

Swalley Irrigation District Irrigation Modernization Project

Draft Watershed Plan-Environmental Assessment

September 21, 2018

United States Department of Agriculture, Natural Resources Conservation Service – Lead Federal Agency in cooperation with the Deschutes Basin Board of Control and Swalley Irrigation District

Prepared by Farmers Conservation Alliance

Draft Watershed Plan-Environmental Assessment for the Swalley Irrigation District Irrigation Modernization Project

Lead Agency: United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), Oregon

Sponsoring Local Organization (SLO): Deschutes Basin Board of Control (DBBC) (lead sponsor) and Swalley Irrigation District (SID) (co-sponsor).

Authority: This Watershed Plan-Environmental Assessment (Plan-EA) has been prepared under the Authority of the Watershed Protection and Flood Prevention Act of 1954 (Public Law 83-566). The Plan-EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, Public Law 91-190, as amended (42 United States Code [U.S.C.] 43221 et seq.).

Abstract: This document is intended to fulfill requirements of the NEPA and to be considered for authorization of Public Law 83-566 funding of the Swalley Irrigation District Irrigation -Modernization Project (Project). The Project seeks to improve water conservation, water delivery reliability, and public safety for irrigation infrastructure in Oregon's Deschutes Basin. The Project would include converting 16.6 miles of SID's canal and laterals to a buried and pressurized pipeline. Total estimated Project costs are \$14,975,000, of which \$3,744,000 would be paid by the sponsors and other non-federal funding sources. The estimated amount to be paid through NRCS Public Law 83-566 funds is \$11,231,000.

Comments: NRCS has completed this Draft Plan-EA in accordance with the NEPA and NRCS guidelines and standards. Reviewers should provide comments to NRCS during the allotted Draft Plan-EA review period. Comments must be submitted to NRCS during the allotted Draft Public Review Period (within 30 days of the public release of the Draft Plan-EA) and become part of the Administrative Record.

To submit comments, send via U.S. Mail to:

Farmers Conservation Alliance, Attention Swalley Watershed Plan-EA,
11 3rd Street Suite #101
Hood River, OR 97031

Or email: swalleycomments@gmail.com

Non Discrimination Statement: In accordance with federal civil rights law and USDA civil rights regulations and policies, the USDA, its agencies, offices, employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at [How to File a Program Discrimination Complaint](#) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov. USDA is an equal opportunity provider, employer, and lender.

Watershed Agreement
between the
Deschutes Basin Board of Control
(Referred to herein as the lead sponsor)
and the
Swalley Irrigation District
(Referred to herein as the co-sponsor)
and the
U.S. Department of Agriculture,
Natural Resources Conservation Service,
(Referred to herein as NRCS)

Whereas, application has heretofore been made to the Secretary of Agriculture by the sponsor for assistance in preparing a plan for works of improvement for the Swalley Irrigation District Irrigation Modernization Project, State of Oregon, under the authority of the Watershed Protection and Flood Prevention Act, as amended (16 U.S.C. Sections 1001 to 1008, 1010, and 1012); and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, has been assigned by the Secretary of Agriculture to NRCS; and

Whereas, there has been developed through the cooperative efforts of the sponsors and NRCS a watershed project plan and environmental assessment for works of improvement for the Swalley Irrigation District Irrigation Modernization Project, State of Oregon, hereinafter referred to as the watershed project plan or plan, which plan is annexed to and made a part of this agreement.

Now, therefore, in view of the foregoing considerations, the Secretary of Agriculture, through NRCS, and the sponsors hereby agree on this watershed project plan and that the works of improvement for this project will be installed, operated, and maintained in accordance with the terms, conditions, and stipulations provided for in this plan and including the following:

- 1. Term.** The term of this agreement is for the installation period and evaluated life of the project (100 years) and does not commit NRCS to assistance of any kind beyond the end of the evaluated life.
- 2. Costs.** The costs shown in this plan are preliminary estimates. Final costs to be borne by the parties hereto will be the actual costs incurred in the installation of works of improvement.
- 3. Real Property.** The sponsor will acquire such real property as will be needed in connection with the works of improvement. The amounts and percentages of the real property acquisition costs to be borne by the sponsors and NRCS are as shown in the cost-share table in Section 5 hereof.

The sponsor agrees that all land acquired for measures, other than land treatment practices, with financial or credit assistance under this agreement will not be sold or otherwise disposed of for the

evaluated life of the project except to a public agency that will continue to maintain and operate the development in accordance with the operation and maintenance (O&M) agreement.

4. Uniform Relocation Assistance and Real Property Acquisition Policies Act. The sponsors hereby agree to comply with all of the policies and procedures of the Uniform Relocation Assistance and Real Property Acquisition Policies Act (42 U.S.C. Section 4601 et seq. as further implemented through regulations in 49 Code of Federal Regulations [CFR] Part 24 and 7 CFR Part 21) when acquiring real property interests for this federally assisted project. If the sponsor is legally unable to comply with the real property acquisition requirements, it agrees that, before any federal financial assistance is furnished, it will provide a statement to that effect, supported by an opinion of the chief legal officer of the state containing a full discussion of the facts and law involved. This statement may be accepted as constituting compliance.

5. Cost-share for Watershed Project Plans. The following table will be used to show cost-share percentages and amounts for watershed project plan implementation.

Cost-share Table for Watershed Operation or Rehabilitation Projects					
Works of Improvement	NRCS		Sponsor		Total
	Percent	Cost	Percent	Cost	Cost
Cost-Sharable Items^{1/}					
Agricultural Water Management	73%	\$9,540,000	27%	\$3,468,000	\$13,008,000
Sponsors Engineering Costs	75%	\$345,000	25%	\$115,000	\$460,000
Subtotal: Cost-Sharable Costs	73%	\$9,885,000	27%	\$3,583,000	\$13,468,000
Non-Cost-Sharable Items^{2/}					
NRCS Technical Assistance/Engineering	67%	\$268,000	33%	\$134,000	\$402,000
Project Administration ^{3/}	100%	\$1,078,000	0%	\$0	\$1,078,000
Permits	0%	\$0	100%	\$27,000	\$27,000
Subtotal: Non-Cost-Share Costs	89%	\$1,346,000	11%	\$161,000	\$1,507,000
Total:	75%	\$11,231,000	25%	\$3,744,000	\$14,975,000
Installation costs explanatory notes:					
1/ The cost-share rate is the percentage of the average cost of installing the practice in the selected plan for the evaluation unit. During project implementation, the actual cost-share rate must not exceed the rate of assistance for similar practices and measures under existing national programs.					
2/ If actual non-cost-sharable item expenditures vary from these figures, the responsible party will bear the change.					
3/ The sponsors and NRCS will each bear the costs of project administration that each incurs. Sponsor costs for project administration include relocation assistance advisory service.					
4/ The sponsors will acquire with other than Watershed Protection and Flood Prevention Act funds, such real property as will be needed in connection with the works of improvement. The value of real property is eligible as in-kind contributions toward the sponsors' share of the works of improvement costs. In no case will the amount of an in-kind contribution exceed the sponsors' share of the cost for the works of improvement. The maximum cost eligible for in-kind credit is the same as that for cost sharing.					

6. Land Treatment Agreements. The sponsors will obtain agreements from owners of not less than 50 percent of the land above each multiple-purpose and floodwater-retarding structure. These agreements must provide that the owners will carry out farm or ranch conservation plans on their land. The sponsors will ensure that 50 percent of the land upstream of any retention reservoir site is adequately protected before construction of the dam. The sponsors will provide assistance to landowners and operators to ensure the installation of the land treatment measures shown in the watershed project plan. The sponsors will encourage landowners and operators to continue to operate and maintain the land treatment measures after the long-term contracts expire, for the protection and improvement of the watershed.

