PG3 Pipe D-2	$3,000
PG4 Line D-3	N/A
PG5 Pipe D-12	$1,000
PG6 Pipe D-14	N/A
PG7 Pipe D-16	N/A
PG8 Pipe D-16A	N/A
PG9 Pipe D-18	N/A
PG10 Pipe D-19	N/A
PG11 Pipe D-20	N/A
PG12 Adams Pump	N/A
PG13 Stukel Pump	N/A
Total	**$4,000**

Note: Totals may not sum due to rounding. Prepared November 2025
1/ Price Base: 2023 dollars amortized over 100 years at a discount rate of 2.75 percent.
2/ Piping is not completed immediately, and due to discounting of future costs and benefits, the annualized cost is less than the sum of average annual costs of canal repairs and property damage.

Currently, D-Canal at Adams Point leaks regularly and spills water onto Highway 50. While data on the extent of damage and disruption caused by this flooding are not available, the District notes that the flooding disrupts traffic and creates a significant public safety hazard for vehicles travelling through this section of highway.

D.1.3 Modernization Alternative

This section describes the costs and benefits of the Modernization Alternative.

D.1.3.1 Costs of the Modernization Alternative

Costs of the Modernization Alternative include implementation costs, which consist of installation and OM&R costs. There are no expected other direct costs.

D.1.3.1.1 Project Installation Costs

Project installation costs include mobilization and staging of construction or installation equipment, delivery of construction materials to project areas, dewatering (where necessary), installation/construction of equipment, excavation (where necessary), replacing a bridge crossing, compaction of backfill that is native material, restoration and reseeding of the disturbed areas, and any costs associated with obtaining easements or land acquisitions. There are no expected installation costs associated with cultural mitigation.

The total cost of installation/construction of the Modernization Alternative is estimated at $22,798,000 (see Section 8.9 in the Watershed Plan-Environment Assessment). This includes the

costs of construction,[13] contractor markup (estimated at 14 percent of construction costs), contingency costs (estimated at 30 percent of the subtotal of other cost components), permitting (estimated at 1.3 percent of construction costs), and engineering (estimated at 15 percent of the subtotal of other cost components).

The total costs also include project administration costs for KID and NRCS (7 percent of the subtotal of previously mentioned cost components), and technical assistance from NRCS (estimated at 8 percent of the subtotal of previously mentioned cost components). The costs of project installation are provided in Table D-6 and Table D-7 below (which correspond to NWPM 506.11 Economic Table 1 and NWPM 506.12 Economic Table 2, respectively).

[13] Construction costs include the cost of a bridge replacement in Project Group 2.

Table D-8. Estimated Installation Cost, Klamath River Watershed, Oregon, 2023 dollars[1]

Works of Improvement	Number				Estimated Costs (2023 dollars)[1]						Total
					Public Law 83-566 Funds			Other Funds			
	Unit	Federal land	Non-Federal land	Total	Federal land NRCS[2]	Non-Federal land NRCS[2]	Total	Federal land	Non-Federal land	Total	
PG1 Line D-Canal AP	Miles	0.00	0.93	0.93	$0	$993,000	$993,000	$0	$313,000	$313,000	$1,306,000
PG2 Line D-Canal M2P	Miles	0.00	0.89	0.89	$0	$1,310,000	$1,310,000	$0	$520,000	$520,000	$1,830,000
PG3 Pipe D-2	Miles	0.30	0.22	0.52	$325,000	$240,000	$565,000	$101,000	$75,000	$176,000	$741,000
PG4 Line D-3	Miles	0.00	1.10	1.10	$0	$803,000	$803,000	$0	$268,000	$268,000	$1,071,000
PG5 Pipe D-12	Miles	0.00	2.59	2.59	$0	$2,342,000	$2,342,000	$0	$759,000	$759,000	$3,101,000
PG6 Pipe D-14	Miles	0.00	0.72	0.72	$0	$769,000	$769,000	$0	$240,000	$240,000	$1,009,000
PG7 Pipe D-16	Miles	0.00	2.44	2.44	$0	$2,624,000	$2,624,000	$0	$853,000	$853,000	$3,477,000
PG8 Pipe D-16A	Miles	0.00	1.21	1.21	$0	$1,291,000	$1,291,000	$0	$413,000	$413,000	$1,704,000
PG9 Pipe D-18	Miles	0.00	1.32	1.32	$0	$1,487,000	$1,487,000	$0	$475,000	$475,000	$1,962,000
PG10 Pipe D-19	Miles	0.00	1.58	1.58	$0	$1,797,000	$1,797,000	$0	$578,000	$578,000	$2,375,000
PG11 Pipe D-20	Miles	0.00	1.31	1.31	$0	$1,506,000	$1,506,000	$0	$482,000	$482,000	$1,988,000
PG12 Adams Pump	Acres	0.00	0.30	0.30	$0	$850,000	$850,000	$0	$267,000	$267,000	$1,117,000
PG13 Stukel Pump	Acres	0.00	0.58	0.58	$0	$850,000	$850,000	$0	$267,000	$267,000	$1,117,000
Total project	**N/A**	**N/A**	**N/A**	**N/A**	**$325,000**	**$16,862,000**	**$17,187,000**	**$101,000**	**$5,510,000**	**$5,611,000**	**$22,798,000**

1/ Price base: 2023 dollars

Prepared November 2025

2/ Federal agency responsible for assisting in installation of works of improvement

Table D-9. Estimated Cost Distribution-Water Resource Project Measures, Klamath River Watershed, Oregon, 2023 dollars[1]

Works of Improvement	Installation Cost – PL 83-566				Installation Cost – Other Funds				Total
	Construction	Engineering	Project Admin Subtotal [2]	Total Public Law 566	Construction	Engineering	Project Admin Subtotal [3]	Total Other	
PG1 Line D-Canal AP	$782,000	$54,000	$157,000	$993,000	$261,000	$18,000	$34,000	$313,000	$1,306,000
PG2 Line D-Canal M2P	$1,049,000	$63,000	$198,000	$1,310,000	$349,000	$21,000	$150,000	$520,000	$1,830,000
PG3 Pipe D-2	$440,000	$31,000	$94,000	$565,000	$147,000	$10,000	$19,000	$176,000	$741,000
PG4 Line D-3	$635,000	$39,000	$129,000	$803,000	$211,000	$13,000	$44,000	$268,000	$1,071,000
PG5 Pipe D-12	$1,898,000	$132,000	$312,000	$2,342,000	$633,000	$44,000	$82,000	$759,000	$3,101,000
PG6 Pipe D-14	$603,000	$42,000	$124,000	$769,000	$200,000	$14,000	$26,000	$240,000	$1,009,000
PG7 Pipe D-16	$2,132,000	$148,000	$344,000	$2,624,000	$711,000	$49,000	$93,000	$853,000	$3,477,000
PG8 Pipe D-16A	$1,031,000	$64,000	$196,000	$1,291,000	$344,000	$21,000	$48,000	$413,000	$1,704,000
PG9 Pipe D-18	$1,186,000	$82,000	$219,000	$1,487,000	$396,000	$27,000	$52,000	$475,000	$1,962,000
PG10 Pipe D-19	$1,444,000	$100,000	$253,000	$1,797,000	$482,000	$33,000	$63,000	$578,000	$2,375,000
PG11 Pipe D-20	$1,202,000	$83,000	$221,000	$1,506,000	$401,000	$28,000	$53,000	$482,000	$1,988,000
PG12 Adams Pump	$668,000	$46,000	$136,000	$850,000	$223,000	$15,000	$29,000	$267,000	$1,117,000
PG13 Stukel Pump	$668,000	$46,000	$136,000	$850,000	$223,000	$15,000	$29,000	$267,000	$1,117,000
Total project	**$13,738,000**	**$930,000**	**$2,519,000**	**$17,187,000**	**$4,581,000**	**$308,000**	**$722,000**	**$5,611,000**	**$22,798,000**

1/ Price base: 2023 dollars. Prepared November 2025

2/ Includes $1,069,000 in project administration costs and $1,450,000 in technical assistance costs.

3/ Includes $429,000 in project administration costs and $293,000 in permitting costs.

D.1.3.1.2 Operations, Maintenance, and Replacement (OM&R) Costs

Under the Modernization Alternative, some project infrastructure would reach the end of its useful life before the end of the period of analysis and therefore require replacement. HDPE canal liners (used in Project Groups 1, 2, and 4) have a useful life of approximately 20 years and so would need to be replaced four times during the period of analysis. The Adams and Stukel pump stations (Project Groups 12 and 13) have a useful life of approximately 50 years and would therefore need to be replaced once during the period of analysis.

The analysis assumes the costs of replacing canal lining are equal to the costs of canal lining under the Modernization Alternative (including construction, engineering, construction management, and contingency costs). The estimated cost to replace Adams and Stukel pump stations is $650,000 and $550,000, respectively, per the District (Souza, 2023).

For the Adams and Stukel pumping plants, KID estimates that annual pump maintenance costs would total $750 per pumping plant for the first five years and would double every two years afterwards until they reach a maximum cost of $5,000 per year, all in 2023 dollars (Souza, 2023). Following the District's guidance, we model pump maintenance costs of $750 per year in the first five years after replacement, doubling every other year until they reach a maximum of $5,000 per year.

New pumps would reduce electricity usage by an estimated 10 to 15 percent (Adams, 2023) compared to the energy costs to operate the current pumps. Based on the current annual average power use for Adams and Stukel plants of 30,364 kWh and 32,552 kWh, respectively, electricity costs of $0.118 per kWh, and average energy savings of 12.5 percent, the annual energy costs after the pumps are replaced would be approximately $3,100 kWh and $3,400 for Adams and Stukel pumps, respectively.

No other OM&R costs are expected to be required to maintain the new infrastructure installed in the Modernization Alternative. The OM&R costs under the Modernization Alternative are summarized in Table D-8 below. Accounting for timing of costs, the average annual cost of replacing project components under the Modernization Alternative is estimated at approximately $152,000, as shown in Table D-8 below.[14]

[6] Replacement costs are expressed in current (2023 dollars) and then discounted and amortized following the methodology illustrated in Figure 1-3, Section 611.0103(b), Part 611 - Water Resources Handbook for Economics, National Resource Economics Handbook.

Table D-10. OM&R Costs under the Modernization Alternative, Klamath River Watershed, Oregon, 2023 dollars[1]

Project Group	Replacement Costs per Occasion	Replacement Years (after initial installation)	Annualized Average Pump O&M Costs[2]	Annualized OM&R Costs
PG1 Line D-Canal AP	$1,223,000	22, 42, 62, 82		$42,000
PG2 Line D-Canal M2P	$1,573,000	22, 42, 62, 82		$54,000
PG3 Pipe D-2				$0
PG4 Line D-3	$977,000	23, 43, 63, 83		$33,000
PG5 Pipe D-12				$0
PG6 Pipe D-14				$0
PG7 Pipe D-16				$0
PG8 Pipe D-16A				$0
PG9 Pipe D-18				$0
PG10 Pipe D-19				$0
PG11 Pipe D-20				$0
PG12 Adams Pump	$650,000	51	$7,000	$12,000
PG13 Stukel Pump	$550,000	51	$7,000	$11,000
TOTAL	**N/A**	**N/A**	**$14,000**	**$152,000**

Note: Totals may not sum due to rounding. Prepared November 2025
1/ Price Base: 2023 dollars. Future replacement costs are amortized over 100 years at a discount rate of 2.75 percent following the replacement cost methodology illustrated in Example 1-1 (page 1-8) and Figure 1-3 (page 1-20), Section 611.0103(b), Part 611 - Water Resources Handbook for Economics, National Resource Economics Handbook.
2/ Pump maintenance costs are expected to be lower in first decade after replacement, and then rise to a stable level after Year 11.

D.1.3.1.3 Other Direct Costs

The Modernization Alternative is not expected to result in any long-term adverse effects on water, fish and aquatic resources, or recreation. The Project may impact unknown cultural resources; however, no known impacts are expected. Minor short-term adverse impacts are expected on soils, vegetation, and wildlife during Project construction. Minor long-term impacts are expected for nearby wetland and riparian areas (and the wildlife that depends on them) that would be affected by the loss of water from canal seepage. Because of the uncertainty regarding the likelihood and magnitude of negative project externalities, we do not model other direct costs associated with the Modernization Alternative. See the Plan-EA for a more in-depth analysis of these resources.

D.1.3.1.4 Summary of Costs under the Modernization Alternative

Installation costs of the Modernization Alternative would occur over multiple years, and the timing of installation differs by project group (see Section D.1.7.3). For this reason, the annual construction costs are discounted to present value prior to annualizing.

The costs of the Modernization Alternative are equal to the estimated average annual installation/construction costs ($636,000 annually) plus the OM&R costs ($152,000 annually) for

each project group. The OM&R costs would be incurred by KID and are not covered by federal funding. There are no anticipated other direct costs of the Modernization Alternative.

In total across all project groups, the average annual Project costs are $788,000. These costs are summarized in Table D-9 below, which corresponds to NWPM 506.18 Economic Table 4.

Table D-11. Estimated Average Annual Cost of the Modernization Alternative, Klamath River Watershed, Oregon, 2023 dollars[1]

Project Group	Project Outlays (Amortization of Installation Cost)	OM&R Costs[2]	Other Direct Costs	Total Annualized Costs
PG1 Line D-Canal AP	$37,000	$42,000	$0	$79,000
PG2 Line D-Canal M2P	$52,000	$54,000	$0	$106,000
PG3 Pipe D-2	$21,000	$0	$0	$21,000
PG4 Line D-3	$30,000	$33,000	$0	$63,000
PG5 Pipe D-12	$87,000	$0	$0	$87,000
PG6 Pipe D-14	$27,000	$0	$0	$27,000
PG7 Pipe D-16	$97,000	$0	$0	$97,000
PG8 Pipe D-16A	$48,000	$0	$0	$48,000
PG9 Pipe D-18	$53,000	$0	$0	$53,000
PG10 Pipe D-19	$64,000	$0	$0	$64,000
PG11 Pipe D-20	$54,000	$0	$0	$54,000
PG12 Adams Pump	$33,000	$12,000	$0	$45,000
PG13 Stukel Pump	$33,000	$11,000	$0	$44,000
Total	**$636,000**	**$152,000**	**$0**	**$788,000**

Note: Totals may not sum due to rounding. Prepared November 2025
1/ Price Base: 2023 dollars amortized over 100 years at a discount rate of 2.75 percent.
2/ Price Base: 2023 dollars. Future OM&R costs are amortized over 100 years at a discount rate of 2.75 percent following the replacement cost methodology illustrated in Example 1-1 (page 1-8) and Figure 1-3 (page 1-20), Section 611.0103(b), Part 611 - Water Resources Handbook for Economics, National Resource Economics Handbook.

D.1.3.2 Benefits of the Modernization Alternative

This section describes the benefits of the Modernization Alternative compared to the Future Without Federal Investment (No Action) Alternative. All quantified benefits of the Modernization Alternative are on-site benefits: avoided damage to agricultural production (including both efficiency gains and increased production value) and avoided flood damages. The Project could produce off-site benefits, such as benefits to aquatic habitat due to water conservation from enhanced agricultural water management. While these benefits are not quantified in this analysis, we do discuss these qualitatively.

D.1.3.2.1 Benefits Included in the Analysis

D.1.3.2.1.1 Agricultural Damage Reduction Benefits

As noted in the Water Resources Handbook for Economics, "The national economic development (NED) benefits are the value of increases in the agricultural output of the Nation and the cost savings in maintaining a given level of output. The benefits include reductions in production and in associated costs; reductions in damage costs from floods, erosion, sedimentation, inadequate drainage, or inadequate water supply; the value of increased production of crops; and the economic efficiency of increasing production of crops in the project area." (Natural Resources Conservation Service, 1998).[15] The Modernization Alternative results in several of these types of agricultural benefits, both of which are categorized in the Water Resources Handbook as agricultural damage reduction benefits related to increased net income. This section describes these agricultural damage benefits, which include: 1) reduced agricultural damages from inadequate water supply, and 2) cost savings in maintaining a given level of output (i.e., efficiency gains from reduced production costs to deliver water in the District).

D.1.3.2.1.2 Increased Agricultural Production Value

The piping or lining of earthen canals in the Modernization Alternative would reduce agricultural damage by addressing inadequate water supply through increasing the amount of usable irrigation water through reduced seepage. The District's earthen canals currently experience seepage that would be avoided if the canals were piped or lined under the Modernization Alternative. In total, piping and lining is expected to save approximately 5,528 AFY in avoided seepage (Farmers Conservation Alliance, 2024).[16] The breakdown of water savings under the Modernization Alternative by project group is provided in Table D-10 below. The value of this water savings, as presented in Section D.2.2, is estimated at approximately $136 per AFY in reduced net agricultural income. At $136/AFY, the savings from avoided seepage of 5,528 AFY would generate benefits of $754,000 per year (or $710,000 discounted).[17]

As described in Section D.2.2, replacing Adams and Stukel pumps would allow the District to continue irrigating roughly 12,000 acres of land and support roughly $2.7 million in annualized agricultural net revenues. Replacing these pumps under the Modernization Alternative would support this same level of production. As in the Future Without Federal Investment (No Action) Alternative, pump replacement under the Modernization Alternative is also expected to provide 3,176 AF in additional water for agricultural by reducing operational spills and increasing usable return flows. However, this would happen sooner under the Modernization Alternative (with the pumps being replaced in Year 0 compared Year 5 under the Future Without Federal Investment (No Action) Alternative). Because the same level of benefit would occur under the Modernization Alternative as under the Future Without Federal Investment (No Action) Alternative, just sooner, the net benefits of the Modernization Alternative consist of the benefits between pump replacement under the Modernization Alternative and pump replacement under the Future Without Federal

[15] See Section 611.0200 (a) page 44, which describes the conceptual basis for agricultural NED benefits.

[16] For lining projects, we assume a 2-percent reduction in water savings versus piping due to evaporation. Of the 733 AFY of uncontrolled spill that would be avoided in the D-Canal, 25 percent would be attributable to PG2 Line D-Canal M2P under the Modernization Alternative, or about 183 AFY (Souza, 2023).

[17] At 1.8 AF per acre, the total water saved under the Modernization Alternative (8,705 AFY) would beneficially impact 10,135 acres. Past Klamath Basin crop reports indicate that grain acres decrease by 10,300 acres from an average to a dry water year (U.S. Bureau of Reclamation, 2020). This indicates it is reasonable to assume the water could beneficially impact all the acres modeled in this analysis.

Investment (No Action) Alternative; in other words, the water savings benefits that occur between Years 1 and 5.

As described in Section D.2.2, the water savings benefits for Adams and Stukel pumps after replacement are approximately $243,000 and $189,000 per year, respectively. The same benefits would accrue under the Modernization Alternative, although they would begin to accrue sooner.

The breakdown of water savings under the Modernization Alternative by project group is provided in Table D-10 below. In total, the projected water saving under the Modernization Alternative (8,705 AFY) represents about 2.3 percent of the average water deliveries to the Klamath Basin Project from 2011 to 2019 (380,000 AFY) (U.S. Bureau of Reclamation, 2020). The benefits of saved water and associated enhanced irrigation water supply under the Modernization Alternative are summarized in Table D-10.

Table D-12. Agricultural Damage Reduction Benefits of Conserved Water under the Modernization Alternative, Klamath River Watershed, Oregon, 2023 dollars[1]

Project Group	Years of Benefit	Conserved Water (AFY)	Undiscounted Benefit of Saved Water	Annualized Agricultural Damage Reduction Benefits
PG1 Line D-Canal AP	Years 2 to 101	528	$72,000	$70,000
PG2 Line D-Canal M2P	Years 2 to 101	675	$92,000	$89,000
PG3 Pipe D-2	Years 3 to 102	44	$6,000	$6,000
PG4 Line D-3	Years 3 to 102	98	$13,000	$13,000
PG5 Pipe D-12	Years 4 to 103	737	$100,000	$95,000
PG6 Pipe D-14	Years 4 to 103	305	$42,000	$38,000
PG7 Pipe D-16	Years 3 to 102	1,067	$145,000	$138,000
PG8 Pipe D-16A	Years 3 to 102	305	$42,000	$39,000
PG9 Pipe D-18	Years 4 to 103	549	$75,000	$69,000
PG10 Pipe D-19	Years 4 to 103	915	$125,000	$115,000
PG11 Pipe D-20	Years 4 to 103	305	$42,000	$38,000
PG12 Adams Pump	Years 1 to 103	1,787	$243,000	$243,000
PG13 Stukel Pump	Years 1 to 103	1,390	$189,000	$189,000
Total	**N/A**	**8,705**	**$1,186,000**	**$1,142,000**

Note: Totals may not sum due to rounding. Prepared November 2025
1/ Price Base: 2023 dollars amortized over 100 years at a discount rate of 2.75 percent.

As described in Section D.2.2, if Adams and Stukel pumps were not replaced, then the pumps are projected to fail and reduce water supply to approximately 12,000 acres with associated lost productivity on these acres and agricultural damages of roughly $2.7 million annualized (assuming as in the No Action that the pumps would not fail for the first five years, but would then fail or be too costly to repair after that time). These agricultural damages would be avoided in the Modernization Alternative since the pumps would be replaced, which would maintain productivity on these 12,000 acres. Note that the Modernization Alternative may provide greater benefits than $2.7 million in annualized benefits as it is possible that the existing pumps could fail in the next five years.

Table D-11 shows the total agricultural damage reduction benefits (from both conserved water and avoided pump failure) under the Modernization Alternative. Combined, the total annualized benefit of reducing agricultural damages under the Modernization Alternative would be around $3,808,000.

Table D-13. Agricultural Damage Reduction Benefits from Increased Agricultural Production Value of the Modernization Alternative, Klamath River Watershed, Oregon, 2023 dollars[1]

Project Group	Agricultural Damage Reduction Benefits of Conserved Water	Agricultural Damage Reduction Benefits of Maintaining Productivity (Pump Replacement)	Agricultural Damage Reduction Benefits of the Modernization Alternative Over the FWOFI Alternative
PG1 Line D-Canal AP	$70,000	$0	$70,000
PG2 Line D-Canal M2P	$89,000	$0	$89,000
PG3 Pipe D-2	$6,000	$0	$6,000
PG4 Line D-3	$13,000	$0	$13,000
PG5 Pipe D-12	$95,000	$0	$95,000
PG6 Pipe D-14	$38,000	$0	$38,000
PG7 Pipe D-16	$138,000	$0	$138,000
PG8 Pipe D-16A	$39,000	$0	$39,000
PG9 Pipe D-18	$69,000	$0	$69,000
PG10 Pipe D-19	$115,000	$0	$115,000
PG11 Pipe D-20	$38,000	$0	$38,000
PG12 Adams Pump	$243,000	$578,000	$821,000
PG13 Stukel Pump	$189,000	$2,088,000	$2,277,000
Total	**$1,142,000**	**$2,666,000**	**$3,808,000**

D.1.3.2.1.3 Efficiency Gains

The Modernization Alternative would also provide efficiency gains in the project area by reducing costs to convey irrigation water to growers' fields, resulting in lower costs for the same level of water delivery and associated agricultural production.[18] The source of the cost reductions would come from avoiding many of the OM&R costs outlined in Section D.2.1 that would occur in the Future Without Federal Investment (No Action) Alternative. The Modernization Alternative would eliminate many of these costs, including a portion of routine canal O&M, O&M of aging pumps, and repairing failed canals. Note that all OM&R costs of the infrastructure installed under the Modernization Alternative are included above in Section D.3.1.2. This section addresses reductions in OM&R costs of District operations that would otherwise continue in the absence of the Modernization Alternative, and that are not required with the infrastructure installed under the Modernization Alternative.

Currently, the annual costs of routine canal maintenance for the District are approximately $22,462 for each project group, as described in Section D.2.1 (Souza, 2023). For nearly all project groups that

[18] In fact, it is reduced cost of delivery for an increased amount of water delivered, since the piping would also increase water conveyed and delivered by reducing seepage. The value of this increased delivery of water is described above.

involve piping (with the exception of PG8 Pipe D-16A), the District expects to save roughly $7,000 annually per project group in reduced routine canal O&M costs (Souza, 2023). The savings would come from avoided mowing, equipment O&M costs, use of herbicides, ditch maintenance, replacing turnouts, and fewer patron callouts (Souza, 2023). For PG8 Pipe D-16A, cost savings are estimated to be slightly lower: the District expects to avoid roughly $4,000 per year in ditch cleaning, weed control, and staff time responding to patron requests (Souza, 2023).

Similarly, the Future Without Federal Investment (No Action) Alternative would have repair costs associated with canal failure totaling $251,000 (discussed in Section D.2.1). These costs of production would also be eliminated under the Modernization Alternative and therefore are also an efficiency benefit.

Also, as discussed in Section D.2.1, under the Future Without Federal Investment (No Action) Alternative, the District would incur costs associated with replacing a headgate on the D-12. The Modernization Alternative would completely avoid these costs, which total $2,000. Replacing the Adams and Stukel Pumps under the Modernization Alternative would avoid the replacement and O&M costs under the Future Without Federal Investment (No Action) Alternative (totaling $39,000 in replacement costs and $14,000 in O&M costs, as shown in Table D-3). In total, the Modernization Alternative would save $53,000 in pump OM&R. The pump O&M costs that would occur under the Modernization Alternative are accounted for in Section D.3.1.2.

Because the same (or actually higher levels) of water delivery are produced at a reduced cost, this efficiency gain is a benefit of the Modernization Alternative. Table D-12 below summarizes the different types of efficiency gains that would occur under the Modernization Alternative. These efficiency gains result from the same level (or actually slightly higher level) of water delivery and associated agricultural production being achieved at lower production cost.

Table D-14. Avoided Agricultural Damages from Efficiency Gains (Reduced Production Costs) of the Modernization Alternative, Klamath Watershed, Oregon, 2023$[1]

Project Group	Avoided Routine Canal Maintenance Costs	Avoided Canal Failure Repair Costs	Avoided Headgate Replacement Costs	Avoided Pump OMR Costs[2]	Total Efficiency Gains of the Modernization Alternative
PG1 Line D-Canal AP	$0	$0	$0	$0	$0
PG2 Line D-Canal M2P	$0	$24,000	$0	$0	$24,000
PG3 Pipe D-2	$7,000	$7,000	$0	$0	$14,000
PG4 Line D-3	$0	$59,000	$0	$0	$59,000
PG5 Pipe D-12	$7,000	$1,000	$2,000	$0	$10,000
PG6 Pipe D-14	$6,000	$0	$0	$0	$6,000
PG7 Pipe D-16	$7,000	$83,000	$0	$0	$90,000
PG8 Pipe D-16A	$4,000	$12,000	$0	$0	$16,000
PG9 Pipe D-18	$6,000	$7,000	$0	$0	$13,000
PG10 Pipe D-19	$6,000	$35,000	$0	$0	$41,000
PG11 Pipe D-20	$6,000	$23,000	$0	$0	$29,000
PG12 Adams Pump	$0	$0	$0	$28,000	$28,000
PG13 Stukel Pump	$0	$0	$0	$25,000	$25,000
Total	**$49,000**	**$251,000**	**$2,000**	**$53,000**	**$355,000**

Note: Totals may not sum due to rounding. Prepared November 2025

1/ Price base: 2023 dollars amortized over 100 years at a discount rate of 2.75 percent.

2/ Per Oregon NRCS state economist guidance, replacement costs expected to occur in the absence of the Modernization Alternative (i.e., under No Action) are included as a benefit of the Modernization Alternative rather than as a cost of the No Action (this results in the same net benefits but a slightly lower BC ratio). We note that DM 9500-013 on page 39 states that use of the cost of the most likely alternative to obtain a desired output can be used in benefit estimation if society would in fact undertake such an alternative. KID is confident that these investments would be necessary and would be incurred if the Modernization Alternative were not implemented, albeit the investments are expected to occur at a later time. In the sections below we include the increased (incremental) benefits of the Modernization Alternative infrastructure compared to the infrastructure that would be replaced in the absence of the Modernization Alternative. Pump replacement costs are not technically an efficiency gain since they do not represent a cost reduction compared to the Modernization Alternative, but are a cost incurred in both alternatives and need to be incorporated to comprehensively consider the additional costs and benefits of the Modernization Alternative compared to the FWOFI Alternative.

D.1.3.2.1.4 Total Agricultural Damage Reduction Benefits

Table D-13 below summarizes the different types of agricultural damage reduction benefits that would occur under the Modernization Alternative, including both increased production value and decreased production costs. Table D-14 shows the agricultural damage reduction benefits of the Modernization Alternative that would exceed those under the Future Without Federal Investment (No Action) Alternative (from Table D-4).

Table D-15. Total Avoided Agricultural Damages (Increased Production Value and Reduced Production Costs) of the Modernization Alternative, Klamath Watershed, Oregon, 2023$[1]

Project Group	Increased Production Value (Conserved Water & Pump Replacement)	Reduced Production Costs (Efficiency Gains)	Total Agricultural Damage Reduction of the Modernization Alternative
PG1 Line D-Canal AP	$70,000	$0	$70,000
PG2 Line D-Canal M2P	$89,000	$24,000	$113,000
PG3 Pipe D-2	$6,000	$14,000	$20,000
PG4 Line D-3	$13,000	$59,000	$72,000
PG5 Pipe D-12	$95,000	$10,000	$105,000
PG6 Pipe D-14	$38,000	$6,000	$44,000
PG7 Pipe D-16	$138,000	$90,000	$228,000
PG8 Pipe D-16A	$39,000	$16,000	$55,000
PG9 Pipe D-18	$69,000	$13,000	$82,000
PG10 Pipe D-19	$115,000	$41,000	$156,000
PG11 Pipe D-20	$38,000	$29,000	$67,000
PG12 Adams Pump	$821,000	$28,000	$849,000
PG13 Stukel Pump	$2,277,000	$25,000	$2,302,000
Total	**$3,808,000**	**$355,000**	**$4,163,000**

Note: Totals may not sum due to rounding. Prepared November 2025

1/ Price base: 2023 dollars amortized over 100 years at a discount rate of 2.75 percent.

Table D-16. Avoided Agricultural Damage Benefits of the Modernization Alternative Over the Future Without Federal Project (No Action) Alternative, Klamath Watershed, Oregon, 2023$[1]

Project Group	Agricultural Damage Reduction Under FWOFI Alternative	Agricultural Damage Reduction Modernization Alternative	Agricultural Damage Reduction Benefit of the Modernization Alternative Over FWOFI Alternative
PG1 Line D-Canal AP	$0	$70,000	$70,000
PG2 Line D-Canal M2P	$0	$113,000	$113,000
PG3 Pipe D-2	$0	$20,000	$20,000
PG4 Line D-3	$0	$72,000	$72,000
PG5 Pipe D-12	$0	$105,000	$105,000
PG6 Pipe D-14	$0	$44,000	$44,000
PG7 Pipe D-16	$0	$228,000	$228,000
PG8 Pipe D-16A	$0	$55,000	$55,000
PG9 Pipe D-18	$0	$82,000	$82,000
PG10 Pipe D-19	$0	$156,000	$156,000
PG11 Pipe D-20	$0	$67,000	$67,000
PG12 Adams Pump	$788,000	$849,000	$61,000
PG13 Stukel Pump	$2,252,000	$2,302,000	$50,000
Total	**$3,040,000**	**$4,163,000**	**$1,123,000**

Note: Totals may not sum due to rounding. Prepared November 2025
1/ Price base: 2023 dollars amortized over 100 years at a discount rate of 2.75 percent.
2/These are pump replacement costs that would be incurred under the Future Without Federal Investment (No Action) Alternative that would not be necessary under the Modernization Alternative.

D.1.3.2.2 Avoided Flood Damages

The flood risk currently experienced in D-2 and D-12, as described in D.2.2, would be eliminated by the Modernization Alternative as earthen canal failure would no longer be a risk (the probability of failure of piped canals that would result in flooding is estimated to be essentially zero). As such, the Modernization Alternative would result in avoided flood damage benefits of $4,000 projected to occur in the Future Without Federal Investment Alternative (see Section D.2.2) and the first column of Table D-15.

Further, the Modernization Alternative would eliminate the leakage of water from the D-Canal at Adams Point (PG1 Line D-Canal AP) that spills water onto Highway 50. As noted in Section D.2.3, the flooding disrupts traffic and creates a significant public safety hazard for vehicles travelling through this section of highway. Installation of PG1 would prevent canal leaks and avoid flooding, which would reduce traffic disruptions and risk to vehicles using the highway.

By preventing flooding incidents at Adams Point, the Modernization Alternative may avoid traffic delays (i.e., saved time, fuel, and vehicle depreciation), prevent damage to vehicles and property from accidents, avoid costs of repairing the road, and avoid costs associated with traffic-related injuries. While these benefits are conceptually quantifiable, the necessary data are not available to quantify these benefits in this analysis. As a proxy for these benefits, we use the value of the least cost

alternative to preventing the flooding: lining the D-canal at Adams Point. The District has stated that this is the next best alternative for addressing the leaks and flooding at Adams Point if piping is not implemented, and that they would seek funding for this option (demonstrating that they believe the transportation and public safety benefits exceed the cost of this alternative) (Souza, 2023).

The District estimated that lining the canal at Adams Point would cost roughly $100,000 and that the liner would have a useful life of approximately five years (Souza, 2023). If the liner were installed in Year 0 and every five years thereafter through Year 100, the discounted annualized cost would be roughly $22,000. We use this value as a proxy for the transportation and public safety benefits that would occur under the Modernization Alternative.

Table D-17. Avoided Flood Damages to Transportation and Public Safety under the Modernization Alternative, Klamath River Watershed, Oregon, 2023 dollars[1]

Project Group	Replacement Costs per Occasion	Replacement Years	Annualized Benefit
PG1 Line D-Canal AP	$100,000	0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100	$22,000
PG2 Line D-Canal M2P			$0
PG3 Pipe D-2			$0
PG4 Line D-3			$0
PG5 Pipe D-12			$0
PG6 Pipe D-14			$0
PG7 Pipe D-16			$0
PG8 Pipe D-16A			$0
PG9 Pipe D-18			$0
PG10 Pipe D-19			$0
PG11 Pipe D-20			$0
PG12 Adams Pump			$0
PG13 Stukel Pump			$0
TOTAL	**N/A**	**N/A**	**$22,000**

Note: Totals may not sum due to rounding. Prepared November 2025
1/ Price Base: 2023 dollars. Future replacement costs are amortized over 100 years at a discount rate of 2.75 percent

Table D-16 Annualized Average Flood Damages Benefits under the Modernization Alternative, Klamath River Watershed, Oregon, 2023 dollars[1]

Project Area	Average Annual Property Damage under Future Without Federal Investment Alternative	Average Annual Transportation Damage under Future Without Federal Investment Alternative	Average Annual Damage under Modernization Alternative	Avoided Flood Damage Benefits of the Modernization Alternative
PG1 Line D-Canal AP	N/A	$22,000	$0	$22,000
PG2 Line D-Canal M2P	N/A	N/A	N/A	$0
PG3 Pipe D-2	$3,000	N/A	$0	$3,000
PG4 Line D-3	N/A	N/A	N/A	$0
PG5 Pipe D-12	$1,000	N/A	$0	$1,000
PG6 Pipe D-14	N/A	N/A	N/A	$0
PG7 Pipe D-16	N/A	N/A	N/A	$0
PG8 Pipe D-16A	N/A	N/A	N/A	$0
PG9 Pipe D-18	N/A	N/A	N/A	$0
PG10 Pipe D-19	N/A	N/A	N/A	$0
PG11 Pipe D-20	N/A	N/A	N/A	$0
PG12 Adams Pump	N/A	N/A	N/A	$0
PG13 Stukel Pump	N/A	N/A	N/A	$0
Total	**$4,000**	**$22,000**	**$0**	**$26,000**

Note: Totals may not sum due to rounding. Prepared November 2025
1/ Price Base: 2023 dollars amortized over 100 years at a discount rate of 2.75 percent.

D.1.3.3 Benefits Considered but Not Included in the Analysis

D.1.3.3.1 Wildlife Habitat

The saved water from the Project would make more water available in the Upper Klamath Basin to alleviate water shortages. Repeatedly in the last several decades, there has not been sufficient water to meet irrigation demand and fish and wildlife habitat needs. If there is enough water for KID to meet its irrigation water delivery obligations, any additional saved water from the Project would go to the next most senior water right holder, such as the US Fish and Wildlife Service (USFWS), which could result in enhanced habitats in Upper Klamath Lake and the Klamath National Wildlife Refuges, supporting aquatic and migratory bird species. KID draws stored water from Upper Klamath Lake. Because both alternatives would result in water savings to the District (with the Modernization Alternative saving more water), they could result in more water being left in Upper Klamath Lake and/or more water being available for and delivered to wetland habitats in the Lower Klamath National Wildlife Refuge (LKNWR) and Tule Lake National Wildlife Refuge (TLNWR).

Upper Klamath Lake is the primary home of two endangered species: the Lost River and shortnose suckers. These two fish species have faced severe population declines due to habitat degradation, which includes declining water levels in Upper Klamath Lake, drought, hotter temperatures, and poor water quality (Smith, 2021; Grable, 2023). The Klamath National Wildlife Refuges are some of the most important sources of habitat for waterfowl on the West Coast's Pacific Flyway – a major

waterfowl migration corridor that connects breeding grounds in the northern North America with major wintering grounds in South America (Gilmer, Yee, Mauser, & Hainline, 2004). Approximately 80 percent of the Flyway's migrating waterfowl travel through the Klamath Basin during spring and fall migrations, during which they rely on the refuge for rest, refueling, breeding, molting, and staging (U.S. Fish and Wildlife Service, 2023; California Waterfowl Association, 2023). To the extent that the conserved water is not used to augment irrigation water supplies in the Basin, the saved water from the Project could improve the habitat for these species by increasing the lake levels in Upper Klamath Lake and wetlands in the National Wildlife Refuges. Since the saved water would most likely be used to irrigate crops in the Klamath Basin, we do not quantify the potential benefit to wildlife habitats.

However, if there is enough water for KID to meet its irrigation water delivery obligations, any additional saved water could result in enhanced habitat in Upper Klamath Lake, LKNWR, and/or TLNWR, supporting aquatic and migratory bird species. If conserved water benefits fish and wildlife habitat, the value of water to fish and wildlife is likely as high as it is for irrigation.[19]

D.1.4 Summary of Benefits and Costs of the Modernization Alternative

This section compares the benefits and costs of the Modernization Alternative. Specifically, this section provides the estimated benefits and costs of the Modernization Alternative that exceed those in the Future Without Federal Investment (No Action) Alternative. Across all project groups, the Modernization Alternative would provide annual average benefits of approximately $1.15 million at an annual average cost of $788,000. The result is net average annual benefits of $361,000. The costs and benefits are summarized in Table D-19 below.

D.1.4.1 Summary of NEE Benefits

Table D-17 (NWPM 506.19, Economic Table 5) summarizes the flood reduction benefits of the Modernization Alternative that are described in Sections D.3.2.2.

Table D-18. Estimated Average Annual Flood Damage Reduction Benefits, of the Modernization Alternative over the Future Without Federal Investment (No Action), Klamath River Watershed, Oregon, 2023 dollars[1]

Item	Estimated Average Annual Damage		Damage Reduction Benefit
	With project	Without Project	
Residential	$0	$4,000	$4,000
Other (roadways)	$0	$22,000	$22,000
Total	**$0**	**$26,000**	**$26,000**

Note: Totals may not sum due to rounding. Prepared November 2025
1/ Price Base: 2023 dollars amortized over 100 years at a discount rate of 2.75 percent.

Table D- (NWPM 506.20, Economic Table 5a) summarizes annual average benefits of the Modernization Alternative over the Future Without Federal Investment (No Action) Alternative.

[19] By prioritizing water use to meet ESA requirements and tribal trust obligations related to fish and wildlife, the federal government is implicitly indicating that the value to the public of water in the Basin for fish and wildlife is at least as high as the value of water for irrigation.