7. Floodplain Management. Before construction of any project for flood prevention, the sponsors must agree to participate in and comply with applicable federal floodplain management and flood insurance programs. For plans approved as of the date of this revised manual the sponsor is required to have development controls in place below low and significant hazard dams prior to NRCS or the sponsor entering into a construction contract.

8. Water and Mineral Rights. The sponsors will acquire or provide assurance that landowners or resource users have acquired such water, mineral, or other natural resources rights pursuant to state law as may be needed in the installation and operation of the works of improvement.

9. Permits. The sponsors will obtain and bear the cost for all necessary federal, state, and local permits required by law, ordinance, or regulation for installation of the works of improvement.

10. Natural Resources Conservation Service Assistance. This agreement is not a fund-obligating document. Financial and other assistance to be furnished by NRCS in carrying out the plan is contingent upon the fulfillment of applicable laws and regulations and the availability of appropriations for this purpose.

11. Additional Agreements. A separate agreement will be entered into between NRCS and the sponsors before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

12. Amendments. This plan may be amended or revised only by mutual agreement of the parties hereto, except that NRCS may deauthorize or terminate funding at any time it determines that the sponsors have failed to comply with the conditions of this agreement or when the program funding or authority expires. In this case, NRCS must promptly notify the sponsors in writing of the determination and the reasons for the deauthorization of project funding, together with the effective date. Payments made to the sponsors or recoveries by NRCS must be in accordance with the legal rights and liabilities of the parties when project funding has been deauthorized. An amendment to incorporate changes affecting a specific measure may be made by mutual agreement between NRCS and the sponsors having specific responsibilities for the measure involved.

13. Prohibitions. No member of or delegate to Congress, or resident commissioner, may be admitted to any share or part of this plan or to any benefit that may arise therefrom; but this

provision may not be construed to extend to this agreement if made with a corporation for its general benefit.

14. Operation and Maintenance (O&M). The sponsors will be responsible for the operation, maintenance, and any needed replacement of the works of improvement by actually performing the work or arranging for such work, in accordance with an O&M agreement. An O&M agreement will be entered into before federal funds are obligated and will continue for the project life (100 years). Although the sponsors' responsibility to the Federal Government for O&M ends when the O&M agreement expires upon completion of the evaluated life of measures covered by the agreement, the sponsors acknowledge that continued liabilities and responsibilities associated with works of improvement may exist beyond the evaluated life.

15. Emergency Action Plan. Prior to construction, the sponsors must prepare an Emergency Action Plan (EAP) for each dam or similar structure where failure may cause loss of life or as required by state and local regulations. The EAP must meet the minimum content specified in NRCS Title 180, National Operation and Maintenance Manual, Part 500, Subpart F, Section 500.52, and meet applicable state agency dam safety requirements. NRCS will determine that an EAP is prepared prior to the execution of fund obligating documents for construction of the structure. EAPs must be reviewed and updated by the sponsors annually.

16. Nondiscrimination Provisions. In accordance with federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

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By signing this agreement, the recipient assures the USDA that the program or activities provided for under this agreement will be conducted in compliance with all applicable federal civil rights laws, rules, regulations, and policies.

17. Certification Regarding Drug-Free Workplace Requirements (7 CFR Part 3021). By signing this Watershed Agreement, the sponsors are providing the certification set out below. If it is later determined that the sponsors knowingly rendered a false certification, or otherwise violated the requirements of the Drug-Free Workplace Act, NRCS, in addition to any other remedies available to the Federal Government, may take action authorized under the Drug-Free Workplace Act.

Controlled substance means a controlled substance in schedules I through V of the Controlled Substances Act (21 U.S.C. Section 812) and as further defined by regulation (21 CFR Sections 1308.11 through 1308.15);

Conviction means a finding of guilt (including a plea of *nolo contendere*) or imposition of sentence, or both, by any judicial body charged with the responsibility to determine violations of the federal or state criminal drug statutes;

Criminal drug statute means a federal or non-federal criminal statute involving the manufacturing, distribution, dispensing, use, or possession of any controlled substance;

Employee means the employee of a grantee directly engaged in the performance of work under a grant, including (i) all direct charge employees, (ii) all indirect charge employees unless their impact or involvement is insignificant to the performance of the grant, and (iii) temporary personnel and consultants who are directly engaged in the performance of work under the grant and who are on the grantee's payroll. This definition does not include workers not on the payroll of the grantee (e.g., volunteers, even if used to meet a matching requirement, consultants or independent contractors not on the grantees' payroll, or employees of subrecipients or subcontractors in covered workplaces).

Certification:

A. The sponsors certify that they will or will continue to provide a drug-free workplace by—

- (1) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition.
- (2) Establishing an ongoing drug-free awareness program to inform employees about—
 - (a) The danger of drug abuse in the workplace.
 - (b) The grantee's policy of maintaining a drug-free workplace.
 - (c) Any available drug counseling, rehabilitation, and employee assistance programs.
 - (d) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace.

- (3) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (1).
 - (4) Notifying the employee in the statement required by paragraph (1) that, as a condition of employment under the grant, the employee must—
 - (a) Abide by the terms of the statement; and
 - (b) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than 5 calendar days after such conviction.
 - (5) Notifying NRCS in writing, within 10 calendar days after receiving notice under paragraph (4)(b) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every grant officer or other designee on whose grant activity the convicted employee was working, unless the federal agency has designated a central point for the receipt of such notices. Notice must include the identification numbers of each affected grant.
 - (6) Taking one of the following actions, within 30 calendar days of receiving notice under paragraph (4)(b), with respect to any employee who is so convicted—
 - (a) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or
 - (b) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a federal, state, or local health, law enforcement, or other appropriate agency.
 - (7) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (1), (2), (3), (4), (5), and (6).
- B. The sponsors may provide a list of the sites for the performance of work done in connection with a specific project or other agreement.
- C. Agencies will keep the original of all disclosure reports in the official files of the agency.

18. Certification Regarding Lobbying (7 CFR Part 3018).

- A. The sponsors certify to the best of their knowledge and belief, that—
- (1) No federal appropriated funds have been paid or will be paid, by or on behalf of the sponsors, to any person for influencing or attempting to influence an officer or employee of an agency, Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any federal grant, the making of any federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any federal contract, grant, loan, or cooperative agreement.
 - (2) If any funds other than federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this federal contract, grant, loan, or cooperative agreement, the

undersigned must complete and submit Standard Form LLL, “Disclosure Form to Report Lobbying,” in accordance with its instructions.

- (3) The sponsors must require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients must certify and disclose accordingly.

B. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. Section 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

19. Certification Regarding Debarment, Suspension, and Other Responsibility Matters—Primary Covered Transactions (7 CFR Part 3017).

A. The sponsors certify to the best of their knowledge and belief, that they and their principals—

- (1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any federal department or agency;
- (2) Have not within a 3-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state, or local) transaction or contract under a public transaction; violation of federal or state antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- (3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (federal, state, or local) with commission of any of the offenses enumerated in paragraph A(2) of this certification; and
- (4) Have not within a 3-year period preceding this application/proposal had one or more public transactions (federal, state, or local) terminated for cause or default.

B. Where the primary sponsors are unable to certify to any of the statements in this certification, such prospective participant must attach an explanation to this agreement.

20. Clean Air and Water Certification.

(Applicable if this agreement exceeds \$100,000, or a facility to be used has been subject of a conviction under the Clean Air Act (42 U.S.C. Section 7413(c)) or the Federal Water Pollution Control Act (33 U.S.C. Section 1319(c)) and is listed by USEPA, or is not otherwise exempt.)