Table D-1819. Estimated Average Annual Damage Reduction Benefits, of the Modernization Alternative over the Future Without Federal Investment (No Action), Klamath River Watershed, Oregon, 2023 dollars[1]

Item	Damage Reduction Benefit, Average Annual	
	Agricultural-related	Non-Agricultural-related
PG1 Line D-Canal AP		
On-Site Damage Reduction Benefits		
Agricultural Damage Reduction	$70,000	
Flood Damage Reduction	$22,000	
Onsite Subtotal	$92,000	
Off-Site Damage Reduction Benefits		
Offsite Quantified Subtotal		$0
Total Quantified Benefits	**$92,000**	
PG2 Line D-Canal M2P		
On-Site Damage Reduction Benefits		
Agricultural Damage Reduction	$113,000	
Flood Damage Reduction	$0	
Onsite Subtotal	$113,000	
Off-Site Damage Reduction Benefits		
Offsite Quantified Subtotal		$0
Total Quantified Benefits	**$113,000**	
PG3 D-2		
On-Site Damage Reduction Benefits		
Agricultural Damage Reduction	$20,000	
Flood Damage Reduction	$3,000	
Onsite Subtotal	$23,000	
Off-Site Damage Reduction Benefits		
Offsite Quantified Subtotal		$0
Total Quantified Benefits	**$23,000**	
PG4 Line D-3		
On-Site Damage Reduction Benefits		
Agricultural Damage Reduction	$72,000	
Flood Damage Reduction	$0	
Onsite Subtotal	$72,000	
Off-Site Damage Reduction Benefits		
Offsite Quantified Subtotal		$0
Total Quantified Benefits	**$72,000**	

Item	Damage Reduction Benefit, Average Annual	
	Agricultural-related	Non-Agricultural-related
PG5 D-12		
On-Site Damage Reduction Benefits		
Agricultural Damage Reduction	$105,000	
Flood Damage Reduction	$1,000	
Onsite Subtotal	$106,000	
Off-Site Damage Reduction Benefits		
Offsite Quantified Subtotal		$0
Total Quantified Benefits	**$106,000**	
PG6 D-14		
On-Site Damage Reduction Benefits		
Agricultural Damage Reduction	$44,000	
Flood Damage Reduction	$0	
Onsite Subtotal	$44,000	
Off-Site Damage Reduction Benefits		
Offsite Quantified Subtotal		$0
Total Quantified Benefits	**$44,000**	
PG7 D-16		
On-Site Damage Reduction Benefits		
Agricultural Damage Reduction	$228,000	
Flood Damage Reduction	$0	
Onsite Subtotal	$228,000	
Off-Site Damage Reduction Benefits		
Offsite Quantified Subtotal		$0
Total Quantified Benefits	**$228,000**	
PG8 D-16A		
On-Site Damage Reduction Benefits		
Agricultural Damage Reduction	$55,000	
Flood Damage Reduction	$0	
Onsite Subtotal	$55,000	
Off-Site Damage Reduction Benefits		
Offsite Quantified Subtotal		$0
Total Quantified Benefits	**$55,000**	

Item	Damage Reduction Benefit, Average Annual	
	Agricultural-related	Non-Agricultural-related
PG9 D-18		
On-Site Damage Reduction Benefits		
Agricultural Damage Reduction	$82,000	
Flood Damage Reduction	$0	
Onsite Subtotal	$82,000	
Off-Site Damage Reduction Benefits		
Offsite Quantified Subtotal		$0
Total Quantified Benefits	**$82,000**	
PG10 D-19		
On-Site Damage Reduction Benefits		
Agricultural Production Value	$156,000	
Flood Damage Reduction	$0	
Onsite Subtotal	$156,000	
Off-Site Damage Reduction Benefits		
Offsite Quantified Subtotal		$0
Total Quantified Benefits	**$156,000**	
PG11 D-20		
On-Site Damage Reduction Benefits		
Agricultural Damage Reduction	$67,000	
Flood Damage Reduction	$0	
Onsite Subtotal	$67,000	
Off-Site Damage Reduction Benefits		
Offsite Quantified Subtotal		$0
Total Quantified Benefits	**$67,000**	
PG12 Adams Pump		
On-Site Damage Reduction Benefits		
Agricultural Damage Reduction	$61,000	
Flood Damage Reduction	$0	
Onsite Subtotal	$61,000	
Off-Site Damage Reduction Benefits		
Offsite Quantified Subtotal		$0
Total Quantified Benefits	**$61,000**	

Item	Damage Reduction Benefit, Average Annual	
	Agricultural-related	Non-Agricultural-related
PG13 Stukel Pump		
On-Site Damage Reduction Benefits		
Agricultural Production Value	$50,000	
Flood Damage Reduction	$0	
Onsite Subtotal	$50,000	
Off-Site Damage Reduction Benefits		
Offsite Quantified Subtotal		$0
Total Quantified Benefits	**$50,000**	

Note: Totals may not sum due to rounding. Prepared November 2025
1/ Price Base: 2023 dollars amortized over 100 years at a discount rate of 2.75 percent.

Table D-19 summarizes the benefits of the Modernization Alternative over the Future Without Federal Investment (No Action) and compares them to the costs of the Modernization Alternative (which corresponds to NWPM 506.21 Economic Table 6).

Table D-20. Comparison of Costs and Benefits of the Modernization Alternative Compared to the Future Without Project (No Action) Alternative, Klamath River Watershed, Oregon, 2023 dollars[1]

Works of Improvement	Agriculture-related		Average Annual Benefits	Average Annual Cost [2]	Benefit cost ratio
	Agricultural Damage Reduction	Flood Damage Reduction			
PG1 Line D-Canal AP	$70,000	$22,000	$92,000	$79,000	1.2
PG2 Line D-Canal M2P	$113,000	$0	$113,000	$106,000	1.1
PG3 Pipe D-2	$20,000	$3,000	$23,000	$21,000	1.1
PG4 Line D-3	$72,000	$0	$72,000	$63,000	1.1
PG5 Pipe D-12	$105,000	$1,000	$106,000	$87,000	1.2
PG6 Pipe D-14	$44,000	$0	$44,000	$27,000	1.6
PG7 Pipe D-16	$228,000	$0	$228,000	$97,000	2.4
PG8 Pipe D-16A	$55,000	$0	$55,000	$48,000	1.1
PG9 Pipe D-18	$82,000	$0	$82,000	$53,000	1.5
PG10 Pipe D-19	$156,000	$0	$156,000	$64,000	2.4
PG11 Pipe D-20	$67,000	$0	$67,000	$54,000	1.2
PG12 Adams Pump	$61,000	$0	$61,000	$45,000	1.4
PG13 Stukel Pump	$50,000	$0	$50,000	$44,000	1.1
Total	**$1,123,000**	**$26,000**	**$1,149,000**	**$788,000**	**1.5**

1/ Price Base: 2023 dollars amortized over 100 years at a discount rate of 2.75 percent. Prepared November 2025
2/ From Table D-9.

D.1.4.2 Incremental Analysis

The Modernization Alternative is evaluated using an incremental analysis, which identifies how total costs and benefits change as project groups are added (or removed). The design of each project group is independent of the number of project groups included and the order in which they are installed. Table D-20 presents the incremental costs and benefits of the Modernization Alternative.

Table D-21. Incremental Analysis of Annual NEE Costs and Benefits Under the Modernization Alternative, Klamath River Watershed, Oregon, 2023 dollars[1]

Project Groups	Total Costs	Incre-mental Costs	Total Benefits	Incre-mental Benefits	Net Benefits
1	$79,000	N/A	$92,000	N/A	$13,000
1,2	$185,000	$106,000	$205,000	$113,000	$20,000
1,2,3	$206,000	$21,000	$228,000	$23,000	$22,000
1,2,3,4	$269,000	$63,000	$300,000	$72,000	$31,000
1,2,3,4,5	$356,000	$87,000	$406,000	$106,000	$50,000
1,2,3,4,5,6	$383,000	$27,000	$450,000	$44,000	$67,000
1,2,3,4,5,6,7	$480,000	$97,000	$678,000	$228,000	$198,000
1,2,3,4,5,6,7,8	$528,000	$48,000	$733,000	$55,000	$205,000
1,2,3,4,5,6,7,8,9	$581,000	$53,000	$815,000	$82,000	$234,000
1,2,3,4,5,6,7,8,9,10	$645,000	$64,000	$971,000	$156,000	$326,000
1,2,3,4,5,6,7,8,9,10,11	$699,000	$54,000	$1,038,000	$67,000	$339,000
1,2,3,4,5,6,7,8,9,10,11,12	$744,000	$45,000	$1,099,000	$61,000	$355,000
1,2,3,4,5,6,7,8,9,10,11,12,13	$788,000	$44,000	$1,149,000	$50,000	$361,000

1/ Price Base: 2023 dollars amortized over 100 years at a discount rate of 2.75 percent. Prepared November 2025

D.1.4.3 Preferred Alternative

As the Modernization Alternative would provide net quantified benefits of $361,000 and would meet the purpose and need, the Modernization Alternative is the preferred alternative.

D.1.5 References

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D.1.6 NEE Appendix

This presents the crop enterprise method used to estimate the benefits of avoiding agricultural damage to the Klamath Basin under the Modernization and Future Without Federal Investment (No Action) Alternatives (described in Section D.3.2.1.1).

D.1.6.1 Crop Enterprise Budgets

The analysis uses a total of two crop budgets: One for fallowing and another for irrigated wheat. We estimate the costs and benefits of agricultural production using enterprise budgets that represent typical costs and returns of producing crops in the Klamath Watershed of Oregon. Enterprise budgets aim to reflect common practices and relevant costs for production in the region, but do not necessarily represent the conditions of any particular farm. As a starting point for the crop budgets in this analysis, we used two crop budgets: One for fallowing developed by Washington State University (WSU) and one for spring wheat from University of Idaho (UID). We adjusted values in the budgets to account for changes in prices through time and local conditions in the Klamath Basin. The following sections outline the data and assumptions used in adjusting the budgets.

D.1.6.1.1 Wheat Enterprise Budget

The wheat enterprise budget was based on a 2019 budget developed by UID for establishing and producing soft white spring wheat in southwest Idaho (Eborn, 2019). We selected this budget as the basis for Klamath Basin crop production costs because it is the most recent crop budget developed for producing wheat in an area that is relatively close to Southern Oregon. We updated the costs presented in the original budget to account for changing values over time and to reflect conditions specific to the Klamath Basin.

D.1.6.1.1.1 Modeled Farm

The modeled farm is 1,200 acres total with 300 acres in wheat. The wheat field is disc-ripped in the fall, roller harrowed and planted in the spring and corrugated once after planting. Fertilizing, spraying, combining, and harvesting are provided by custom labor. Irrigation is delivered by concrete ditch and siphon tube irrigation system. Because this analysis models a farm that transitions from fallow to wheat production, all fixed costs are assumed to be the same regardless of cultivation, including the land and machinery ownership costs. Consequently, we only consider the difference in variable costs and revenues between the two scenarios (fallow and wheat) to calculate the difference in net returns.

D.1.6.1.1.2 Input Costs

For fertilizers, we adjust the amount used proportionally according to differences in yield from the original budget. For example, the original wheat budget calls for 125 pounds (lbs) of dry nitrogen to produce 110 bushels of wheat per acre; we model a yield of only 101.6 bushels per acre (92 percent of the original yield), so we reduce the amount of dry nitrogen to 115 lbs (92 percent of 125 lbs).

All prices are adjusted from the original values in the UID budget. We used area-specific values for fuel prices and land costs. A Klamath wheat grower provided guidance on the costs of custom fertilizing ($13 per acre) (McKoen, 2024). For costs that did not have area-specific values, we adjusted the value in the original budget using the national Producer Price Indices (PPI) produced by the National Agricultural Statistics Services (NASS), which are published for a variety of farm expenses (NASS, 2023). For example, there are price indices for fertilizer, herbicides, supplies, tractors, custom work, as well as one for the farm sector in general. The PPI cost adjustments range

from a 17-percent increase in the price of Seeds & Plants Totals to a 63-percent increase in cost of Fertilizer Totals (incl lime & soil conditioners). For land costs, we use the normalized average[20] of available NASS data on rental rates for irrigated cropland in Klamath County from 2014 to 2023: $248 per acre (NASS, 2023).[21]

D.1.6.1.1.3 Labor Costs

The original budget models three types of labor: Equipment operator, general farm, and irrigation labor. For general farm and irrigation labor, we used the mean hourly wage rate for the farmworkers occupation in the region in 2022 and adjust to 2023 dollars using the "Labor, Wage Rates" PPI.[22] We further adjust this wage rate up by 20 percent to account for non-wage employment costs, such as health care and insurance.[23] This results in total costs of $21.97 per hour for general farm and irrigation labor. For equipment operator labor costs, we use the mean hourly wage for agricultural equipment operators in the region and adjust the labor rate in the same way to derive the total cost of labor.[24] This results in total labor costs of $25.18 per hour for equipment operators.

We adjusted the cost of custom work using the "Ag Services, Custom Rates" PPI. We adjusted the amount of custom hauling proportionally to the change in yield (e.g., if yield falls by 10 percent, the amount of labor also falls by 10 percent).

D.1.6.1.1.4 Revenues

To estimate the gross revenues of wheat, we estimate the price and yield of spring wheat in KID. For the price, we use the NRCS method for calculating the normalized price for commodities, with a few modifications: We use more recent data and adjust the price for inflation.[25] This generates a normalize price of wheat in Oregon of $7.34 per bushel. Because spring wheat often fetches a higher price than other wheat, we add an additional 4 percent (the average premium in the most recent five-years of national-level data) to the average price of all wheat. This results in an average price of spring wheat of $7.61 per bushel, which is the price used in our spring wheat budget. For wheat yields, we use the normalized average of yields in California's Klamath Basin from 2013 to 2019: 101.6 bushels per acre (U.S. Bureau of Reclamation, 2021).

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[20] The normalized average is calculated by removing the highest and lowest values from the dataset and taking the mean of the remaining values.

[21] For Klamath County, we took the average price of the data available from 2014-2023.

[22] We use the average wage for the Farmworkers and Laborers, Crop, Nursery, and Greenhouse (occupation code 45-2092) in the North Valley-Northern Mountains Region non-metropolitan area according to the Bureau of Labor Statistics' Occupational Employment and Wage Estimates data in May 2022 (U.S. Bureau of Labor Statistics, 2022).

[23] This is roughly the average proportion of non-wage labor costs for all private, part-time workers in the U.S. in December 2018 (Bureau of Labor Statistics, 2018).

[24] We use the average wage for the Agricultural Equipment Operators (occupation code 45-2091) in the North Valley-Northern Mountains Region non-metropolitan area according to the Bureau of Labor Statistics' Occupational Employment and Wage Estimates data in May 2022 (U.S. Bureau of Labor Statistics, 2022).

[25] The NRCS method consists of dividing the three-year average of state prices by the three-average of national prices and multiplying by the five-year average of national prices (USDA Economic Research Service, 2023). The NRCS method uses data that is at least two years prior to calculate normalized prices in given year. For example, the normalized price of wheat in 2023 would use state data from 2019 to 2021 and national data from 2017 to 2021. Our modified method uses the most recent data available (2021 to 2023 for Oregon and 2019 to 2023 for the US) and adjusted the price for inflation prior to averaging using the Implicit Price Deflator for Gross Domestic Product (Bureau of Economic Analysis, 2023).

D.1.6.1.1.5 Wheat Budget Tables

The table below presents the wheat enterprise budget used to estimate the costs and returns for irrigated wheat.

Table D-22. Wheat Net Revenues Above Variable Costs Per Acre

Item	Quantity	Unit	$/Unit	Total
REVENUE				
Soft white spring wheat	102	bu	$7.61	$772.52
VARIABLE COSTS				
Wheat Seed: SWS	150	lb	$0.26	$38.50
Dry Nitrogen	115	lb	$0.60	$69.78
Dry P2O5	46	lb	$0.67	$30.84
K2O	46	lb	$0.51	$23.32
Sulfur	44	lb	$0.36	$15.89
Bronate Advanced	0.8	pint	$8.60	$6.88
Affinity Broad Spectrum	0.6	oz	$10.95	$6.57
N-I Surfactant + UAN	1	acre	$1.05	$1.05
Custom Fertilize	1	acre	$13.00	$13.00
Custom Spraying	1	acre	$8.94	$8.94
Custom Combine	1	acre	$78.71	$78.71
Custom Haul	101.6	bu	$0.42	$42.39
Water Assessment	1	acre	$67.93	$67.93
Repairs - Conc. Ditch	1	acre	$5.04	$5.04
Fuel - Gas	1.28	gal	$4.84	$6.20
Fuel - Diesel	7.02	gal	$5.24	$36.78
Fuel - Road Diesel	0.1	gal	$5.39	$0.54
Lube	1	acre	$4.35	$4.35
Machinery Repair	1	acre	$15.53	$15.53
Equipment Operator Labor	1.76	hrs	$25.18	$44.31
General Farm Labor	0.3	hrs	$21.97	$6.59
Irrigation Labor	2.45	hrs	$21.97	$53.84
Interest on operating capital	1	acre	$16.57	$16.57
Crop Insurance	1	acre	$17.88	$17.88
Total variable costs				$611.43
Net returns above variable costs				**$161.09**

D.1.6.1.2 Fallow Enterprise Budget

We based the fallow enterprise budget on a 2002 budget for winter wheat-summer fallow by WSU (Nail, Young, Hinman, & Schillinger, 2004). We selected this budget as the basis for Klamath fallowing costs because it was the closest available to southern Oregon. As in the wheat budget, we updated the costs presented in the original budget to account for changing values over time and to reflect conditions specific to the Klamath Basin.

D.1.6.1.2.1 Modeled Farm

The modeled farm is assumed to be the same size and have the same complement of machinery as the wheat budget.

D.1.6.1.2.2 Input Costs

Input costs for fallowing in the original budget include the cost of chemicals (herbicides and fertilizers) and the cost of running and maintaining the equipment to apply the chemicals. As in the wheat budget, we adjusted all costs in the fallowing budget from their original dollar year (2002) to 2023 dollars using the PPI.

D.1.6.1.2.3 Labor Costs

The only labor in the fallowing budget is equipment operator labor, which we assign the same total cost as the wheat budget: $25.18 per hour.

D.1.6.1.2.4 Revenues

Fallowing produces no saleable products and therefore generates no revenues.

D.1.6.1.2.5 Fallowing Enterprise Budget Table

The table below presents the fallowing enterprise budget used to estimate the costs of fallowing land in the Klamath Basin.

Table D-23. Variable Costs of Fallowing Per Acre

Item	Quantity	Unit	$/Unit	Total
VARIABLE COSTS				
Round-up	8	oz	$0.43	$3.42
Aqua N	50	lb	$0.78	$39.24
Thio-sulfate	5	lb	$0.21	$1.03
Machinery fuel/lube	1	acre	$13.09	$13.09
Machinery repairs	1	acre	$8.86	$8.86
Labor (trac/mach)	0.63	hour	$25.18	$15.86
Overhead	1	acre	$4.50	$4.50
Interest on operating capital	1	acre	$2.53	$2.53
Total variable costs				**$88.53**

D.2 Alternatives Considered During Formulation

This appendix section presents the alternatives considered in the formulation phase.

During the formulation phase, alternatives were evaluated based on meeting both NEPA and environmental review requirements specific to NRCS federal investments in water resources projects (PR&G) (Table D-18). According to NEPA, "agencies shall rigorously explore and objectively evaluate all reasonable alternatives" (40 CFR 1502.14). According to the PR&G DM9500-013, alternatives should reflect a range of scales and management measures and be evaluated against the Federal Objective and Guiding Principles; against the extent to which they address the problems and opportunities identified in the purpose and need; and against the criteria of completeness, effectiveness, efficiency, and acceptability:

1. Completeness is the extent to which an alternative provides and accounts for all features, investments, and/or other actions necessary to realize the planned effects, including any necessary actions by others. It does not necessarily mean that alternative actions need to be large in scope or scale.
2. Effectiveness is the extent to which an alternative alleviates the specified problems and achieves the specified opportunities.
3. Efficiency is the extent to which an alternative alleviates the specified problems and realizes the specified opportunities at the least cost.
4. Acceptability is the viability and appropriateness of an alternative from the perspective of the Nation's general public and consistency with existing Federal laws, authorities, and public policies. It does not include local or regional preferences for particular solutions or political expediency.

Alternatives eliminated during formulation are shown in Table D-18. Alternatives Considered During the Formulation Phase and discussed below. Alternatives selected for further evaluation are discussed in the Plan-EA.

TableD-24. Alternatives Considered During the Formulation Phase

Alternative	Which criteria in the PR&G does the alternative achieve?				Selected for Further Evaluation
	Completeness	Effectiveness	Efficiency	Acceptability	
Lining and Piping Whole District	X	X			
Line D-Main Canal and D-System Laterals	X	X		X	
D-Main Canal and D-1 Canal Lining and Lateral Piping	X	X	X	X	X
D-Main Canal and Lateral Pressurized Piping	X	X	X	X	X

D-Main Canal Gravity Piping	X	X	X	X	X
No Action (Future without Federal Investment)					X
Modernization Alternative	X	X	X	X	X

D.2.1 Alternatives Not Selected for Further Evaluation

D.2.1.1 Lining and Piping Whole District

This alternative evaluated the lining and piping of the entire KID canal and lateral network. Two-hundred miles of District-operated canals and laterals generally run southeast to irrigate 53,638 acres of agricultural lands as well as urban and rural areas. After consultation with engineers and KID, it was determined that this alternative would be logistically infeasible to pursue, due to the vast scale of District infrastructure and cost of implementing a system-wide project. KID would not be reasonably able to obtain match funding for a project of this size, and the implementation of the project would be logistically infeasible for the District. This alternative was dismissed from further consideration because it would not efficiently address the project purpose and need, was not logistically acceptable or reasonable for the District to pursue, and thus would not achieve the Federal Objective and Guiding Principles.

After evaluating District goals, The D system was prioritized for modernization due to is location at the bottom of the District, where the portion of land designated for agricultural purposes is higher, and where a higher proportion of operational challenges exist for the District. The D Canal system conveys irrigation water through approximately 23 miles of main canals and 28.5 miles of laterals, comprising approximately 27.8% of the entire District.

KID worked with SHN Engineering to develop a SIP, to develop modernization projects (both energy and water conservation-focused) throughout the D-System. Based on the high-level engineering designs presented in the SIP, the District determined that a combination of lining and piping select areas of the D-System would be acceptable both to the District and patrons, as well as having the maximum benefit while maintaining feasible project scope and costs. The combination of lining and piping the select areas of the D-system was carried forward for detailed analysis.

D.2.1.2 Line D Main Canal and D System Laterals

This alternative evaluated the lining of the entire D Canal and system laterals. Canal lining would involve covering the bottom and sides of the currently open D Canal with a geotextile liner and shotcrete to prevent water from seeping into the underlying soils and rock.

Lining would increase water velocity in the canals because the concrete cover is a smoother surface than the existing underlying soils and rock. The smoother surface would make the sides of the canals slippery and could be a threat to public safety if the lined section of the canal were adjacent to a population-dense area or easily accessible by the public. Fencing and safety ladders would be needed for the canal lining alternative to address the public safety criteria of the Federal Objective.

Canal lining would only partially meet the project purpose of conserving water. While lining would reduce water loss from seepage, it would not reduce water loss from evaporation. The lining materials would have an expected lifespan of approximately 50 years for Concrete Canvas and 25 to 50 years for HDPE before needing to be replaced (SHN 2023). Before replacement, as the system aged, it would likely require maintenance with progressively increasing frequency. This would be necessary to address wear and cracks in the lining, which would otherwise result in increased water loss through seepage over time.

Canal lining the entire D-System (Main Canal and laterals) would not fully meet the project purpose and need to improve water delivery reliability. An anticipated increase in O&M costs and continued potential losses from evaporation and seepage would preclude the provision of a similar level of water conservation efficiency as piping, making canal lining a less effective approach when applied to the entire D-System. As a result, the D Main Canal and D-System lateral lining alternative was dismissed from further consideration because it would not effectively or efficiently meet the project purpose and need, would not be acceptable to the public due to risks for public safety, and thus would not achieve the Federal Objective and Guiding Principles.

D.3 Capital Costs

D.3.1 D-Main Canal and D-1 Canal Lining and Lateral Piping Costs

Due to the high costs of pressurized piping the entire D-Main Canal, a common and less expensive option for modernization is lining canals with an impervious material. This alternative evaluated the feasibility, cost, and longevity of lining the entirety of both the D-Main and the D-1 Canals. A variety of liner materials were considered as potential solutions for lining the D and D-1 canals. These liners were found to have shorter lifespans when compared to other options evaluated in the District's System Improvement Plan (SIP) and, over time, would require increasing maintenance as they are exposed to the elements.

Additionally, this alternative would gravity pipe all laterals within the D-System and incorporate pump station improvements, including new pumps, the integration of VFDs, and automated trash rakes to both the Adams and Stukel Pumping Plants. This alternative would cost approximately $70,789,000.

Table D-25. D-Main Canal and D-1 Canal Lining and Lateral Piping Capital Costs.

						30%		15%	
	Lined Canals	**Feature**	**Pipe Diameter (in)**	**Quantity**	**Estimated Construction Costs**	**Contingency**	**Subtotal**	**Engineering Cost**	**TOTAL**
D-1 Canal Main	D-1 Canal	HDPE Liner	N/A	701316 SF	$1,051,974	$315,592	$1,367,566	$205,135	$1,572,701
	D-1 Canal	Sub-Liner	N/A	701316 SF	$617,158	$185,147	$802,306	$120,346	$922,651
	D-1 Canal Lined Total				$1,669,132	$500,740	$2,169,872	$325,481	$2,495,352
	D-1 Canal	Large Control	N/A	0 EA	$ -	$ -	$ -	$ -	$ -
	D-1 Canal	Small Control	N/A	8 EA	$1,600,000	$480,000	$2,080,000	$312,000	$2,392,000
	D-1 Canal	Turnout	N/A	4 EA	$90,000	$27,000	$117,000	$17,550	$134,550
	D-1 Canal Structure Total				$1,690,000	$507,000	$2,197,000	$329,550	$2,526,550
	Adams Pump Station	Pump Replace	N/A	3 EA	$450,000	$135,000	$585,000	$87,750	$672,750
	Adams Pump Station	Trash Rake	N/A	1 EA	$180,000	$54,000	$234,000	$35,100	$269,100
	Adams Pump Station Total				$630,000	$189,000	$819,000	$122,850	$941,850
	D-1 Canal Main Total				$3,989,132	$1,196,740	$5,185,872	$777,881	**$5,963,752**
D-1 Canal Laterals	D-1A	Piping	18	1350 LF	$135,189	$40,557	$175,746	$26,362	$202,108
	D-1A	Turnout	Turnout	1 EA	$7,500	$2,250	$9,750	$1,463	$11,213
	D-1A Total				$142,689	$42,807	$185,496	$27,824	$213,320
	D-1B	Piping	18	4500 LF	$450,630	$135,189	$585,819	$87,873	$673,692
	D-1B	Turnout	Turnout	1 EA	$7,500	$2,250	$9,750	$1,463	$11,213
	D-1B Total				$458,130	$137,439	$595,569	$89,335	$684,904

	D-1C								Existing Piped
	D-2	Piping	24	2700 LF	$377,946	$113,384	$491,330	$73,699	$565,029
	D-2	Turnout	Turnout	5 EA	$37,500	$11,250	$48,750	$7,313	$56,063
	D-2 Total				$415,446	$124,634	$540,080	$81,012	$621,092
	D-3	Piping	36	5400 LF	$1,120,365	$336,110	$1,456,475	$218,471	$1,674,946
	D-3	Turnout	Turnout	4 EA	$30,000	$9,000	$39,000	$5,850	$44,850
	D-3A	Piping	24	4700 LF	$657,906	$197,372	$855,278	$128,292	$983,569
	D-3A	Turnout	Turnout	5 EA	$37,500	$11,250	$48,750	$7,313	$56,063
	D-3 Total				$1,845,771	$553,731	$2,399,502	$359,925	$2,759,428
	D-1 Canal Laterals Total				$2,862,036	$858,611	$3,720,647	$558,097	**$4,278,744**
D Canal Main	D Canal	HDPE Liner	N/A	6105275 SF	$9,157,912	$2,747,374	$11,905,285	$1,785,793	$13,691,078
	D Canal	Sub-Liner	N/A	6105275 SF	$5,372,642	$1,611,792	$6,984,434	$1,047,665	$8,032,099
	D Canal Lined Total				$14,530,553	$4,359,166	$18,889,719	$2,833,458	$21,723,177
	D Canal	Large Control	N/A	6 EA	$2,400,000	$720,000	$3,120,000	$468,000	$3,588,000
	D Canal	Small Control	N/A	11 EA	$2,200,000	$660,000	$2,860,000	$429,000	$3,289,000
	D Canal	Turnout	N/A	26 EA	$585,000	$175,500	$760,500	$114,075	$874,575
	D Canal Structure Total				$5,185,000	$1,555,500	$6,740,500	$1,011,075	$7,751,575
	Stukel Pump Station	Pump Replace	N/A	3 EA	$450,000	$135,000	$585,000	$87,750	$672,750
	Stukel Pump Station	Trash Rake	N/A	1 EA	$180,000	$54,000	$234,000	$35,100	$269,100
	Stukel Pump Station Total				$630,000	$189,000	$819,000	$122,850	$941,850
	D Canal Main Total				$40,061,107	$12,018,332	$52,079,439	$7,811,916	$30,416,602
D Canal Laterals	D-5	Piping	30	6650 LF	$1,050,201	$315,060	$1,365,262	$204,789	$1,570,051
	D-5	Turnout	Turnout	3 EA	$22,500	$6,750	$29,250	$4,388	$33,638

	D-5 Total				$1,072,701	$321,810	$1,394,512	$209,177	$1,603,688
	Drain 1	Piping	24	6550 LF	$916,869	$275,061	$1,191,930	$178,789	$1,370,719
	Drain 2	Piping	24	4300 LF	$601,914	$180,574	$782,488	$117,373	$899,861
	D-7	Piping	18	1250 LF	$125,175	$37,553	$162,728	$24,409	$187,137
	D-7	Turnout	Turnout	2 EA	$15,000	$4,500	$19,500	$2,925	$22,425
	D-7 Total				$140,175	$42,053	$182,228	$27,334	$209,562
	D-8	Piping	18	1000 LF	$100,140	$30,042	$130,182	$19,527	$149,709
	D-8	Turnout	Turnout	1 EA	$7,500	$2,250	$9,750	$1,463	$11,213
	D-8 Total				$107,640	$32,292	$139,932	$20,990	$160,922
	D-9	Piping	24	3650 LF	$510,927	$153,278	$664,205	$99,631	$763,836
	D-9	Turnout	Turnout	2 EA	$15,000	$4,500	$19,500	$2,925	$22,425
	D-9 Total				$525,927	$157,778	$683,705	$102,556	$786,261
	D-9.5	Piping	18	1150 LF	$115,161	$34,548	$149,709	$22,456	$172,166
	D-9.5	Turnout	Turnout	2 EA	$15,000	$4,500	$19,500	$2,925	$22,425
	D-9.5 Total				$130,161	$39,048	$169,209	$25,381	$194,591
	Private Pump_01	Piping	24	700 LF	$97,986	$29,396	$127,382	$19,107	$146,489
	Private Pump_01	Turnout	Turnout	1 EA	$7,500	$2,250	$9,750	$1,463	$11,213
	Private Pump_01 Total				$105,486	$31,646	$137,132	$20,570	$157,702
	D-10	Piping	18	3000 LF	$300,420	$90,126	$390,546	$58,582	$449,128
	D-10	Turnout	Turnout	2 EA	$15,000	$4,500	$19,500	$2,925	$22,425
	D-10 Total				$315,420	$94,626	$410,046	$61,507	$471,553
	D-11	Piping	18	2500 LF	$250,350	$75,105	$325,455	$48,818	$374,273
	D-11	Turnout	Turnout	4 EA	$30,000	$9,000	$39,000	$5,850	$44,850
	D-11 Total				$280,350	$84,105	$364,455	$54,668	$419,123
	D-12	Piping	36	1000 LF	$207,475	$62,243	$269,718	$40,458	$310,175
	D-12	Piping	24	6300 LF	$881,874	$264,562	$1,146,436	$171,965	$1,318,402
	D-12	Turnout	Turnout	2 EA	$15,000	$4,500	$19,500	$2,925	$22,425
	D-12A	Piping	18	3200 LF	$320,448	$96,134	$416,582	$62,487	$479,070
	D-12A	Turnout	Turnout	3 EA	$22,500	$6,750	$29,250	$4,388	$33,638
	D-12C	Piping	18	3200 LF	$320,448	$96,134	$416,582	$62,487	$479,070

	D-12C	Turnout	Turnout	3 EA	$22,500	$6,750	$29,250	$4,388	$33,638
	D-12 Total				$1,790,245	$537,074	$2,327,319	$349,098	$2,676,416
	D-13	Not in Use							
	D-14	Piping	24	3900 LF	$545,922	$163,777	$709,699	$106,455	$816,153
	D-14	Turnout	Turnout	3 EA	$22,500	$6,750	$29,250	$4,388	$33,638
	D-14 Total				$568,422	$170,527	$738,949	$110,842	$849,791
	D-15	Piping	30	7000 LF	$1,105,475	$331,643	$1,437,118	$215,568	$1,652,685
	D-15	Turnout	Turnout	7 EA	$52,500	$15,750	$68,250	$10,238	$78,488
	D-15 Total				$1,157,975	$347,393	$1,505,368	$225,805	$1,731,173
	Private Pump_02	Piping	24	1300 LF	$181,974	$54,592	$236,566	$35,485	$272,051
	Private Pump_02	Turnout	Turnout	1 EA	$7,500	$2,250	$9,750	$1,463	$11,213
	Private Pump_02 Total				$189,474	$56,842	$246,316	$36,947	$283,264
	D-16	Piping	36	2900 LF	$601,678	$180,503	$782,181	$117,327	$899,508
	D-16	Piping	24	9750 LF	$1,364,805	$409,442	$1,774,247	$266,137	$2,040,383
	D-16	Turnout	Turnout 30	6 EA	$45,000	$13,500	$58,500	$8,775	$67,275
	D-16-A	Piping	Turnout	6100 LF	$963,343	$289,003	$1,252,345	$187,852	$1,440,197
	D-16-A	Turnout	24	1 EA	$7,500	$2,250	$9,750	$1,463	$11,213
	D-16-A1	Piping	Turnout	1800 LF	$251,964	$75,589	$327,553	$49,133	$376,686
	D-16-A1	Turnout		1 EA	$7,500	$2,250	$9,750	$1,463	$11,213
	D-16 Total				$3,241,789	$972,537	$4,214,326	$632,149	$4,846,475
	D-17	Piping	18	950 LF	$95,133	$28,540	$123,673	$18,551	$142,224
	D-17	Turnout	Turnout	1 EA	$7,500	$2,250	$9,750	$1,463	$11,213
	D-17 Total				$102,633	$30,790	$133,423	$20,013	$153,436
	D-18	Piping	30	6800 LF	$1,073,890	$322,167	$1,396,057	$209,409	$1,605,466
	D-18	Turnout	Turnout	6 EA	$45,000	$13,500	$58,500	$8,775	$67,275
	D-18 Total				$1,118,890	$335,667	$1,454,557	$218,184	$1,672,741
	D-19	Piping	30	8200 LF	$1,294,985	$388,496	$1,683,481	$252,522	$1,936,003
	D-19	Turnout	Turnout	9 EA	$67,500	$20,250	$87,750	$13,163	$100,913
	D-19 Total				$1,362,485	$408,746	$1,771,231	$265,685	$2,036,915

	D-20	Piping	30	6800 LF	$1,073,890	$322,167	$1,396,057	$209,409	$1,605,466
	D-20	Turnout	Turnout	8 EA	$60,000	$18,000	$78,000	$11,700	$89,700
	D-20 Total				$1,133,890	$340,167	$1,474,057	$221,109	$1,695,166
	D-22	Pipe	30	5500 LF	$868,588	$260,576	$1,129,164	$169,375	$1,298,538
	D-22	Turnout	Turnout	5 EA	$37,500	$11,250	$48,750	$7,313	$56,063
	D-22 Total				$906,088	$271,826	$1,177,914	$176,687	$1,354,601
	D-23	Piping	24	4000 LF	$559,920	$167,976	$727,896	$109,184	$837,080
	D-23	Turnout	Turnout	3 EA	$22,500	$6,750	$29,250	$4,388	$33,638
	D-23 Total				$582,420	$174,726	$757,146	$113,572	$870,718
	D-23.5	Piping	18	1000 LF	$100,140	$30,042	$130,182	$19,527	$149,709
	D-23.5	Turnout	Turnout	1 EA	$7,500	$2,250	$9,750	$1,463	$11,213
	D-23.5 Total				$107,640	$32,292	$139,932	$20,990	$160,922
	D-24	Piping	24	4300 LF	$601,914	$180,574	$782,488	$117,373	$899,861
	D-24	Turnout	Turnout	6 EA	$45,000	$13,500	$58,500	$8,775	$67,275
	D-24 Total				$646,914	$194,074	$840,988	$126,148	$967,136
	Drain 11	Not Enough Info							
	D-25	Piping	36	4900 LF	$1,016,628	$304,988	$1,321,616	$198,242	$1,519,858
	D-25	Turnout	Turnout	4 EA	$30,000	$9,000	$39,000	$5,850	$44,850
	D-25 Total				$1,046,628	$313,988	$1,360,616	$204,092	$1,564,708
	D-25.5	Piping	30	8600 LF	$1,358,155	$407,447	$1,765,602	$264,840	$2,030,442
	D-25.5	Turnout	Turnout	5 EA	$37,500	$11,250	$48,750	$7,313	$56,063
	D-25.5 Total				$1,395,655	$418,697	$1,814,352	$272,153	$2,086,504
	D-26	Piping	30	3600 LF	$568,530	$170,559	$739,089	$110,863	$849,952
	D-26	Turnout	Turnout	5 EA	$37,500	$11,250	$48,750	$7,313	$56,063
	D-26 Total				$606,030	$181,809	$787,839	$118,176	$906,015
	D Canal Laterals Total				$20,153,820	$6,046,146	$26,199,966	$3,929,995	$30,129,961
								D Canal Lining Alternative Project Total =	**$70,789,000**

D.3.2 D-Main Canal and Lateral Pressurized Piping Costs

A pressurized pipeline is an effective option for addressing KID's modernization goals. Pressurized piping is the most capital cost-intensive option, yet it is intended for a lifespan of 100 years or more with adequate maintenance. Several alignments, pipe sizes, and configurations were considered as part of a high-level design and analysis of this option.

Through discussion with FCA and KID, SHN determined a series of three pipelines to be an effective method of pressurized conveyance within the alignment of the existing D and D-1 canals. Each of the pipelines vary in diameter and serve specific sections of the D Canal along with Shasta View and Malin irrigation districts. Each lateral has an appropriately sized connection and capacity to meet design requirements. For the D-1 Canal, a single pipeline was determined sufficient for the canal and laterals. The pressurized pipeline option also incorporates pump station improvements, including upgrading existing pumps, installing new pumps, integrating VFDs, and installing automated trash rakes. Additionally, a new pump station would be implemented at the G-D Drop. This alternative would cost approximately $464,652,000.