A. The project sponsoring organizations signatory to this agreement certify as follows:

- (1) Any facility to be utilized in the performance of this proposed agreement is (____), is not (x) listed on the U.S. Environmental Protection Agency List of Violating Facilities.
- (2) To promptly notify NRCS-State administrative officer prior to the signing of this agreement by NRCS, of the receipt of any communication from the Director, Office of Federal

Activities, U.S. Environmental Protection Agency, indicating that any facility which is proposed for use under this agreement is under consideration to be listed on the Environmental Protection Agency List of Violating Facilities.

- (3) To include substantially this certification, including this subparagraph, in every nonexempt subagreement.

B. The project sponsoring organizations signatory to this agreement agree as follows:

- (1) To comply with all the requirements of section 114 of the Clean Air Act as amended (42 U.S.C. Section 7414) and section 308 of the Federal Water Pollution Control Act (33 U.S.C. Section 1318), respectively, relating to inspection, monitoring, entry, reports, and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, issued there under before the signing of this agreement by NRCS.
- (2) That no portion of the work required by this agreement will be performed in facilities listed on the USEPA List of Violating Facilities on the date when this agreement was signed by NRCS unless and until the USEPA eliminates the name of such facility or facilities from such listing.
- (3) To use their best efforts to comply with clean air standards and clean water standards at the facilities in which the agreement is being performed.
- (4) To insert the substance of the provisions of this clause in any nonexempt subagreement.

C. The terms used in this clause have the following meanings:

- (1) The term “Air Act” means the Clean Air Act, as amended (42 U.S.C. Section 7401 et seq.).
- (2) The term “Water Act” means Federal Water Pollution Control Act, as amended (33 U.S.C. Section 1251 et seq.).
- (3) The term “clean air standards” means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted pursuant to the Air Act or Executive Order 11738, an applicable implementation plan as described in section 110 of the Air Act (42 U.S.C. Section 7414) or an approved implementation procedure under section 112 of the Air Act (42 U.S.C. Section 7412).
- (4) The term “clean water standards” means any enforceable limitation, control, condition, prohibition, standards, or other requirement which is promulgated pursuant to the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a state under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. Section 1342), or by a local government to assure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. Section 1317).
- (5) The term “facility” means any building, plant, installation, structure, mine, vessel, or other floating craft, location or site of operations, owned, leased, or supervised by a sponsor, to be utilized in the performance of an agreement or subagreement. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location will be deemed to be a facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are collocated in one geographical area.

21. Assurances and Compliance.

As a condition of the grant or cooperative agreement, the sponsor assures and certifies that it is in compliance with and will comply in the course of the agreement with all applicable laws, regulations, executive orders and other generally applicable requirements, including those set out below which are hereby incorporated in this agreement by reference, and such other statutory provisions as a specifically set forth herein.

State, Local, and Indian Tribal Governments: Office for Management and Budget (OMB) Circular Nos. A-87, A-102, A-129, and A-133; and 7 CFR Parts 3015, 3016, 3017, 3018, 3021, and 3052.

Nonprofit Organizations, Hospitals, Institutions of Higher Learning: OMB Circular Nos. A-110, A-122, A-129, and A-133; and 7 CFR Parts 3015, 3017, 3018, 3019, 3021 and 3052.

22. Examination of Records.

The sponsors must give NRCS or the Comptroller General, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to this agreement, and retain all records related to this agreement for a period of three years after completion of the terms of this agreement in accordance with the applicable OMB Circular.

23. Signatures

DESCHUTES BASIN BOARD OF CONTROL

The signing of this plan was authorized by a resolution by the DBBC governing body and adopted at an official meeting held on

_____, at [_____], Oregon.

By:

Date: _____

Mike Britton, Chairman
Deschutes Basin Board of Control
c/o: DBBC Chair
2024 NW Beech Street
Madras, OR 97741

SWALLEY IRRIGATION DISTRICT

The signing of this plan was authorized by a resolution by the SID governing body and adopted at an official meeting held on

_____, at [_____], Oregon.

By:

Date: _____

Jer Camarata, Manager
Swalley Irrigation District
64672 Cook Avenue, #1
Bend, OR 97703

USDA-NATURAL RESOURCES CONSERVATION SERVICE

Approved by:

Date: _____

Ron Alvarado, State Conservationist
Natural Resources Conservation Service
1201 NE Lloyd Blvd
Suite 900
Portland, OR 97232

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Office of Management and Budget (OMB) Fact Sheet

<p>Summary Watershed Plan-Environmental Assessment Document For Swalley Irrigation District Irrigation Modernization Project Deschutes Junction, Laidlaw Butte-Deschutes River, Overturf Butte-Deschutes River, and Cline Falls-Deschutes River Deschutes County, Oregon Oregon 2nd Congressional District</p>	
Authorization	Public Law 83-566 Stat. 666 as amended (16 U.S.C. Section 1001 et seq.) 1954.
Lead Sponsor	Deschutes Basin Board of Control and Swalley Irrigation District (co-sponsor)
Proposed Action	The Swalley Irrigation District (SID or District) Irrigation Modernization Project is a large agricultural water conveyance efficiency project. The proposed action would pipe and pressurize 16.6 miles of SID’s main canal and laterals.
Purpose and Need	<p>The purpose of this project is to improve water conservation, water delivery reliability, and public safety on 16.6 miles of District-owned canals and laterals.</p> <p>Implementation of the proposed action would meet Public Law 83-566 Authorized Project Purpose, Agricultural Water Management, through irrigation water conservation, water quality improvement, and more reliable agricultural water supply.</p> <p>Federal action is needed to address the following watershed problems and resource concerns: water loss in District conveyance systems, water delivery and operation inefficiencies, instream flow for fish and aquatic habitat, and risks to public safety from open irrigation canals.</p> <p>The proposed action addresses water loss and would provide better managed water diversions for farm use, increased agricultural production, improved streamflow for fish, aquatic, and riparian habitat, and increased public safety. These measures would serve to stretch the supply of water by increasing the reliability and efficiency of water delivered for irrigation while permanently reducing the amount of water diverted, and legally protecting saved water instream.</p>
Description of the Preferred Alternative	Under the Preferred Alternative, 16.6 miles of the SID system (6.5 miles of main canal and 10.1 miles of laterals) would be converted to high-density polyethylene (HDPE) gravity and pump pressurized buried pipe.
Project Measures	Under the Preferred Alternative, project sponsors would replace canals and laterals with HDPE pipe and 178 turnouts would be upgraded to pressurized delivery systems. Additionally, a 400-horsepower booster pump and associated pump house would be installed to pressurize water for patrons downstream of the existing hydroelectric plant. Construction of the Preferred Alternative would occur in two project groups over the course of 7 years.