Table D-26. D-Main Canal and Lateral Pressurized Piping Capital Costs

	Pressurized Canals	Proposed Feature	Pipe Diameter (in)	Quantity	Estimated Construction Costs	30% Contingency	Subtotal	15% Engineering Cost	TOTAL
D-1 Canal Main	D-1 Canal Pipe	Piping	48	20,500 LF	$8,994,375	$2,698,313	$11,692,688	$1,753,903	$13,446,591
	D-1 Canal Pipe	Turnouts	N/A	4 EA	$60,000	$18,000	$78,000	$11,700	$89,700
	D-1 Canal Pipe Total				$9,054,375	$2,716,313	$11,770,688	$1,765,603	$13,536,291
	Adams Pump	Pump Replace	N/A	3 EA	$19,110,000	$5,733,000	$24,843,000	$3,726,450	$28,569,450
	Adams Pump	Trash Rake	N/A	1 EA	$180,000	$54,000	$234,000	$35,100	$269,100
	Adams Pump				$19,290,000	$5,787,000	$25,077,000	$3,761,550	$28,838,550
	D-1 Canal Main Total				$28,344,375	$8,503,313	$36,847,688	$5,527,153	$42,374,841
D-1 Canal Laterals	D-1A	Piping	12	1350 LF	$50,356	$15,107	$65,462	$9,819	$75,282
	D-1A	Turnout	Turnout	1 EA	$7,500	$2,250	$9,750	$1,463	$11,213
	D-1A Total				$57,856	$17,357	$75,212	$11,282	$86,494
	D-1B D-1B	Piping	16	4500 LF	$264,263	$79,279	$343,541	$51,531	$395,072
		Turnout	Turnout	1 EA	$7,500	$2,250	$9,750	$1,463	$11,213
	D-1B Total				$271,763	$81,529	$353,291	$52,994	$406,285
	D-1C	Existing Piped							
	D-2	Piping	24	2700 LF	$356,833	$107,050	$463,883	$69,583	$533,466
	D-2	Turnout	Turnout	5 EA	$37,500	$11,250	$48,750	$7,313	$56,063
	D-2 Total				$394,333	$118,300	$512,633	$76,895	$589,528
	D-3	Piping	36	5400 LF	$1,338,120	$401,436	$1,739,556	$260,933	$2,000,489

	D-3	Turnout	Turnout	4 EA	$30,000	$9,000	$39,000	$5,850	$44,850
	D-3A	Piping	24	4700 LF	$621,154	$186,346	$807,501	$121,125	$928,626
	D-3A	Turnout	Turnout	5 EA	$37,500	$11,250	$48,750	$7,313	$56,063
	D-3 Total				$2,026,774	$608,032	$2,634,807	$395,221	$3,030,028
	D-1 Canal Laterals Total				$2,750,726	$825,218	$3,575,944	$536,392	$4,112,335
D Canal Main	D Canal Pipe #1	Piping	63	34,000 LF	$20,604,000	$6,181,200	$26,785,200	$4,017,780	$30,802,980
	D Canal Pipe #1	Turnout	Turnout	10 EA	$150,000	$45,000	$195,000	$29,250	$224,250
	D Canal Pipe #1 Total				$20,754,000	$6,226,200	$26,980,200	$4,047,030	$31,027,230
	D Canal Pipe #2	Piping	63	33,900 LF	$20,543,400	$6,163,020	$26,706,420	$4,005,963	$30,712,383
	D Canal Pipe #2	Piping	72	66,100 LF	$92,407,800	$27,722,340	$120,130,140	$18,019,521	$138,149,661
	D Canal Pipe #2	Turnout	Turnout	14 EA	$210,000	$63,000	$273,000	$40,950	$313,950
	D Canal Pipe #2				$113,161,200	$33,948,360	$147,109,560	$22,066,434	$169,175,994
	D Canal Pipe #3	Piping	72	66,100 LF	$92,407,800	$27,722,340	$120,130,140	$18,019,521	$138,149,661
	D Canal Pipe #3	Turnout	Turnout	2 EA	$30,000	$9,000	$39,000	$5,850	$44,850
	D Canal Pipe #3				$92,437,800	$27,731,340	$120,169,140	$18,025,371	$138,194,511
	D Canal Pipe Total				$226,353,000	$67,905,900	$294,258,900	$44,138,835	$338,397,735
	Stukel Pump	Pump Replace	N/A	3 EA	$450,000	$135,000	$585,000	$87,750	$672,750
	Stukel Pump	Trash Rake	N/A	1 EA	$180,000	$54,000	$234,000	$35,100	$269,100

	Stukel Pump				$630,000	$189,000	$819,000	$122,850	$941,850
	D Canal New Pump	Pump Station	N/A	1 EA	$34,000,000	$10,200,000	$44,200,000	$6,630,000	$50,830,000
	D Canal New Pump	Trash Rack+Rake	N/A	1 EA	$330,000	$99,000	$429,000	$64,350	$493,350
	D Canal New Pump Station Total				$34,330,000	$10,299,000	$44,629,000	$6,694,350	$51,323,350
	D Canal Main Total				$261,313,000	$78,393,900	$339,706,900	$50,956,035	$390,662,935
D Canal Laterals	D-5	Piping	26	6650 LF	$859,546	$257,864	$1,117,409	$167,611	$1,285,021
	D-5	Turnout	Turnout	3 EA	$22,500	$6,750	$29,250	$4,388	$33,638
	D-5 Total				$882,046	$264,614	$1,146,659	$171,999	$1,318,658
	Drain 1	Piping	22	6550 LF	$727,649	$218,295	$945,944	$141,892	$1,087,836
	Drain 2	Piping	22	4300 LF	$477,693	$143,308	$621,001	$93,150	$714,152
	D-7	Piping	12	1250 LF	$46,626	$13,988	$60,613	$9,092	$69,705
	D-7	Turnout	Turnout	2 EA	$15,000	$4,500	$19,500	$2,925	$22,425
	D-7 Total				$61,626	$18,488	$80,113	$12,017	$92,130
	D-8	Piping	16	1000 LF	$58,725	$17,618	$76,343	$11,451	$87,794
	D-8	Turnout	Turnout	1 EA	$7,500	$2,250	$9,750	$1,463	$11,213
	D-8 Total				$66,225	$19,868	$86,093	$12,914	$99,006
	D-9	Piping	22	3650 LF	$405,484	$121,645	$527,129	$79,069	$606,199
	D-9	Turnout	Turnout	2 EA	$15,000	$4,500	$19,500	$2,925	$22,425
	D-9 Total				$420,484	$126,145	$546,629	$81,994	$628,624
	D-9.5	Piping	12	1150 LF	$42,896	$12,869	$55,764	$8,365	$64,129
	D-9.5	Turnout	Turnout	2 EA	$15,000	$4,500	$19,500	$2,925	$22,425
	D-9.5 Total				$57,896	$17,369	$75,264	$11,290	$86,554
	Private Pump_01	Piping	20	700 LF	$64,244	$19,273	$83,518	$12,528	$96,045
	Private Pump_01	Turnout	Turnout	1 EA	$7,500	$2,250	$9,750	$1,463	$11,213

Private Pump_01 Total				$71,744	$21,523	$93,268	$13,990	$107,258
D-10	Piping	12	3000 LF	$111,902	$33,570	$145,472	$21,821	$167,293
D-10	Turnout	Turnout	2 EA	$15,000	$4,500	$19,500	$2,925	$22,425
D-10 Total				$126,902	$38,070	$164,972	$24,746	$189,718
D-11	Piping	16	2500 LF	$146,813	$44,044	$190,856	$28,628	$219,485
D-11	Turnout	Turnout	4 EA	$30,000	$9,000	$39,000	$5,850	$44,850
D-11 Total				$176,813	$53,044	$229,856	$34,478	$264,335
D-12	Piping	32	1000 LF	$195,795	$58,739	$254,534	$38,180	$292,714
D-12	Piping	24	6300 LF	$832,611	$249,783	$1,082,394	$162,359	$1,244,754
D-12	Turnout	Turnout	2 EA	$15,000	$4,500	$19,500	$2,925	$22,425
D-12A	Piping	16	3200 LF	$187,920	$56,376	$244,296	$36,644	$280,940
D-12A	Turnout	Turnout	3 EA	$22,500	$6,750	$29,250	$4,388	$33,638
D-12C	Piping	16	3200 LF	$187,920	$56,376	$244,296	$36,644	$280,940
D-12C	Turnout	Turnout	3 EA	$22,500	$6,750	$29,250	$4,388	$33,638
D-12 Total				$1,464,246	$439,274	$1,903,520	$285,528	$2,189,048
D-13	Not in use							
D-14	Piping	22	3900 LF	$433,257	$129,977	$563,234	$84,485	$647,719
D-14	Turnout	Turnout	3 EA	$22,500	$6,750	$29,250	$4,388	$33,638
D-14 Total				$455,757	$136,727	$592,484	$88,873	$681,356
D-15	Piping	26	7000 LF	$904,785	$271,436	$1,176,221	$176,433	$1,352,654
D-15	Turnout	Turnout	7 EA	$52,500	$15,750	$68,250	$10,238	$78,488
D-15 Total				$957,285	$287,186	$1,244,471	$186,671	$1,431,141
Private Pump_02	Piping	22	1300 LF	$144,419	$43,326	$187,745	$28,162	$215,906
Private Pump_02	Turnout	Turnout	1 EA	$7,500	$2,250	$9,750	$1,463	$11,213
Private Pump_02 Total				$151,919	$45,576	$197,495	$29,624	$227,119

D-16	Piping	36	2900 LF	$718,620	$215,586	$934,206	$140,131	$1,074,337
D-16	Piping	24	9750 LF	$1,288,565	$386,569	$1,675,134	$251,270	$1,926,404
D-16	Turnout	Turnout	6 EA	$45,000	$13,500	$58,500	$8,775	$67,275
D-16-A	Piping	30	6100 LF	$1,049,711	$314,913	$1,364,624	$204,694	$1,569,318
D-16-A	Turnout	Turnout	1 EA	$7,500	$2,250	$9,750	$1,463	$11,213
D-16-A_1	Piping	24	1800 LF	$237,889	$71,367	$309,256	$46,388	$355,644
D-16-A_1	Turnout	Turnout	1 EA	$7,500	$2,250	$9,750	$1,463	$11,213
D-16 Total				$3,354,785	$1,006,435	$4,361,220	$654,183	$5,015,403
D-17	Piping	12	950 LF	$35,435	$10,631	$46,066	$6,910	$52,976
D-17	Turnout	Turnout	1 EA	$7,500	$2,250	$9,750	$1,463	$11,213
D-17 Total				$42,935	$12,881	$55,816	$8,372	$64,189
D-18	Piping	26	6800 LF	$878,934	$263,680	$1,142,614	$171,392	$1,314,006
D-18	Turnout	Turnout	6 EA	$45,000	$13,500	$58,500	$8,775	$67,275
D-18 Total				$923,934	$277,180	$1,201,114	$180,167	$1,381,281
D-19	Piping	30	8200 LF	$1,411,087	$423,326	$1,834,413	$275,162	$2,109,575
D-19	Turnout	Turnout	9 EA	$67,500	$20,250	$87,750	$13,163	$100,913
D-19 Total				$1,478,587	$443,576	$1,922,163	$288,324	$2,210,487
D-20	Piping	30	6800 LF	$1,170,170	$351,051	$1,521,220	$228,183	$1,749,403
D-20	Turnout	Turnout	8 EA	$60,000	$18,000	$78,000	$11,700	$89,700
D-20 Total				$1,230,170	$369,051	$1,599,220	$239,883	$1,839,103
D-22	Piping	30	5500 LF	$946,461	$283,938	$1,230,399	$184,560	$1,414,959
D-22	Turnout	Turnout	5 EA	$37,500	$11,250	$48,750	$7,313	$56,063
D-22 Total				$983,961	$295,188	$1,279,149	$191,872	$1,471,021
D-23	Piping	24	4000 LF	$528,642	$158,593	$687,235	$103,085	$790,320
D-23	Turnout	Turnout	3 EA	$22,500	$6,750	$29,250	$4,388	$33,638
D-23 Total				$551,142	$165,343	$716,485	$107,473	$823,957
D-23.5	Piping	12	1000 LF	$37,301	$11,190	$48,491	$7,274	$55,764
D-23.5	Turnout	Turnout	1 EA	$7,500	$2,250	$9,750	$1,463	$11,213
D-23.5				$44,801	$13,440	$58,241	$8,736	$66,977
D-24	Piping	24	4300 LF	$568,290	$170,487	$738,777	$110,817	$849,594
D-24	Turnout	Turnout	6 EA	$45,000	$13,500	$58,500	$8,775	$67,275

	D-24 Total				$613,290	$183,987	$797,277	$119,592	$916,869
	Drain 11	Not Enough Info							
	D-25	Piping	36	4900 LF	$1,214,220	$364,266	$1,578,486	$236,773	$1,815,259
	D-25	Turnout	Turnout	4 EA	$30,000	$9,000	$39,000	$5,850	$44,850
	D-25 Total				$1,244,220	$373,266	$1,617,486	$242,623	$1,860,109
	D-25.5	Piping	28	8600 LF	$1,289,162	$386,748	$1,675,910	$251,386	$1,927,296
	D-25.5	Turnout	Turnout	5 EA	$37,500	$11,250	$48,750	$7,313	$56,063
	D-25.5 Total				$1,326,662	$397,998	$1,724,660	$258,699	$1,983,359
	D-26	Piping	26	3600 LF	$465,318	$139,595	$604,913	$90,737	$695,650
	D-26	Turnout	Turnout	5 EA	$37,500	$11,250	$48,750	$7,313	$56,063
	D-26 Total				$502,818	$150,845	$653,663	$98,050	$751,713
	D Canal Laterals Total				$18,395,587	$5,518,676	$23,914,263	$3,587,139	$27,501,403
Main Canal and Lateral Pressurized Piping Project Total =									**$464,652,000**

D.3.3 D-Main Canal Gravity Piping Costs

A gravity-flow pipeline is less expensive compared to a pressurized pipeline, but at the cost of many of the conveniences and efficiencies of a pressurized system. The alignments, pipe sizes, and configurations were determined in the same manner as the pressurized option, but with size variations due to meeting design requirements. As a result, the design alignments are the same but include the appurtenances required of a gravity system.

As part of this option, both the D-Main Canal and the D-System laterals would be gravity piped and would serve to provide irrigation flow to patrons. The gravity pipeline option also incorporates pump station improvements, including new pumps, the integration of VFDs, and automated trash rakes. This alternative would cost approximately $268,860,000.

Table D-27. D-Main Canal Gravity Piping Capital Costs.

							30%		15%	
	Piped Gravity	Proposed Feature	Pipe Diameter (in)	Quantity		Estimated Construction Costs	Contingency	Subtotal	Engineering Cost	TOTAL
D-1 Canal Main	D-1 Canal Pipe	Piping	60	20,500	LF	$8,511,600	$2,553,480	$11,065,080	$1,659,762	$12,724,842
	D-1 Canal Pipe	Turnouts	N/A	4	EA	$45,000	$13,500	$58,500	$8,775	$67,275
	D-1 Canal Pipe Total					$8,556,600	$2,566,980	$11,123,580	$1,668,537	$12,792,117
	Adams Pump Station	Pump Replace	N/A	3	EA	$450,000	$135,000	$585,000	$87,750	$672,750
	Adams Pump Station	Trash Rake	N/A	1	EA	$180,000	$54,000	$234,000	$35,100	$269,100
	Adams Pump Station Total					$630,000	$189,000	$819,000	$122,850	$941,850
	D-1 Canal Main Total					$9,186,600	$2,755,980	$11,942,580	$1,791,387	$13,733,967
D-1 Canal Laterals	D-1A	Piping	18	1350	LF	$135,189	$40,557	$175,746	$26,362	$202,108
	D-1A	Turnout	Turnout	1	EA	$7,500	$2,250	$9,750	$1,463	$11,213
	D-1A Total					$142,689	$42,807	$185,496	$27,824	$213,320
	D-1B	Piping	18	4500	LF	$450,630	$135,189	$585,819	$87,873	$673,692
	D-1B	Turnout	Turnout	1	EA	$7,500	$2,250	$9,750	$1,463	$11,213
	D-1B Total					$458,130	$137,439	$595,569	$89,335	$684,904
	D-1C	Existing Piped								
	D-2	Piping Turnout	24	2700	LF	$377,946	$113,384	$491,330	$73,699	$565,029
	D-2		Turnout	5	EA	$37,500	$11,250	$48,750	$7,313	$56,063
	D-2 Total					$415,446	$124,634	$540,080	$81,012	$621,092

	D-3	Piping	36	5400	LF	$1,120,365	$336,110	$1,456,475	$218,471	$1,674,946
	D-3	Turnout	Turnout	4	EA	$30,000	$9,000	$39,000	$5,850	$44,850
	D-3A	Piping	24	4700	LF	$657,906	$197,372	$855,278	$128,292	$983,569
	D-3A	Turnout	Turnout	5	EA	$37,500	$11,250	$48,750	$7,313	$56,063
	D-3 Total					$1,845,771	$553,731	$2,399,502	$359,925	$2,759,428
	D-1 Canal Laterals Total					$2,862,036	$858,611	$3,720,647	$558,097	$4,278,744
D-Canal Main	D Canal Pipe #1	Piping	60	34,000	LF	$14,116,800	$4,235,040	$18,351,840	$2,752,776	$21,104,616
	D Canal Pipe #1	Turnout	Turnout	10	EA	$112,500	$33,750	$146,250	$21,938	$168,188
	D Canal Pipe #1 Total					$14,229,300	$4,268,790	$18,498,090	$2,774,714	$21,272,804
	D Canal Pipe #2	Piping	60	33,900	LF	$14,075,280	$4,222,584	$18,297,864	$2,744,680	$21,042,544
	D Canal Pipe #2	Piping	96	66,100	LF	$59,261,294	$17,778,388	$77,039,682	$11,555,952	$88,595,635
	D Canal Pipe #2	Turnout	Turnout	14	EA	$157,500	$47,250	$204,750	$30,713	$235,463
	D Canal Pipe #2 Total					$73,494,074	$22,048,222	$95,542,296	$14,331,344	$109,873,641
	D Canal Pipe #3	Piping	96	66,100	LF	$59,261,294	$17,778,388	$77,039,682	$11,555,952	$88,595,635
	D Canal Pipe #3	Turnout	Turnout	2	EA	$22,500	$6,750	$29,250	$4,388	$33,638
	D Canal Pipe #3 Total					$59,283,794	$17,785,138	$77,068,932	$11,560,340	$88,629,272
	D Canal Pipe Total					$147,007,168	$44,102,150	$191,109,318	$28,666,398	$219,775,716
	Stukel Pump Station	Pump Replace	N/A	3	EA	$450,000	$135,000	$585,000	$87,750	$672,750
	Stukel Pump Station	Trash Rake	N/A	1	EA	$180,000	$54,000	$234,000	$35,100	$269,100
	Stukel Pump Station Total					$630,000	$189,000	$819,000	$122,850	$941,850
	D Canal Main Total					$147,637,168	$44,291,150	$191,928,318	$28,789,248	$220,717,566

	D-5	Piping	30	6650	LF	$1,050,201	$315,060	$1,365,262	$204,789	$1,570,051
	D-5	Turnout	Turnout	3	EA	$22,500	$6,750	$29,250	$4,388	$33,638
	D-5 Total					$1,072,701	$321,810	$1,394,512	$209,177	$1,603,688
	Drain 1	Piping	24	6550	LF	$916,869	$275,061	$1,191,930	$178,789	$1,370,719
	Drain 2	Piping	24	4300	LF	$601,914	$180,574	$782,488	$117,373	$899,861
	D-7	Piping	18	1250	LF	$125,175	$37,553	$162,728	$24,409	$187,137
	D-7	Turnout	Turnout	2	EA	$15,000	$4,500	$19,500	$2,925	$22,425
	D-7 Total					$140,175	$42,053	$182,228	$27,334	$209,562
	D-8	Piping	18	1000	LF	$100,140	$30,042	$130,182	$19,527	$149,709
	D-8	Turnout	Turnout	1	EA	$7,500	$2,250	$9,750	$1,463	$11,213
	D-8 Total					$107,640	$32,292	$139,932	$20,990	$160,922
	D-9	Piping	24	3650	LF	$510,927	$153,278	$664,205	$99,631	$763,836
	D-9	Turnout	Turnout	2	EA	$15,000	$4,500	$19,500	$2,925	$22,425
D Canal Laterals	D-9 Total					$525,927	$157,778	$683,705	$102,556	$786,261
	D-9.5	Piping	18	1150	LF	$115,161	$34,548	$149,709	$22,456	$172,166
	D-9.5	Turnout	Turnout	2	EA	$15,000	$4,500	$19,500	$2,925	$22,425
	D-9.5 Total					$130,161	$39,048	$169,209	$25,381	$194,591
	Private Pump_01	Piping	24	700	LF	$97,986	$29,396	$127,382	$19,107	$146,489
	Private Pump_01	Turnout	Turnout	1	EA	$7,500	$2,250	$9,750	$1,463	$11,213
	Private Pump_01 Total					$105,486	$31,646	$137,132	$20,570	$157,702
	D-10	Piping	18	3000	LF	$300,420	$90,126	$390,546	$58,582	$449,128
	D-10	Turnout	Turnout	2	EA	$15,000	$4,500	$19,500	$2,925	$22,425
	D-10 Total					$315,420	$94,626	$410,046	$61,507	$471,553
	D-11	Piping	18	2500	LF	$250,350	$75,105	$325,455	$48,818	$374,273
	D-11	Turnout	Turnout	4	EA	$30,000	$9,000	$39,000	$5,850	$44,850
	D-11 Total					$280,350	$84,105	$364,455	$54,668	$419,123

D-12	Piping	36	1000	LF	$207,475	$62,243	$269,718	$40,458	$310,175
D-12	Piping	24	6300	LF	$881,874	$264,562	$1,146,436	$171,965	$1,318,402
D-12	Turnout	Turnout	2	EA	$15,000	$4,500	$19,500	$2,925	$22,425
D-12A	Piping	18	3200	LF	$320,448	$96,134	$416,582	$62,487	$479,070
D-12A	Turnout	Turnout	3	EA	$22,500	$6,750	$29,250	$4,388	$33,638
D-12C	Piping	18	3200	LF	$320,448	$96,134	$416,582	$62,487	$479,070
D-12C	Turnout	Turnout	3	EA	$22,500	$6,750	$29,250	$4,388	$33,638
D-12 Total					$1,790,245	$537,074	$2,327,319	$349,098	$2,676,416
D-13									Not in Use
D-14	Piping	24	3900	LF	$545,922	$163,777	$709,699	$106,455	$816,153
D-14	Turnout	Turnout	3	EA	$22,500	$6,750	$29,250	$4,388	$33,638
D-14 Total					$568,422	$170,527	$738,949	$110,842	$849,791
D-15	Piping	30	7000	LF	$1,105,475	$331,643	$1,437,118	$215,568	$1,652,685
D-15	Turnout	Turnout	7	EA	$52,500	$15,750	$68,250	$10,238	$78,488
D-15 Total					$1,157,975	$347,393	$1,505,368	$225,805	$1,731,173
Private Pump_02	Piping	24	1300	LF	$181,974	$54,592	$236,566	$35,485	$272,051
Private Pump_02	Turnout	Turnout	1	EA	$7,500	$2,250	$9,750	$1,463	$11,213
Private Pump_02 Total					$189,474	$56,842	$246,316	$36,947	$283,264
D-16	Piping	36	2900	LF	$601,678	$180,503	$782,181	$117,327	$899,508
D-16	Piping	24	9750	LF	$1,364,805	$409,442	$1,774,247	$266,137	$2,040,383
D-16	Turnout	Turnout	6	EA	$45,000	$13,500	$58,500	$8,775	$67,275
D-16-A	Piping	30	6100	LF	$963,343	$289,003	$1,252,345	$187,852	$1,440,197
D-16-A	Turnout	Turnout	1	EA	$7,500	$2,250	$9,750	$1,463	$11,213
D-16-A_1	Piping	24	1800	LF	$251,964	$75,589	$327,553	$49,133	$376,686
D-16-A_1	Turnout	Turnout	1	EA	$7,500	$2,250	$9,750	$1,463	$11,213

D-16 Total					$3,241,789	$972,537	$4,214,326	$632,149	$4,846,475
D-17	Piping	18	950	LF	$95,133	$28,540	$123,673	$18,551	$142,224
D-17	Turnout	Turnout	1	EA	$7,500	$2,250	$9,750	$1,463	$11,213
D-17 Total					$102,633	$30,790	$133,423	$20,013	$153,436
D-18	Piping	30	6800	LF	$1,073,890	$322,167	$1,396,057	$209,409	$1,605,466
D-18	Turnout	Turnout	6	EA	$45,000	$13,500	$58,500	$8,775	$67,275
D-18 Total					$1,118,890	$335,667	$1,454,557	$218,184	$1,672,741
D-19	Piping	30	8200	LF	$1,294,985	$388,496	$1,683,481	$252,522	$1,936,003
D-19	Turnout	Turnout	9	EA	$67,500	$20,250	$87,750	$13,163	$100,913
D-19 Total					$1,362,485	$408,746	$1,771,231	$265,685	$2,036,915
D-20	Piping	30	6800	LF	$1,073,890	$322,167	$1,396,057	$209,409	$1,605,466
D-20	Turnout	Turnout	8	EA	$60,000	$18,000	$78,000	$11,700	$89,700
D-20 Total					$1,133,890	$340,167	$1,474,057	$221,109	$1,695,166
D-22	Pipe	30	5500	LF	$868,588	$260,576	$1,129,164	$169,375	$1,298,538
D-22	Turnout	Turnout	5	EA	$37,500	$11,250	$48,750	$7,313	$56,063
D-22 Total					$906,088	$271,826	$1,177,914	$176,687	$1,354,601
D-23	Piping	24	4000	LF	$559,920	$167,976	$727,896	$109,184	$837,080
D-23	Turnout	Turnout	3	EA	$22,500	$6,750	$29,250	$4,388	$33,638
D-23 Total					$582,420	$174,726	$757,146	$113,572	$870,718
D-23.5	Piping	18	1000	LF	$100,140	$30,042	$130,182	$19,527	$149,709
D-23.5	Turnout	Turnout	1	EA	$7,500	$2,250	$9,750	$1,463	$11,213
D-23.5 Total					$107,640	$32,292	$139,932	$20,990	$160,922
D-24	Piping	24	4300	LF	$601,914	$180,574	$782,488	$117,373	$899,861
D-24	Turnout	Turnout	6	EA	$45,000	$13,500	$58,500	$8,775	$67,275
D-24 Total					$646,914	$194,074	$840,988	$126,148	$967,136
Drain 11									Not Enough Info
D-25	Piping	36	4900	LF	$1,016,628	$304,988	$1,321,616	$198,242	$1,519,858

	D-25	Turnout	Turnout	4	EA	$30,000	$9,000	$39,000	$5,850	$44,850
	D-25 Total					$1,046,628	$313,988	$1,360,616	$204,092	$1,564,708
	D-25.5	Piping	30	8600	LF	$1,358,155	$407,447	$1,765,602	$264,840	$2,030,442
	D-25.5	Turnout	Turnout	5	EA	$37,500	$11,250	$48,750	$7,313	$56,063
	D-25.5 Total					$1,395,655	$418,697	$1,814,352	$272,153	$2,086,504
	D-26	Piping	30	3600	LF	$568,530	$170,559	$739,089	$110,863	$849,952
	D-26	Turnout	Turnout	5	EA	$37,500	$11,250	$48,750	$7,313	$56,063
	D-26 Total					$606,030	$181,809	$787,839	$118,176	$906,015
	D Canal Laterals Total					$20,153,820	$6,046,146	$26,199,966	$3,929,995	$30,129,961
									D Main Canal Gravity Piping Total =	**$268,860,000**

D.3.5 Modernization Alternative Costs

This section presents capital costs for the Modernization Alternative (Table D-27).

A wide variety of materials are available for piping; availability of piping materials, prices, and new products change over time. Materials that could be used for the Modernization Alternative include, but are not limited to, polyvinyl chloride, steel, high-density polyethylene (HDPE), bar-wrapped concrete cylinder, fiberglass, and ductile iron. The Modernization Alternative was priced using HDPE pipe, which at the time of this analysis was considered to be the most cost-effective material.

At the time of proposed project implementation, the specific piping material would be selected based on a number of considerations: the cost of the proposed project must meet the NEE requirements; design must meet construction requirements; the pipe material must be appropriate based on local conditions and risk factors; and the pipe material must result in a no or minor change to project effects described in Section 6 of the Plan-EA, as determined through the tiered decision framework approach outlined in Section 1.4 of the Plan-EA. The NRCS State Conservationist and the Sponsoring Local Organization would possess the final discretion to select the appropriate piping material.

Table D-28. Modernization Alternative Capital Costs.

Project	Feature	Nominal Diameter (in)	Length (ft) or Quantity	Estimated Construction Cost per feature	Construction Cost Subtotal	Contractor Markup (14%)	Engineering (15%)	Permitting (1.3%)	Contingency (30%)	Total Costs
Adams Pump Station Upgrade	Pump Replacement	N/A	3 EA	$450,000.00	$630,000.00	$88,200.00	$137,309.00	$8,190.00	$189,000.00	$1,053,000.00
	Trash Rake	N/A	1 EA	$180,000.00						
Stukel Pump Station Upgrade	Pump Replacement	N/A	3 EA	$450,000.00	$630,000.00	$88,200.00	$137,309.00	$8,190.00	$189,000.00	$1,053,000.00
	Trash Rake	N/A	1 EA	$180,000.00						
Line Adams Point Section of D Main Canal	HDPE Liner	N/A	207,000 SF	$310,500.00	$737,660.00	$103,272.00	$160,773.00	$9,590.00	$221,298.00	$1,233,000.00
	Sub-Liner	N/A	207,000 SF	$182,160.00						
	Control Structures	N/A	1 EA	$200,000.00						
	Headgates	N/A	2 EA	$45,000.00						
Pipe D Main Canal (McKoen to Paygr Rd. Section)	Pipe #1	96	4,700 LF	$4,213,738.00	$9,049,976.00	$1,266,997.00	$1,972,442.00	$117,650.00	$2,714,993.00	$15,122,000.00
	Pipe #2	96	4,700 LF	$4,213,738.00						
	Control Structures	N/A	1 EA	$600,000.00						
	Headgates	N/A	2 EA	$22,500.00						
Pipe D-2 Lateral	Pipe	24	2,700 LF	$377,946.00	$415,446.00	$58,162.00	$90,546.00	$5,401.00	$124,634.00	$694,000.00
	Turnout	Turnout	5 EA	$37,500.00						
Pipe D-3 Lateral	Pipe	36	5,400 LF	$1,120,365.00	$1,150,365.00	$161,051.00	$250,722.00	$14,955.00	$345,110.00	$1,922,000.00
	Turnout	Turnout	4 EA	$30,000.00						
Pipe D-12 Lateral	Pipe	36	1,000 LF	$207,475.00	$1,104,349.00	$154,609.00	$165,653.00	$14,357.00	$331,305.00	$1,770,000.00
	Pipe	24	6,300 LF	$881,874.00						
	Turnout	Turnout	2 EA	$15,000.00						
Pipe D-12A Spur	Pipe	18	3,200 LF	$320,448.00	$685,896.00	$96,026.00	$102,885.00	$8,917.00	$205,769.00	$1,099,000.00
	Turnout	Turnout	3 EA	$22,500.00						
Pipe	Pipe	18	3,200 LF	$320,448.00	$685,896.00	$96,026.00	$102,885.00	$8,917.00	$205,769.00	$1,099,000.00

D-12C Spur	Turnout	Turnout	3 EA	$22,500.00						
Pipe D-14 Lateral	Pipe	24	3,900 LF	$545,922.00	$568,422.00	$79,579.00	$123,888.00	$7,389.00	$170,527.00	$950,000.00
	Turnout	Turnout	3 EA	$22,500.00						
Pipe D-16 Lateral	Pipe	36	2,900 LF	$601,678.00	$2,011,483.00	$281,608.00	$438,403.00	$26,149.00	$603,445.00	$3,361,000.00
	Pipe	24	9750 LF	$1,364,805.00						
	Turnout	Turnout	6 EA	$45,000.00						
Pipe D-16A Spur	Pipe	30	6,100 LF	$963,343.00	$970,843.00	$135,918.00	$211,595.00	$12,621.00	$291,253.00	$1,622,000.00
	Turnout	Turnout	1 EA	$7,500.00						
Pipe D-18 Lateral	Pipe	30	6,800 LF	$1,073,890.00	$1,118,890.00	$156,645.00	$167,834.00	$14,546.00	$335,667.00	$1,794,000.00
	Turnout	Turnout	6 EA	$45,000.00						
Pipe D-19 Lateral	Pipe	30	8,200 LF	$1,294,985.00	$906,088.00	$126,853.00	$135,914.00	$11,780.00	$271,827.00	$1,452,000.00
	Turnout	Turnout	9 EA	$67,500.00						
Pipe D-20 Lateral	Pipe	30	6,800 LF	$1,073,890.00	$582,420.00	$81,539.00	$87,363.00	$7,572.00	$174,726.00	$934,000.00
	Turnout	Turnout	8 EA	$60,000.00						
Total					**$21,247,734.00**	**$2,974,685.00**	**$4,285,521.00**	**$276,224.00**	**$6,374,323.00**	**$35,158,000.00**

Notes: Total cost column is rounded to the nearest $1,000. Totals may not sum exactly.

D.3.1 Modernization Alternative Costs

Table D-28. Construction Timeline and Installation Costs by Funding Source for the Preferred Alternative, 2023$.[1]

Construction Phase	Construction Year	PL 83-566 Funds	Other, Nonfederal Funds	Total Construction Costs
1 – Pumps Project	0	$1,700,000	$534,000	$2,234,000
2 – Main D Canal Project	1	$2,303,000	$833,000	$3,136,000
3 – Laterals Group 1 Project	2	$7,625,000	$2,469,000	$10,094,000
4 – Laterals Group 2 Project	3	$5,559,000	$1,775,000	$7,334,000
Total Project		**$17,187,000**	**$5,611,000**	**$22,798,000**

Notes: Prepared: September 2024

[1] Price Base: 2023 dollars.

[2] Percentages included in total cost: Engineering (15%), Construction Contractor Markup (14%), Permitting (1.3%), and Contingency (30%).

Table D-29.Location, Construction Timeline, and Design Cost for the Preferred Alternative

Project Group	Latitude[1]	Longitude[1]	Construction Start Year	Construction End Year	Estimated Design Cost (Technical Assistance)[2]
1 – Pumps Project	42.03772 (Adams), 42.07615 (Stukel)	-121.62184 (Adams), -121.65157 (Stukel)	0	1	$274,618
2 – Main D Canal Project	42.02656	-121.48582	1	2	$2,133,215

3 – Laterals Group 1 Project	42.01667	- 121.49957	2	3	$1,362,689
4 – Laterals Group 2 Project	42.02056	-121.43770	3	4	$514,999

[1] Latitude and Longitude represent the central point of the project group.

Table D-30. Proposed Components of the Preferred Alternative Within the Klamath Irrigation District 2023$.

Type	Project Component	Quantity	Subtotal (2023$)
Pump (270 total HP)	Adams Pumping Plant Replacement	3	$630,000
Pump (500 total HP)	Stukel Pumping Plant Replacement	3	$630,000
Canal Lining	D Canal at Adams Point; HDPE	0.9 mile	$738,000
Canal Lining	D Canal McKoen to Paygr; HDPE	0.9 mile	$994,000
Lateral Piping	D-2 Lateral; single 24-inch	0.5 mile	$415,000
Canal Lining	D-3 Lateral at Adams Pumping Plant, HDPE	1.1 mile	$598,000
Lateral Piping	D-12 Lateral (including D-12A and D-12C Spur Laterals); combination of single 36-inch and single 24-inch	2.6 miles	$1,790,000
Lateral Piping	D-14 Lateral; combination of single 36-inch and single 24-inch	0.7 mile	$568,000
Lateral Piping	D-16 Lateral; combination of single 36-inch and single 24-inch	2.4 miles	$2,011,000
Lateral Piping	D-16A Spur Lateral; single 30-inch	1.2 miles	$971,000
Lateral Piping	D-18 Lateral; single 30-inch	1.3 miles	$1,119,000
Lateral Piping	D-19 Lateral; single 30-inch	1.6 miles	$1,362,000
Lateral Piping	D-20 Lateral; single 30-inch	1.3 miles	$1,134,000
		Subtotal	$12,961,000
		Engineering, Construction Management, Permitting, Survey [1]	$2,759,000

Type	Project Component	Quantity	Subtotal (2023$)
		Construction Contractor Markup [1]	$1,815,000
		Contingency [1]	$3,878,000
		Total [2]	**$21,413,000**

Notes: Totals are rounded to nearest $1,000.
[1] Percentages include: Engineering (15%), Construction Contractor Markup (14%), Permitting (1.3%) and Contingency (30%).
[2] Total may not sum due to rounding and this does not include additional project administration, technical assistance, and permitting costs.

D.3.2 Net Present Value of the Preferred Alternative

This section presents the estimated present value of the Modernization Alternative over the course of its anticipated benefit lifespan.

Discount Rate: 2.75%

Period of Analysis: 100 years

1/ Values represent the change from Baseline conditions.

	Preferred Alternative [1]
Design Life (years)	100
Capital Costs	$22,798,000
Net Present Value of Replacement Costs[1]	$4,665,000
Annual O&M Costs	$14,000
Percent Change in O&M	N/A
Net Present Value of O&M Costs	$471,000
Total Net Present Value of Project	**$27,934,000**

Notes: Prepared March 2021
N/A = not applicable. Totals rounded to nearest $1,000.

D.4 Additional Information – Modernization Alternative Construction Means and Methods

D.4.1 Construction Means and Methods – Pump Upgrades

Construction that would occur during the pump upgrades would include mobilization and staging of appropriately sized construction equipment and delivery of equipment to construction areas. A bearing structure for the traveling belt screen or trash rake would be constructed at the pump intake. Additionally, a concrete pad would be constructed adjacent to the traveling screen or trash rake and would be used to stockpile detritus removed by the traveling screen. At the sump pump, a small amount of dirt and concrete work would be performed to enlarge the sump area. Where needed, electrical improvements would be made to increase capacity at the pumps. During construction, the construction sites would be accessed via existing access routes when possible.

D.4.2 Construction Means and Methods – Piping

Construction of the Modernization Alternative would include mobilizing and staging construction equipment; delivering pipe to construction areas; excavating trenches; fusing pipelines; placing pipe in trenches, which in some cases are below the grade of the canal; compacting backfill; and restoring and reseeding disturbed areas. In some locations, construction access would need to be created before delivering pipe or equipment into construction areas and could include vegetation removal within the construction area. Appropriately sized construction equipment would be used to minimize disturbance in the construction area.

Pipe installation would require staging and storage areas for pipe, other construction materials, and construction equipment. Source areas for borrow or fill material could also potentially be required. These areas have not yet been identified and would be determined prior to construction. Areas that have been previously disturbed and are accessible via existing access routes would be prioritized for use as staging, storage, and borrow/fill areas (as applicable).

D.4.3 Construction Methods and Means – Canal Lining

Lining would increase the water velocity in the canal because the lining material is a smoother surface than the existing underlying soils and rock. The smoother surface would make the sides of the canal slippery and make it more difficult for people, livestock, and wildlife that might accidentally fall in the water to be able to climb out. This does not meet the public safety component of the Federal Objective and Guiding Principles, but these are in areas of limited public access.

Canal lining would improve canal long-term stability but would only partially meet the project purpose of conserving water. While lining would reduce water loss from seepage, it would not reduce water loss from evaporation. The lining materials would have an expected lifespan of approximately 25 to 50 years before needing to be replaced. Before replacement, as the system aged, it would likely require maintenance with progressively increasing frequency. This would be necessary to address wear and cracks in the lining, which would otherwise result in increased water loss through seepage over time. Additionally, this alternative would still require energy use and other pumping costs for farmers similar to their current operations.