Resource Information			
Subwatersheds	12-digit Hydrologic Unit Code	Latitude and Longitude	Subwatershed Size
Deschutes Junction	170703010801	44.367777, -121.404444	47,337 acres
Laidlaw Butte-Deschutes River	170703010802	44.151316, -121.329905	42,749 acres
Overturf Butte-Deschutes River	170703010406	44.027097, -121.367571	31,374 acres
Cline Falls-Deschutes River	170703010803	44.298611, -121.271666	11,864 acres
Subwatershed Total Size	133,324 acres		
Swalley Irrigation District Size	16,285 acres		
Climate and Topography	The Project is located in the rain shadow of the Cascade Mountain range. SID's annual average precipitation is 10-14 inches. The average high temperature for July is 82 degrees Fahrenheit and average low temperature for December is 23 degrees Fahrenheit. The land within SID is slightly undulating with an average elevation of 3,300 feet above mean sea level.		
Land Use Swalley Irrigation District (total 16,285 acres)	Use	Acres	
	Agriculture	3,745	
	Developed	5,114	
	Undeveloped	7,426	
Land Ownership Swalley Irrigation District (total 16,285 acres)	Owner	Percentage	
	Private	91% (14,805 acres)	
	State-Local	8% (1,240 acres)	
	Federal	1% (240 acres)	
Population and Demographics	The Preferred Alternative would occur within Deschutes County, Oregon. In 2015, the population of Deschutes County was 166,622, or 56 people per square mile. The population growth rate of the county between 2005 and 2015 was 14 percent. The population of the State of Oregon grew by about 8 percent in the same time period.		
Population and Demographics		Deschutes County	Oregon
	Population 2015	166,622	3,939,233
	Unemployment Rate	3.2%	3.7%
	Median Household Income	\$51,223	\$51,243

<p>Relevant Resource Concerns</p>	<p>Resource concerns identified through scoping are water conservation and quality, groundwater, aquatic and fish resources, soil and geologic resources, visual resources, cultural resources, recreation, socioeconomics, wetlands, terrestrial wildlife, and vegetation resources.</p>
<p>Alternatives</p>	
<p>Alternatives Considered</p>	<p>Twelve alternatives were considered; ten were eliminated from full analysis due to inconsistency with the purpose and need for action, inconsistency with PL 83-566 requirements, or due to cost, logistics, existing technology, social, or environmental reasons. The No Action Alternative and HDPE Piping Alternative were analyzed in full.</p>
<p>No Action Alternative</p>	<p>Under the No Action Alternative, construction activities associated with the project would not occur and SID would continue to operate and maintain its existing canals and pipe system in their current condition. The need for the project would still exist; and the District would only be able to modernize its infrastructure on a project-by-project basis if public funding became available. This funding is not reasonably certain to be available under a project-by-project approach at a scale large enough to fully modernize the District’s infrastructure.</p>
<p>Proposed Action</p>	<p>One action alternative was studied in more detail. Under the HDPE Piping Alternative, SID would modernize 16.6 miles of their system. The District would replace 6.5 miles of canals and 10.1 miles of laterals with gravity and pump pressurized HDPE buried pipe. The HDPE Piping Alternative has been identified as the National Economic Development (NED) plan and is also the Preferred Alternative.</p>
<p>Mitigation, Minimization, and Avoidance Measures</p>	<p>Land that could provide seasonal wetland characteristics along 16.6 miles of open canals and laterals would be converted to upland vegetation. Project canals and laterals are not considered jurisdictional wetlands by state or federal agencies. The wetland characteristics that could occur in the open canals and laterals have low function, and the loss would be offset by gains in water quantity and habitat function in the project area’s natural riverine systems. The National Wetland Inventory (NWI) geographic information systems data identifies approximately 65.6 acres of wetland features classified as either “PUSC_x (Palustrine, Unconsolidated Shore, Seasonally Flooded, and excavated by humans)” and “R4SBC_x (Riverine, Intermittent, Streambed Seasonally, and excavated by humans)” within and adjacent to canals and laterals that would be affected by the project (USFWS 2016). These have not been field verified. Wetland determinations and/or delineations would be conducted adjacent to canals in areas where work would occur prior to implementation of construction of each project group, and if present, wetlands would be avoided to the extent practicable.</p> <p>Consultation between the District, NRCS, and the Oregon State Historic Preservation Office (SHPO) for compliance with Section 106 of the National Historic Preservation Act (NHPA) has occurred and is ongoing. A Memorandum of Agreement (MOA) between SID and SHPO was drafted in 2007 and amended in 2018 for additional piping. The amendment stipulates new mitigation measures to be completed within one year of piping the last 4.5 miles of the Main Canal. These include erecting five interpretive signs along the original Main Canal, creating a “Historical Records” section on the District</p>

	<p>website, and displaying a historic wood stave pipe and sign in front of the District office.</p> <p>For all project groups, ground disturbances would be limited to only those areas necessary and within rights-of-way (ROWs) to minimize effects to soil, vegetation, wildlife, wetlands, visual resources, recreation, and land use. Confining construction activities to existing ROWs would largely limit effects to lands currently used for agricultural infrastructure. Where roads or access routes do not currently allow construction access, temporary access routes would be selected in a manner to minimize erosion and effects on vegetation and avoid the removal of trees. Stormwater best management practices would be employed during and after construction, and construction schedules would be determined to minimize disturbance to wildlife and the public. After construction, disturbed areas would be graded and replanted with a mix of native grasses and forbs to reduce the risk of erosion and spread of noxious weeds.</p>					
Project costs	PL 83-566 funds		Other funds		Total	
Construction	\$9,540,000	73%	\$3,468,000	27%	\$13,008,000	(100%)
Engineering	\$345,000	75%	\$115,000	25%	\$460,000	(100%)
SUBTOTAL COSTS	\$9,885,000	73%	\$3,583,000	27%	\$13,468,000	(100%)
Technical assistance	\$1,078,000	100%	\$0	0%	\$1,078,000	(100%)
Relocation	Not applicable					
Real property rights	Not applicable					
Project administration	\$268,000	67%	\$134,000	33%	\$402,000	(100%)
Permitting	\$0	0%	\$27,000	100%	\$27,000	(100%)
Annual O&M	Not applicable					
TOTAL COSTS	\$11,231,000	75%	\$3,744,000	25%	\$14,975,000	(100%)
Project Benefits						
Project Benefits	Implementation of the Preferred Alternative would improve water delivery reliability for SID's patrons, conserve up to 6,172 acre-feet of water annually for instream and agricultural use, reduce SID's operation and maintenance costs, reduce electricity costs from pumping, and improve public safety.					
Number of Direct Beneficiaries	SID serves 668 patrons, who would directly benefit from the project.					
Other Beneficial Effects-Physical Terms	Implementation of the Preferred Alternative would have minor to moderate, long-term, beneficial effects to agricultural water availability, water quantity, and fish and wildlife habitat.					
Damage Reduction Benefits	Project Group*					
	1			2		
Other - Reduced O&M	\$5,000			\$5,000		

Other – Patron Pumping Cost Savings	\$171,000	\$239,000
Other - Social Value of Carbon (Avoided Carbon Emissions)	\$19,000	\$17,000
Water Conservation	\$125,000	\$190,000
Total Quantified Benefits	\$320,000	\$451,000
Benefit to Cost Ratio	1.86	1.36

*Project Group refers to groupings of canals and laterals that would undergo construction during the same period. Canals and laterals under each project group are as follows:
¹ Rogers, Rogers Sublateral, Elder, Riley, Riley Sublateral
² Mickelson, Butte, Main Canal, Main Canal Pump Station

Installation Period (years)	3	4
Project Life	100 years for each project group.	

Funding Schedule

Year--- Project Group	PL 83-566	Other Funds	Total
2019-2021 1	\$3,929,000	\$1,217,000	\$5,146,000
2022-2025 2	\$7,302,000	\$2,527,000	\$9,829,000

Environmental Effects

In portions of the project area where canals are considered historic features under Section 106 of the NHPA, conversion of the canals would be mitigated through implementation of measures described in the 2018 Amendment to the MOA. Surveys for archaeological and historical resources have been completed for the Rogers Lateral, and no National Register-eligible resources were found. Effects to below-ground archaeological resources are not anticipated, as surveys for the Rogers Lateral found no archaeological resources. As there would be no known effects to below-ground cultural resources, and changes to the Main Canal would be mitigated, effects to cultural resources would be limited to moderate for each project group.