For pump upgrades, piping of canals and laterals, and canal lining, vegetation clearing before construction, vegetation and weed management during construction, and reseeding after construction would be completed according to NRCS guidelines. During construction, vegetation

clearing would be minimized to the extent practicable, and locations for vehicle and equipment access, staging, and storage would be selected to occur in previously disturbed areas and to avoid trees. Trees would only be removed if there were no other alternative to access the construction site or if they posed a safety threat to construction crews.

When possible, all project areas would be accessed from existing maintenance roads or public roads. Existing maintenance roads and overland access routes commonly used for O&M may require some improvements for use during construction.

D.4.4 Supporting Information for Summary of Comparison of Alternatives

Table D-30. Summary and Comparison of Alternatives.

Item or Concern	No Action Alternative (Future without Federal Investment)	Modernization Alternative (Future with Federal Investment)
Alternative Plans		
Locally Preferred		✓
National Economic Efficiency		✓
Socially Preferred		✓
Environmentally Preferred		✓
Guiding Principles Check marks indicate that the Guiding Principles have been met		
Healthy and Resilient Ecosystems		✓
Sustainable Economic Development		✓
Floodplains	Not Applicable	Not Applicable
Public Safety		✓
Watershed Approach		✓

Item or Concern	No Action Alternative (Future without Federal Investment)	Modernization Alternative (Future with Federal Investment)
Provisioning Services – Trade-Offs		
Irrigation water	No effect. No change to the overall amount of water diverted to the Klamath Project would occur, and the identified losses of water in the D System due to seepage and evaporation would not be addressed.	Piping, lining, and pump upgrades would allow the District to better manage water throughout the D-system, resulting in more secure and reliable irrigation water for patrons and improved conditions for downstream irrigation districts.
Instream fish species	No effect. Trends in water levels, habitat availability, and water quality would remain the same within District-associated waterbodies that contain Lost River and shortnose suckers.	The Modernization Alternative may enable the retention of more water within UKL later into the summer. This could improve habitat for resident fish species in UKL, resulting in beneficial effects for fish populations.
Regulating Services – Trade-Offs		
Water quality	No effect. The existing problems with poor water quality in natural waterbodies would continue to occur.	Piping upgrades may result in a beneficial effect on surface water quality. Piped laterals would be less susceptible to pollutants carried by stormwater runoff into the open canals and would have limited to no sunlight exposure, leading to reduced water temperatures and less accumulation of toxic algae.

Item or Concern	No Action Alternative (Future without Federal Investment)	Modernization Alternative (Future with Federal Investment)
Cultural Services – Trade-Offs		
Culturally important species	Continuation of current use and management of water from UKL for Lost River sucker and shortnose sucker populations—species that have cultural significance to the Klamath Tribes—may result in an adverse effect for these species.	The Modernization Alternative could contribute to higher water levels later into the summer within UKL that has resident Lost River and shortnose sucker populations and whose water levels help support riverine wetlands that have resident Oregon spotted frog. Water savings could also reduce supplemental diversions through the Lost River Diversion Channel, conserving streamflow within the Lost River and benefiting sucker populations within that system.
Installation Costs		
Federal PL 83-566	$0	$17,187,000
Local only or Matching PL 83-566	$0	$5,611,000
Total	$0	$22,798,000
Average Annual Cost		
Installation	$0	$636,000
OM&R[2]	$0	$152,000
Total	$0	$788,000
Annual Benefits[1]	$0	$1,149,000
Annual Costs	$0	$788,000
Annual Net Benefits[2]	$0	$361,000

Item or Concern	No Action Alternative (Future without Federal Investment)	Modernization Alternative (Future with Federal Investment)
[1] Quantified benefits include agricultural damage reduction and avoided flood damages. [2] Annual net benefits shown for the Piping Alternative are the additional net benefits compared to the No Action Alternative.		
Regional Economic Development Analysis – Regional Economic Impacts (Employment)		
Annual Jobs from Recreation	Not applicable	0
Annual Local Jobs during 3-Year Construction (including direct/indirect/induced)[26]	Not applicable	70
Annual Jobs from agriculture (including direct/indirect/induced)	Not applicable	20

[26] This assumes that Project-related construction employment is similar to the local employment generated from typical construction spending in the region as estimated by IMPLAN regional economic modeling software. It may overstate impacts as it assumes that the project administration and technical assistance provided by NRCS is generally provided by local staff and not state office staff located outside the region.

Item or Concern	No Action Alternative (Future without Federal Investment)	Modernization Alternative (Future with Federal Investment)
Regional Economic Development Analysis – Beneficial Effects Annualized (Regional Income, Millions, 2023 dollars)		
Region - Construction (Direct, indirect, induced income from installation expenditures)[27]	$0	$0.3
Region - Ag Damage Reduction (NED benefits)[28]	$0	$1.1
Region - Ag Damage Reduction,(Indirect and induced income in other sectors from increased crop production)	$0	$0.8
Region – Total	$0	$2.2
Rest of Nation - Labor Income from Project Construction and Increased Agricultural Production	$0	Some ripple effects on jobs and income, not quantified

[27] This assumes that Project-related construction income is similar to the local income generated from typical construction spending in the region as estimated by IMPLAN regional economic modeling software. It may overstate impacts as it assumes that the project administration and technical assistance provided by NRCS is generally provided by local staff and not state office staff located outside the region.

[28] In addition to agricultural damage reduction benefits (crop production and efficiency gains), the Modernization Alternative also provides small NED benefits related to transportation and avoided flooding; these are not included in the table as they round down to $0.

Item or Concern	No Action Alternative (Future without Federal Investment)	Modernization Alternative (Future with Federal Investment)
Regional Economic Development Analysis – Adverse Effects Annualized (Millions, 2023 dollars)		
Region - Installation Costs[29]	$0	$0
Region - OM&R Costs[30]	$0	$0.2
Rest of Nation - Installation Costs	$0	$0.6
Rest of Nation – OM&R Costs	$0	$0

Price Base: 2023 dollars using a 2.75% discount rate Prepared December 2025

D.5 References

SHN Engineers & Geologists (SHN). 2023. Klamath Irrigation District System Improvement Plan.

[29] Grants are expected to cover the regional share of installation costs; most of these costs are expected to be from sources outside the region, so no regional installation costs are included, and all installation costs are allocated to the Rest of the Nation.

[30] The O&M costs will decline compared to the modernization Alternative; the O&M cost savings (efficiency benefits) are included above in the NED agricultural damage reduction benefits. The values in this table are the annualized replacement costs for the canal lining projects.

Appendix E

Other Supporting Information

E.1 Additional Supporting Information for Cultural Resources

E.1.1 Supporting Consultation Documentation

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

Rachel Gebauer, State Archaeologist
1945 Main St., Suite 200
Klamath Falls, Oregon 97601

Jamie French
Oregon Parks and Recreation Department
Heritage Conservation Division
725 Summer St NE, Suite C
Salem, OR 97301

August 29, 2025

Subject: Cultural Resources Assessment for the Klamath Irrigation District, Klamath County, Oregon

Dear Jamie French,

The USDA Natural Resources Conservation Service (NRCS Oregon) offers a variety of programs to help farmers, ranchers, family forests, Tribes, and conservation partners perform voluntary conservation on private lands. NRCS Oregon proposes to provide federal funding to the Klamath Irrigation District in Klamath County, Oregon, for infrastructure modernization to increase operational and water delivery efficiency. The project is being performed through the NRCS' Watershed Protection and Flood Prevention Program, Public Law 83-566 (PL 83-566). This undertaking is subject to Section 106 of the National Historic Preservation Act (NHPA), as amended, and its implementing regulations (36CFR Part 800) and also subject to Section 110(f) of the NHPA (36 CFR 800.10). NRCS is serving as the lead federal agency for the project. Other consulting parties include the US Bureau of Reclamation. Consultation for this project was initiated with Oregon SHPO on November 28, 2023.

Proposed Undertaking

The project will make the following improvements to the Klamath Irrigation District (KID):

- Upgrade a total of six existing pumps at the Adams and Stukel Pumping Plants, including replacing existing pump and motor units, retrofitting existing pump drives with VFDs, and/or installing trash racks.
- Pipe ten currently open laterals of the D Canal System, including: D-1 Canal north of Adams Pumping Plant (3.9 miles), D-2 Lateral north of Adams Pumping Plant (0.5 miles),D-3 Later north of Adams Pumping Plant (1.1 miles), D-12 Lateral east of Adams Point along Hwy 50 to the end of the lateral on Gaines Road (1.4 miles), D-14 Lateral east of Adams Point along Old Malin Highway (0.7 miles), D-16 Lateral east of Paygr Road and along Harpold Road (2.4 miles), D-16A Spur Lateral from D-16 Lateral north of Jellnek Road southward towards Hwy 50 (1.2 miles), D-18 Lateral east of Harpold Road and west of McCulley Road (1.3 miles), D-19 Lateral along McCulley Road (1.6 miles), D-20 Lateral along Drazil Road (1.3 miles)

- Pipe three discrete segments of the currently open and unlined D Main Canal, including: 0.9 miles from the McKoen turnout (D-14 Lateral) to Paygr Road, 2.1 miles from Paygr Road to Shasta View Irrigation Pumps, 2.4 miles east of Malin city limits to Oregon-California border.
- Line 0.9 miles of the currently open and unlined D Main Canal in the Adams Point area

The enclosed report includes the identification of archaeological and built environment resources located in the Area of Potential Effect, evaluation of these resources for listing in the National Register of Historic Places (NRHP), and an assessment of effects to the resources from the proposed project. Parametrix conducted archaeological and built environment survey of the project area to identify and document cultural resources present within the project area. Archaeological survey identified four archaeological sites, KID_Surf_site1, KID_Surf_site2, KID_Surf_site3, and KID_Sub_site1. One Isolate was also identified, KID_Iso1. None of the archaeological sites or isolates are located in areas where project-related ground disturbance is proposed. A 30-foot buffer will be flagged around each site prior to construction to ensure that the sites will not be affected.

Determination of Eligibility

One NRHP-eligible historic district was identified within the APE, the previously identified Klamath Project historic district. Effects from project activities on this resource are considered in the assessment of effects on the Klamath Project historic district. Two built environment resources within the APE, the D Canal and D Canal Lateral System, are recommended eligible as contributors to the previously identified NRHP-eligible Klamath Project historic district. The proposed APE for the project intersects with the Klamath Project historic district on two discreet segments of the D Canal and on eight of the laterals of the D Canal Lateral System.

D Canal

The D Canal is recommended eligible for listing in the NRHP as contributor to the Klamath Project Historic District. The lining of the D Canal would result in physical changes to the D Canal through the introduction of new materials within the canal. However, these changes would be limited to two discrete segments of the D Canal that combined represent only 1.85 miles of the D Canal's 19-mile alignment, or approximately 10% of its overall length. The remaining 16.15 miles of the canal's alignment would continue to be an unlined earthen canal, the entirety of the canal would remain an open water conveyance, and no changes would be made to any of the D Canal's related irrigation features. This project activity would not affect the D Canal's integrity of location, setting or association, as the activity will not involve the removal of any segments or related features of the canal, the introduction of new permanent features in the vicinity of the canal, or prohibit the canal's continued function as a principal water conveyance structure of KID and the Klamath Project. Although the lining of the D Canal would result in physical changes to the canal, its integrity of design, materials, workmanship, and feeling would not be diminished. The lining of these two discreet segments of the canal would represent a limited change relative the larger scale of the D Canal's overall alignment and would not otherwise physically change the D Canal. Furthermore, the D Canal would continue to function as principal water conveyance structure of KID and the Klamath Project. Given that the overall integrity of the D Canal would not be diminished by the project activity, the resource would retain its capacity to convey its significance under Criteria A and C and thus can be treated as an **eligible contributing resource** to the Klamath Project historic district.

D-3 Lateral

The lining of the D-3 lateral would result in physical changes to one of the 26 laterals comprising the D Canal Lateral System. However, these changes would be limited to only a 1.1-mile segment of the total 32.80 miles of secondary and tertiary water conveyance structures comprising the D Canal Lateral System. Furthermore, the activity would occur on a lateral alignment that has already been physically disconnected from the D Canal and is discontiguous from the broader D Canal Lateral System. This project activity would not affect the D Canal Lateral System's integrity of location, setting, feeling, or association. Given that the overall integrity of D Canal Lateral System would not be diminished by the project activity, the resource would retain its capacity to convey its significance under Criteria A and thus can be treated as an **eligible contributing resource** to the Klamath Project historic district.

Lateral Piping

The piping of the D-2, D-12, D-14, D16, D18, D-19, and D-20 laterals, including three sublaterals (D-12A, D-12C, and D-16A), would result in physical changes to seven of the 26 laterals comprising the D Canal Lateral System. Combined, these laterals and sublaterals represent 11.5 miles of the total 32.80 miles of secondary and tertiary water conveyance structures comprising the D Canal Lateral System. The piping of these laterals would fully enclose these seven laterals, introducing both new design elements and materials to the D Canal Lateral System directly and in the vicinity of the D Canal. The D-2 lateral, one of the laterals to be piped, has already been physically disconnected from the D Canal and is discontiguous from the broader D Canal Lateral System. However, the proposed activity would eliminate the visible physical connections and spatial relationships between the other six laterals to be piped (D-12, D-14, D16, D18, D-19, and D-20) and the D Canal.

This project activity would not affect the D Canal Lateral System's integrity of location and setting, as the piped laterals and sublaterals would retain their current alignments and no new permanent features will be introduced in the vicinity of the D Canal Lateral System. Although the project activity would result in physical changes to seven of the 26 laterals, and including three of their sublaterals, comprising the D Canal Lateral System, this resource's overall integrity of design, materials, workmanship, and feeling of the would not be diminished. The piping of seven of 26 laterals represents a limited change relative the larger collective scale of the D Canal Lateral and this change would be dispersed throughout this system of water conveyance structures. Given that the overall integrity of D Canal Lateral System and D Canal would not be diminished by the project activity, these two resources would retain their capacity to convey their significance under Criterion A and thus can be treated as an **eligible contributing resource** to the Klamath Project historic district.

Effects Analysis for the Klamath Project Historic District

Project activities are not anticipated to affect the Klamath Project historic district's integrity of location, as these project activities would not require the removal or relocation of the D Canal's alignment or related irrigation features, or the removal or relocation of the alignments of the laterals and sublaterals comprising the D Canal Lateral System or their related irrigation features. The project is also not anticipated to affect the district's integrity of setting or feeling, as the visible introduction of new materials in the D Canal and D-3 Lateral and the elimination of visibility of the physical connections and spatial relationships between the D Canal and seven of its associated laterals would not detract from the Klamath Project's overall historic character as a large-scale irrigation system. The Klamath Project historic district's integrity of design, materials, and workmanship would not be diminished by the project. The lining of two limited and discreet

segments of the D Canal segment, the lining of one lateral, and piping of seven laterals and three sublaterals of the D Canal Lateral System would not affect the respective design, materials, and workmanship of the D Canal or D Canal Lateral System. Although these activities would result in physical changes to contributing resources of the historic district, these alterations would be limited in scale relative the total length of the D Canal and combined lengths of the secondary and tertiary water conveyance structures comprising the D Canal Lateral System, and the piping of laterals and sublaterals would also be dispersed throughout this system of water conveyance structures. The D Canal and nearly two-thirds of the alignments of laterals and sublaterals in the D Canal Lateral System would also remain open and almost entirely unlined. The Klamath Project historic district integrity of association also would not be diminished by the project. Although the visible evidence of the physical connection and spatial relationships between the D Canal and seven of the laterals of the D Canal Lateral System would eliminated, nearly two-thirds of the alignments of laterals and sublaterals in the D Canal Lateral System would remain open water conveyance structures and retain their visible connection to each other, the D Canal, and other components of KID, such as the G Canal and the Adams Pumping Plant. Furthermore, the D Canal and entire D Canal Lateral System would continue to function as principal, secondary, tertiary water conveyance structures of KID and the Klamath Project. Given that the project activities are considered to be insufficient to detract from the overall integrity of the D Canal or D Canal Lateral System, these two contributing resources would retain their capacity to convey their significance under Criterion A and thus can be treated as an eligible contributing resource to the Klamath Project historic district. NRCS recommends that the project would have **no adverse effect** on the Klamath Project historic district.

Attached you will find materials to support our present consultation effort, including:

- A full archaeological report (Cultural Resources Assessment for the Klamath Irrigation District, Klamath County, Oregon)
- Section 106 Documentation Files (NameOfFile.shpo)
- Spatial data (.shpo files)

In compliance with section 106 of the NHPA of 1966, please provide your concurrence or comment on the following: The adequacy of historic property identification efforts (pursuant to 36 CFR 800.4[b][1]); and The finding of No Adverse Effect to Historic Properties in accordance with 36 CFR 800.5(b).

Pursuant to 36 CFR 800.2(c) the tribes receiving the survey information for this project include:

The Klamath Tribes, Modoc Nation, The Burns Paiute Tribe, Confederated Tribes of the Cow Creek Band of Umpqua Indians, Confederated Tribes of the Warm Springs Reservation of Oregon, Fort Bidwell Indian Community, Karuk Tribe, Yurok Tribe

If you have any questions, please let me know and I will be happy to address them.

Sincerely,

Rachel LS Gebauer

Rachel Smith Gebauer, M.A., RPA,
NRCS Oregon State Cultural Resources Specialist

cc. Gary Diridoni, NRCS Oregon ASTC for Watersheds

Natural Resources Conservation Service
USDA is an equal opportunity provider, employer, and lender.

Cultural Resources Assessment for the Klamath Irrigation District, Klamath County, Oregon

Prepared for

Farmers Conservation Alliance

Prepared by

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Lead Federal Agency: United States Department of Agriculture, Natural Resources Conservation Service

Bureau of Reclamation ARPA Permit and Fieldwork Authorization: #24-KBAO-007

Bureau of Land Management Permit: #OR-51125

Parametrix Project Number: 273-8767-006

May 2025

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1. INTRODUCTION

The Klamath Irrigation District (KID) is proposing an irrigation infrastructure modernization project (the project) through the Natural Resources Conservation Service's (NRCS) Watershed Protection and Flood Prevention Program, Public Law 83-566 (PL 83-566). NRCS is serving as the lead federal agency for the project under PL 83-566, while the Bureau of Land Management (BLM) and the United States Bureau of Reclamation (Reclamation)[1] are serving as cooperating agencies. As the lead federal agency, NRCS is responsible for compliance with the requirements of Section 106 of the National Historic Preservation Act (NHPA).

The Farmers Conservation Alliance (FCA) retained Parametrix on behalf of KID to prepare a cultural resources assessment of the project's Area of Potential Effects (APE) to satisfy the requirements of Section 106 of the NHPA. This assessment included the identification of archaeological and built resources located in the APE, evaluation of these resources for listing in the National Register of Historic Places (NRHP), and an assessment of effects from the proposed project on these resources.

Parametrix conducted an archaeological and built environment survey to identify and document cultural resources present within the APE. The archaeological survey identified four archaeological sites (Temporary Sites KID_Surf_site1, KID_Surf_site2, KID_Surf_site3, and KID_Sub_site1) and one archaeological isolate (KID_ISO1) in the APE. Archaeological site and isolate forms associated with these resources are provided in Appendix A. None of the archaeological sites or isolates identified during the survey were formally evaluated for their NRHP eligibility, because they will not be physically impacted by project-related activities. A 30-foot buffer will be flagged around each site prior to construction to ensure they will be avoided. One previously identified historic property, the Klamath Project historic district, is present within the APE, and will be treated as eligible for the purposes of this project. The built environment survey identified four components of KID: the D Canal, the D Canal Lateral System, the Adams Pumping Plant, and the Stukel Pumping Plant. Parametrix recommends that none of the four resources are individually eligible for listing in the NRHP. The D Canal and D Canal Lateral System are treated eligible as contributing resources to the NRHP-eligible Klamath Project historic district. The Adams Pumping Plant and Stukel Pumping Plant are treated as not eligible, non-contributing resources to the Klamath Project historic district. Section 106 Documentation Forms for these resources are provided in Appendix B.

Based on the information presented in this document, Parametrix recommends a finding of No Adverse Effect to historic properties in the APE, including the D Canal, D Canal Lateral System, and Klamath Project historic district.

1.1 Project Description

The proposed project is to enhance Agricultural Water Management, an Authorized Purpose defined in 290-National Watershed Program Manual, Part 500, Subpart A, Section 500.3B. Existing district infrastructure will be improved to increase water conveyance efficiency, reduce District operations and

[1] In this report, the capitalized term *Reclamation* refers to the United States Bureau of Reclamation, and the uncapitalized term *reclamation* refers to activities associated with the restoration or improvement of land for other purposes such as water control or agriculture.

maintenance costs, and enhance drought resilience within the Klamath Irrigation District (FCA 2024). Project activities will include the following (FCA 2024):

- Adams Pumping Plant Pump Replacement (three pumps; 270 total horsepower [HP]): These pump upgrades would include improvements such as replacement of the pump and motor, VFD installation, and traveling screen or trash rake installations.
- Stukel Pumping Plant Pump Replacement (three pumps; 500 total HP): These pump upgrades would include improvements such as replacement of the pump and motor, VFD installation, and traveling screen or trash rake installations.
- Line two separate segments of the D Canal (19-miles in total length) in the Adams Point area (both segments approximately 0.9 miles) to address current operational issues in this area, primarily canal sidewall failures. The proposed lining material would be determined during final design but would likely be high-density polyethylene (HDPE) material incorporating a geomembrane liner.
- Pipe the entirety of the D-2 lateral (approximately 0.5 miles) from just north of the Adams Pumping Plant to the end of the lateral. This piping would be gravity flow and 24 inches in diameter.
- Line the entirety of the D-3 lateral (approximately 1.1 miles) from just north of the Adams Pumping Plant to the end of the lateral. The proposed lining material would be determined during final design but would likely be HDPE material incorporating a geomembrane liner.
- Pipe the entirety of the D-12 lateral from east of Adams Point along Highway 50 to the end of the lateral on Gaines Road (approximately 1.4 miles) and D-12A and D-12C spur laterals from the D-12 lateral south to each lateral's terminus (approximately 0.6 miles and 0.5 miles, respectively). This piping would be gravity flow and a combination of 36 and 24 inches in diameter.
- Pipe the entirety of the D-14 lateral (approximately 0.7 miles) from east of Adams Point along Old Malin Highway. This piping would be gravity flow and 24 inches in diameter.
- Pipe the entirety of the D-16 lateral (approximately 1.2 miles) from east of Paygr Road and along Harpold Road (approximately 2.4 miles) and D-16A spur lateral from north of Jelinek Road and southward towards Highway 50. This piping would be gravity flow and 30 inches in diameter.
- Pipe the entirety of the D-18 lateral (approximately 1.3 miles) from east of Harpold Road and west of McCulley Road. This piping would be gravity flow and 30 inches in diameter.
- Pipe the entirety of the D-19 lateral (approximately 1.6 miles) along McCulley Road. This piping would be gravity flow and 30 inches in diameter.
- Pipe the entirety of the D-20 lateral (approximately 1.3 miles) along Drazil Road. This piping would be gravity flow and 30 inches in diameter.

1.2 Project Location

The project is located within the Klamath Irrigation District, a Reclamation-managed irrigation district. Klamath Project located near the Oregon-California border, south and southeast of Klamath Falls, Oregon. Project activities are located in Sections 21, 34, and 35 of Township 40 South, Range 10 East; Section 3, Township 41, Range 10 East and Sections 1, 2, 3, 7, 8, 9, 10, 11, 15, and 16 of Township 41, Range 11 East. The location of the project is shown in Figures 1-1 to 1-5.

1.2.1 Area of Potential Effects

A project's APE is defined in Section 106 of the NHPA as "geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties" (36 CFR 800.16.c). Effects may be direct or indirect, with the former including any type of effect (i.e., physical, visual, auditory, etc.) resulting from an "undertaking at the same time and place with no intervening cause," and the latter including any type of effect "caused by the undertaking that is later in time or farther in distance but are still reasonably foreseeable" (ACHP 2019).

In determining the project's APE, the APE for direct effects was delineated primarily to account for physical and visual effects. Direct effects from construction such as vibration, noise, and fugitive dust are also considered within the direct APE but are anticipated to be minor and temporary. The project's physical APE will be limited to the vertical and horizontal footprint of the areas and/or structures where the proposed project activities will occur, as well as staging and laydown areas adjacent to where project activities will occur, which will be accessed via existing access roads within the Klamath Irrigation District. The project's visual APE includes a 100-foot radial buffer around the physical APE to account for effects on the viewsheds of historic properties resulting from alterations to select components of the Klamath Irrigation District. The APE for indirect effects is the same as the APE for direct effects as reasonably foreseeable indirect effects are not anticipated to occur outside of the APE established for direct effects. The APE is approximately 179 acres and is shown in Figures 1-1 to 1-5.

1.3 Personnel

This report was prepared by Corey Lentz, MS, a Secretary of Interior (SOI) Qualified Architectural Historian; Kainoa Little, MA, RPA, a SOI Qualified Archaeologist; Jenny Wildt, PhD, RPA, a SOI Qualified Archaeologist; Christopher Hetzel, MA, a SOI Qualified Architectural Historian; and J. Tait Elder, MA, RPA, a SOI Qualified Archaeologist and Principal Investigator. Built environment field survey was conducted by Corey Lentz and Eliot Heath, MS, a SOI Qualified Architectural Historian. Archaeological field survey was conducted by Kainoa Little, Lauren Collins, BA and Nathan Benson, BA. Mathew Sisneros, MA, contributed figures for the report.

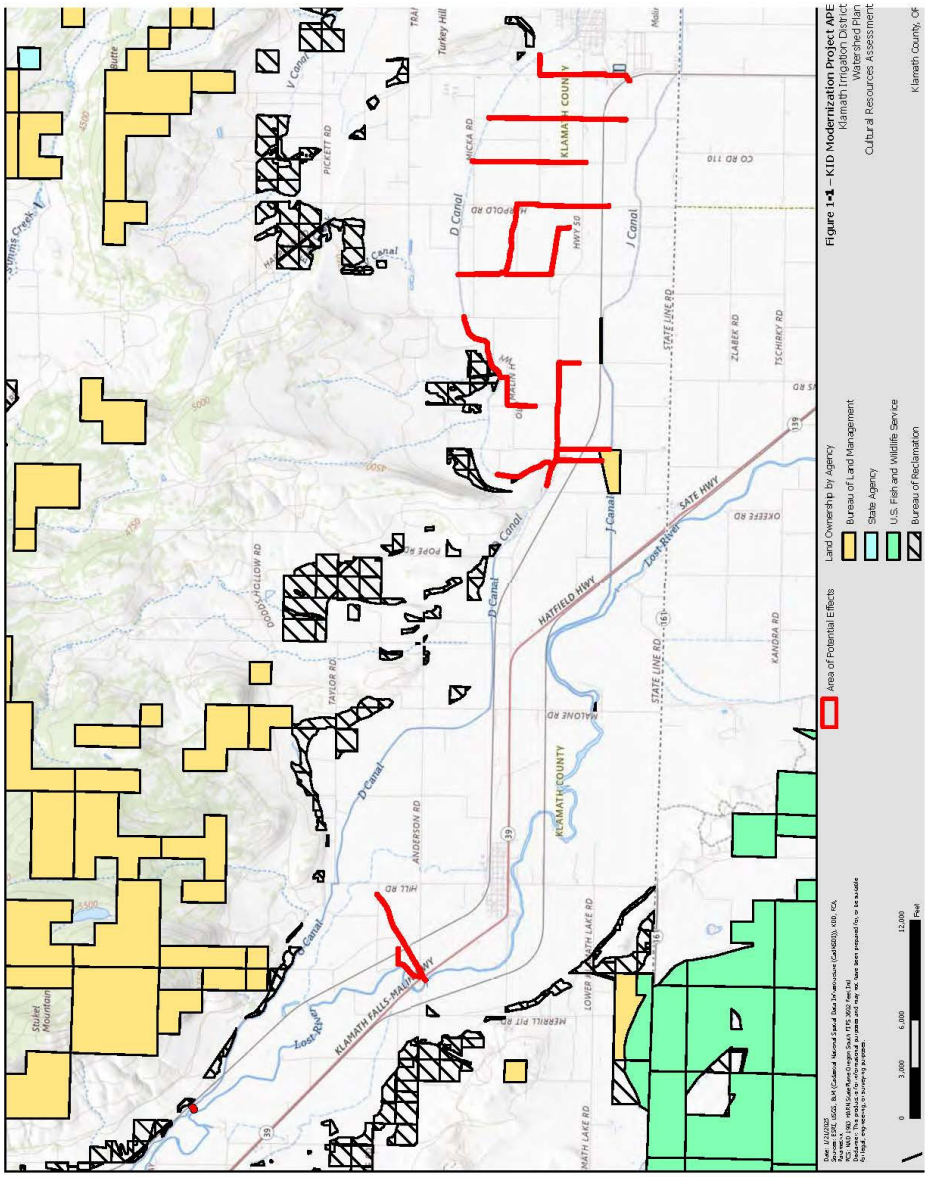
Figure 1-1 – KID Modernization Project APE
Klamath Irrigation District
Watershed Plan
Cultural Resources Assessment
Klamath County, OR
Land Ownership by Agency
Bureau of Land Management
State Agency
U.S. Fish and Wildlife Service
Bureau of Reclamation
Area of Potential Effects
KLAMATH COUNTY
D Canal
J Canal
V Canal
HATFIELD HWY
KLAMATH FALLS-MALIN HWY
STATE LINE RD
Lost River
Stukel Mountain
Turkey Hill
Butte
Miller Creek
Feet

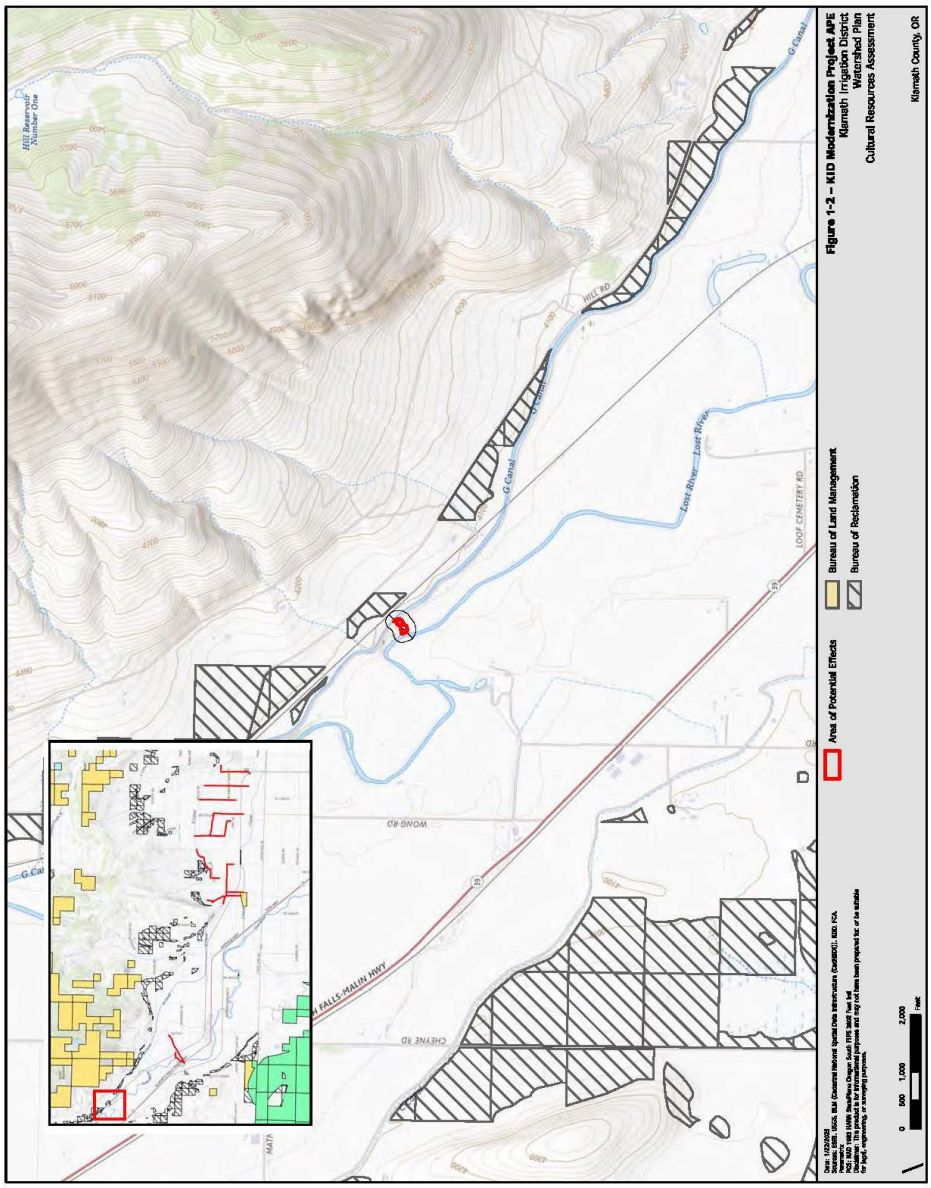
Figure 1-2 – KID Modernization Project APE
Klamath Irrigation District
Watershed Plan
Cultural Resources Assessment
Klamath County, OR
Area of Potential Effects
Bureau of Land Management
Bureau of Reclamation
Hill Reservoir Number One
G Canal
Lost River
HILL RD
LOOF CEMETERY RD
WONG RD
CHENE RD
FALLS-MALIN HWY
MAIN
0
500
1,000
2,000
Feet

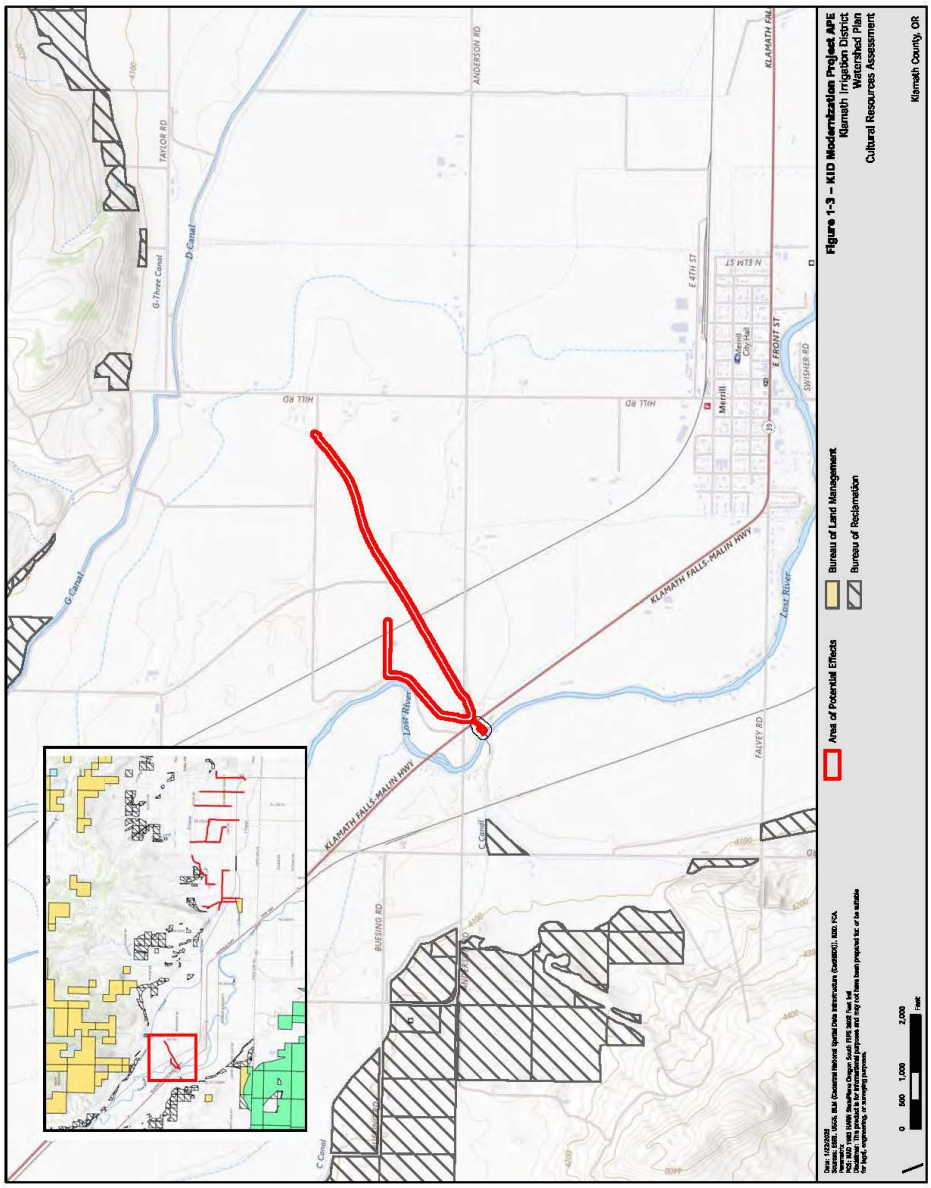
Figure 1-3 – KID Modernization Project APE
Klamath Irrigation District
Watershed Plan
Cultural Resources Assessment
Klamath County, OR
Area of Potential Effects
Bureau of Land Management
Bureau of Reclamation
KLAMATH FALLS-MALIN HWY
ANDERSON RD
TAYLOR RD
D Canal
G-Three Canal
G Canal
HILL RD
E 4TH ST
N ELM ST
E FRONT ST
SWISHER RD
Merrill
Merrill City Hall
Lost River
FALKEY RD
RIESING RD
C Canal
0
800
1,600
2,000
Feet

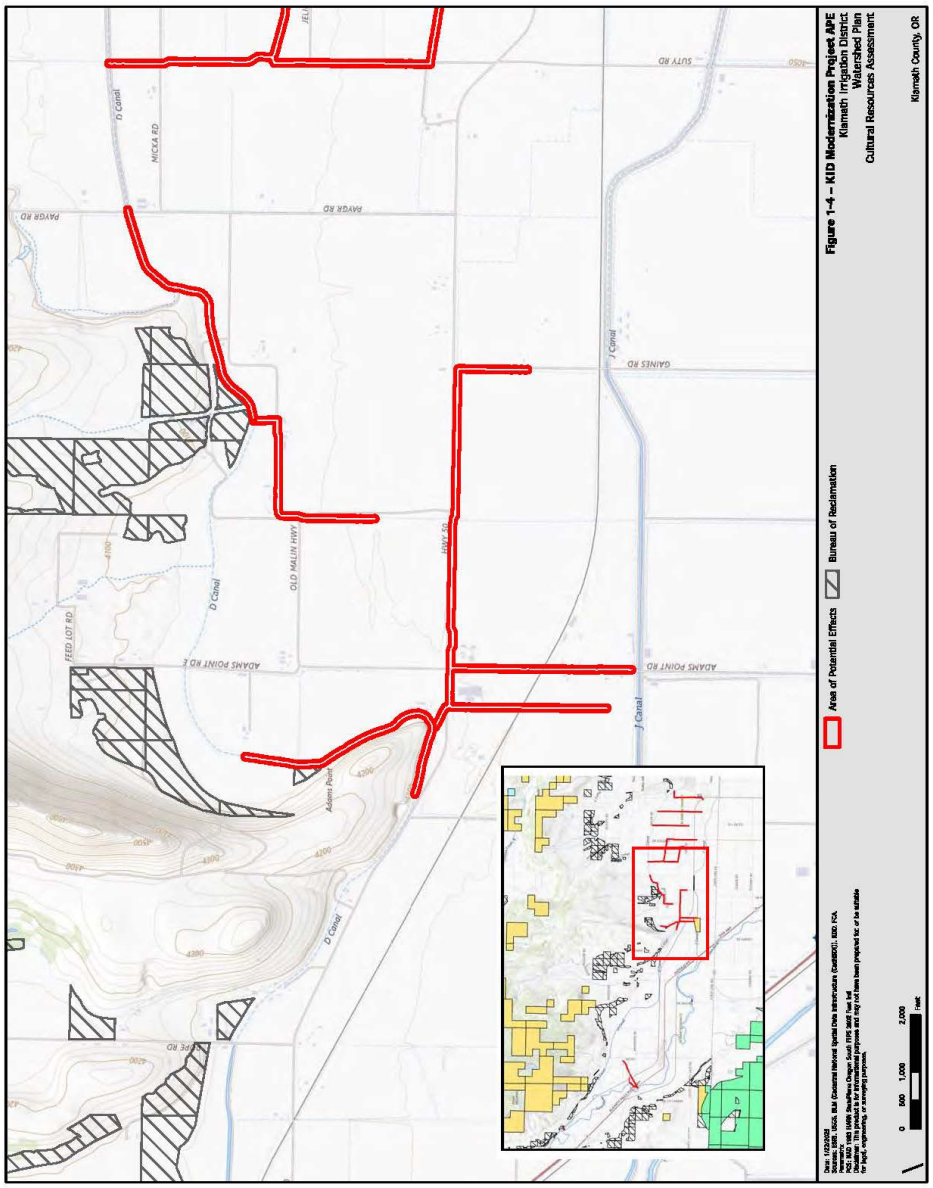
Figure 1-4 – KID Modernization Project APE
Klamath Irrigation District
Watershed Plan
Cultural Resources Assessment
Klamath County, OR
Areas of Potential Effects
Bureau of Reclamation
D Canal
J Canal
ADAMS POINT RD
GAINES RD
PAYGE RD
SUTY RD
MICKA RD
OLD MALIN HWY
HWY 39
FEED LOT RD
Adams Point
0
500
1,000
2,000
Feet

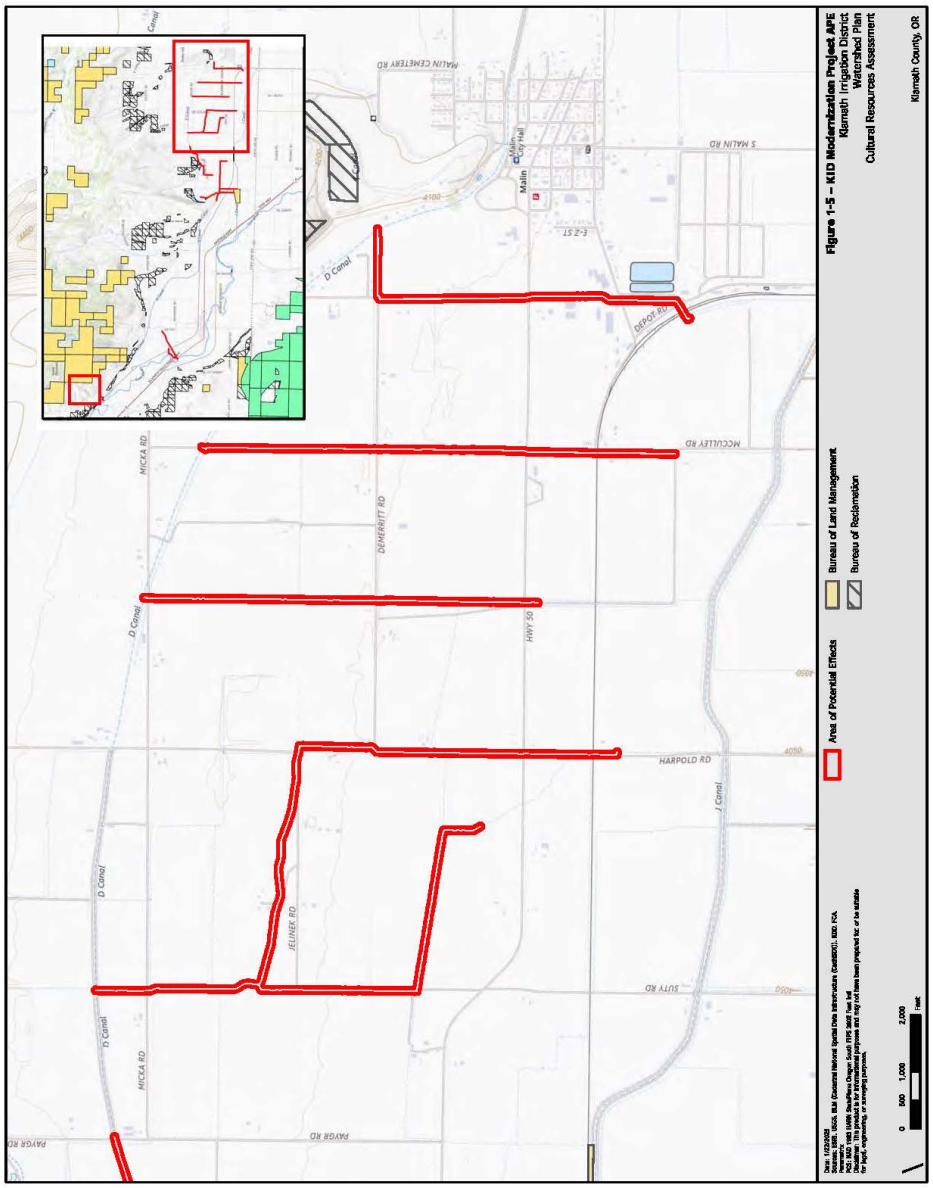
Figure 1-5 – KID Modernization Project APE
Klamath Irrigation District
Watershed Plan
Cultural Resources Assessment
Klamath County, OR
Area of Potential Effects
Bureau of Land Management
Bureau of Reclamation
MALIN CEMETERY RD
S MALIN RD
Malin City Hall
Malin
E-2 ST
D Canal
DEPOT RD
MCCULLEY RD
MICKA RD
DEMERRITT RD
HWY 50
HARPOLD RD
J Canal
JELINEK RD
SUTY RD
PAYGR RD
0
800
1,000
2,000
Feet

5. RESEARCH AND SURVEY METHODOLOGY

This chapter outlines background research sources, and the methodology of the archaeological and built environment resource surveys conducted as part of this report.

5.1 Background Research

Parametrix personnel conducted background research through review of online resources and Oregon Heritage (Oregon State Historic Preservation Office [SHPO]) and NPS cultural resource databases. The following databases and online archival collections were reviewed:

- Oregon Archaeological Records Remote Access (OARRA) – OARRA is a GIS-based database of previously recorded archaeological resources and archaeological survey reports.
- Oregon Historic Database (OHSD) – OHSD contains the Oregon Statewide Inventory, the public database of previously recorded built environment properties for which Oregon SHPO has collected physical and/or historical information.
- NPS NRHP NPGallery Database – The NPGallery Database contains digital records for historic properties listed in the NRHP, provided by the National Park Service. The database is available at https://www.nps.gov/subjects/nationalregister/database-research.htm.
- National Archives and Records Administration (NARA) NHRP Database – The NARA NRHP Database contains digital records for historic properties listed in the NRHP, hosted by the National Archives. The database is available at https://catalog.archives.gov/id/20812721.
- Nationwide Environmental Title Research (NETR) Historic Aerials – A digital mapping tool for historic aerial photographs. The mapping tool is available at https://www.historicaerials.com/.
- U.S. Geological Survey (USGS) Topographic Map Database – A digital collection of USGS topographic maps. The database is available at https://ngmdb.usgs.gov/topoview/viewer.
- Oregon Institute of Technology (OIT) Klamath Project Annual Project Histories Collection – OIT Klamath Project Annual Project Histories Collection contains digital copies of Reclamation Annual Project History and Operation and Maintenance Reports for the years 1912-1921, 1926-1932, 1934-1943, 1945-1951, 1954-1955, 1957-1958, 1962, and 1964.

5.2 Survey And Evaluation Methods

5.2.1 Archaeological Survey

The purpose of archaeological field investigations for this project was to identify and delineate known and as-yet undocumented archaeological resources in the APE. No artifacts were collected for analysis and curation during the archaeological field investigations. Based on the nature of the proposed project-related ground disturbing activities, the fact that the APE contains sediments with sensitivity for buried archaeological resources, and the presence of precontact and historical archaeological resources outside of the APE but on landforms with comparable depositional context, Parametrix proposed to use two archaeological field methods – pedestrian survey and shovel probes. All archaeological field methods were implemented in accordance with Reclamation, Interior Region 10 – California-Great Basin, General

Scope of Work for Cultural Resources Investigations in Oregon (Reclamation 2012) and the Oregon SHPO Guidelines for Conducting Field Archaeology in Oregon (Oregon SHPO 2013a, 2023).

The APE crosses privately-owned land, Reclamation-owned lands and facilities, and BLM-owned lands. Based on the locations and types of proposed project-related ground disturbing activities within Reclamation- and BLM-owned lands, Parametrix obtained permits from these agencies to perform archaeological survey. These permits include an ARPA permit for subsurface archaeological investigations on Reclamation-land (Permit #22-KBAO-007) and a fieldwork authorization to perform pedestrian survey on BLM lands (Permit #OR-51125). The field methods described below are consistent with those presented in the project's ARPA and Fieldwork Authorization permit applications. Permit applications are provided in Appendix C.

A Phase 1 Field Investigation was conducted on November 5-6 and December 17-20, including pedestrian inspection of the APE and 11 shovel probes. The location of excavation units was selected based on planned ground disturbance associated with construction activities.

5.2.1.1 Pedestrian Survey

Parametrix performed pedestrian survey across the entirety of the APE. Pedestrian survey consisted of archaeologists walking side-by-side, approximately 15 meters apart, across the entire APE in a systematic fashion while carefully inspecting the ground surface. The ground surface was inspected for indicators of human activity – such as midden soil, lithic artifacts, or concentrations of historic-era artifacts. Whenever possible, locations where the subsurface has been exposed by rodent burrows, road cuts, or vegetation disturbances were examined for artifacts or archaeological features. All pedestrian survey transects were mapped via Global Positioning System (GPS).

In instances where surface-exposed archaeological deposits were encountered, Parametrix archaeologists reduced their transect intervals to 5-meters spacing and delineated the margins of the archaeological deposits. Archaeological deposits were considered delineated if no additional artifacts or features were encountered within 30 meters of the next-closest artifact or feature.

Parametrix archaeologists documented field conditions, ground surface visibility, topography and visible geologic features, indicators of ground disturbance, and archaeological deposits in field notes and photographs; and mapped key landmarks and archaeological resources via GPS.

5.2.1.2 Subsurface Survey

Parametrix archaeologists excavated shovel probes at locations where project-related ground disturbance is anticipated to result in subsurface ground disturbance greater than 10 centimeters in depth. Shovel probes were excavated at intervals of 20 meters either in a grid pattern or in linear transects depending on the shape and extent of the proposed ground disturbance. Shovel probes were approximately 45 centimeters in diameter and excavated to the maximum anticipated depth of ground disturbance, until Pleistocene-aged or older deposits were encountered, or until impassable conditions were encountered.

All excavated sediments were screened through 0.25-inch mesh. If artifacts were encountered in a shovel probe, all the remaining sediment from the probe were screened through 0.125-inch mesh. Additionally, four shovel probes were excavated 5 meters away from the discovery in cardinal directions to determine whether the discovery was an archaeological site or an isolate. Upon completion, information relating to each shovel probe's sediments and stratigraphy, contents, and any other

relevant observations were collected in field notes. Each shovel probe was photographed and mapped using a GPS unit, and backfilled and any recovered artifacts reburied. The specific depth of reburied artifacts was also recorded in field notes.

5.2.2 Built Environment

5.2.2.1 Built Environment Survey

Built environment survey was designed and conducted in accordance Oregon SHPO's *Guidance for Historic Resource Surveys in Oregon* and *Guidance for Recording* and *Evaluating Linear Cultural Resources*, including specific guidance for the documentation of irrigation systems (Oregon SHPO 2011, 2013b). A Reconnaissance-Level Historic Property Survey, consisting of photography and field notes, was conducted July 29-31, 2024, to identify and document the Klamath Irrigation District D Canal, D Canal Lateral System, Adams Pumping Plant, and Stukel Pumping Plant. Pedestrian survey was conducted for segments of the D Canal and D Canal Lateral System in the APE and at the locations of the Adams Pumping Plant and Stukel Pumping Plant. Documentation of the D Canal was supplemented by a windshield survey consisting of driving the length of the entirety of the D Canal along its southern berm access road and desktop review consisting of background research and review of historic Reclamation maps of the Klamath Project, historic USGS topographic maps, and historic aerial photographs. Documentation of the D Canal Lateral System was likewise supplemented by desktop review. Documented historic built environment components of the Klamath Drainage District are summarized in 7.2 Built Environment Survey.

5.2.2.2 Built Environment Evaluation Methodology

The Klamath Irrigation District D Canal, Stukel Pumping Plant, and Adams Pumping Plant were evaluated for listing in the NRHP based on Oregon SHPO's *Guidance for Recording and Evaluating Linear Cultural Resources* (OR SHPO 2013b), which identifies irrigation systems as type of linear resource. Secondarily, the registration requirements established for individual components of irrigation systems in *Carey and Reclamation Acts Irrigation Projects in Oregon, 1901-1978 Multiple Property Documentation Form* (Hetzel 2016) informed the evaluation of Klamath Irrigation District components as contributing resources to Klamath Project historic district, including the identification of component types and assessment of historic integrity.

Oregon SHPO guidance indicates that irrigation systems can be considered significant under Criterion A if they demonstrate that agricultural land use in a discreet area was made possible by the development of the irrigation system or that the system's development improved agricultural land use to a degree that would not otherwise have occurred. Additionally, this increase in agricultural land use should be demonstrated to have influenced historic patterns of settlement, social organization, and/or the appearance of the landscape in the vicinity of the irrigation system.

Irrigation systems may be considered significant under Criterion B if their development substantially involved individuals significant for activities related to irrigation advocacy, land development, commercial irrigation development, or politics. However, the significance of this individual must be demonstrated to have a direct association with the development of a particular irrigation system and should consider whether other properties may demonstrate this association better. Importantly, if an individual's significance is associated primarily with the design or construction of an irrigation system, this association should be evaluated under Criterion C.

Irrigation systems may be considered significant under Criterion C as an intact collection of engineered components constructed within a defined period that represent either a design approach to overcoming an extraordinary environmental challenge or that consist of unusual or innovative design elements or aesthetic features. Large-scale, federal projects may also be considered significant due to the sheer size of the project and the scale of mobilization required for its construction.

Irrigation systems may be considered significant under Criterion D in cases where the system itself "serves as its own primary source of information," is considered to be an "artifact of primary importance," and this information is not otherwise available from documentary sources. As such, the application of this criteria is uncommon and must substantially rely on the physical elements of the system and its integrity.

Individual components of irrigation systems such as pumping plants, diversion structures, or principal water conveyance structures may be considered individually eligible under Criterion A if they are significant in an area other than Agriculture, or under Criterion C if they represent an innovative design and retain a high degree of integrity, represent a significant concentration of intact, contributing elements that together reflect the conveyance's function, or is the last intact segment of a canal or significant lateral (Hetzel 2016:F-44, F-51). Available guidance does not specify additional thresholds that would qualify an individual component eligible for individual listing in the NRHP under Criteria B or D. Therefore, it is assumed that the same guidance for evaluating irrigation systems under these criteria would apply to individual components (Hetzel 2016).

9. CONCUSION AND RECOMMENDATIONS

9.1 Conclusion

Archaeological survey identified four archaeological sites (Temporary Sites KID_Surf_site1, KID_Surf_site2, KID_Surf_site3, and KID_Sub_site1) and one archaeological isolate (KID_ISO1) in the APE. While these resources are located within the APE, project-related ground disturbance is not anticipated within or adjacent to any of the sites or isolates. As a result, they were documented but not formally evaluated for listing in the NRHP.

The Klamath Project is treated as an historic district eligible for listing in the NRHP that overlaps within the APE. Built environment survey identified four components of KID: the D Canal, D Canal Lateral System, Adams Pumping Plant, and Stukel Pumping Plant. These four components were evaluated for individual eligibility for listing in the NRHP and treatment as eligible contributors to the Klamath Project historic district.

9.2 Recommendations

Based on the information presented in this document, Parametrix recommends a finding of No Adverse Effect to historic properties in the APE, including the D Canal and Klamath Project historic district.

None of the archaeological sites or isolates identified during the survey will be physically impacted by project-related activities. A 30-foot buffer will be flagged around each site prior to construction to ensure they will be avoided.

Parametrix recommends that none of the four built environment resources identified in the APE are individually eligible for listing in the NRHP. The D Canal and D Canal Lateral System are treated as eligible as contributing resources to the Klamath Project historic district. The Adams Pumping Plant and Stukel Pumping Plant are treated as non-eligible, non-contributing resources to the Klamath Project historic district. Parametrix recommends a finding of No Adverse Effect to historic built environment resources in the APE, including the Klamath Project historic district and its contributing resources, the D Canal, and D Canal Lateral System.

United States Department of the Interior
BUREAU OF RECLAMATION
2800 Cottage Way
Sacramento, CA 95825-1898

IN REPLY REFER TO:
CGB-153
2.1.1.04

February 12, 2024

VIA ELECTRONIC MAIL ONLY

Mr. Gary Diridoni
USDA - Natural Resources Conservation Service
1201 NE Lloyd Blvd
Suite 900
Portland, OR 97232
gary.diridoni@usda.gov

Subject: Designation of Lead Federal Agency for Compliance with the National Historic Preservation Act (NHPA) Section 106 Consultation for the Klamath Irrigation District Modernization Project (Project), Klamath County, Oregon, and Modoc County, California (24-KBAO-007)

Dear Mr. Diridoni:

This letter concerns the designation of lead Federal agency to the Natural Resources Conservation Service (NRCS) for the proposed project to modernize facilities used by the Klamath Irrigation District (KID) to improve water delivery efficiency and to address local water, fish, and wildlife resource concerns. The Bureau of Reclamation's action is to issue KID a Use Authorization for the KID Infrastructure Modernization Project, which includes installation of new components on and modifications to existing Reclamation facilities. NRCS is providing funding to KID under the Watershed Protection and Flood Prevention Program (Public Law (PL) 83-566) as well as technical assistance.

We hereby designate NRCS as the lead Federal agency to act on behalf of Reclamation for the purposes of compliance with Title 54 U.S.C. § 306108, commonly known as Section 106 of the NHPA, and its implementing regulations found at 36 CFR Part 800. Reclamation and NRCS executed a Memorandum of Understanding (MOU) in 2022 to coordinate activities carried out under the NRCS Watershed Operations Program on lands and facilities owned by Reclamation. Pursuant to Section 4.C.(1)(c) of the MOU, we request that any submissions NRCS makes to the State Historic Preservation Officer (SHPO) for projects located on Reclamation's California-Great Basin Region lands and facilities in Oregon or California include a statement indicating that we have designated NRCS as the lead Federal agency for the proposed project. We will need to provide direct input for any determinations of eligibility for cultural resources and assessment of effects for historic properties on Reclamation lands. Reclamation also requests that NRCS provide us with copies of all reports, the opportunity to review and comment on all documents prior to their submission to SHPO, and copies of all correspondence.

INTERIOR REGION 10 • CALIFORNIA-GREAT BASIN
CALIFORNIA*, NEVADA*, OREGON*
* PARTIAL

We also request that any submissions you make to interested parties, tribes, or the SHPO reference Reclamation's undertaking and designation of lead agency. If this is not done, then Reclamation may need to consult separately on our undertaking prior to issuing the use authorization. Please reference our tracking number, 24-KBAO-007, on correspondence.

Prior to our role in the proposed project being identified, NRCS had conducted tribal consultations for their action on November 28, 2023. To fulfill our NHPA Section 106 requirements, Reclamation will also conduct tribal consultations for our undertaking independently of NRCS. We will coordinate with NRCS on any responses as appropriate.

We look forward to our continued involvement in this project. If you have any questions, please contact Ms. Amy Barnes, Archaeologist, at (916) 978-5047 or abarnes@usbr.gov.

Sincerely,

ANASTASIA LEIGH

Digitally signed by ANASTASIA LEIGH
Date: 2024.02.12 16:02:46 -08'00'

Anastasia T. Leigh
Regional Environmental Officer

cc: Ms. Christine Curran
Deputy State Historic Preservation Officer
Oregon State Parks and Recreation
725 Summer Street NE, Suite C
Salem, OR 97301
Chrissy.CURRAN@oprd.oregon.gov

Mr. Michael Petrozza, NRCS
USDA - Natural Resources Conservation Service
1201 NE Lloyd Blvd
Suite 900
Portland, OR 97232
michael.petrozza@usda.gov

Ms. Anne Timm, NRCS
USDA - Natural Resources Conservation Service
1201 NE Lloyd Blvd
Suite 900
Portland, OR 97232
anne.timm@usda.gov

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

Oregon State Office
1201 NE Lloyd Blvd. Suite 900
Portland, OR 97232

November 28, 2023

Review and Compliance
Oregon Heritage/State Historic Preservation Office
725 Summer Street NE, Suite C
Salem, OR 97301

Re: Invitation to Participate in Section 106 Consultation for the Klamath Irrigation District Modernization Project, Klamath County, Oregon

Dear Jamie French,

The Farmers Conservation Alliance (FCA) is proposing the Klamath Irrigation District (KID) Modernization Project (the project) in Klamath County, Oregon. The project is being performed through the Natural Resources Conservation Service's (NRCS) Watershed Protection and Flood Prevention Program, Public Law 83-566 (PL 83-566). As a result, the project is considered a federal undertaking and is subject to Section 106 of the National Historic Preservation Act (Section 106) and its implementing regulations 36 CFR Part 800. NRCS is serving as the lead federal agency for the project and the U.S. Bureau of Reclamation is serving as a cooperating agency. In this letter, NRCS wishes to formally initiate Section 106 of the National Historic Preservation Act (NHPA) consultation with OR SHPO in accordance with 36 CFR 800.3; and requests feedback on the project's Area of Potential Effects (APE).

Project Description

KID proposes to make a series of upgrades and improvements. They include:

- Upgrade a total of six existing pumps at the Adams and Stukel Pumping Plants, including replacing existing pump and motor units, retrofitting existing pump drives with VFDs, and/or installing trash racks.
- Pipe ten currently open laterals branching off from the D Canal System, including:
  - D-1 Canal north of Adams Pumping Plant (3.9 miles)
  - D-2 Lateral north of Adams Pumping Plant (0.5 miles)
  - D-3 Later north of Adams Pumping Plant (1.1 miles)
  - D-12 Lateral east of Adams Point along Hwy 50 to the end of the lateral on Gaines Road (1.4 miles)
  - D-14 Lateral east of Adams Point along Old Malin Highway (0.7 miles)
  - D-16 Lateral east of Paygr Road and along Harpold Road (2.4 miles)
  - D-16A Spur Lateral from D-16 Lateral north of Jellnek Road southward towards Hwy 50 (1.2 miles)
  - D-18 Lateral east of Harpold Road and west of McCulley Road (1.3 miles)
  - D-19 Lateral along McCulley Road (1.6 miles)
  - D-20 Lateral along Drazil Road (1.3 miles)
- Pipe three discrete segments of the currently open and unlined D Main Canal, including:
  - 0.9 miles from the McKoen turnout (D-14 Lateral) to Paygr Road
  - 2.1 miles from Paygr Road to Shasta View Irrigation Pumps
  - 2.4 miles east of Malin city limits to Oregon-California border
- Line 0.9 miles of the currently open and unlined D Main Canal in the Adams Point area

Area of Potential Effects

A project's APE is defined as the geographic area(s) in which an undertaking may directly or indirectly effect the character or use of historic properties (36 CFR 800.16.c). Effects may be direct or indirect, with the former including any type of effect (i.e., physical, visual, auditory, etc.) resulting from an undertaking and the latter including any type of reasonably foreseeable effect caused by the undertaking after its completion or farther in distance. In determining the Project's APE, the APE for direct effects was delineated primarily to account for physical and visual effects, as well as construction-related effects such as vibration, noise, and fugitive dust. The Project's physical APE will be limited to the vertical and horizonal footprint of the areas and/or structures where the

proposed project activities will occur. The project's visual APE includes a 30-foot radial buffer around the physical APE to account for effects on the viewsheds of historic properties resulting from alterations to select components of the KID. The APE for indirect effects is the same as the APE for direct effects as reasonably foreseeable indirect effects are not anticipated to occur outside of the APE established for direct effects. The APE is shown in the enclosed figure.

Cultural resources studies of the APE will be performed and shared with consulting parties. If Oregon SHPO is interested in becoming a consulting party for the project, please provide a response within 30-days of receipt of this letter with confirmation of your interest and any key contacts to be included in future correspondence. NRCS is also interested in input regarding the identification of any historic properties that may exist within the project's APE that may have religious and cultural significance to Oregon SHPO. If you have any questions or concerns about the project, please contact me at Michael.Petrozza@usda.gov or 503.414.3212.

Sincerely,

Michael Petrozza

Michael Petrozza
State Cultural Resources Specialist
USDA NRCS
503.414.3212
Michael.Petrozza@usda.gov

cc:
Gary Diridoni, State Watershed Planner

Enclosure: Area of Potential Effect Figure

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

Oregon State Office
1201 NE Lloyd Blvd. Suite 900
Portland, OR 97232

November 28, 2023

Klamath Tribes
Les Anderson
Culture and Heritage Interim Director
P.O. Box 436
501 Chiloquin Blvd.
Chiloquin, OR 97624

Re: Invitation to Participate in Section 106 Consultation for the Klamath Irrigation District Modernization Project, Klamath County, Oregon

Dear Mr. Anderson,

The Farmers Conservation Alliance (FCA) is proposing the Klamath Irrigation District (KID) Modernization Project (the project) in Klamath County, Oregon. The project is being performed through the Natural Resources Conservation Service's (NRCS) Watershed Protection and Flood Prevention Program, Public Law 83-566 (PL 83-566). As a result, the project is considered a federal undertaking and is subject to Section 106 of the National Historic Preservation Act (Section 106) and its implementing regulations 36 CFR Part 800. NRCS is serving as the lead federal agency for the project and the U.S. Bureau of Reclamation is serving as a cooperating agency. In this letter, NRCS wishes to formally initiate Section 106 of the National Historic Preservation Act (NHPA) consultation with the Klamath Tribes in accordance with 36 CFR 800.3; and requests feedback on the project's Area of Potential Effects (APE).

Project Description

KID proposes to make a series of upgrades and improvements. They include:

- Upgrade a total of six existing pumps at the Adams and Stukel Pumping Plants, including replacing existing pump and motor units, retrofitting existing pump drives with VFDs, and/or installing trash racks.
- Pipe ten currently open laterals branching off from the D Canal System, including:
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  - D-3 Later north of Adams Pumping Plant (1.1 miles)
  - D-12 Lateral east of Adams Point along Hwy 50 to the end of the lateral on Gaines Road (1.4 miles)
  - D-14 Lateral east of Adams Point along Old Malin Highway (0.7 miles)
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  - D-16A Spur Lateral from D-16 Lateral north of Jellnek Road southward towards Hwy 50 (1.2 miles)
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  - D-19 Lateral along McCulley Road (1.6 miles)
  - D-20 Lateral along Drazil Road (1.3 miles)
- Pipe three discrete segments of the currently open and unlined D Main Canal, including:
  - 0.9 miles from the McKoen turnout (D-14 Lateral) to Paygr Road
  - 2.1 miles from Paygr Road to Shasta View Irrigation Pumps
  - 2.4 miles east of Malin city limits to Oregon-California border
- Line 0.9 miles of the currently open and unlined D Main Canal in the Adams Point area

Area of Potential Effects

A project's APE is defined as the geographic area(s) in which an undertaking may directly or indirectly effect the character or use of historic properties (36 CFR 800.16.c). Effects may be direct or indirect, with the former including any type of effect (i.e., physical, visual, auditory, etc.) resulting from an undertaking and the latter including any type of reasonably foreseeable effect caused by the undertaking after its completion or farther in distance. In determining the Project's APE, the APE for direct effects was delineated primarily to account for physical and visual effects, as well as

construction-related effects such as vibration, noise, and fugitive dust. The Project's physical APE will be limited to the vertical and horizonal footprint of the areas and/or structures where the proposed project activities will occur. The project's visual APE includes a 30-foot radial buffer around the physical APE to account for effects on the viewsheds of historic properties resulting from alterations to select components of the KID. The APE for indirect effects is the same as the APE for direct effects as reasonably foreseeable indirect effects are not anticipated to occur outside of the APE established for direct effects. The APE is shown in the enclosed figure.

Cultural resources studies of the APE will be performed and shared with consulting parties. If the Klamath Tribes are interested in becoming a consulting party for the project, please provide a response within 30-days of receipt of this letter with confirmation of your interest and any key contacts to be included in future correspondence. NRCS is also interested in input regarding the identification of any historic properties that may exist within the project's APE that may have religious and cultural significance to the Klamath Tribes. If you have any questions or concerns about the project, please contact me at Michael.Petrozza@usda.gov or 503.414.3212.

Sincerely,

Michael Petrozza

Michael Petrozza
State Cultural Resources Specialist
USDA NRCS
503.414.3212
Michael.Petrozza@usda.gov

cc:
Gary Diridoni, State Watershed Planner

Enclosure: Area of Potential Effect Figure

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

Oregon State Office
1201 NE Lloyd Blvd. Suite 900
Portland, OR 97232

November 28, 2023

Modoc Nation
Gina McGaughey
Second Chief

Re: Invitation to Participate in Section 106 Consultation for the Klamath Irrigation District Modernization Project, Klamath County, Oregon

Dear Ms. McGaughey,

The Farmers Conservation Alliance (FCA) is proposing the Klamath Irrigation District (KID) Modernization Project (the project) in Klamath County, Oregon. The project is being performed through the Natural Resources Conservation Service's (NRCS) Watershed Protection and Flood Prevention Program, Public Law 83-566 (PL 83-566). As a result, the project is considered a federal undertaking and is subject to Section 106 of the National Historic Preservation Act (Section 106) and its implementing regulations 36 CFR Part 800. NRCS is serving as the lead federal agency for the project and the U.S. Bureau of Reclamation is serving as a cooperating agency. In this letter, NRCS wishes to formally initiate Section 106 of the National Historic Preservation Act (NHPA) consultation with the Modoc Nation in accordance with 36 CFR 800.3; and requests feedback on the project's Area of Potential Effects (APE).

Project Description

KID proposes to make a series of upgrades and improvements. They include:

- Upgrade a total of six existing pumps at the Adams and Stukel Pumping Plants, including replacing existing pump and motor units, retrofitting existing pump drives with VFDs, and/or installing trash racks.
- Pipe ten currently open laterals branching off from the D Canal System, including:
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- Pipe three discrete segments of the currently open and unlined D Main Canal, including:
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- Line 0.9 miles of the currently open and unlined D Main Canal in the Adams Point area

Area of Potential Effects

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around the physical APE to account for effects on the viewsheds of historic properties resulting from alterations to select components of the KID. The APE for indirect effects is the same as the APE for direct effects as reasonably foreseeable indirect effects are not anticipated to occur outside of the APE established for direct effects. The APE is shown in the enclosed figure.

Cultural resources studies of the APE will be performed and shared with consulting parties. If the Modoc Nation is interested in becoming a consulting party for the project, please provide a response within 30-days of receipt of this letter with confirmation of your interest and any key contacts to be included in future correspondence. NRCS is also interested in input regarding the identification of any historic properties that may exist within the project's APE that may have religious and cultural significance to the Modoc Nation. If you have any questions or concerns about the project, please contact me at Michael.Petrozza@usda.gov or 503.414.3212.

Sincerely,

Michael Petrozza

Michael Petrozza
State Cultural Resources Specialist
USDA NRCS
503.414.3212
Michael.Petrozza@usda.gov

cc:
Gary Diridoni, State Watershed Planner

Enclosure: Area of Potential Effect Figure

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

Oregon State Office
1201 NE Lloyd Blvd. Suite 900
Portland, OR 97232

January 6, 2025
Chairman Russell Attebery
Karuk Tribe
P.O. Box 1016
Happy Camp, CA 96039

Re: Invitation to Participate in Section 106 Consultation for the Klamath Irrigation District Modernization Project, Klamath County, Oregon

Dear Chairman Attebery,

The Farmers Conservation Alliance (FCA) is proposing the Klamath Irrigation District (KID) Modernization Project (the project) in Klamath County, Oregon. The project is being performed through the Natural Resources Conservation Service's (NRCS) Watershed Protection and Flood Prevention Program, Public Law 83-566 (PL 83-566). As a result, the project is considered a federal undertaking and is subject to Section 106 of the National Historic Preservation Act (Section 106) and its implementing regulations 36 CFR Part 800. NRCS is serving as the lead federal agency for the project and the U.S. Bureau of Reclamation is serving as a cooperating agency. In this letter, NRCS wishes to formally initiate Section 106 of the National Historic Preservation Act (NHPA) consultation with the Fort Bidwell Indian Community in accordance with 36 CFR 800.3; and requests feedback on the project's Area of Potential Effects (APE).

Project Description

KID proposes to make a series of upgrades and improvements. They include:

- Upgrade a total of six existing pumps at the Adams and Stukel Pumping Plants, including replacing existing pump and motor units, retrofitting existing pump drives with VFDs, and/or installing trash racks.
- Pipe ten currently open laterals branching off from the D Canal System, including:
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APE established for direct effects. The APE is shown in the enclosed figure.

Cultural resources studies of the APE will be performed and shared with consulting parties. If the Karuk Tribe is interested in becoming a consulting party for the project, please provide a response within 30-days of receipt of this letter with confirmation of your interest and any key contacts to be included in future correspondence. NRCS is also interested in input regarding the identification of any historic properties that may exist within the project's APE that may have religious and cultural significance to Karuk Tribe. If you have any questions or concerns about the project, please contact me at rachel.gebauer@usda.gov.

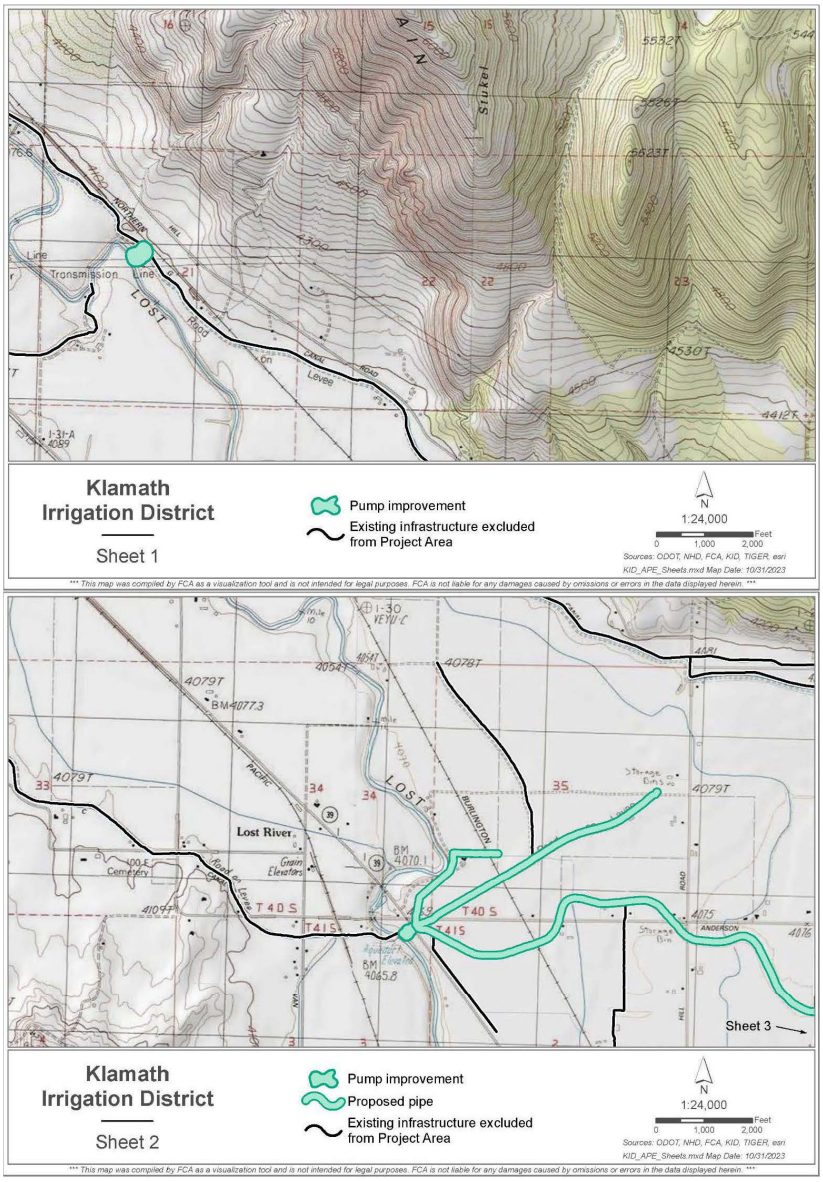
Sincerely,

Rachel LS Gebauer

Rachel Gebauer
Acting State Cultural Resources Specialist
USDA NRCS
541.887.3511
rachel.gebauer@usda.gov

cc:
Gary Diridoni, NRCS Oregon State Watershed Planner
Melina Pastos, NRCS Oregon State Tribal Liaison

Enclosure: Area of Potential Effect Figure



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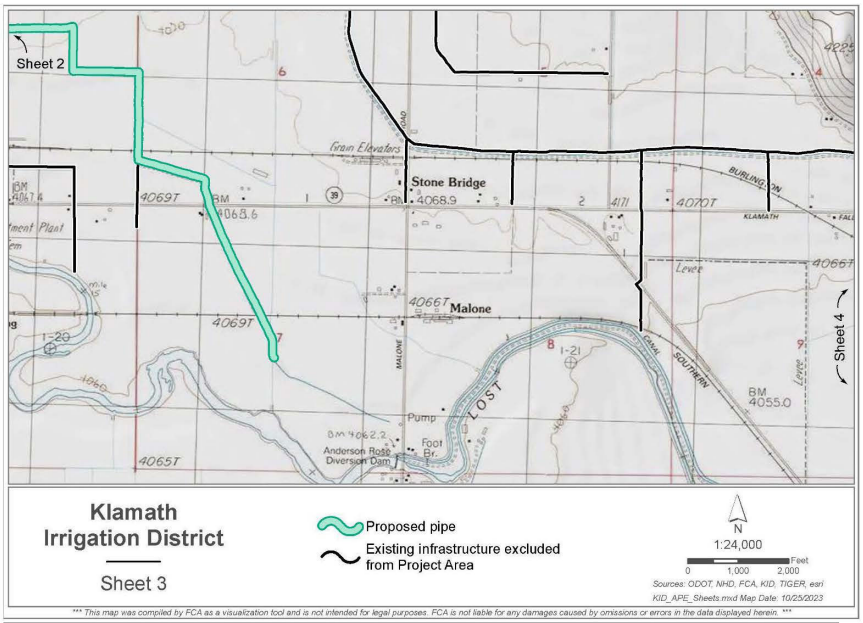