Effects to fish and aquatic species would result from the application of legal and permanent protection to conserved water in the Deschutes River downstream of the North Canal Diversion Dam. Two federally listed threatened species may occur in the area potentially affected by the project: bull trout and steelhead. There would be no effect from the Preferred Alternative on bull trout or steelhead due to the timing of increased streamflow resulting from project actions and the location of bull trout and steelhead populations being at the very downstream end of where effects could be detectable. Additionally, there would be no effects to the identified primary constituent elements (PCE's) of critical habitat for bull trout and steelhead therefore no effect to bull trout and steelhead designated critical habitat would occur. Overall, the presence (and legal protection) of conserved water from the Preferred Alternative would serve to benefit fish and aquatic species and their habitat, thus the effects of the project on all fish and aquatic species would be minor and beneficial in the long term.

The Preferred Alternative would result in a total of approximately 46,000 cubic yards of soil disturbance during the 7-year construction period. Soil disturbances would be minor, as these effects would be short-term and localized to small portions of the larger project area over the 7-year construction period. Effects would be further minimized through implementation of soil stabilization measures during construction and re-vegetating disturbed areas after construction.

The Preferred Alternative would have no effect on land use adjacent to the project area, as property ownership and existing use of land would not change. It is anticipated that the Preferred Alternative would encourage and promote agricultural sustainability in the watershed through improved irrigation water reliability. There would be negligible to minor effects within the project area and SID's ROW due to potential short-term interruptions to access and use during construction. Installation of piping and the pump house would be consistent with the existing ROW.

As the Preferred Alternative would eliminate drowning risk from open canals, the project would have minor, long-term effects on public safety; these effects would be entirely beneficial.

Effects to recreation from the Preferred Alternative would be minor in the short-term, as construction may temporarily preclude or limit recreational opportunities during project construction. After construction, effects to both river- and land-based recreation would be negligible as the project would create visual and water level changes but would not change the quality of the recreational experience in a quantifiable way.

Of the 16,285 acres within SID, construction of the Preferred Alternative would disturb a total of approximately 47 acres of vegetation. Since the project would be completed over a 7-year construction period, only a portion of these effects would be evident at any one time. Long-term vegetation changes would occur over less than half of 1 percent of the District. Further, mitigation measures such as seeding all exposed areas with native grasses and forbs would be implemented. At project completion, about 11 acres of previously open canals and laterals would be converted to upland vegetation over the buried pipes. Since effects on vegetation would be localized and occur over a relatively small area, and all disturbed vegetated areas would be revegetated, effects on vegetation would be minor.

Overall, the visual change from canal to buried pipe would be expected to have a minor effect because there would be short-term visual changes during construction, and the long-term effect would be a vegetated corridor that would blend in with the natural landscape following revegetation.

Effects on surface water hydrology would be minor to moderate and entirely beneficial in the reaches of the Deschutes River affected by SID operations, downstream from North Canal Diversion Dam (River Mile [RM] 164.8) to Lake Billy Chinook (RM 120). Following the Preferred Alternative, effects to surface water quality would be negligible to minor but entirely beneficial in the river reach affected by SID operations. Effects to groundwater realized from the piped canals would be minor because there would be small, localized changes to average groundwater elevations.

Effects to wetlands, floodplains, and riparian areas would be minor, as there are no natural wetland features in the canals or laterals and riparian and wetland areas downstream of the project would benefit from the protection and addition of instream flows.

Effects to terrestrial wildlife would be minor because there would be small, localized changes in wildlife populations and their habitats due to construction disturbance; however, these changes would be limited due to an abundance of species and their habitats in the area. As the project would be constructed over a 7-year period, terrestrial wildlife would have ample time to adjust and find new water sources and habitats as open canals are converted to buried pipe.

There would be no effects from the Preferred Alternative on the Wild and Scenic River or State Scenic Waterways designation, or the free-flowing condition of the designated reaches downstream from SID's diversion at the North Canal Diversion Dam (RM 164.8) to Lake Billy Chinook (RM 120). However, the Preferred Alternative would have negligible effects on some of the qualities that support these designations, specifically, any effect of increased streamflow would be an enhancement to fish, recreation, scenery, wildlife, hydrological, and botanical/ecological values.

Major Conclusions	Implementation of the Preferred Alternative would improve reliability of water delivery for farmers, reduce water loss to seepage and evaporation in District infrastructure, enhance fish and aquatic habitat through greater instream flows, and improve public safety while supporting agriculture and improving the environmental quality of the Deschutes River.
Areas of Controversy	There have been no areas of controversy identified.
Issues to be Resolved	None
Evidence of Unusual Congressional or Local Interest	Comments on the Preliminary Investigative Report were received from one state representative (Knut Buehler, District 54), one state agency (Oregon Department of Environmental Quality), two federal agencies (U.S. Fish and Wildlife Service and USDA Forest Service Deschutes National Forest), local non-governmental organizations, and individuals.
Compliance	Is this report in compliance with executive orders, public laws, and other statutes governing the formulation of water resource projects? Yes <u> X </u> No _____

1 Introduction

Aging infrastructure, growing populations, shifting rural economies, and changing climate conditions have increased pressure on water resources across the western United States (U.S.). Irrigated agriculture is the primary out-of-stream water use in Oregon’s Deschutes Basin and relies on mainly 100-year-old infrastructure to divert, store, and deliver water to farms and ranches across the region. In recent years, improving water resource management has been a community focus within the Deschutes Basin and a coordinated focus of the eight irrigation districts within the basin (Figure 1-1).

Due to the basin-wide need for improved water management, the Swalley Irrigation District (herein referred to as SID or the District) has been pursuing water conservation strategies including the development of several water conservation projects that have permanently returned approximately 43 cubic feet per second (cfs) of water to the Deschutes River (J. Camarata, personal communication, August 22, 2018). Although some improvements have been made, aging and outdated infrastructure contributes to water delivery insecurity for out-of-stream users and limits streamflow, which affects water quality and aquatic habitat along the Deschutes River and its tributaries. Irrigation canals and laterals in the District have become more of a public safety risk as the surrounding area has urbanized. Aging infrastructure also affects the financial stability of SID and its patrons, as the District must find new approaches to fund growing maintenance needs that are not accommodated in standard annual budgets.

The District is located in Central Oregon, in the northern half of Deschutes County, north of the City of Bend and east of the Deschutes River. The entire District is 16,285 acres; within that area, 4,333 acres are currently irrigated by 668 patrons (SID 2017). The District is about 14 miles long (north to south) and 4 miles wide (east to west). The District operates and maintains 28.1 miles of canals and laterals; of these, approximately 12.8 miles are piped and the rest are unlined, open channels dug into volcanic soils. Approximately 23 percent of the water diverted through SID’s canals and laterals¹ currently seeps into the area’s porous, volcanic soil or evaporates prior to reaching farms (SID 2017). The District has a higher diversion rate than their on-farm delivery rate to account for the loss in the distribution system. If the distribution system were more efficient, the District would divert less water and leave more water in the Deschutes River and its tributaries. Patrons would continue receiving their allocated water rights, supporting local agriculture and the local economy. Modernizing irrigation infrastructure offers an opportunity to conserve water, increase water delivery reliability to farms, enhance streamflow and habitat conditions for fish and aquatic species in the Deschutes Basin, reduce risks to public safety from open irrigation canals, reduce operation and maintenance (O&M) costs for the District, and reduce O&M for farmers through decreased pumping.

The Deschutes Basin Board of Control (DBBC) is the lead sponsor for the SID Irrigation Modernization Project (herein referred to as the project or proposed action), which would improve water conservation, water delivery reliability, and public safety for District-owned canals and laterals. The proposed action would pipe and pressurize up to 16.6 miles of canals and laterals in order to

¹ “Laterals” are smaller canals that branch off from main canals.

save up to 6,172 acre-feet of water annually (see Table 5-2 in Section 5.2.3 for further information on increases to cfs). Specific details regarding the District’s proposed action are further described in this document and in the System Improvement Plan (SIP) (SID 2017).