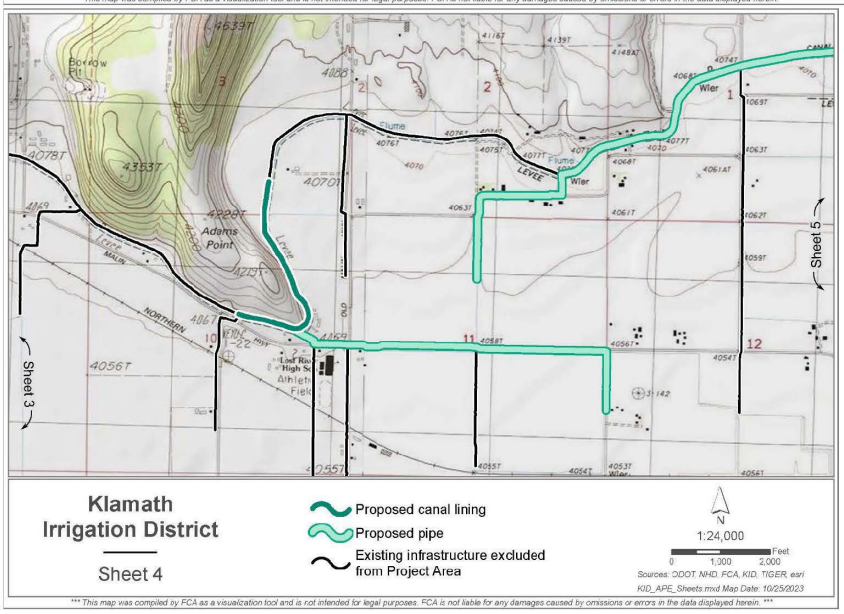

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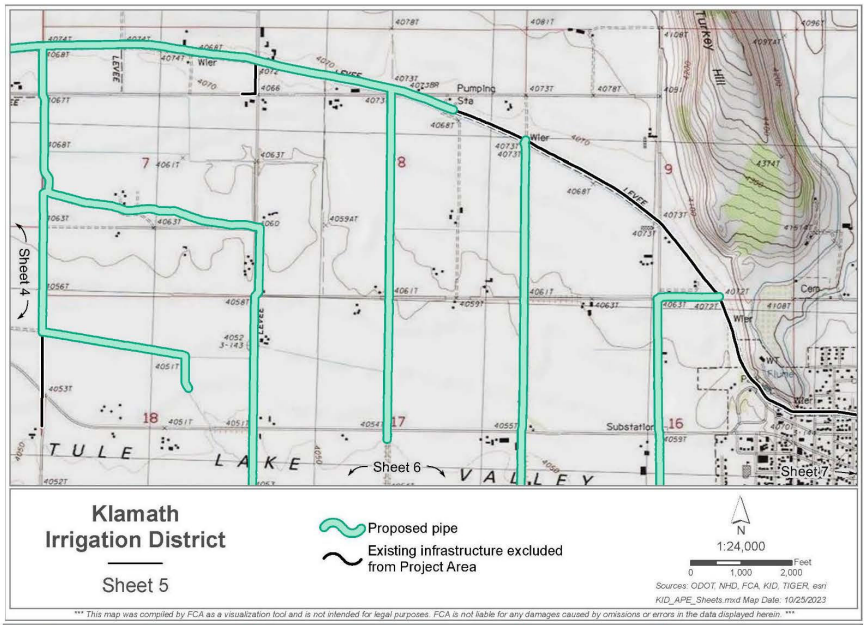

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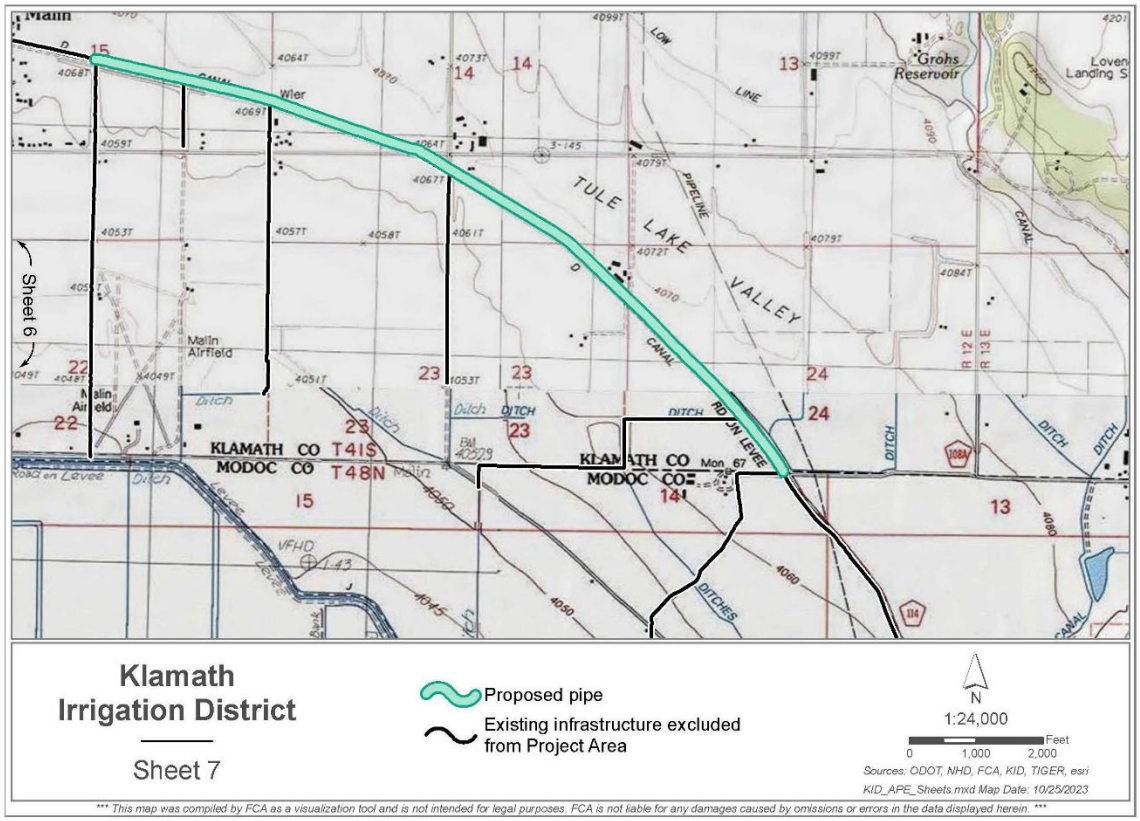

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

OR State Office 1201
NE Lloyd Blvd. Suite 900
Portland, OR 97232

April 25, 2025

Chairman Russell Attebery
PO Box 1016
Happy Camp, CA 96039

Subject: Klamath Irrigation District Infrastructure Modernization Project Draft Watershed Plan–Environmental Assessment Notice of Availability

Dear Chairman Attebery,

The United States Department of Agriculture Natural Resources Conservation Service (NRCS), in cooperation with Klamath Irrigation District (KID or District) is proposing to partially fund through the Watershed Protection and Flood Prevention Act of 1954 (PL83-566) the Klamath Irrigation District Infrastructure Modernization Project (Project) located in Klamath County, Oregon.

The purpose of the proposed Project is to enhance agricultural water management by improving District infrastructure in a manner that improves water conveyance efficiency, reduces operations and maintenance costs, and improves drought resilience for the local agricultural community. Water losses through seepage, evaporation, and fluctuations in water demand make it challenging for the District to manage their system in a way that optimizes the available water. Additionally, the D-system is at the end of the District's canal network, making this region more susceptible to supply disruptions.

Klamath Irrigation District proposes to improve agricultural water management by piping and lining select canal sections and laterals, upgrading pumping stations, eliminating uncontrolled spill, and reducing return flows to surface waterbodies. Project activities would include upgrading two pump stations and piping and lining 14.3 miles of KID's D-system canals and laterals.

A Draft Watershed Plan-Environmental Assessment (Draft Plan-EA) is being prepared for the Project. The Draft Plan-EA is being prepared under the authority of the Watershed Protection and Flood Prevention Act (Public Law 83-566) and in accordance with section 102(2)(c) of the National Environmental Policy Act of 1969 (Public Law 91-190). A public scoping period was held from January 23 through March 9, 2023, including a public scoping meeting on February 7, 2023. Public comments from this scoping period were incorporated into the Draft Plan-EA.

For additional information regarding the proposed Project, please contact Gary Diridoni, Assistant State Conservationist for Watershed Resources at USDA, NRCS, 1201 NE Lloyd Blvd, Portland, Oregon, 97232; by phone at 503-414-3092; or email at gary.diridoni@usda.gov.

Sincerely,

GREGGORY BECKER Digitally signed by GREGGORY BECKER
Date: 2025.04.25 14:43:30 -07'00'

GREG BECKER
State Conservationist

Cc: Bill Tripp, Natural Resources Director Karuk Tribe

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

OR State Office 1201
NE Lloyd Blvd. Suite 900
Portland, OR 97232

April 25, 2025

Chief Robert Burkybile III
22 N. 8 Tribes Trl.
Miami, OK 74354

Subject: Klamath Irrigation District Infrastructure Modernization Project Draft Watershed Plan–Environmental Assessment Notice of Availability

Dear Chief Burkybile,

The United States Department of Agriculture Natural Resources Conservation Service (NRCS), in cooperation with Klamath Irrigation District (KID or District) is proposing to partially fund through the Watershed Protection and Flood Prevention Act of 1954 (PL83-566) the Klamath Irrigation District Infrastructure Modernization Project (Project) located in Klamath County, Oregon.

The purpose of the proposed Project is to enhance agricultural water management by improving District infrastructure in a manner that improves water conveyance efficiency, reduces operations and maintenance costs, and improves drought resilience for the local agricultural community. Water losses through seepage, evaporation, and fluctuations in water demand make it challenging for the District to manage their system in a way that optimizes the available water. Additionally, the D-system is at the end of the District's canal network, making this region more susceptible to supply disruptions.

Klamath Irrigation District proposes to improve agricultural water management by piping and lining select canal sections and laterals, upgrading pumping stations, eliminating uncontrolled spill, and reducing return flows to surface waterbodies. Project activities would include upgrading two pump stations and piping and lining 14.3 miles of KID's D-system canals and laterals.

A Draft Watershed Plan-Environmental Assessment (Draft Plan-EA) is being prepared for the Project. The Draft Plan-EA is being prepared under the authority of the Watershed Protection and Flood Prevention Act (Public Law 83-566) and in accordance with section 102(2)(c) of the National Environmental Policy Act of 1969 (Public Law 91-190). A public scoping period was held from January 23 through March 9, 2023, including a public scoping meeting on February 7, 2023. Public comments from this scoping period were incorporated into the Draft Plan-EA.

For additional information regarding the proposed Project, please contact Gary Diridoni, Assistant State Conservationist for Watershed Resources at USDA, NRCS, 1201 NE Lloyd Blvd, Suite 900, Portland, Oregon, 97232; by phone at 503-414-3092; or email at gary.diridoni@usda.gov.

Sincerely,

GREGGORY BECKER
Digitally signed by GREGGORY BECKER
Date: 2025.04.25 14:48:07 -07'00'

GREG BECKER
State Conservationist

Cc:
Ken Sandusky, Modoc Nation Homelands Director
Audrey McGaughey, Tribal Historic Preservation Officer

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

OR State Office 1201
NE Lloyd Blvd. Suite 900
Portland, OR 97232

April 25, 2025

Chairman Joe James
PO Box 1027
Klamath, CA 95548

Subject: Klamath Irrigation District Infrastructure Modernization Project Draft Watershed Plan–Environmental Assessment Notice of Availability

Dear Chairman James,

The United States Department of Agriculture Natural Resources Conservation Service (NRCS), in cooperation with Klamath Irrigation District (KID or District) is proposing to partially fund through the Watershed Protection and Flood Prevention Act of 1954 (PL83-566) the Klamath Irrigation District Infrastructure Modernization Project (Project) located in Klamath County, Oregon.

The purpose of the proposed Project is to enhance agricultural water management by improving District infrastructure in a manner that improves water conveyance efficiency, reduces operations and maintenance costs, and improves drought resilience for the local agricultural community. Water losses through seepage, evaporation, and fluctuations in water demand make it challenging for the District to manage their system in a way that optimizes the available water. Additionally, the D-system is at the end of the District's canal network, making this region more susceptible to supply disruptions.

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Sincerely,

GREGGORY BECKER
Digitally signed by GREGGORY BECKER
Date: 2025.04.25 14:49:17 -07'00'

GREG BECKER
State Conservationist

Cc: Tim Hayden, Natural Resources Director Yurok Tribe

Natural Resources Conservation Service
USDA is an equal opportunity provider, employer, and lender.

E.1.2 Regulatory Context

The National Environmental Policy Act (NEPA) requires federal agencies to consider effects of federally funded projects on cultural resources (40 CFR 1508.1(g)(4)). While NEPA does not define cultural resources, the term is understood to include "historic properties" as defined by Section 106 of the National Historic Preservation Act (NHPA), as well as sacred sites, archaeological sites not eligible for the National Register of Historic Places (NRHP), and archaeological collections (Council on Environmental Quality Executive Office of the President and Advisory Council on Historic Preservation and Advisory Council on Historic Preservation 2013). Under Section 106 of the

NHPA, historic properties are defined as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on, the NRHP, including artifacts, records, and material remains related to such a property or resource" (36 CFR 800.16(l)(1)). Consideration of historic properties under Section 106 supports NEPA consideration of effects on cultural resources but does not encompass all types of cultural resources under NEPA.

The study area for cultural resources consists of the area of potential effects (APE) that has been delineated to support consultation with regulatory agencies. This area includes sites where ground-disturbing work would occur under the proposed action, adjacent areas, and construction staging and access areas.

A project's Area of Potential Effects (APE) is defined in Section 106 of the NHPA as "geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties" (36 CFR 800.16.c). Effects may be direct or indirect, with the former including any type of effect (i.e., physical, visual, auditory, etc.) resulting from an "undertaking at the same time and place with no intervening cause," and the latter including any type of effect "caused by the undertaking that is later in time or farther in distance but are still reasonably foreseeable" (Advisory Council on Historic Preservation 2019).

This project's APE for direct effects was delineated primarily to account for physical and visual effects. Direct effects from construction such as vibration, noise, and fugitive dust are also considered within the direct APE but are anticipated to be minor and temporary. The Project's physical APE will be limited to the vertical and horizonal footprint of the areas and/or structures where the proposed project activities would occur—that is, at the locations where pumps would be replaced or where segments of canals and laterals would be piped or lined, as well as staging and laydown areas needed for implementation of these actions. The project's visual APE includes a 100-foot buffer around the physical APE to account for effects on the viewsheds of historic properties resulting from alterations to select components of the Klamath Irrigation District. The APE for indirect effects is the same as the APE for direct effects, as reasonably foreseeable indirect effects are not anticipated to occur outside of the APE established for direct effects.

E.1.3 Ethnographic Context

The study area includes portions of the traditional territory of the Modoc peoples, who established permanent camps around Tule Lake, Lower Klamath Lake, and Clear Lake. These Modoc camps consisted of domed tule huts and associated sites. Known Modoc camp sites in the vicinity of Tule Lake include *Kumbatuash*, *Leush*, *Nakoshkeni*, *Pashka*, *Waisha*, *Wachamshwash*, *Welwashkeni*, and *Wukakeni*. The Modoc subsisted on seasonally available plant and animal resources, including gathered bird eggs, roots and berries, and fish from spring spawning runs. The Modoc moved to higher elevations during the summer, where they hunted mule deer and gathered pine nuts and manzanita berries. Pictographs and petroglyphs present within the broader Klamath Basin are attributed in part to the Modoc peoples. (North State Resources, Inc. [NRS] 2011).

Though located outside the study area, the broader Klamath Basin also includes the traditional territories of the two other Native American peoples, the Klamath and Yahooskin. The Klamath are closely related to the Modoc, sharing similar linguistic, religious, subsistence, and settlement patterns. The traditional territories of the Klamath were concentrated around Klamath Marsh, Agency Lake, the Williamson River, Pelican Bay of Upper Klamath Lake, Klamath Falls, and the Sprague River Valley. The Yahooskin are a Yuman-speaking band of Shoshoni, whose traditional

territories were concentrated around Goose, Silver, Warner, and Harney lakes, and in Surprise Valley and Klamath Marsh. (NRS 2011).

E.1.4 Historic Context

The purpose of this historic context is to illustrate pre-contact and post-contact land use and settlement patterns in the Klamath Basin and inform analysis of the potential for cultural resources within the study area.

E.1.4.1 Pre-contact Context

Archaeological evidence indicates that human occupation of the Klamath Basin dates to 12,000 to 13,000 years ago. The prehistoric period is divided into four distinct periods: the Paleoarchaic (12,000 to 7,000 years Before Present [B.P.]), Early Archaic (7,000 to 4,500 B.P.), Middle Archaic (4,500 to 2,500 B.P.), and Lake Archaic/Late Prehistoric (2,500 to 200 B.P.). The Paleoarchaic period is characterized by occupation of hunter-gatherers with high seasonal and annual mobility, low population density, and maximally flexible technologies and a broad subsistence economy of large game animals and supplemented by fish, birds, and plants. The Early Archaic period is distinguished by the first appearance of semisubterranean house pits indicative of a less mobile lifestyle, and includes artifacts such as large stemmed, lanceolate, leaf-shaped, and broad necked projectile points, knives, gravers, scrapers, cobble and ground stone tools, atlatls, and utilitarian items such as portable mortars, mullers, and stone bowls. Burial practices during this period consisted of supine burials placed in rock-covered pits.

The Middle Archaic period is characterized by a shift toward sedentary life, including increased exploitation of riverine and marsh environments and resources such as salmon and root species. Typical artifacts include milling stones and pestles, broad-necked, corner- and side-notched projectile points, bone and antler tools, and specialized fishing gear such as bone harpoon barbs and net sinkers. Additionally, burial practices transitioned to flexed burials. The Late Archaic/Late Prehistoric period is marked by the widespread appearance of pit houses, increased reliance on fishing and storage pits for salmon, camas cultivation, development of seasonal settlement and land use patterns, and adoption of the bow and arrow, indicated by small corner- and side-notched projectile points. Additionally, extensive trade networks were developed between Native American groups and burial practices shifted to cremation with associated grave goods during this period. (NRS 2011).

E.1.4.2 Post-contact Context

The earliest Euro-American exploration of the Klamath Basin occurred in 1825-1826, when a Hudson's Bay Company expedition traveled from Fort Vancouver on the Columbia River as far south as Klamath River. This early expedition was followed by John Charles Frémont's 1842 survey expedition north from California. The establishment of emigration routes through the Klamath Basin in the 1840s resulted in increased contact and conflict between Euro-American and Native American groups. In the vicinity of Tule Lake, several instances of violent conflict occurred, including a Modoc attack in 1850 at Bloody Point that killed eighty people and retaliatory attacks on Modoc encampments led by Ben Wright in 1851 and 1852. A Modoc leader, Keintpoos (also known as Captain Jack), proposed the development of a treaty in the 1850s to the U.S. Office of Indian Affair's appointed Indian Agent, Judge Elisha Steele. In the Treaty of 1864, the Modoc, Klamath, and Yahooskin Band of Northern Paiutes ceded their traditional territories in southern Oregon and northeastern California and were confined to the newly established Klamath Indian Reservation in

exchange for thousands of dollars of supplies, which were ultimately not distributed fully or fairly among the signatory Tribes. Contemporaneous with treaty negotiations, the U.S. Army established Fort Klamath in the Wood River Valley north of Upper Klamath Lake.

Euro-American settlement of the Klamath Basin increased after the Treaty of 1864, as the settlers moved into former Native American territories, digging irrigation ditches and using the land for cattle grazing. However, small groups began leaving the Klamath Indian Reservation to return to their traditional areas or pursuing work on nearby ranches, including a band led by the Modoc leader Keintpoos. In 1872-73, the U.S. Army, at the behest of some ranchers, attempted capture these groups and return them to the reservation, resulting in several battles between the U.S. Army and Modoc groups, known as the Modoc War. Ultimately, the bands of Keintpoos and another Modoc leader known as Hooker Jim were captured and sent to Fort Klamath for a military tribunal. Keintpoos and five other men were sentenced to death by hanging, while others were imprisoned or sent by train to the Indian Territory (now Oklahoma). (NRS 2011).

Trails and roads were further developed through the Klamath Basin in the latter half of the 19th century, including the Rancheria Trail across the southern Cascade Mountains north of Mount McLoughlin and the Applegate Trail through the Nevada desert, past Goose, Tule and Lower Klamath lakes, and across the Cascades into the Rogue River Valley, roughly following the modern alignment of Oregon State Highway 66. These rudimentary roads served as the primary transportation routes bringing settlers and supplies to the Klamath Basin from railheads along the Oregon-California border. 19th century settlers also made use of barges and small watercraft to transport people and goods along Upper Klamath Lake and its tributaries—in particular, the Wood River, which ran north to Fort Klamath. As transportation infrastructure improved, logging became the increasingly dominant regional industry. While 19th century mills primarily produced lumber for local uses, the construction of rail lines to Klamath Falls at the turn of the century led to a substantial expansion of the timbering and lumber production in the Klamath Basin for wider markets, with at least thirteen companies establishing operations in the area between 1900 and 1920. Due to its reliance on timbering and lumber production, the area's economy in the 20th century largely mirrored national trends in lumber industry, declining in the 1930s due to the Great Depression, rebounding during World War II and the post-war housing boom, and declining again in the 1960s amid a national economic slowdown and pressure from the emerging environmental and conservation movements that resulted in changing forest management practices and increased industry regulations. (NRS 2011).

E.1.4.2.1 The Klamath Project, Klamath Irrigation District, and D Canal

The Klamath Irrigation District was one of the earliest irrigation districts formed as part of the Klamath Project. The major reservoir and diversion dams and canals of the Klamath Project's various irrigation districts were constructed between 1906 and 1925, with additional sub-canal water conveyances and associated structures added in phases following the completion of primary components (Stene 1994:2, 7, 26).

The construction of Klamath Irrigation District Main Canal (A Canal) began in 1906 and was completed in 1907, running from Upper Klamath Lake to an intersection with East Branch (B Canal) and South Branch (C Canal) canals northeast of present-day Henley. Construction of the East Branch Canal, running from its intersection with the Main Canal to Olene, began in May 1906 and was completed in July 1907, at which point the Reclamation Service shifted labor to the construction

of the Keno Canal, built adjacent to the Link River in 1907-1908. The South Branch Canal was constructed between May 1908 and March 1909, running from its intersection with the Main Canal to agricultural land southwest of present-day Henley. The Main, East, and South Branch Canals are all now components of the Klamath Irrigation District. Contemporaneous with these canal projects, the Reclamation Service began construction of two dam projects, Clear Lake Dam and Lost River Dam. The Clear Lake Dam was constructed between 1908 and 1910, located on the northeast side of Clear Lake on the Lost River. The Lost River Dam was built between 1911 and 1912, located on the Wilson River southeast of Henley. Three additional canals were constructed between 1913 and 1915, including the North Poe Canal (E Canal) and the South Poe (F Canal), which ran along either side of the Lost River east of Olene in the Poe Valley, and the Griffith Canal (G Canal), which ran south from the Wilson River toward Merrill, Oregon. At this time, the Reclamation Service adopted the current lettering systems for the Klamath Project's Canal, including the pre-project Adams Canal between Merrill and Malin, Oregon as Canal D. (Stene 1994:7-19; Souza 2022).

The Adams Canal, built in 1886, ran six miles from the Lost River to Adams Point east of Malone, Oregon (United States Bureau of Reclamation [USBR] 1912:13). Water was supplied through Van Brimmer's canal from White Lake, which drew water from Lower Klamath Lake via a canal constructed jointly by Adams and the Van Brimmer brothers in 1887-1888 (USBR 1912:14). From White Lake, water was delivered to the west bank of the Lost River via the Van Brimmer Canal (now the principal canal of the Van Brimmer Ditch Company water-district) to an 8-foot-wide flume constructed across the Lost River northeast of Merrill, Oregon, and into the 1886 segment of the Adams Canal. (USRB 1912:15). In 1904, the Adams Canal was extended 22 miles from Adams Point east and southeast to the Oregon-California border east Malin, Oregon, roughly following the alignment of the current D Canal (Souza 2022). In 1905, Frank Adams agreed to sell the Klamath Ditch Company and its irrigation infrastructure and water rights to the Reclamation Service (Driscoll 2023:2). Modifications made to Canal D portion of the Klamath Drainage District by the Reclamation Service include: construction of its distribution and drainage systems in the 1910s; the enlargement of the D Canal and replacement of the Lost River flume, built in 1888, that connected it to the Van Brimmer Ditch Company Canal in 1912; and the disconnection of the D Canal from the Klamath Irrigation District C Canal and Van Brimmer Ditch Company system and interconnection with the G Canal between 1945 and 1955 (USBR 1945:Appendix; Nationwide Environmental Title Research 1955).

E.1.5 Previously Identified Cultural Resources

A review of Oregon Archaeological Records Remote Access (OARRA) indicated previously conducted cultural resource surveys and previously identified cultural resource records in the study area was conducted in June 2023.

Three cultural resource surveys have been previously conducted in the study area. These cultural resource surveys are summarized in Table E-1**.** Nineteen cultural resource surveys have been previously conducted within 0.25-mile of the study area. These cultural resource surveys are summarized in Table E-2**.**

Table E-1. Previously Conducted Cultural Resource Surveys in the Study Area

Report No.	Year	Author(s)	Title	Resources

24750	2012	Connolly, T.	Cultural Resources Survey of the Proposed Malin Quarry Expansion, Klamath County	35KL 03626 35KL 03627 35KL 03628 35KL 03629 35KL 03630
24769	2012	Connolly, T.	Cultural Resources Survey and Testing on the OR39: Matney Road-NCL Merril Section, Klamath County	N/A
32134	2021	Gray, D. and J.W. Jones	Duncan Family Farms Pipeline Crossing Cultural Resources Survey Klamath County, Oregon	

Table E-2. Previously Conducted Cultural Resource Surveys Within 0.25-mile of the Study Area

Report No.	Year	Author(s)	Title	Resources
159	1977	Hopkins, J.W. III	A Cultural Resources Survey of a Proposed Sewerage Project, Merrill, Klamath County, Oregon	N/A
1344	1960	Daugherty, R.D.	An Archaeological Survey of Pacific Gas Transmission Company's Alberta to California Pipeline System; Idaho, Oregon, Washington	N/A
1345	1961	Combes, J.D.	An Archaeological Survey of Pacific Gas Transmission Company's Alberta to California Pipeline System: MP 108.0 to MP 722.0 Phase II	N/A
12296	1991	Thomas, B.	A Survey For Cultural Resources At A Proposed BPA Operations And Maintenance Headquarters In Malin, Klamayh County, Oregon	N/A
14959	1994	Price, B.A., N.D. Sharp, T.W. Canaday, L.A. Ross, C.K. Roper, K.T. Katsura, L.J. Sekora, and F.A. Riddell	Cultural Resources Assessment Report Tuscarora Pipeline Project Phase 1: Survey, Inventory, and Preliminary Assessment of Cultural Resources	N/A
18569	2003	Carpenter, K.	Malin 1-mile Survey	N/A
21584	2009	Bowden, B., S. Byram, K. Derr, E.K. Ragsdale, P.Solimano, and M. Tveskov	Pacific Connector Gas Pipeline Project Cultural Resources Survey, Coos, Douglas, Jackson, and Klamath Counties, Oregon. Volume I: Survey Report, Part 1: Chapter 1-5	35KL 03043

Report No.	Year	Author(s)	Title	Resources
25039	2012	Finley, A.A.	Results of a cultural resources study of the Verizon Wireless OR6 Malin/Merrill cell collocation site, Klamath County, Oregon	N/A
25809	2013	Bowden, B., J. Olander, E. Ragsdale, L. Ponte, and N. Perrin	Pacific Connector Gas Pipeline Project Cultural Resources Survey, Coos, Douglas, Jackson, and Klamath Counties, Oregon 2013 Cultural Resources Addendum #1	N/A
26190	2013	Ragsdale E.K., S. Willis, and L. Ponte	Pacific Connector Gas Pipeline Project Cultural Resources Survey, Coos, Douglas, Jackson, and Klamath Counties, Oregon 2013 Cultural Resources Addendum #2	N/A
29364	2017	Smith, R. and J. Junge	Merrill Solar Array Project, Merrill, Klamath County, Oregon: Archaeological Phase I Assessment Report	N/A
29369	2017	Smith, R. and J. Junge	Turkey Hill Solar Array Project, Malin, Klamath County, Oregon: Archaeological Phase I Assessment Report	N/A
29499	2017	N/A	Pacific Connector Gas Pipeline Cultural Resources Survey - Coos, Douglas, Jackson, and Klamath Counties: 2017 Cultural Resources Addendum	N/A
30628	2010	Dobschuetz, K., R. Robinson, R. Halbmaier, S. McDaniel II, S. Mandelko, and C. Londardo	A Cultural Resource Survey for the Ruby Pipeline Project: Oregon Segment – Lake and Klamath Counties, Oregon Addendum II Reroutes near Goose Lake, Big Valley, Rogger Meadow, and Southern Langell Valley	N/A
30715	N/A	N/A	A Cultural Resource Survey for the Ruby Pipeline Project: Oregon Segment – Lake and Klamath Counties, Oregon Addendum I Klamath, Lakeview, Langell and Merrill Yards; Marlin LaReroutes near Goose Lake, Big Valley, Rogger Meadow, and Southern Langell Valley	N/A

Report No.	Year	Author(s)	Title	Resources
31801	2019	Davis, S.J., S.C. Hamilton, M.L. Punke, J.Tuck, J.Hopt, and K.M. Derr	Phase II Evaluation at Sites 35KL3046, HRA-1227-840, and HRA-1227-843	N/A

A review of OARRA and the Oregon Historic Sites Database indicated one cultural resource was identified in the study area, the D Irrigation Canal, and 38 cultural resources, 15 archaeological sites and 23 built environment resources were identified within 0.25 mile of the study area. Archaeological resources are summarized in Table E-3 and built environment resources are summarized in Table E-4.

Table E-3. Previously Identified Archaeological Sites Within 0.25-miles of the Study Area

Trinomial	Type/Age	Reports No.
35KL 03043	Historic	21584
35KL 03626	Historic	24750
35KL 03627	Precontact	24750
35KL 03628	Precontact	24750
35KL 03629	Precontact	24750
35KL 03630	Historic	24750
Null	Burial	Null
Null	Precontact	24750
Null	Precontact	24750
Null	Precontact	24750
Null	Precontact	Null
Null	Precontact	26369
Null	Precontact	26369
Null	Precontact	30628
Null	Precontact	30715

Table E-4. Previously Identified Historic Built Environment Within 0.25-miles of the Study Area

OHSD Resource ID	Name	Address
42545	American Legion Veterans Memorial	334 Main Street, Klamath Falls, Oregon
42720	Colwell, Daniel, House	E Front Street, Merrill, Oregon
42721	Brandon, Frank S, House	203 N Monroe Street, Merrill, Oregon
42722	Merrill Bank Building	105 E Front, Merrill, Oregon

OHSD Resource ID	Name	Address
42770	Haskins, Luther, House	Vicinity Merrill, Oregon
42779	Kandra House	Vicinity Merrill, Oregon
42796	Merrill, Guy, Tank & Well	Vicinity Merrill, Oregon
42797	Merrill, Nathan, House	Vicinity Merrill, Oregon
42704	Paygr, Frank, Farm	Paygr Road, Malin, Oregon
42738	Cacka, Adolph, Farm	Old Malin Highway, Malin, Oregon
42769	Hartery Barn	Old Malin Highway, Malin, Oregon
42708	Malin Broadway Hall	S Main Street, Malin, Oregon
42709	Kalina, Alois, Rental Building	1231 S Main Street, Malin, Oregon
42710	Kalina, Alois, Building	2147 Broadway Street, Malin, Oregon
42711	Presbyterian Church	3rd Street & Railroad Avenue, Malin, Oregon
42712	Adams, Walter, Store?	S Main Street, Malin, Oregon
42714	Malin Post Office	Railroad Avenue, Malin, Oregon
42715	Applegate, Lindsay, Landmark	North side Malin City Park
42716	Wilde, Emma Mary, Marker	3rd Street & Railroad Avenue, Malin, Oregon
42719	Stastney Farm	Loveless Road, Malin, Oregon
42792	Malin Pool Building	Malin Community Park, Malin, Oregon
42812	Rajnus Farm	Highway 39, Malin, Oregon
648689	Malin State Bank & Drug Store	2139 Broadway Street, Malin, Oregon

E.1.6 References

Advisory Council on Historic Preservation. 2019. Memorandum from Office of General Counsel to staff, clarifying the distinction between direct and indirect effects in meeting obligations under section 106 of the National Historic Preservation Act. June 7, 2019.

Council on Environmental Quality, Executive Office of the President, and Advisory Council on Historic Preservation. 2013. NEPA and NHPA: A Handbook for Integrating NEPA and Section 106. March. Washington, D.C.

Driscoll, M. 2023. History Surrounding the Van Brimmer Ditch Company. August 21. Prepared by Klamath Water Users Association, Klamath Falls, Oregon. Available: https://drive.google.com/file/d/1344AwGN8021EBgsJ8w0oqTHBGXm8CeVz/view. Accessed January 24, 2024.

Nationwide Environmental Title Research (NETR). 1955. Klamath Falls, Oregon 97603, Aerial Photograph. Available: https://www.historicaerials.com/viewer. Accessed January 24, 2024.

North State Resources, Inc. (NRS). 2011. Klamath Basin NWR Complex Cultural Resources Assessment, May. Redding, CA. Prepared for U.S. Fish and Wildlife Service, Region 9, Pacific Southwest Klamath Basin National Wildlife Refuge Complex, Tule Lake, CA.

Stene, Eric, A. 1994. Klamath Project. Available : https://www.usbr.gov/projects/pdf.php?id=129. Accessed January 24, 2024.

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United States Bureau of Reclamation. 1912. *History of the Klamath Project, Oregon-California, From May 1, 1903 to December 31, 1912*. Klamath Project Annual Project Histories Collection, archived at Oregon Technology Institute. Available: http://digitallib.oit.edu/digital/collection/histories/search. Accessed January 24, 2024.United States Bureau of Reclamation. *Annual Project History and O&M Report of the Klamath Project, Oregon-California, for Calendar Year 1945*. Klamath Project Annual Project Histories Collection, archived at Oregon Technology Institute. Available: http://digitallib.oit.edu/digital/collection/histories/search. Accessed January 24, 2024.

E.2 Additional Supporting Information for Land Use

Table E5. Infrastructure Ownership in Project Area and Lands Affected by the Project Area.

Existing Infrastructure/Areas	Owner	Operations and Maintenance Responsible Party	Existing Easement Owned By
Adams Pumping Plant	U.S. Bureau of Reclamation	Klamath Irrigation District	U.S. Bureau of Reclamation
Stukel Pumping Plant	U.S. Bureau of Reclamation	Klamath Irrigation District	U.S. Bureau of Reclamation
D Canal – Adams Point	U.S. Bureau of Reclamation	Klamath Irrigation District	U.S. Bureau of Reclamation
D Canal – McKoen turnout to Paygr Road	U.S. Bureau of Reclamation	Klamath Irrigation District	U.S. Bureau of Reclamation
D-2 Lateral	U.S. Bureau of Reclamation	Klamath Irrigation District	U.S. Bureau of Reclamation
D-3 Lateral	U.S. Bureau of Reclamation	Klamath Irrigation District	U.S. Bureau of Reclamation
D-12 Lateral (includes 12A and 12C Spurs)	U.S. Bureau of Reclamation	Klamath Irrigation District	U.S. Bureau of Reclamation
D-14 Lateral	U.S. Bureau of Reclamation	Klamath Irrigation District	U.S. Bureau of Reclamation
D-16 Lateral	U.S. Bureau of Reclamation	Klamath Irrigation District	U.S. Bureau of Reclamation
D-16A Spur	U.S. Bureau of Reclamation	Klamath Irrigation District	U.S. Bureau of Reclamation

D-18 Lateral	U.S. Bureau of Reclamation	Klamath Irrigation District	U.S. Bureau of Reclamation
D-19 Lateral	U.S. Bureau of Reclamation	Klamath Irrigation District	U.S. Bureau of Reclamation
D-20 Lateral	U.S. Bureau of Reclamation	Klamath Irrigation District	U.S. Bureau of Reclamation

The purpose of the EFU-C Zone is to "protect and maintain agricultural lands for farm use, consistent with existing and future needs for agricultural products." Irrigation reservoirs, canals, delivery lines, and structures and accessory operational facilities associated with a District are an allowed use in the EFU Zone (Klamath County 2023).

FR zoning is intended to "promote management and conservation of lands of mixed farm and forest use." The criteria, standards, and procedures of either Farm or Forestry zones apply to land within this zone based on several criteria listed in Klamath County Land Development Code Section 55.230. Irrigation uses and associated infrastructure are permitted in both Farm and Forestry zones (Klamath County 2023).

GC zoning is intended to establish and maintain places for a full range of retail goods and services available to a large area. Irrigation and its associated uses are not explicitly listed under permitted or conditional uses in the GC Zone (Klamath County 2023).

E.3 Additional Supporting Information for Soils

Fordney loamy fine sand makes up 51 percent of the project area. The Fordney series consists of very deep, excessively drained soils (nonhydric) that formed in alluvium or lacustrine deposits derived from volcanic rocks with an influence of volcanic ash. Fordney soils are on lake terraces, stream terraces, and fan remnants. These soils have slopes of 0 to 20 percent.

Poe loamy fine sand makes up 14 percent of the project area. The Poe series consists of moderately deep, somewhat poorly drained soils (nonhydric) that formed in sediments weathered from tuff, basalt, diatomite, and ash. Poe soils are on terraces and have slopes of 0 to 2 percent.

Laki fine sandy loam makes up 6 percent of the project area. The Laki series consists of deep, moderately well-drained soils(nonhydric) that formed in mixed sediments having small amounts of ash. Laki soils are on terraces and have slopes of 0 to 2 percent saltgrass.

Calimus loam makes up 3 percent of the project area. The Calimus series consists of very deep, well-drained soils (nonhydric) that formed in sediments weathered from diatomite, tuff, and basalt. Calimus soils are on terraces and fans and have slopes of 0 to 35 percent.

Henley Laki loams make up 3 percent of the project area. The Laki series is described above. The Henley series consists of moderately deep to a duripan, somewhat poorly drained, sodic soils (nonhydric) that formed in mixed alluvium. Henley soils are on low terraces and have slopes of 0 to 2 percent.

Padus loamy fine sand makes up 3 percent of the project area. The Padus series consists of very deep, well-drained soils (nonhydric) which are moderately deep to stratified sandy outwash. These soils formed mostly in loamy alluvium and are underlain by stratified sandy outwash on glacial lake

plains, outwash plains, stream terraces, eskers, kames, and moraines. Permeability is moderate or moderately rapid in the loamy mantle and rapid or very rapid in the sandy outwash. Slopes range from 0 to 45 percent.

The remainder of the project area consists of several other sandy loam soils (each less than 2 percent of the project area) which have similar characteristics as the soil series already discussed.

E.4 Additional Supporting Information for Vegetation Resources

E.4.1 Plant Species That May Occur in the Study Area

Table E6. Plant Species That May Occur in the Study Area.

Plant Species	Scientific Name
Arrowleaf balsamroot	*Balsamorhiza sagittata*
Basin wildrye	*Leymus cinereus*
Big sagebrush	*Artemisia tridentata*
Bluebunch wheatgrass	*Pseudoroegneria spicata*
Broadleaf arrowhead	*Sagittaria latifolia*
Broad-leaf cattail	*Typha latifolia*
Carelessweed	*Amaranthus palmeri*
Cheatgrass	*Bromus tectorum*
Common yarrow	*Achillea millefolium*
Coontail	*Ceratophyllum demersum*
Hard-stem club-rush	*Schoenoplectus acutus*
Herb sophia	*Descurainia sophia*
Idaho fescue	*Festuca idahoensis*
Indian ricegrass	*Achnatherum hymenoides*
Kings fescue	*Leucopoa kingii*
Low sagebrush	*Artemisia arbuscula*
Mouse barley	*Hordeum murinum*
Muttongrass	*Poa fendleriana*

Plant Species	Scientific Name
Needle-and-thread grass	*Hesperostipa comata*
Northern bedstraw	*Galium boreale*
Owl's-claws	*Hymenoxys hoopesii*
Prairie junegrass	*Koeleria macrantha*
Praire smoke	*Geum triflorum*
Perennial pepperweed	*Lepidium latifolium*
Poison hemlock	*Conium maculatum*
Prickly lettuce	*Lactuca serriola*
Purple loosestrife	*Lythrum salicaria*
Quackgrass	*Elymus repens*
Reed canary grass	*Phalaris arundinacea*
Richardson's needlegrass	*Achnatherum richardsonii*
Rosy Pussytoes	*Antennaria rosea*
Rough fescue	*Festuca campestris*
Rubber rabbitbrush	*Ericameria nauseosa*
Rye brome	*Bromus secalinus*
Sandberg bluegrass	*Poa sandbergii*
Silvery lupine	*Lupinus argenteus*
Silver sagebrush	*Artemisia cana*
Slender wheatgrass	*Elymus trachycaulus*
Stinging nettle	*Urtica dioica ssp. holosericea*
Sulphurflower buckwheat	*Eriogonum umbellatum*
Tall annual willowherb	*Epilobium brachycarpum*
Tall hedge-mustard	*Sisymbrium altissimum*
Teasel	*Dipsacus* sp.

Plant Species	Scientific Name
Threadleaf sedge	*Carex filifolia*
Thurber's fescue	*Festuca thurberi*
Tumble Mustard	*Sisymbrium altissimum*
Western juniper	*Juniperus occidentalis*
Western needlegrass	*Achnatherum occidentale*
Western wheatgrass	*Pascopyrum smithii*
White sagebrush	*Artemisia ludoviciana*
Wild mint	*Mentha arvensis*
Yellow rabbitbrush	*Chrysothamnus viscidiflorus*

Sources: NatureServe 2022a, 2022b, 2022c.
General site visit. August 3, 2023. Colton Kyro.

E.4.2 Special-Status Species

Federal and state databases of threatened, endangered, candidate, and other sensitive plant species protected under the federal ESA or by the state of Oregon were consulted to determine the potential for these species to be present within the study area USFWS 2023; ORBIC 2023). No documented occurrences of special status plant species were identified. USFWS Information for Planning and Consultation list the potential occurrence of two species within the study area listed as endagndered under the ESA; Greene's tuctoria (*Tuctoria greenei*) and slender Orcutt grass (*Orcuttia tenuis*). However, both species habitat are within vernal pools and the heavily developed agricultural study area is unlikley to support that habitat. Thus, these species are unlikely to occur in the study area.

Applegate's milkvetch (*Astralagus applegatei*), federally and state-listed as endangered, has the potential to occur within the study area. Applegate's milkvetch is endemic to the Klamath Basin and occurs in seasonally alkaline soils in meedaows and adjcent to wayside ditches. Applegate's milkvetch is found along the Klamath River and may be present along ditches within the study area. However, ditches are routinely disturbed by vegetation mainteance and thus the species is unlikley to occur within the study area. The species was not observed within the study area during the site visit (Colton Kyro 8/3/2023).

A survey for species' presence and presence of suitable habitat was not conducted. Species' occurrence potential was evaluated based on available aerial imagery, background information (ORBIC 2023; USFWS 2023), and habitat types within the study area. See Table E-1.

E.4.3 References

NatureServe (2022a). *Great Basin xeric mixed sagebrush.* Shrubland.https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.722898/Great_Basin_Xeric_Mixed_Sagebrush_Shrubland

NatureServe (2022b). *Inter-mountain basins montane sagebrush steppe.* https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.722887/Inter-Mountain_Basins_Montane_Sagebrush_Steppe

NatureServe (2022c). *Northern Rocky Mountain lower montane, foothill and valley grassland.* https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.769647/Northern_Rocky_Mountain_Lower_Montane_Foothill_and_Valley_Grassland

Oregon Biodiversity Information Center (ORBIC) (2023). *Biotics rare species database*. Institute for Natural Resources – Portland. Portland State University, Portland, Oregon. https://inr.oregonstate.edu/orbic

U.S. Fish and Wildlife Service (USFWS) (2023). *IPaC information for planning and consultation*. Retrieved July 20, 2023, from https://ipac.ecosphere.fws.gov/

E.5 Invasive or Noxious Weeds Present within the Klamath Irrigation District

Plant pests within the KID are defined by law, regulation, and technical organizations, and are regulated by many different sources, including the Oregon Department of Agriculture (ODA) and the USDA.

The purpose of the ODA classification system is to act as the ODA's official guideline for prioritizing and implementing noxious weed control projects, assist the ODA in the distribution of available funds for Oregon State Weed Board grants and county noxious weed control requests, and serve as a model for the private and public sectors in developing noxious weed classification systems. The CDFA and ODA list categories are explained below. Invasive and noxious weeds known to occur within the vicinity of the District, and their respective status in each state, are listed in 2.

Oregon Department of Agriculture Categories (ODA 2023).

- A-Designated weed – a weed of known economic importance which occurs in the state in small enough infestations to make eradication or containment possible; or is not known to occur but its presence in neighboring states make future occurrence in Oregon seem imminent. Recommended action: infestations are subject to eradication or intensive control when and where found.
- B-Designated weed – a weed of economic importance, which is regionally abundant, but which may have limited distribution in some counties. Recommended action: limited to intensive control at the state, county, or regional level as determined on a case-by-case basis. Where implementation of a fully integrated statewide management plan is not feasible, biological control (when available) shall be the main control methods.
- T-Designated weed – a priority noxious weed designated by the Oregon State Weed Board as a target on which the ODA will develop and implement a statewide management plan. "T" designated noxious weeds are species selected from either the "A" or "B" list.

Table E-7. Noxious Weeds that May Occur within the Planning Area.

Common Name	Scientific Name	Oregon State Designation
Bull thistle	*Cirsium vulgare*	B
Canada thistle	*Cirsium arvense*	B
Diffuse knapweed	*Centaurea diffusa*	B
Dyer's woad	*Isatis tinctoria*	B
Field bindweed	*Convolvulus arvensis*	B
Mediterranean sage	*Salvia aethiopis*	B
Musk thistle	*Carduus nutans*	B
Perennial pepperweed	*Lepidium latifolium*	B (T)
Poison hemlock	*Conium maculatum*	B
Puncturevine	*Tribulus terrestris*	B
Purple loosestrife	*Lythrum salicaria*	B
Scotch thistle	*Onopordum acanthium*	B
Spotted knapweed	*Centaurea stoebe*	B (T)
Taurian thistle	*Onopordum tauricum*	A (T)
Yellow flag iris	*Iris pseudacorus*	B
Yellow star thistle	*Centaurea solstitialis*	B
Whitetop (hoary cress)	*Lepidium draba*	B

Source: ODA, 2023.

E.5.1 References

Oregon Department of Agriculture (2023). *WeedMapper*. https://www.oregon.gov/oda/programs/weeds/pages/weedmapper.aspx

E.6 Additional Supporting Information for Water Resources

The Upper Klamath Basin watershed consists of approximately 6,800 square miles in southern Oregon and northern California. It includes the Williamson, Sprague, Wood, and Lost Rivers watersheds and the UKL drainage. Before the area was drained and hydraulically manipulated for

agriculture, the lakes in the Klamath Basin were shallow, marsh-fringed aquatic systems (Bradbury 1992). The Lost River was a closed basin and terminated in Tule Lake, which covered between 55,000 and 100,000 acres depending on wet/dry hydrologic trends. Today the Upper Klamath Basin has been significantly modified by Reclamation's Klamath Project. Authorized in 1905, the Klamath Project constructed facilities to divert and distribute water for irrigation, to reclaim portions of Tule and Lower Klamath lakes, and to control floods. There are now six mainstem dams in the Upper Klamath Basin, which are used for hydropower, supply of irrigation water, and regulation of flow in the river, as well as for managing lake levels in UKL. The Klamath Project can provide water for up to approximately 200,000 acres of croplands and 50,000 acres of refuge lakes and wetlands (USFWS 2016).

KID is one part of the Klamath Project, located in southern Oregon, south and east of Klamath Falls, just north of the California border. KID's D system operates within the following U.S. Geologic Survey 12-digit Hydrologic Unit Code (HUC) subwatersheds:

- 180102040902 Stukel Mountains-Lost River
- 180102040903 Anderson Rose Diversion Dam-Lost River
- 180102040904 Tule Lake Valley-Lost River
- 180102040906 Mills Creek-Tule Lake Valley

Table E-8. Waterbodies Associated with District Operations in the Planning Area.

Name	Associated River Miles	Size	Tributary To	Project Nexus
Upper Klamath Lake	N/A	61,543 acres	Link River, Lake Ewauna	Primary source of irrigation water
Lake Ewauna	255–257	N/A	Klamath River	Source of water for Lost River Diversion Channel
Klamath River	238–255	N/A	Lower Klamath River	Source and sink for irrigation water used in the Klamath Project
Other waterbodies within KID (Lost River, Spring Lake, Nuss Lake, etc.)	N/A	Variable	N/A	Natural drainage areas, used as sumps for irrigation water and surface water runoff.

E.6.1 Surface Water Quality

Table E-9. Impaired Waterbodies Associated with District Operations.

Name	Listed Reach (River Miles) and Listing History	Parameters Included on Oregon's 303(d) List
Upper Klamath Lake	Entire waterbody First listed as impaired in 2002 Last assessed in 2022	Chlorophyll-a Dissolved oxygen, year-round pH, year-round Temperature Methylmercury, human health toxic Harmful algal blooms Sedimentation
Lake Ewauna	Entire waterbody (Klamath RM 255–257) First listed as impaired in 2004 Last assessed in 2022	Chlorophyll-a Dissolved oxygen, year-round pH Ammonia, aquatic life toxic Harmful algal blooms
Klamath River	Lake Ewauna to Lost River Diversion Channel (Klamath RM 253–255)	Chlorophyll-a Dissolved oxygen, year-round Harmful algal blooms
	Lost River Diversion Channel to Keno Dam (Klamath RM 238–253) First listed as impaired in 2004 Last assessed in 2018	Chlorophyll-a Dissolved oxygen, year-round pH Arsenic inorganic, human health toxic Harmful algal blooms
Lost River	Lost River Pool, upstream of Lost River Diversion Dam (Lost RM 26-29) First listed as impaired in 1998 Last assessed in 2012	Chlorophyll-a Dissolved oxygen, year-round pH Temperature, year-round Total dissolved gas Ammonia, aquatic life toxic

Name	Listed Reach (River Miles) and Listing History	Parameters Included on Oregon's 303(d) List
	Lost River, downstream of Lost River Diversion Dam to Tule Lake (Lost RM 0–25) First listed as impaired in 2004 Last assessed in 2022	Chlorophyll-a Dissolved oxygen, year-round Temperature, year-round Total dissolved gas Arsenic inorganic, human-health toxic
Lost River Diversion Channel	Lost River to Klamath River First listed as impaired in 2010 Last assessed in 2022	Chlorophyll-a Dissolved oxygen, year-round pH Temperature, year-round

N/A = Not Applicable; RM = River Mile

E.6.2 References

Bradbury, J. P. (1992). Late Cenozoic lacustrine and climatic environments at Tule Lake, northern Great Basin, USA. *Climate Dynamics 6*:275–285.

U.S. Fish and Wildlife Service Pacific Southwest Region (USFWS) (2016). *Lower Klamath, Clear Lake, Tule Lake, Upper Klamath, and Bear Valley National Wildlife Refuges final comprehensive conservation plan/environmental impact statement.*

E.7 Additional Supporting Information for Fish and Aquatic Species

E.7.1 General Fish and Aquatic Species

Common native species include Klamath River lamprey (*Lampetra similis),* Klamath tui chub *(Siphatales bicolor bicolor),* blue chub (*Gila coerulea)*, UKL sculpin (*Cottus klamathensis klamathensis*), and Klamath Lake Sculpin (*Cottus princeps*). Common nonnative fish species found in reservoirs, sloughs, and ponds include yellow perch (*Perca flavescens)*, pumpkinseed (*Lepomis gibbosus*), and brown bullhead (*Ameiurus nebulosus)* (NRC 2004). Within cold water streams, brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), and nonnative strains of rainbow trout (*Oncorhynchus mykiss gairdneri*) dominate and have largely pushed out native redband trout and bull trout (*Salvelinus confluentus*) (NRC 2004). A list of fish species within the Klamath Basin above the Iron Gate Dam that may be within the study area can be found below in Table E-10.

Historically, an intricate network of streams and wetlands, such as the Lost River Slough, connected Upper Klamath River and Lost River basins and allowed for free movement of water and aquatic organisms. Currently, networks of canals regulate the movement of water between the two basins, and movement of fish is blocked by a myriad of barriers. Numerous irrigation dams along the Lost River act as barriers to fish passage. Lost River Diversion Dam and Anderson-Rose Diversion Dam likely prevent upstream movement and only allow for downstream passage over the spillway. Fish movement from Klamath River to Lost River is precluded by the lack of upstream passage on the

Lost River Diversion Dam. Further upstream diversion dams such as Harpold Dam are partial barriers during certain times of the year.

Table E-10. Fish Species That May Occur within the Study Area.

Fish Species	Scientific Name	Nativity
Klamath River lamprey	*Lampetra similis*	Native
Klamath largescale sucker	*Catostomus snyderi*	Native
Miller Lake Lamprey	*Lampetra milleri*	Native
Klamath smallscale sucker	*Catostomus rimiculus*	Native
Pit-Klamath brook lamprey	*Lampetra lethophaga*	Native
Redband/Rainbow trout	*Oncorhynchus mykiss gairdneri*	Native
Klamath tui chub	*Siphatales bicolor bicolor*	Native
Bull trout	*Salvelinus confluentus*	Native
Blue chub	*Gila coerulea*	Native
Klamath Lake sculpin	*Cottus princeps*	Native
Klamath speckled dace	*Rhinichthys osculus klamathensis*	Native
Slender sculpin	*Cottus tenuis*	Native
Shortnose sucker	*Chasmistes brevirostris*	Native
Lost River sucker	*Deltistes luxatus*	Native
Upper Klamath marbled sculpin	*Cottus klamathensis klamathensis*	Native
Goldfish	*Carassius auratus*	Non-Native
Brown trout	*Salmo trutta*	Non-Native
Golden shiner	*Notemigonus chrysoleucas*	Non-Native
Sacramento perch	*Archoplites interruptus*	Non-Native
Fathead minnow	*Pimephales promelas*	Non-Native
White crappie	*Pomoxis annularis*	Non-Native
Yellow bullhead	*Ameiurus natalis*	Non-Native

Fish Species	Scientific Name	Nativity
Black crappie	*Pomoxis nigromaculatus*	Non-Native
Brown bullhead	*Ameiurus nebulosus*	Non-Native
Green sunfish	*Lepomis cyanellus*	Non-Native
Black bullhead	*Ameiurus melas*	Non-Native
Bluegill	*Lepomis macrochirus*	Non-Native
Channel catfish	*Ictalurus punctatus*	Non-Native
Pumpkinseed	*Lepomis gibbosus*	Non-Native
Kokanee salmon	*Oncorhynchus nerka*	Non-Native
Largemouth bass	*Micropterus salmoides*	Non-Native
Brook trout	*Salvelinus fontinalis*	Non-Native
Yellow perch	*Perca flavescens*	Non-Native

Note: Anadromous salmonids such as Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*Oncorhynchus kisutch*), and steelhead (*Oncorhynchus mykiss*) historically inhabited the basin before dam construction along the Klamath River prevented upstream travel.
Source: NRC 2004.

E.7.2 Federal Candidate Species

The USFWS proposed to list the northwestern pond turtle (NWPT) as threatened under the ESA on October 3, 2023 (88 Federal Register 68370). NWPT is known to occur within the generally vicinity of the project area (USFWS 2023) in aquatic habitats within waterbodies associated with District operations such as Lost River and Upper Klamath Lake (USFWS 2016, ORBIC 2023) and may occur within the District's conveyance system due to suitable habitat (USGS GAP 2018).

The NWPT is semi-aquatic and uses terrestrial and aquatic habitats for their life history phases. Terrestrial environments are needed for nesting and aestivation, whereas aquatic environments are used for breeding and feeding (USFWS 2023). Both aquatic and terrestrial environments are used for basking, overwintering, and movement/dispersal (USFWS 2023). Aquatic environments vary from intermittent streams and canals to lakes and reservoirs. The species prefers aquatic environments that have standing or slow moving water and that contain abundant basking sites and underwater shelter sites (USFWS 2023), The NWPT may be found in some larger rivers but are generally restricted to areas near the bank or within adjacent backwater habitat where the current is slower and where basking sites exist (WDW 1994). Streams, rivers, and artificial small ponds with muddy bottoms, abundant basking sites, aquatic refugia, and slow-moving or standing water are the most common and preferred habits for the species (Bury and Germano 2012, ODFW 2023).

Populations of NWPT range wide are anticipated to decrease due to threats such as habitat loss and fragmentation, altered hydrology, predation (native and nonnative species such as bullfrog),

competition (nonnative species), road mortality, collection, and contaminants. Within the study area, NWPT are within the Klamath – Lakeview analysis unit (AU-8). The AU-8 unit was estimated to have a ~7% probability of extinction by 2050 (USFWS 2023). Probability of extinction increases with time, with a ~32% and ~50% probability of extinction by 2075 and 2100, respectively (USFWS 2023). There are no population estimates for NWPT within the study area.

Due to the species presence within waterbodies that are affected by District operations and the potential for the species to occur with the District's conveyance system, the full extent of effects of the preferred alternative on NWPT will be assessed within the biological assessment for this project.

E.7.3 Consultation Letters

United States Department of Agriculture

Natural Resources Conservation Service

**1201 NE Lloyd Blvd.
Suite 900
Portland, OR 97232
503-414-3200**

January 23, 2023

Ms. Kessina Lee
State Supervisor
U.S. Fish and Wildlife Service
2600 SE 98th Ave., Suite 100
Portland, OR 97266

Subject: Notice of Public Scoping Meeting February 7, 2023, for Klamath Irrigation District Infrastructure Modernization Project Watershed Plan-Environmental Assessment and Watershed Protection and Flood Prevention Act of 1954, Section 12, Consultation Request

Dear Ms. Lee,

The United States Department of Agriculture Natural Resources Conservation Service (NRCS), in cooperation with Klamath Irrigation District (KID or District) as the Sponsoring Local Organizations, is proposing to partially fund through the Watershed Protection and Flood Prevention Act of 1954 (PL83-566), improvements to District infrastructure that would improve water conveyance efficiency, reduce operations and maintenance costs, and improve drought resilience for the local agricultural community. The project would include piping and/or lining canals and laterals and installing automatic flow monitoring equipment on District-owned infrastructure.

To meet the project's purpose and need, NRCS and KID are considering the needs of the water users, the goals for conservation and restoration, resources, the funding available for both the District and the water users, and the status of the District's previous improvements. Additional information regarding the proposed project, including the *Scoping Document for the Klamath Irrigation District Infrastructure Modernization Project*, prepared by Farmers Conservation Alliance on behalf of the Natural Resources Conservation Service, can be found at oregonwatershedplans.org.

The Watershed Protection and Flood Prevention Act of 1954 (often referred to as P.L.83-566 or PL 566) authorizes the NRCS to assist state and local agencies in the development of water resources development projects in watersheds of 250,000 acres or less. NRCS provides technical, financial, and credit assistance to local sponsors in the development of projects for purposes including watershed protection, flood prevention, agricultural water management, ground water recharge, water quality management, and municipal and domestic water supply. Federal investments through PL 83-566 must comply with the program's requirements, the Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies and Federal Water Resource Investments (PR&G), and the National Environmental Policy Act (NEPA) process. NRCS is the lead federal agency managing the NEPA process and is developing a combined Watershed Plan-Environmental Assessment document for the proposed project.

As part of this planning effort, NRCS and KID announced on January 23rd that we are hosting a meeting, in an open house format, where Tribe, agency personnel and the public have been invited to discuss proposed irrigation system improvements and collect input from the community, stakeholders, and agencies.

At this meeting, participants will have an opportunity to learn more about the proposed project and submit comments, ideas, and concerns. We would like to invite you to the Public Scoping Meeting for the Klamath Irrigation District Infrastructure Modernization Project.

During the meeting, project partners will provide background information on the proposed project, the National Environmental Policy Act including scoping and the Environmental Assessment process, NRCS-specific regulations, and public involvement activities.

Public Scoping Meeting
Date: Tuesday February 7, 2023
Time: 4 PM to 5 PM
Location: Merrill Civic Center, Walt Wilson Hall at 363 W Front St, Merrill, OR.

A recording of the meeting will be available afterwards at oregonwatershedplans.org.

Submitting comments is the most effective way to make your voice heard. Please feel free to send comments at any time during the Scoping Period, starting **January 23, 2023,** and ending on **March 9, 2023.** Comments may be:

Emailed to: klamath.id.comments@gmail.com
Submitted online at: oregonwatershedplans.org
Submitted at: Farmers Conservation Alliance's office number (541) 716-6085 or
Mailed to: Farmers Conservation Alliance, 102 State Street, Hood River, OR 97031.

This project is not covered by the consultation provisions of the Fish and Wildlife Coordination Act of 1934, as amended (FWCA). However, consultation is required under Section 12 of P.L.83-566, which was added to P.L.83-566 by the 1958 amendments to the FWCA. Section 12 was added in recognition of the need for evaluation of fish and wildlife resources impacts and opportunities at P.L.83-566 projects in a manner similar to that required for other construction projects under the FWCA.

Section 12 provides that, in preparing project plans, the Department of Agriculture must consult with the Fish and Wildlife Service (FWS) with regard to the conservation and development of fish and wildlife resources and provide the FWS with the opportunity to participate in project planning. The FWS is to be afforded the opportunity to make surveys and investigations and prepare reports with recommendations on the conservation and development of fish and wildlife. The Department of Agriculture must give full consideration to the recommendations contained in FWS reports and include features that are determined to be feasible and that are acceptable to the Department of Agriculture and the local project sponsor. FWS reports are to be included in project reports prepared by the Department of Agriculture. No funds are provided by the Department of Agriculture for FWS involvement in P.L.83-566 projects; funds for such work must come from those appropriated for FWS work in project planning.

This letter is being sent to you to invite you to participate in the scoping process for the Klamath Irrigation District Infrastructure Modernization Project and to request consultation under the provisions of Section 12 of P.L.83-566 which provides for consultation similar to that required under the FWCA.

For additional information please inquire of Gary Diridoni, Assistant State Conservationist for Watershed Resources and Planning, by phone at 503-414-3092, email at gary.diridoni@usda.gov, or mail at the address provided above.

Sincerely,

RONALD ALVARADO
Digitally signed by RONALD ALVARADO
Date: 2023.01.19 13:03:15 -08'00'

RONALD ALVARADO
State Conservationist

Cc:

Dan Blake, Field Supervisor, U.S. Fish and Wildlife Service, Klamath Falls Fish and Wildlife Office, 1936 California Avenue, Klamath Falls, OR 97601

E.7.4 References

Bury, R. B., H. H. Welsh Jr., D. J. Germano, and D. T. Ashton, editors. 2012. *Western pond turtle: Biology, sampling techniques, inventory and monitoring, conservation, and management: Northwest Fauna No. 7*. The Society for Northwestern Vertebrate Biology. http://pubs.er.usgs.gov/publication/70042665.

National Research Council (NRC) (2004). *Endangered and threatened fishes in the Klamath River Basin: Causes of decline and strategies for recovery*. Washington, DC: The National Academies Press..

Oregon Department of Fish and Wildlife (ODFW). 2023. *Northwestern Pond Turtle (Actinemys marmorata)*. The Oregon Conservation Strategy, Accessed January 11, 2024, from https://oregonconservationstrategy.org/strategy-species/northwestern-pond-turtle/

U.S. Fish and Wildlife Service (USFWS). 2016. Final Plan for Klamath Basin National Wildlife Refuges. U.S. Fish and Wildlife Service (USFWS). 2016. Lower Klamath, Clear Lake, Tule Lake, Upper Klamath, and Bear Valley National Wildlife Refuges final comprehensive conservation plan/environmental impact statement.

USFWS. 2023. *Species Status Assessment Report for Northwestern Pond Turtle (Actinemys marmorata) and Southwestern Pond Turtle (Actinemys pallida)*. U.S. Fish and Wildlife Service Version 1.1 April 2023. U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office, Ventura, California.

U.S. Geological Survey (USGS) - Gap Analysis Project (GAP) 2018. *Western Pond Turtle (Actinemys marmorata) rWPTUx_CONUS_2001v1 Habitat Map: U.S. Geological Survey data release*, https://doi.org/10.5066/F7H993NJ.

Washington Department of Wildlife (WDW). 1994. *Status of the Western Pond Turtle (Clemmys marmorata) in Washington*. Unpublished report Washington Department of Wildlife Management Division.

E.8 Supporting Information for Wetland and Riparian Areas

E.8.1 Dominant Hydrophytic Vegetation in the Project Area

Table E-11. Dominant Hydrophytic Vegetation in the Project Area.

Hydrophytic Vegetation Species	Scientific Name
Broadleaf arrowhead	*Sagittaria latifolia*
Broad-leaf cattail	*Typha latifolia*
Common Duckweed	*Lemna minor*
Coontail	*Ceratophyllum demersum*
Hard-stem club-rush (Tule)	*Schoenoplectus acutus*

Reed canary grass	*Phalaris arundinacea*

E.8.2 Representative Photos of Hydrophytic Vegetation in the Project Area

Photograph 8-1. Representative view of Lost River adjacent to Adams Pumping Plant (Colton Kyro, August 3, 2023).

Photograph 8-2. Representative view of D Canal where proposed canal lining would occur (Colton Kyro, August 3, 2023).

Photograph 8-3. Representative view of D16 Canal Lateral where proposed canal piping would occur (Colton Kyro, August 3, 2023).

E.8.3 Supporting Documentation

United States Department of Agriculture

Natural Resources Conservation Service

1201 NE Lloyd Blvd.
Suite 900
Portland, OR 97232
503-414-3200

January 23, 2023

Ms. Kessina Lee
State Supervisor
U.S. Fish and Wildlife Service
2600 SE 98th Ave., Suite 100
Portland, OR 97266

Subject: Notice of Public Scoping Meeting February 7, 2023, for Klamath Irrigation District Infrastructure Modernization Project Watershed Plan-Environmental Assessment and Watershed Protection and Flood Prevention Act of 1954, Section 12, Consultation Request

Dear Ms. Lee,

The United States Department of Agriculture Natural Resources Conservation Service (NRCS), in cooperation with Klamath Irrigation District (KID or District) as the Sponsoring Local Organizations, is proposing to partially fund through the Watershed Protection and Flood Prevention Act of 1954 (PL83-566), improvements to District infrastructure that would improve water conveyance efficiency, reduce operations and maintenance costs, and improve drought resilience for the local agricultural community. The project would include piping and/or lining canals and laterals and installing automatic flow monitoring equipment on District-owned infrastructure.

To meet the project's purpose and need, NRCS and KID are considering the needs of the water users, the goals for conservation and restoration, resources, the funding available for both the District and the water users, and the status of the District's previous improvements. Additional information regarding the proposed project, including the *Scoping Document for the Klamath Irrigation District Infrastructure Modernization Project*, prepared by Farmers Conservation Alliance on behalf of the Natural Resources Conservation Service, can be found at oregonwatershedplans.org.

The Watershed Protection and Flood Prevention Act of 1954 (often referred to as P.L.83-566 or PL 566) authorizes the NRCS to assist state and local agencies in the development of water resources development projects in watersheds of 250,000 acres or less. NRCS provides technical, financial, and credit assistance to local sponsors in the development of projects for purposes including watershed protection, flood prevention, agricultural water management, ground water recharge, water quality management, and municipal and domestic water supply. Federal investments through PL 83-566 must comply with the program's requirements, the Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies and Federal Water Resource Investments (PR&G), and the National Environmental Policy Act (NEPA) process. NRCS is the lead federal agency managing the NEPA process and is developing a combined Watershed Plan-Environmental Assessment document for the proposed project.

As part of this planning effort, NRCS and KID announced on January 23rd that we are hosting a meeting, in an open house format, where Tribe, agency personnel and the public have been invited to discuss proposed irrigation system improvements and collect input from the community, stakeholders, and agencies.

At this meeting, participants will have an opportunity to learn more about the proposed project and submit comments, ideas, and concerns. We would like to invite you to the Public Scoping Meeting for the Klamath Irrigation District Infrastructure Modernization Project.

During the meeting, project partners will provide background information on the proposed project, the National Environmental Policy Act including scoping and the Environmental Assessment process, NRCS-specific regulations, and public involvement activities.

Public Scoping Meeting
Date: Tuesday February 7, 2023
Time: 4 PM to 5 PM
Location: Merrill Civic Center, Walt Wilson Hall at 363 W Front St, Merrill, OR.

A recording of the meeting will be available afterwards at oregonwatershedplans.org.

Submitting comments is the most effective way to make your voice heard. Please feel free to send comments at any time during the Scoping Period, starting **January 23, 2023,** and ending on **March 9, 2023.** Comments may be:

Emailed to: klamath.id.comments@gmail.com
Submitted online at: oregonwatershedplans.org
Submitted at: Farmers Conservation Alliance's office number (541) 716-6085 or
Mailed to: Farmers Conservation Alliance, 102 State Street, Hood River, OR 97031.

This project is not covered by the consultation provisions of the Fish and Wildlife Coordination Act of 1934, as amended (FWCA). However, consultation is required under Section 12 of P.L.83-566, which was added to P.L.83-566 by the 1958 amendments to the FWCA. Section 12 was added in recognition of the need for evaluation of fish and wildlife resources impacts and opportunities at P.L.83-566 projects in a manner similar to that required for other construction projects under the FWCA.

Section 12 provides that, in preparing project plans, the Department of Agriculture must consult with the Fish and Wildlife Service (FWS) with regard to the conservation and development of fish and wildlife resources and provide the FWS with the opportunity to participate in project planning. The FWS is to be afforded the opportunity to make surveys and investigations and prepare reports with recommendations on the conservation and development of fish and wildlife. The Department of Agriculture must give full consideration to the recommendations contained in FWS reports and include features that are determined to be feasible and that are acceptable to the Department of Agriculture and the local project sponsor. FWS reports are to be included in project reports prepared by the Department of Agriculture. No funds are provided by the Department of Agriculture for FWS involvement in P.L.83-566 projects; funds for such work must come from those appropriated for FWS work in project planning.

This letter is being sent to you to invite you to participate in the scoping process for the Klamath Irrigation District Infrastructure Modernization Project and to request consultation under the provisions of Section 12 of P.L.83-566 which provides for consultation similar to that required under the FWCA.

For additional information please inquire of Gary Diridoni, Assistant State Conservationist for Watershed Resources and Planning, by phone at 503-414-3092, email at gary.diridoni@usda.gov, or mail at the address provided above.

Sincerely,

RONALD ALVARADO
Digitally signed by RONALD ALVARADO
Date: 2023.01.19 13:03:15 -08'00'

RONALD ALVARADO
State Conservationist

Cc:

Dan Blake, Field Supervisor, U.S. Fish and Wildlife Service, Klamath Falls Fish and Wildlife Office, 1936 California Avenue, Klamath Falls, OR 97601

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E.9 Additional Supporting Information for Wildlife

E.9.1 General Wildlife

Wildlife species that may use habitats in KID are largely habitat generalists and other species that are able to adapt to or exploit the agricultural environment. Animals in the area commonly use the District's canals and drains as habitat and water sources. Larger mammals such as deer, pronghorn, and elk also graze within the District's irrigated lands. Table E-12below lists the species that may occur in the study area.

Table E-12. Wildlife Species That May Occur within the Study Area.

Wildlife Species	Scientific Name
American badger	*Taxidea taxus*
American shrew mole	*Neurotrichus gibbsii*
Black-tailed jackrabbit	*Lepus californicus*
Belding's ground squirrel	*Urocitellus beldingi*
Bobcat	*Lynx rufus*
Bullfrog	*Lithobates catesbeianus*
California ground squirrel	*Otospermophilus beecheyi*
Cascades frog	*Rana cascadae*
Columbian ground squirrel	*Urocitellus columbianus*
Coyote	*Canis latrans*
Great basin spadefoot	*Spea intermontana*
Golden-mantled ground squirrel	*Callospermophilus lateralis*
House mouse	*Mus musculus*
Long-toed salamander	*Ambystoma macrodactylum*
Mule deer	*Odocoileus hemionus*
Northern water shrew	*Sorex palustris*
Pronghorn antelope	*Antilocapra americana*
Raccoon	*Procyon lotor*
Roosevelt elk	*Cervus canadensis roosevelti*

Wildlife Species	Scientific Name
Roughed-skinned newt	*Taricha granulosa*
Sagebrush vole	*Lemmiscus curtatus*
Striped skunk	*Mephitis mephitis*
Western toad	*Anaxyrus boreas*
Western rattlesnake	*Crotalus viridis*
Western spotted skunk	*Spilogale gracilis*

Source: USFWS 2016.

E.9.2 Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act Protected Species

Table E-13. Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act Species Potentially occurring within the Study Area.

MBTA/BGEPA Species	Scientific Name	MBTA/BGEPA Species	Scientific Name
American kestrel	*Falco sparverius*	Greater white-fronted goose	*Anser albifrons*
American coot	*Fulica americana*	Greater yellowlegs	*Tringa melanoleuca*
American robin	*Turdus migratorius*	Horned lark	*Eremophila alpestris*
American white pelican	*Pelecanus erythrorhynchos*	Lesser scaup	*Aythya affinis*
Bald eagle	*Haliaeetus leucocephalus*	Lesser yellowlegs	*Tringa flavipes*
Barrow's goldeneye	*Bucephala islandica*	Long-eared owl	*Asio otus*
Black-billed magpie	*Pica hudsonia*	Mallard	*Anas platyrhynchos*
Blue-winged teal	*Spatula discors*	Marbled godwit	*Limosa fedoa*
Brewer's blackbird	*Euphagus cyanocephalus*	Northern harrier	*Circus hudsonius*
Brown-headed cowbird	*Molothrus ater*	Northern rough-winged swallow	*Stelgidopteryx serripennis*
Bufflehead	*Bucephala albeola*	Osprey	*Pandion haliaetus*
California quail	*Callipepla californica*	Red-tailed hawk	*Buteo jamaicensis*

MBTA/BGEPA Species	Scientific Name	MBTA/BGEPA Species	Scientific Name
California gull	*Larus californicus*	Red-winged blackbird	*Agelaius phoeniceus*
Canada goose	*Branta canadensis*	Rock pigeon	*Columba livia*
Cassin's finch	*Carpodacus cassinii*	Rough-legged hawk	*Buteo lagopus*
Clark's grebe	*Aechmophorus clarkii*	Ross's goose	*Anser rossii*
Cliff swallow	*Petrochelidon pyrrhonota*	Rufous hummingbird	*Selasphorus rufus*
Cinnamon teal	*Spatula cyanoptera*	Sage thrasher	*Oreoscoptes montanus*
Common goldeneye	*Bucephala clangula*	Sandhill crane	*Antigone canadensis*
Common Raven	*Corvus corax*	Snow goose	*Anser caerulescens*
Common merganser	*Mergus merganser*	Swainson's hawk	*Buteo swainsoni*
Dark-eyed junco	*Junco hyemalis*	Tricolored blackbird	*Agelaius tricolor*
Double-crested cormorant	*Nannopterum auritum*	Tundra swan	*Cygnus columbianus*
Eared grebe	*Podiceps nigricollis*	Turkey vulture	*Cathartes aura*
Evening grosbeak	*Coccothraustes vespertinus*	Western bluebird	*Sialia mexicana*
Ferruginous hawk	*Buteo regalis*	Western grebe	*Aechmophorus occidentalis*
Forster's tern	*Sterna forsteri*	Western snowy plover	*Charadrius nivosus nivosus*
Franklin's gull	*Leucophaeus pipixcan*	Willet	*Tringa semipalmata*
Gadwall	*Mareca strepera*	White-crowned sparrow	*Zonotrichia leucophrys*
Golden eagle	*Aquila chrysaetos*	White-faced ibis	*Plegadis chihi*
Great blue heron	*Ardea herodias*		

Source: USFWS 2023; Cornell Lab of Ornithology 2023.

E.9.3 Federally Listed and Proposed Species

A review of federally and state-listed and sensitive wildlife species that may potentially be present in KID and vicinity was performed using the IPaC resource list (USFWS 2023) and the ORBIC data report (ORBIC 2023). Two federally listed species' identified ranges overlap with the District boundaries: gray wolf (*Canis lupus*) and yellow-billed cuckoo (*Coccyzus americanus occidentalis*). The range of North American wolverine (*Gulo gulo luscus*), a species listed as threatened, also overlaps the

District. In addition, western snowy plover (*Charadrius nivosus nivosus,* Pacific coast population - threatened) has been recorded to occur near the vicinity of the District. Due to lack of suitable habitat, these species along with any other federally listed terrestrial wildlife species are unlikely to be present. No areas within the District boundaries have been designated or proposed for designation as critical habitat for either species. Monarch butterfly (*Danaus plexippus*)

E.9.3.1 Gray Wolf

The USFWS issued a rule in January 2021 delisting the gray wolf everywhere it was listed in the Lower 48 United States. In February 2022, that delisting was vacated by the U.S. District Court for the Northern District of California, reinstating protection under the ESA for all gray wolves outside of the Northern Rocky Mountain region distinct population segment (DPS) as either endangered or threatened.

Wolves are habitat generalists and establish territories wherever sufficent food resources are present. Young individuals disperse on average 40 to 60 miles to establish new territories. The gray wolf has been known to occur within the boundaries of the LKNWR and TLNWR (USFWS 2016) and two breeding populations of gray wolves are documented to occur within 50 miles of the District (ODFW 2022). Given its large home range, this species could potentially occur within the District. However, because fragmented pockets of agriculture, urbanized development, and transportation infrastructure provide barriers to movement for breeding wolf populations, it is unlikely that gray wolves use habitat within study area on an ongoing basis.

E.9.3.2 North American Wolverine

USFWS listed the DPS of North American wolverine in the contiguous United States as threatened under the ESA (88 FR 83726- 83772). The species is listed as threatened in Oregon.

Wolverines have large territories in relatively inaccessible landscapes within high elevation terrains (5,906 to 11,483 feet) (USFWS 2018). The species is found in naturally low densities throughout the west-northwestern United Sates and much of Canada and Alaska. Wolverines use a variety of habitat types but generally use habitats in locations away from human development (USFWS 2018).

Wolverines occur within mountainous regions within Oregon, including the Cascade range (USFWS 2018; ODFW 2023). However, the highly agricultural developed study area surrounded by human settlement is not preferred habitat by species and the wolverine is unlikely to use the area.

E.9.3.3 Western Snowy Plover

The species was last observed in 1982 within White Lake, an enclosed and seasonally inundated lake with exposed alkali flats located 2.5 miles north of the study area. The species occurs on habitat not found within the study area, such as sandy beaches during the winter and sparsely vegetated beaches and dry salt flats for nesting. The species was not found during surveys conducted by Oregon ODFW in 1986, 1987, and 1988 (ORBIC 2023). In addition, USFWS does not list the occurrence of Pacific coast population of western snowy plover within Klamath County (USFWS 2007). Therefore, it is unlikely the species occurs within the study area.

E.9.3.4 Yellow-Billed Cuckoo

The study area is located within the identified range of the yellow-billed cuckoo, federally listed as threatened. However, this species is unlikely to occur within the study area. The species is

exceedingly rare in Oregon (78 FR 61621), there are no known observations in the District or surrounding region (ORBIC 2023; Cornell Lab of Ornithology 2023), and there is no suitable habitat. This species is also not on the official federal species list for the TLNWR or nearby wildlife refuges within the complex (USFWS 2016). Yellow-billed cuckoo is therefore not addressed further in this Plan-EA.