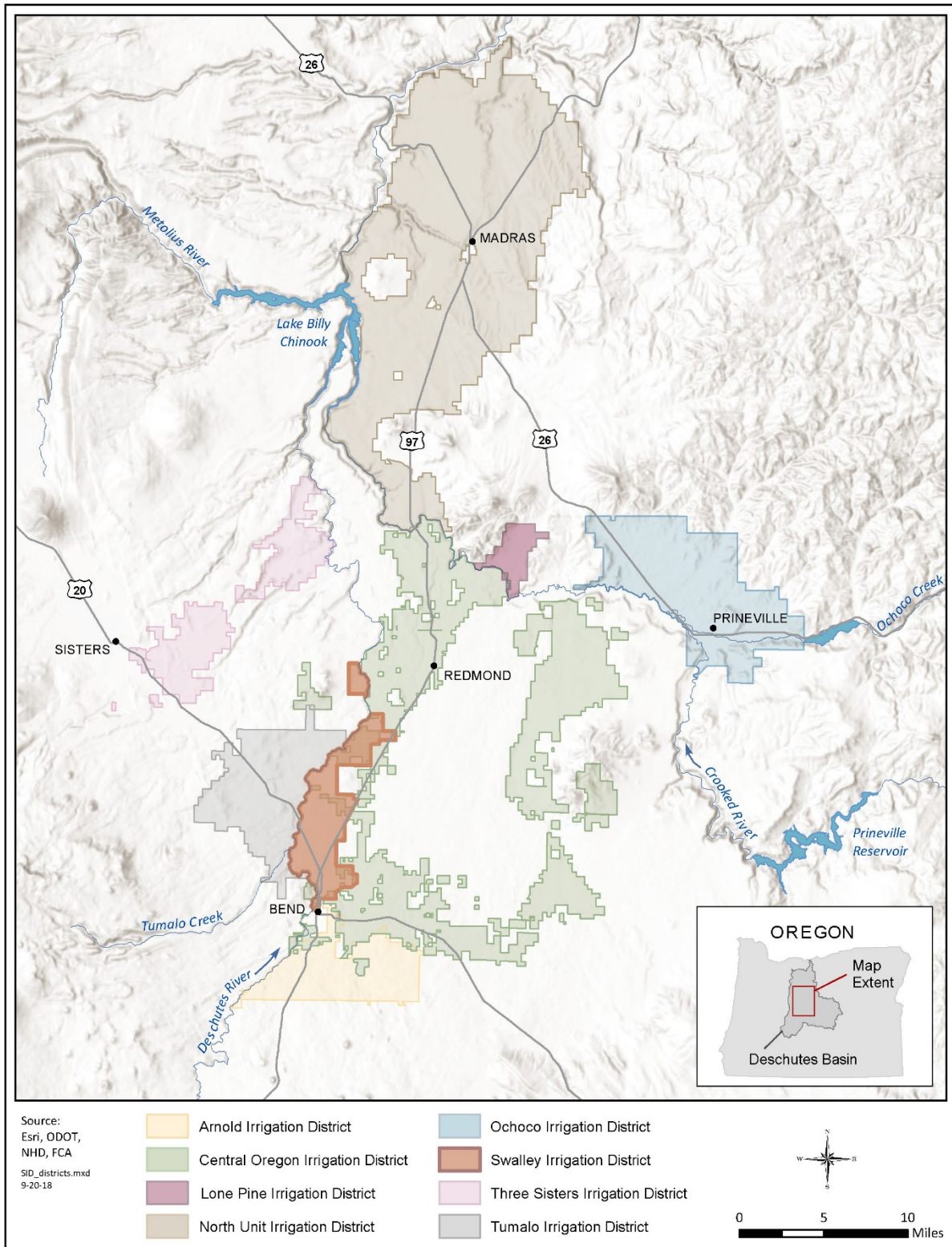


Figure 1-1. Irrigation districts within the Deschutes Basin.

1.1 Watershed Planning Area

The District’s service area and the project are located in four subwatersheds: Deschutes Junction, Laidlaw Butte-Deschutes River, Overturf Butte-Deschutes River, and Cline Falls-Deschutes River (Figure 1-2 and Table 1-1), which total 133,324 acres. These four subwatersheds comprise the SID Watershed Planning Area. They are located within the Upper Deschutes watershed (Hydrologic Unit Code 17070301). Within the Upper Deschutes watershed, portions of the Deschutes River are often called the upper Deschutes River (from River Mile [RM] 226 to RM 164.8) and the middle Deschutes River (from RM 164.8 to RM 120). RM 164.8 divides the river based on its hydrograph, which is influenced by reservoir operations in the river’s upper reaches and irrigation diversions in the river’s middle reaches. Current reservoir management in the upper Deschutes River leads to low winter flows and high summer flows in the upper Deschutes River. Six irrigation districts divert water from the Deschutes River at the City of Bend during the spring, summer, and fall, leading to lower flows in the middle Deschutes River.

Table 1-1 Swalley Irrigation District Watershed Planning Area.

Name	12-Digit Hydrologic Unit Code	Area (acres)
Deschutes Junction	170703010801	47,337
Laidlaw Butte-Deschutes River	170703010802	42,749
Overturf Butte-Deschutes River	170703010406	31,374
Cline Falls-Deschutes River	170703010803	11,864
Total		133,324

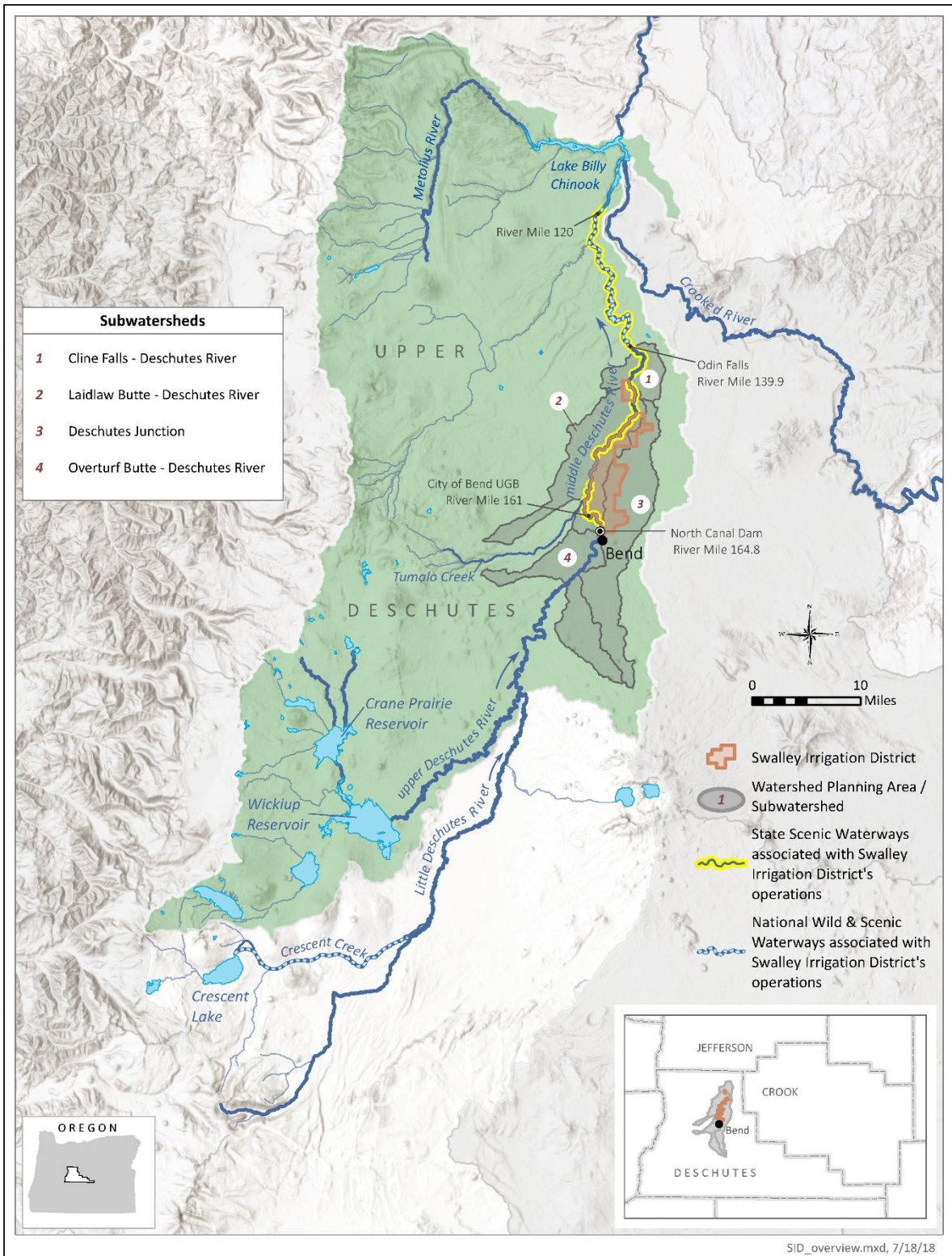


Figure 1-2. The four subwatersheds comprising the Swalley Irrigation District Watershed Planning Area.

1.2 Project Area

The area where construction activities would occur to pipe and pressurize up to 16.6 miles of the District's canals and laterals is referred to as the project area. All construction activities would occur entirely within the District's existing rights-of-way (ROWs), which were granted under the Carey Desert Land Act of 1894 (Carey Act) (Figure 1-3). The District's ROW under the Carey Act extends 50 feet on each side of the canal from the toe of the bank for a total easement width of 100 feet plus the width of the canal.

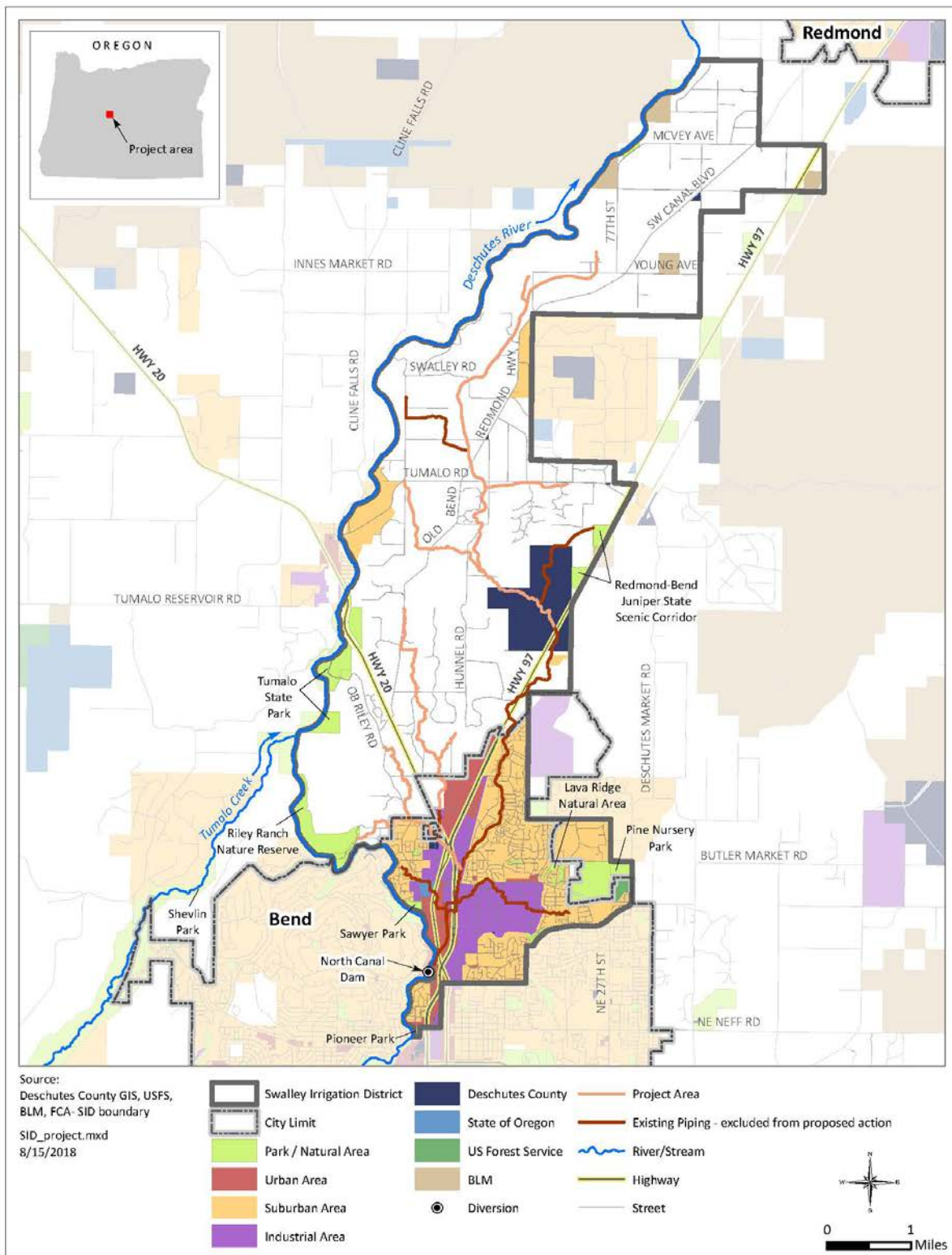


Figure 1-3. Location of the Swalley Irrigation District Irrigation Modernization project area.

1.3 Current Infrastructure

The District cooperatively operates a shared intake structure with North Unit Irrigation District (NUID) and Central Oregon Irrigation District (COID) at the North Canal Dam (RM 164.8) on the Deschutes River (Figure 1-4). Flows diverted to the shared intake structure split into the NUID Primary Feed Canal, the COID Pilot Butte Canal, and SID's Main Canal after passing through an automated fish screen and vertical slide gate (Figure 1-5). The District has a live flow water right on the Deschutes River with a priority date of 1899. During peak irrigation season between May 15 and September 14, the District may divert up to 82.079 cfs of water from the Deschutes River. The District does not have stored water rights.

The District's 28.1-mile system includes approximately 12.8 miles of existing pipe and 15.3 miles of open canal and laterals.² Water enters the Main Canal at the North Canal Dam diversion and flows into a vaulted segment of steel pipe where it is metered. The Main Canal then transitions into a high-density polyethylene (HDPE) pipe for approximately 5.1 miles. The diameter of the Main Canal pipe ranges from 54 to 48 inches, reducing in size as deliveries and laterals withdraw water from the system. Water in the pipe flows north until it reaches the District's 0.75-megawatt Ponderosa Hydroelectric Power Plant. Construction of the hydroelectric facility was completed in 2010, and it generates an average of 2,282 megawatt-hours of power annually.