E.9.3.5 Monarch butterfly

USFWS proposed to list the monarch butterfly as threatened under the ESA on December 12, 2024 (89 FR 100662). Monarch butterflies overwinter in coastal California and Mexico and migrate northward and eastward during the spring. During the breeding and migration seasons, adult monarch butterflies require blooming nectar-producing plants for nourishment along their migration routes and breeding areas. The timing of the monarch butterfly breeding season for a given area varies across the west. Monarch butterflies may be present in the Project Area breeding and migrating from approximately June 1 to September 30 (Xerces Society 2018). No observations of monarchs or milkweed have been recorded in the project area (Xerces Society 2026), and none were observed during a site visit in July 2023. Proposed critical habitat for the species is outside of the project area.

Construction of the Modernization Alternative will occur during the non-irrigation season which is when monarch butterflies will not be present within the project area. Thus, the Modernization Alternative is anticipated to have no effect on monarch butterfly.

E.9.4 References

Cornell Lab of Ornithology (2023). *eBird*. http://www.ebird.org

Endangered and Threatened Wildlife and Plants; Request for New Information for the North American Wolverine Species Status Assessment, 87 F.R. 71557 to 71559 (2022). https://www.federalregister.gov/documents/2022/11/23/2022-25433/endangered-and-threatened-wildlife-and-plants-request-for-new-information-for-the-north-american

Oregon Biodiversity Information Center (ORBIC) (2023). *Biotics rare species database*. Institute for Natural Resources – Portland. Portland State University, Portland, Oregon. Retrieved August 29, 2023, from https://inr.oregonstate.edu/orbic

Oregon Department of Fish and Wildlife (ODFW) (2022). *Oregon wolf population*. https://dfw.state.or.us/Wolves/population.asp

Oregon Department of Fish and Wildlife (2023). *Wolverine wildlife viewing*. Retrieved September 7, 2023, from https://myodfw.com/wildlife-viewing/species/wolverine

U.S. Fish and Wildlife Service Mountain-Prairie Region Headquarters (USFWS) (2018). *Species status assessment for the North American wolverine (Gulo gulo luscus)*. Version 1.2 March 1, 2018.

U.S. Fish and Wildlife Service (USFWS) (2023). *IPaC information for planning and consultation*. Retrieved July 20, 2023, from https://ipac.ecosphere.fws.gov/

U.S. Fish and Wildlife Service Pacific Southwest Region (USFWS) (2016). *Lower Klamath, Clear Lake, Tule Lake, Upper Klamath, and Bear Valley National Wildlife Refuges final comprehensive conservation plan/environmental impact statement.*

U.S. Fish and Wildlife Service Pacific Southwest Region Headquarters (USFWS) (2007). *Recovery plan for the Pacific Coast population of the western snowy plover* (*Charadrius alexandrinus nivosus*). Volume 2: Appendices. https://westernsnowyplover.org/recovery_plan.html#:~:text=According%20to%20the%20Recovery%20Plan,distributed%20across%20the%20range%20of

Xerces Society. 2018. *Managing for Monarchs in the West: Best Management Practices for Conserving the Monarch Butterfly and its Habitat.* https://xerces.org/sites/default/files/2018-06/18-009_01-Monarch_BMPs_Final_Web.pdf.

Xerces Society. 2026. *Western Monarch Milkweed Mapper. In partnership with Idaho Department of Fish and Game, Washington Department of Fish and Wildlife, National Fish and Wildlife Foundation, and US Fish and Wildlife Service.* Available at: https://www.monarchmilkweedmapper.org/.

E.10 Minimization, Avoidance and Compensatory Mitigation Measures for the Preferred Alternative

E.10.1 Temporary Access

Prior to construction, the District would contact adjacent landowners to discuss the project. Landowners would be provided a construction schedule before construction begins. Where possible, work would be confined to existing and new easements. In addition, construction limits would be clearly flagged to preserve existing vegetation and prevent trespassing on private property. Access to residences and farms would be maintained during construction. Construction would occur during the daytime and primarily in the non-irrigation season to minimize disturbance to landowners or other individuals in the construction area vicinity. Following project completion in an area, temporary construction access routes would be decommissioned, restored to original contours, and reseeded.

E.10.2 Staging, Storage, and Stockpiling

Mechanized equipment and vehicles would be selected, operated, and maintained in a manner that minimizes adverse effects on the environment. Construction staging areas would be selected and used to minimize effects on vegetation and avoid tree removal. The use of construction vehicles and equipment within 150 feet of streams would be minimized to the greatest extent practicable. Fueling and maintenance operations would be performed on flat surfaces, away from moving equipment, and at least 150 feet away from any water source.

E.10.3 Roads and Traffic Control

Standard construction safety procedures and traffic control measures would be employed to reduce the risk of collisions between construction vehicles and other vehicles while construction is ongoing. Lane closures on roadways would be avoided during peak travel periods to the greatest extent possible to reduce potential traffic delays from construction vehicles.

E.10.4 Erosion Control

Silt fencing, straw wattles, geotextile filters, straw bales, and other erosion control measures would be used to minimize soil erosion and prevent eroded soil from entering waterbodies during construction. Erosion control measures would be free of weeds and weed seeds. Drainage measures would be incorporated into the engineering design to minimize effects of piping ditches on local flooding.

E.10.5 Revegetation

During excavation, topsoil would be saved and replaced as the top layer after trenches are filled. Areas disturbed for access purposes or during construction would be regraded to their original contours. When necessary, compacted areas such as access roads, stream crossings, staging, and stockpile areas would be loosened to facilitate revegetation and improved infiltration. Disturbed areas would be planted with a native seed mix appropriate to the habitat. Revegetation practices would follow the NRCS *Oregon and Washington Guide for Conservation Seedings and Plantings* (NRCS 2000). Costs of revegetation are included in project installation cost estimates. Pruning and tree removal would occur entirely within the ditch easement and would not exceed what is required for equipment clearance.

E.10.6 Spill Prevention, Control, and Countermeasures

Spill kits would be located at fuel storage areas, and construction crews would have adequate absorbent materials and containment booms on hand to enable rapid cleanup of spills. Immediately upon learning of any spills of fuel, oil, or hazardous material, or upon learning of conditions that could lead to an imminent spill, the person discovering the situation would initiate actions to contain the fluid or eliminate the source of the spill and notify the spill coordinator or crew foreman immediately. If it is determined that a spill is beyond the scope of on-site equipment and personnel, an environmental emergency response contractor would be contacted immediately to contain or clean up the spill. Any spill into a waterbody or along the adjacent streambed would be reported immediately to the Oregon Emergency Response Service at 1-800-452-0311 and the National Response Center at 1-800-424-8802. The spill coordinator would complete a spill report form for each release of a regulated substance, regardless of volume.

E.10.7 Invasive Species Control

The following measures would be taken to avoid the introduction of invasive plants and noxious weeds into project areas.

- Inspect gear and equipment to be used in or near water for aquatic invasive species.
- Limit ground disturbance to those areas necessary to safely implement the Preferred Alternative.
- Begin activities in areas not characterized by invasive plants or noxious weeds before operating in infested areas.
- Use areas that are free of invasive plants or noxious weeds for staging, parking, and cleaning equipment. Avoid or minimize all types of travel through infested areas and restrict travel to those periods when the spread of seed or plant reproductive parts is least likely.

- Schedule soil work in infested roadsides or ditches during periods when seeds or propagules are least likely to be viable and spread.
- Monitor disturbed areas for at least three growing seasons following completion of activities. Provide follow-up treatments based on inspection results.
- Inspect material sources at their site of origin to ensure that they are free of invasive plant material before transport and use to the extent practicable. If possible, treat contaminated material before any use.

E.10.8 Wildlife

Construction would occur outside of the primary nesting period for migratory birds of concern. For rare occasions where construction would occur during the primary nesting period, pre-construction nest surveys would be performed prior to ground disturbance and/or vegetation removal. Should an active nest be found, construction would be paused and consultation with a local USFWS biologist would occur to determine the following steps.

E.10.9 Cultural Resources Mitigation

Before project construction begins at any given site, a cultural resource survey would be conducted by a qualified archaeologist in areas where ground disturbance will occur, consistent with Bureau of Reclamation cultural resource management policies. This survey would include the identification and evaluation of cultural resources present within those areas, and, if necessary, the development of measures to avoid, minimize, or mitigate impacts to those resources.

If archaeological resources were discovered during construction, an Inadvertent Discovery Plan would be followed. Construction would stop in the vicinity of the discovery, the area would be secured and protected, a professional archaeologist would assess the discovery, consultation with the Oregon SHPO and NRCS cultural resources staff would occur as appropriate, and the appropriate tribes would be notified. Continuation of construction would occur in accordance with applicable guidance and law.

E.10.10 Water Resources Mitigation

Concurrence on jurisdictional determinations would be obtained from applicable state and federal agencies prior to construction.

Coordination with the U.S. Army Corps Engineers (USACE) and the Oregon Department of State Lands (DSL) would be conducted prior to implementation of each site-specific action where potential wetland and instream impacts may occur to ensure the Modernization Alternative either meets exemption criteria (see Appendix E.7) or that the proper permitting is completed. Permits from USACE and DSL for in-water work, consultation with ODFW, and a Section 401 Water Quality Certification from the ODEQ would be required to confirm that the project meets federal and state regulatory requirements. During the construction, contractors would be required to follow strict BMPs.

All work would be performed in compliance with the applicable terms and conditions of permits issued by local, state, and federal agencies with permitting authority, as described in the following section.

E.10.11 Permits

E.10.11.1 Additional Information Department of State Lands Permits

Before project implementation begins, the District would be required to consult with DSL. Consultation would entail wetland determinations at project sites to determine the jurisdictional status of wetlands along Lost River and within and adjacent to canals and laterals in the project area.

If the project results in no more than 10 cubic yards of removal-fill activity or only temporarily impacts jurisdictional wetlands, the project can be permitted under a General Authorization which requires submission of a notification to DSL. If the project's removal-fill activity is limited to 0.2 acres of wetlands and does not result in impacts to waters, the project can be permitted under a General Permit which requires submission of a joint permit application. If the project exceeds 0.2 acres of wetland impact or impacts waters, the project would be permitted under an Individual Permit which also requires submission of a joint permit application.

The extent of wetland and water impacts from the project, and the subsequent permit to DSL, depends largely on the jurisdictional status of wetlands found within or adjacent to canals and laterals within the project area. Per Oregon Removal-Fill statute, OAR 141-085-0515(9), an irrigation ditch is not jurisdictional under Oregon Removal-Fill permitting if it meets both of the following criteria:

- The ditch is operated and maintained for the primary purpose of irrigation.
- The ditch is dewatered outside for the irrigation season except for isolated puddles in low areas.

Canals and laterals in the project area are primarily used for irrigation, and areas that are predominantly dewatered annually outside the irrigation season would be considered non-jurisdictional. Canals and laterals that contain water year-round would not be considered exempt.

Per OAR 141-085-0515(8), a non-exempt irrigation ditch is jurisdictional under Oregon Removal-Fill permitting if it meets one of the following criteria:

- Created in wetlands, estuaries, tidal rivers or other waters of this state; or
- Created from upland and meet the following conditions:
  - The ditch contains food and game fish; and
  - The ditch has a free and open connection to waters of this state.

Canals and laterals that contain water year-round and that are found in hydric soils would be considered jurisdictional. Isolated pockets of hydric soil occur within the project area within Canal D laterals (NRCS 2023), suggesting a previous presence of wetlands in those areas. Although fish are found in the canals, it is undetermined if they are considered game fish or food fish. However, the irrigation conveyance system does not provide a free and open connection to waters of the state, such as the Lost River. Pumps, fish screens, drains, and dam spill gates prevent the free movement of fish throughout the system.

Before construction activities begin, coordination and consultation with USACE would occur and measures would be taken as required to identify and mitigate impacts to potential jurisdictional wetlands and other waters of the state.

E.10.11.2 Additional Information Clean Water Act Section 404 Permit

Before project implementation begins, the District would be required to consult with USACE. Consultation would entail wetland determinations at project sites and to determine the jurisdictional status of wetlands along Lost River and within and adjacent to canals and laterals in the project area.

If the project results in no more than 25 cubic yards of fill and the loss of 1/10 acre of waters of the United States (NWP 18) or only temporarily impacts waters of the United States (NWP 33), the project can be permitted under a Nationwide Permit (NWP) with the submission of a joint permit application. If the project exceeds 25 cubic yards of fill or results in the loss of more than 1/10 acres of water of the United States, the project can be permitted under an Individual Permit with the submission of a joint permit application.

The extent of wetland and water impact as a result of the project, and the subsequent permit to USACE, depends largely upon the jurisdictional status of wetlands within and adjacent to laterals and canals within the project area. Under Section 404(f)(1)(C) of the CWA, discharges of dredged or fill material associated with construction or maintenance of irrigation ditches, or with the maintenance (but not construction) of drainage ditches, are not prohibited by or otherwise subject to regulation under Section 404. Discharges of dredged or fill material associated with siphons, pumps, headgates, wingwalls, weirs, diversion structures, and such other facilities as are appurtenant to and functionally related to irrigation ditches are included in the exemption for irrigation ditches. Under 33 C.F.R. 323.4(a)(1)(iii)(C)(1)(i), "construction and maintenance of upland (dryland) facilities such as ditching and tiling, incidental to the planting, cultivating, protecting, or harvesting of crops, involve no discharge of dredged or fill material into waters of the U.S., and as such never require a Section 404 permit."

On August 29, 2023, the EPA and Department of the Army (the agencies) issued a final rule to amend the final "Revised Definition of 'Waters of the United States'" rule, published in the Federal Register on January 18, 2023. This final rule conforms the definition of "waters of the United States" to the U.S. Supreme Court's May 25, 2023, decision in the case of Sackett v. Environmental Protection Agency. Parts of the January 2023 Rule are invalid under the Supreme Court's interpretation of the CWA in the Sackett decision. Therefore, the agencies have amended key aspects of the regulatory text to conform to the Court's decision.

The conforming rule, "Revised Definition of 'Waters of the United States'; Conforming," was published in the Federal Register and became effective on September 8, 2023.

On July 24, 2020, USACE and EPA signed a memorandum providing a clear, consistent approach regarding the application of exemptions from regulation under Section 404(f)(1)(C) of the CWA for construction or maintenance of irrigation ditches and the maintenance of drainage ditches. The guidance in the joint memorandum applies regardless of the definition of waters of the United States.

As defined in the 2020 joint memorandum, an irrigation ditch is a ditch that either conveys water to an ultimate irrigation use or place of use or that moves and/or conveys irrigation water away from irrigated lands. Construction and maintenance of irrigation ditches are considered exempt activities under Section 404 of the CWA. However, if construction or maintenance of irrigation ditches "represents a new use, and the activity would result in a reduction in reach or impairment of flow or circulation of jurisdictional waters, including wetlands," the activity does not meet this exemption.

Canals and laterals at the proposed project sites are irrigation ditches. Proposed infrastructure modernization does not represent a new use, nor would it impair flow to jurisdictional waters. If any

wetlands are present in the project area, they would be exempt from federal permitting requirements, as the infrastructure modernization would be considered maintenance or construction of irrigation ditches.

The construction and maintenance of irrigation canals and laterals and maintenance of drainage ditches may require the construction and/or maintenance of a farm road. Subsection 404(f)(1)(E) exemption for discharges of dredged or fill material associated with the construction or maintenance of farm roads applies where such related farm roads are constructed and maintained in accordance with BMPs. However, in 33 C.F.R. 323.4(a)(6) and 40 C.F.R. 232.3(c)(6), there must be assurance that flow and circulation patterns and chemical and biological characteristics of waters of the U.S. are not impaired, that the reach of the waters of the U.S. is not reduced, and that any adverse effect on the aquatic environment would be otherwise minimized.

Before construction activities begin, coordination and consultation with USACE would occur and measures would be taken as required to identify and mitigate impacts to potential jurisdictional wetlands and other waters of the U.S.

E.10.12 References

Natural Resources Conservation Service (NRCS) (2000). *Oregon and Washington guide for conservation seedings and plantings*. U.S. Department of Agriculture Natural Resources Conservation Service Oregon. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_042417.pdf.

E.10.13 References

Activities Exempt under the Clean Water Act, 404(f)(1)(C) (n.d.). https://www.epa.gov/cwa-404/overview-clean-water-act-section-404

Activities Exempt under the Clean Water Act, 404(f)(1)(E) (n.d). https://www.epa.gov/cwa-404/exemptions-permit-requirements-under-cwa-section-404

Activities Not Requiring Permits, 40 C.F.R. 232.3(c)(6) (2023). https://www.ecfr.gov/current/title-40/chapter-I/subchapter-H/part-232/section-232.3

Bald and Golden Eagle Protection Act, 16 U.S.C. 668–668d (1940). https://www.fws.gov/law/bald-and-golden-eagle-protection-act#:~:text=The%20Bald%20and%20Golden%20Eagle,)%2C%20nests%2C%20or%20eggs.

Compatibility with Acknowledged Comprehensive Plans, OAR 340-018 (2018). https://secure.sos.state.or.us/oard/viewSingleRule.action?ruleVrsnRsn=244085

Discharges Not Requiring Permits, 33 C.F.R. 323.4(a)(6) (2023). https://www.ecfr.gov/current/title-33/chapter-II/part-323

Effect of Undertaking on Historic Property, 54 U.S.C. § 306108 (2021). https://www.govinfo.gov/app/details/USCODE-2021-title54/USCODE-2021-title54-subtitleIII-divsnA-app-dup4-chap3061-subchapI-sec306108

General provisions, 7 U.S.C. 4201 et seq. (2022). https://www.govinfo.gov/app/details/USCODE-2022-title7/USCODE-2022-title7-chap73-sec4201

How Wetlands are Defined and Identified under CWA Section 404 (2023), https://www.epa.gov/cwa-404/how-wetlands-are-defined-and-identified-under-cwa-section-404

Migratory Bird Treaty Act of 1918, 16 U.S.C. 703–712 (1918). https://www.fws.gov/law/migratory-bird-treaty-act-1918

Minor Drainage, 33 C.F.R. 323.4(a)(1)(iii)(C)(1)(i) (2023). https://www.ecfr.gov/current/title-33/chapter-II/part-323

Protection of Historic Properties, 36 C.F.R. § 800 (2023). https://www.ecfr.gov/current/title-36/chapter-VIII/part-800?toc=1

Removal-Fill Jurisdiction by Type of Water, OAR 141-085-0515 (2012). https://secure.sos.state.or.us/oard/viewSingleRule.action?ruleVrsnRsn=15649

State Waters and Ocean Resources; Wetlands; Removal and Fill, ORS 196.800.990 (2021). https://www.oregonlegislature.gov/bills_laws/ors/ors196.html

Sustainable Fisheries Act, P.L. 104-297 (1996). https://www.congress.gov/104/plaws/publ297/PLAW-104publ297.pdf

E.11 Supporting Tables from Affected Environment Section

Table E.14. Crops Grown in the Klamath Irrigation District.

Crop	Total Acreage (2019)	Percent Acreage (2019)
Cereals (wheat, barley, oats)	3,190	7.2%
Forage (alfalfa, hay, irrigated pasture, cover crop)	33,450	75.4%
Miscellaneous Field Crops (rye grass)	85	0.2%
Vegetables (potatoes, onions, lettuce, spinach)	7,391	16.7%
Fruit (miscellaneous garden and tress)	268	0.6%
Total	**44,384**	**100%**

Note: Due to rounding, percentages may not add to 100%.
Source: KID 2021.

Table E-15. Population Characteristics.

Area	2016 Population	2021 Population	Percent Change, 2016 to 2021
Klamath County (OR)	65,946	68,899	+4.5%

Source: U.S. Census Bureau 2017, 2022.

Table E-16. Race and Ethnicity.

Indicator	Klamath County	Oregon
Total Population in 2020	69,413	4,237,256
Two or More Races	6.5%	6.1%
One Race		
• White alone	74.8%	71.7%
• Black or African American alone	0.7%	1.9%
• American Indian or Alaska Native alone	3.6%	1%
• Asian alone	1.1%	4.5%
• Native Hawaiian and Other Pacific Islander alone	0.1%	0.4%
Hispanic or Latino (of any race)	12.6%	13.9%
Not Hispanic or Latino	87.4%	86.1%

Source: EPA 2020.

Table E-17. Labor Force Characteristics.

Indicator	Klamath County	Oregon
Labor Force Participation Rate	51.9%	62.6%
Employed	44.6%	59.0%
Unemployment Rate	5.6%	3.5%

Source: U.S. Census Bureau 2022.

Table E-18. Income and Poverty.

Indicator	Klamath County	Oregon
Median Household Income	$46,721	$70,084
Poverty Rate	20.5%	12.1%

Source: U.S. Census Bureau American Community Survey 5-year Estimates (2017–2021).

Table E-19. Summary of Federally and State-Listed and Sensitive Wildlife Species Potentially Occurring in the Study Area and its Vicinity.

Description	Common Name *(Scientific name)*	Federal Listing	State Listing
Mammals	Gray Wolf (*Canis lupus*)	Endangered	Endangered
	North American Wolverine (*Gulo gulo luscus)*	Threatened	Threatened
Birds	Swainson's Hawk (*Buteo swainsoni*)	No status	Sensitive
	Western Snowy Plover (*Charadrius nivosus nivosus*)	Pacific coast population - Threatened	Threatened
	Yellow-billed Cuckoo (*Coccyzus americanus*)	Threatened	Not Listed
Insects	Monarch Butterfly (*Danaus plexippus*)	Proposed threatened	Not Listed

Source: USFWS 2023a; ORBI, 2023; Cornell Lab of Ornithology 2023.

Table E-20. Existing Lateral Transportation Crossings

System Component	Existing Crossing	Jurisdiction	Length of Crossing(ft)
D-2 Lateral	Anderson Road	Klamath County	30
D-2 Lateral	Railroad	BNSF	100
D-3 Lateral	Anderson Road	Klamath County	50
D-3 Lateral	Railroad	BNSF	100
D-12 Lateral	Hwy 50	ODOT	60
D-12 Lateral	Adams Point Road	Klamath County	60
D-12 Lateral (D-12A Spur)	Railroad	BNSF	100

D-12 Lateral (D-12C Spur)	Railroad	BNSF	100
D-14 Lateral	Old Malin Hwy	Klamath County	50
D-16 Lateral	Micka Road	Klamath County	40
D-16 Lateral	Harpold Road	Klamath County	85
D-16 Lateral	Demerritt Road	Klamath County	75
D-18 Lateral	Micka Road	Klamath County	60
D-18 Lateral	Demerritt Road	Klamath County	85
D-18 Lateral	Hwy 50	ODOT	65
D-19 Lateral	Demerritt Road	Klamath County	65
D-19 Lateral	Hwy 50	ODOT	70
D-19 Lateral	Railroad	BNSF	100
D-20 Lateral	Drazil Road	Klamath County	60
D-20 Lateral	Hwy 50	ODOT	65
D-20 Lateral	Depot Road	Klamath County	40
D-20 Lateral	Malin Siding Road	Klamath County	45
D-20 Lateral	Railroad	BNSF	100

E.12 Additional Supporting Information Environmental Consequences

E.12.1 Supporting Information Cumulative Effects

In 1902, Congress enacted the Reclamation Act (Act of June 17, 1902, Ch. 1093, 32 Stat. 388). Construction of the Klamath Reclamation Project began in 1906. KID was officially formed in 1917. However, the District's infrastructure dates back to 1906 when construction began on the A Canal. Construction of the District's canals, laterals, and drainage system continued through 1917. KID is a Reclamation District and is part of the Klamath Project, which provides water to 240,000 acres of cropland. The District's water supply is from the Klamath River, UKL, and Lake Ewauna.

Seventeen other irrigation districts within the Klamath Basin are a part of the Klamath Project, collectively altering the natural hydrology of the Klamath River and its tributaries. These districts include Ady District Improvement Company, Enterprise Irrigation District, Horsefly Irrigation District, Klamath Drainage District, Langell Valley Irrigation District, Malin Irrigation District, Midland District Improvement Company, P Canal Mutual Water Company, Pine Grove Irrigation District, Pioneer District Improvement Company, Plevna District Improvement Company, Poe Valley Improvement Company, Shasta View Irrigation District, Sunnyside Irrigation District, Tulelake Irrigation District, Van Brimmer Ditch Company, and Westside Improvement District.

Since the early 1990s, there has been increasing interest in improving instream flows and conserving water in the Klamath River. KID and other Klamath Basin–area irrigation districts have completed various water conservation projects. These recent past efforts have included piping existing irrigation canals, on-farm conservation, water management changes, and changes to crop production.

E.12.2 Supporting Information Biological Opinion

Covered activities under the Biological Opinion include:

- Storage of water from the UKL Subbasin and Lost River.
- Operation of the Klamath Project to deliver water for irrigation purposes (including National Wildlife Refuge needs), subject to water availability, and consistent with flood control purposes, while maintaining UKL and Klamath River hydrologic conditions that avoid jeopardizing the continued existence of listed species and adverse modification of designated critical habitat.
- Performance of operation and maintenance activities necessary to maintain Klamath Project facilities to ensure proper long-term function and operation.

Most of the conservation measures set forth in the Biological Opinion are commitments to maintain UKL elevations above 4,138 feet. The 2023 Operations Plan from Reclamation states that Reclamation intends to manage Klamath Project operations this water year to achieve 4,139.2 feet of elevation on UKL on September 30, 2023. Reclamation believes that managing to this elevation for the 2023 water year is appropriate to avoid conditions which could interfere with its ability to fulfill its ESA obligations throughout this irrigation season and the subsequent fall/winter period.

On September 5, 2023, Reclamation announced that it would not order further curtailment of irrigation water supplies for the Klamath Project this season. This notification came eighteen days after Reclamation sent Klamath Project contractors a letter stating that Reclamation would "likely" reduce the allocation of water for irrigation in the Klamath Project) in 2023.

E.13 Supporting Information for Scoping

Table E21. Public Scoping Comment Summary.

Comment Topic	Section Where Topic is Discussed
Given anticipated drought conditions and water availability challenges in the Klamath Basin, how can canal efficiency be addressed?	Section 2.1 Purpose and Need for Action – Watershed Problems and Resource Concerns Section 6.6.2 Water Resources – Modernization Alternative (Future with Federal Investment)
Will the basin and District have water in the future?	Section 5.3.1 Alternatives – No Action Alternative (Future without Federal Investment) Section 5.3.2 Alternatives – Modernization Alternative (Future with Federal Investment)
How will the recharge of domestic wells be impacted by changes to the system?	Section 4.6.4 Affected Environment – Groundwater
How will piped canals in the KID system influence how water is delivered to farms and ranches?	Section 1.3 Introduction – Current Infrastructure Section 5.3.2 Alternatives – Modernization Alternative (Future with Federal Investment)

Comment Topic	Section Where Topic is Discussed
Will improved efficiency carry greater benefit on farm or instream returns?	Section 6.6.2 Water Resources – Modernization Alternative (Future with Federal Investment)
What are the cost differences between a modernization project vs. simply adding O&M staff and additional ditch riders?	Section 2.1.2 Purpose and Need for Action – Water Loss in District Conveyance Systems Section 5.4 Alternatives – Summary and Comparison of Alternatives Section 8.6 Preferred Alternative – Costs
What are the differences in groundwater effects between piped and open conveyance systems?	Section 1.3 Introduction – Current Infrastructure Section 4.6.4 Affected Environment – Groundwater Section 5.4 Alternatives – Summary and Comparison of Alternatives
What are the impacts on wildlife from lining or piping canals?	Section 4.9 Affected Environment – Wildlife Resources Section 5.4 Alternatives – Summary and Comparison of Alternatives Section 6.9 Environmental Consequences – Wildlife Resources

Table E25. Summary of Resource Concerns for the Irrigation District Infrastructure Modernization Project.

Resource	Relevant to the proposed action?		Justification
	Yes	No	
Air			
Air Quality		X	Oregon Department of Environmental Quality (ODEQ) air quality data indicates that the entire project area is in attainment for all criteria pollutants. Emissions from equipment associated with construction activities would occur; however, such emissions are considered negligible when compared to background levels and the application of BMPs.
Soils			
Soils	X		Construction of the project could affect soils.

Resource	Relevant to the proposed action?		Justification
	Yes	No	
Prime Farmlands	X		Prime farmlands occur in the project area and could be affected by the project.
Ecologically critical areas		X	The project area does not cross through any ecologically critical areas
Human Environment			
Cultural Resources	X		Construction associated with the project may affect cultural resources. Consultation with the SHPO, Klamath Tribes, the Modoc Nation, and other consulting parties, including affiliated tribes, is required for compliance with Section 106 of the NHPA.
Land Use	X		Construction and operation of the project could affect land use.
National Parks, Monuments, and Parklands		X	There are no National Parks, Monuments, or Parklands within the project area so there is relevant impact.
Noise		X	No relevant impact to noise. With implementation of BMPs, noise impacts during construction would be negligible and temporary.
Public Safety	X		Drowning risk in the open canal could be reduced.
Visual Resources	X		Visual resources in the project area could be affected where the open canal would be altered.
Socioeconomics			
Local and Regional Economy	X		The proposed action involves an expenditure of public funds, which could affect the local and regional economy.
National Economic Efficiency (NEE)	X		A NEE analysis has been completed as required by the Departmental Manual (DM) 9500-013, Guidance for Conducting Analyses Under the PR&G.

Resource	Relevant to the proposed action?		Justification
	Yes	No	
Vegetation			
Invasive Species/Noxious Weeds	X		Various invasive and noxious weed species are present in district canals. With implementation of BMPs, the spread of noxious weeds during construction would be avoided.
Mature Trees	X		Direct and indirect effects on mature trees could occur.
Special Status/Threatened or Endangered Species		X	None have been observed in the project area, and no designated critical habitat occurs in that area.
Water			
Coastal Zones		X	None present.
Groundwater Quantity, Aquifer Recharge	X		Construction and operation of the project could affect aquifer recharge.
Regional Water Resources Plans		X	The proposed action will not affect the District's Water Management and Conservation Plan and is not included in the analysis.
Surface Water Quality	X		The Modernization Alternative may result in a beneficial effect on surface water quality within the project area (i.e., the D Canal and laterals).
Surface Water Quantity	X		The proposed action would not adversely affect surface water quantity and would only potentially result in increased quantity in the Klamath and Lost Rivers.
Wild and Scenic Rivers		X	The proposed action is not expected to affect reaches of the Klamath River that are designated Wild and Scenic River.
Natural Areas		X	The project area does not cross any natural areas
Wetlands and Riparian Areas			

Resource	Relevant to the proposed action?		Justification
	Yes	No	
Wetlands and Riparian Areas	X		Wetlands and riparian areas could be affected by project construction activities or changes in water levels.
Fish and Wildlife			
Coral Reefs		X	None present.
Endangered Species	X		Waterbodies associated with District operations support populations of native Lost River sucker and shortnose sucker, both of which are federally and state-listed as endangered.
Essential Fish Habitat (EFH)		X	No EFH occurs within the project area or within the project area subwatersheds. Since the project would not adversely affect EFH, consultation under the Magnuson Stevens Act is not expected to be required.
Fish and Fish Habitat	X		The proposed action could affect fish habitat within waterbodies associated with District operations.
General Wildlife and Wildlife Habitat	X		Construction and operation of project components could affect wildlife near District operations.
Ecosystem Services			
Provisioning Services	X		Provisioning services supported by water quantity, quality, and availability could be impacted by the proposed action.
Regulating Services	X		Regulating services supported by water quantity, quality, and availability could be impacted by the proposed action.
Cultural Services	X		Cultural services supported by water quantity, quality, and availability could be impacted by the proposed action.

E.14 List of Persons and Agencies Consulted

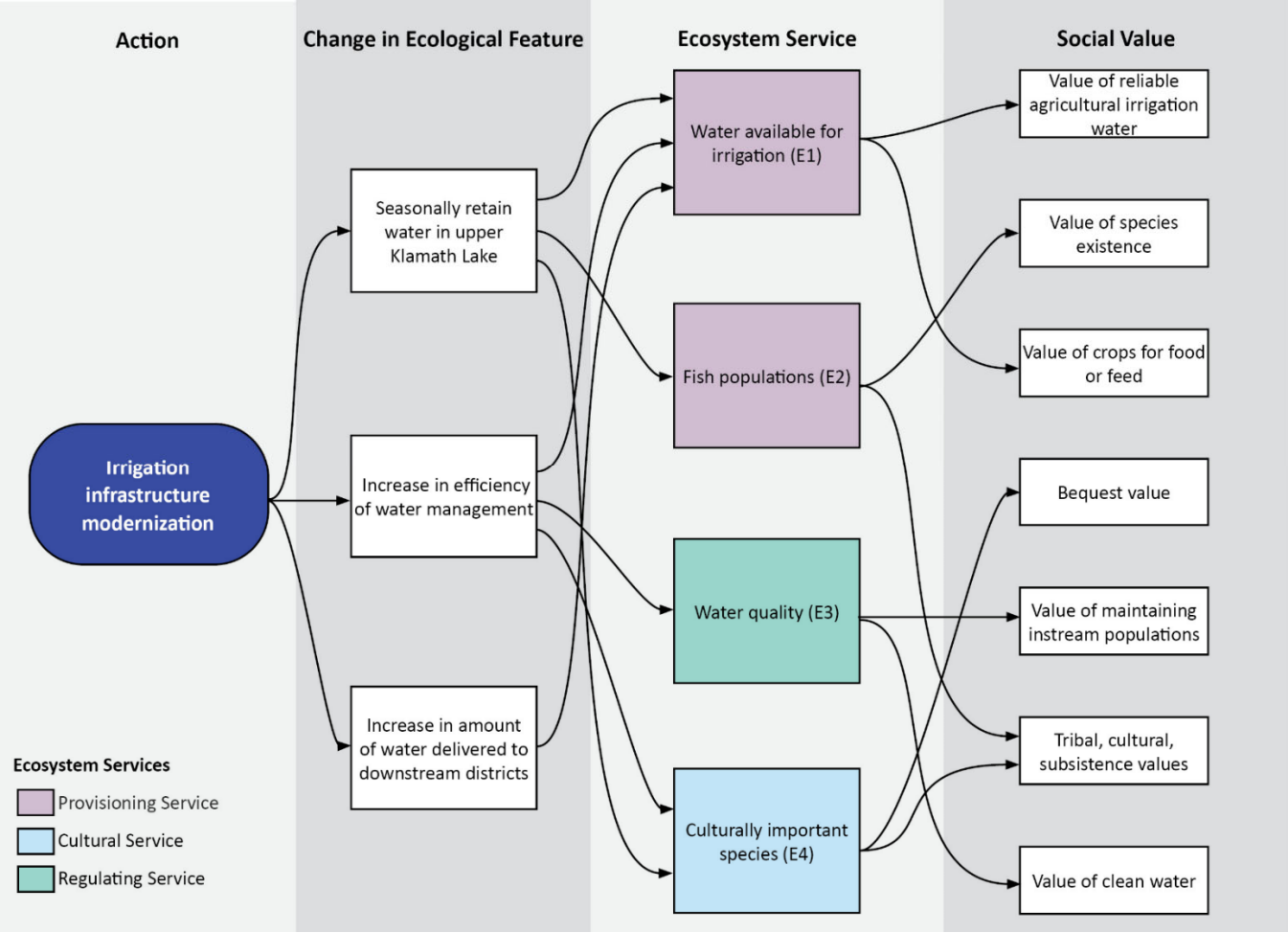
Table E-23. Agency Consultation and Communication Record.

Date	Contact, Agency	Communication
November 7, 2023	Brandon Young, Bureau of Reclamation Anne Timm & Jane Dalgliesh, NRCS-OR Gene Souza, KID	Kick-off agency coordination meeting for the KID Watershed Plan-EA Project. Agencies discussed the proposed actions, reviewed project timelines, and defined roles and responsibilities between NRCS and Reclamation. From this date forward Coordination meetings were held monthly (first Tuesday of each month).
September 28, 2023	Michael Petrozza & Anne Timm, NRCS-OR Brandon Young & Amanda Babcock, Bureau of Reclamation	Met to discuss the cultural permitting process for the KID Watershed Plan-EA Project.
December 11, 2023	Greg Austin, USFWS Jennie Land – USFWS Margie Shaffer – USFWS Robin Snider - USFWS	Held an informal meeting to discuss and collect more information about the Section 7 permitting process for the KID Watershed Plan-EA Project.
March 26, 2024	Jeanne Spaur, Margie Shaffer, Elizabeth Willy, USFWS	Discussed the Northwestern Pond Turtle and its potential nexus with watershed planning activities occurring in the Klamath Basin
November 28, 2023	OR State Historic Preservation Office	Consultation on proposed project and APE
November 28, 2023	Les Anderson, Klamath Tribes Culture and Heritage Dept	Letter sent, Consultation on proposed project and APE
November 28, 2023	Gina McGaughey, Modoc Nation	Letter sent, Consultation on proposed project and APE
December 1, 2023	Anastasia Lee, Bureau of Reclamation	Reclamation designates NRCS as Lead Federal Agency

Date	Contact, Agency	Communication
February 16, 2024	Tahnaya Miller, The Klamath Tribes	Response from The Klamath Tribes to schedule a meeting to discuss KID. This meeting was scheduled for March 12, 2024
March 12, 2024	Tribal Council, The Klamath Tribes	Will Fett, NRCS Tribal Liaison, Damon Brosnan, ASTC-FO, and Gary Diridoni, ASTC-Watersheds met with Chairman Dumont and members of the tribal council of The Klamath Tribes regarding two Irrigation District projects (KDD and KID) in the Klamath Basin
July 30, 2024	The Tribal Council, Klamath Tribes	Will Fett, NRCS Tribal Liaison, sent an email reaching out to The Klamath Tribes for a follow up meeting to discuss updated plans for KID.
September 10, 2024	Tracy Kennedy, Chair, Burns Paiute Tribe	Letter sent, Consultation on proposed project and APE
September 10, 2024	Carla Keene, Chair, Cow Creek Tribe	Letter sent, Consultation on proposed project and APE
September 10, 2024	Jonathan Smith, Sr., Chair, Confederated Tribes of the Warm Springs Reservation of Oregon	Letter sent, Consultation on proposed project and APE
September 10, 2024	Kevin Townsend, Chair, Fort Bidwell Indian Community	Letter sent, Consultation on proposed project and APE
December 5, 2024	Tahnaya Miller, Klamath Tribes	Phone conversation with Tahnaya Miller at the Klamath Tribes requesting another meeting with Tribal Council.
January 6, 2025	Russel Attebery, Chair, Karuk Tribe	Letter, Consultation on proposed project and APE

Date	Contact, Agency	Communication
January 6, 2025	Joe James, Chair, Yurok Tribe	Letter, Consultation on proposed project and APE
April 25, 2025	Russel Attebery, Chair, Karuk Tribe	Letter, Notice of Availability
April 25, 2025	Joe James, Chair, Yurok Tribe	Letter, Notice of Availability
April 25, 2025	Chief Robert Burkybile III, Modoc Nation	Letter, Notice of Availability
June 5, 2025	Russel Attebery, Chair, Karuk Tribe	Email, follow up on April 25 letter
June 5, 2025	Joe James, Chair, Yurok Tribe	Email, follow up on April 25 letter
June 5, 2025	Chief Robert Burkybile III, Modoc Nation	Email, follow up on April 25 letter
July 8, 2025	Russel Attebery, Chair, Karuk Tribe	Email, follow up on April 25 letter
July 8, 2025	Joe James, Chair, Yurok Tribe	Email, follow up on April 25 letter
July 8, 2025	Chief Robert Burkybile III, Modoc Nation	Email, follow up on April 25 letter
July 8, 2025	Ken Sandusky, Modoc Nation	Response from Mr. Sandusky and general comment on irrigation modernization

E.15 Additional Supporting Information for Ecosystem Services



Note: 1) E1 through E5 refer to ecosystem services 1 through 4. These services are referenced and explained in more detail throughout Sections 4 and 6.
2) Ecosystem services concept diagram developed by FCA.

Figure E4-1. Ecosystem Services Concept Diagram for the Klamath Irrigation District Infrastructure Modernization Project