After water passes through the hydroelectric facility, it continues in the Main Canal, which is open and unlined for the remaining 7 miles to the northern terminus. Several laterals branching from both the piped and open portions of the Main Canal have been piped, including portions of the NC-1 Lateral, Kotzman Lateral, Rogers Lateral, Deschutes Lateral, and Frakes Lateral. Laterals that remain open and unlined are the Riley Lateral and Sublateral, Rogers Lateral and Sublateral, Elder Lateral, Butte Lateral, and Mickelson Lateral.

The elevation in the District drops approximately 400 feet between the diversion and the northern limit of the District. Patron turnouts from the Main Canal and laterals are gate-regulated and weir-measured by SID field staff. Also, the District monitors and meters several single-farm diversions on the Deschutes River that irrigate a total of 328 acres.

The District's distribution system does not discharge to any natural waterbodies. Due to the age of the District's distribution system and porous nature of the underlying soils, the District's system loses approximately 19.2 cfs of water to seepage and evaporation. This loss is approximately 23 percent of the maximum amount of water diverted by the District, and it is water that never reaches the farm. Water loss associated with specific canals and laterals is detailed in the SIP (Appendix D).

² Depending on the alternative selected for the project, up to 16.6 miles of SID's system would be piped, which could include updating 1.3 miles of existing pipe with pressure-rated pipe.



Figure 1-4. North Canal Dam on the Deschutes River (RM 164.8) where Swalley Irrigation District shares an intake structure with Central Oregon and North Unit Irrigation Districts.



Figure 1-5. The Swalley Irrigation District, Central Oregon Irrigation District, and North Unit Irrigation District fish screen at the North Canal Dam on the Deschutes River (RM 164.8).

1.4 Decision Framework

This Draft Watershed Plan-Environmental Assessment (Plan-EA) has been prepared to assess and disclose the potential effects of the proposed action. The Plan-EA is required to request federal funding through the Watershed Protection and Flood Prevention Program, Public Law 83-566, authorized by Congress in 1954 (herein referred to as PL 83-566). This program is managed by the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS). Through this program, NRCS provides technical and financial assistance to project sponsors such as states, local governments, and tribes to plan and implement authorized watershed project plans for watershed protection; flood mitigation; water quality improvements; soil erosion reduction; rural, municipal, and industrial water supply; irrigation; water management; sediment control; fish and wildlife enhancement; and hydropower. NRCS is the lead federal agency for this Plan-EA and is responsible for review and issuance of a decision in accordance with the National Environmental Policy Act (NEPA).

NEPA requires that Environmental Impact Statements (EISs) are completed for projects using federal funds that significantly affect the quality of the human and natural environment (individually or cumulatively). When a proposed project is not likely to result in significant impacts requiring an EIS, but the activity has not been categorically excluded from NEPA, an agency can prepare an EA to assist them in determining whether an EIS is needed (see 40 Code of Federal Regulations [CFR] 1501.4 and 1508.9; 7 CFR 650.8).

For purposes of NEPA compliance, the intent of this Plan-EA is to provide a programmatic platform for the implementation of the proposed action. DBBC and SID are partnered with NRCS to implement the Irrigation Modernization Project within SID's Watershed Planning Area under the watershed authority of the PL 83-566 program.

Tiering is a staged approach to NEPA as described in the Council on Environmental Quality's Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500 to 1508). Broad programs and issues are described in initial analyses, while site-specific proposals and impacts are described in subsequent site-specific studies. The tiered process permits the lead agency to focus on issues that are ripe for decision, and exclude from consideration issues already decided or not yet ripe. Tiering eliminates repetitive discussions of the same issues across site specific project groups through incorporation by reference of the general discussions.

NRCS has determined the need for a Plan-EA to implement the proposed action under PL 83-566 watershed authority. Due to the broad spatial scale of this analysis, and the multi-year project group approach, this Plan-EA does not identify the specific details associated with the engineering design and construction activities that would be required to implement the proposed action. Instead, this document intends to present an analysis in sufficient detail to allow implementation of a proposed action within the designated project area with minimal additional NEPA analysis.

The proposed action would be completed in two project groups.³ Consistent with the tiering process as described above, before implementing each site specific project, an onsite Environmental Evaluation (EE) review would occur using Form NRCS-CPA-52, Environmental Evaluation Worksheet. The EE process would determine if that particular individual site project meets applicable project specifications, and whether the site-specific environmental effects are consistent with those as described and developed in this Plan-EA. This process provides information for the Responsible Federal Official to determine if the proposed action has been adequately analyzed, and if the conditions and environmental effects described in the Plan-EA are still valid. Where the impacts of the narrower project-specific action are adequately identified and analyzed in the broader NEPA document, no further analysis would occur and the Plan-EA would be used for purposes of the pending action.

If it is determined that the Plan-EA is not sufficiently comprehensive, is not adequate to support further decisions, or if resource concerns or effects have not been adequately evaluated through the programmatic approach, a separate site-specific supplemental EA would be prepared.

This Plan-EA has been prepared in accordance with applicable Council on Environmental Quality's regulations for implementing NEPA (40 CFR 1500–1508), USDA's NEPA regulations (7 CFR Part 650), NRCS Title 190 General Manual Part 410, and NRCS' National Environmental Compliance Handbook Title 190 Part 610 (May 2016). The Plan-EA also meets the NRCS program policy of the 2015 NRCS National Watershed Program Manual (NWPM) and guidance of the 2014 NRCS National Watershed Program Handbook. This Plan-EA serves to fulfill the NEPA and NRCS environmental review requirements for the proposed action.

³ "Project group" refers to groupings of canals and laterals that would undergo construction during the same period. The project groups identified in the SIP are not identical to the project groups identified in the Plan-EA.

2 Purpose and Need for Action

The purpose of this project is to improve water conservation, water delivery reliability, and public safety on up to 16.6 miles of District-owned canals and laterals.

Federal action is needed in addressing the following watershed problems and resource concerns: water loss in District conveyance systems, water delivery and operations inefficiencies, instream flow for fish and aquatic habitat, and risks to public safety from open irrigation canals. The District has begun to address these concerns as funding opportunities have allowed. These funding opportunities are not reasonably certain to occur if the District continues to follow their current approach. Federal action would enable the District to follow a strategic, comprehensive approach to securing additional funding and addressing these issues, which are discussed below in more depth.

2.1 Watershed Problems and Resource Concerns

2.1.1 Water Loss in District Conveyance Systems

Conserving water is a key goal of the District; it has already invested in multiple large piping projects and used the State of Oregon's Allocation of Conserved Water Program to protect the water conserved instream. Currently, the District's remaining antiquated canal infrastructure loses approximately 19.2 cfs, or 6,172 acre-feet annually, of water to seepage through the porous underlying soils, evaporation, and other conveyance inefficiencies. This loss is approximately 23 percent of the maximum amount of water diverted by the District (82.079 cfs) and is water that never reaches farms. If the District's distribution system did not lose so much water to seepage and evaporation, less would need to be diverted and more water could remain instream. Details on water losses and demands can be found in the District's SIP (SID 2017; Appendix D).

2.1.2 Water Delivery and Operations Inefficiencies

In addition to seepage and evaporation losses, it can take days to recharge open canals and laterals after the District reduces its diversions, further affecting the reliability of water deliveries for patrons. When the District increases its diversion rate again to increase the water level in the canal, the ends of the District's laterals remain dry as the system recharges. During these periods, the District cannot always fully meet its obligations to deliver water to its patrons due to conveyance inefficiencies. The District's canals and laterals do not transport and deliver water as precisely, accurately, or efficiently as a modernized system would.

The District's antiquated canal and laterals make it difficult to deliver the correct amount of water to patrons at the correct time, particularly early and late in the irrigation season. During these periods, the District's water rights require it to divert water at a reduced rate. At these reduced flow rates, the canals and laterals are more sensitive to small changes in streamflow at the diversion or deliveries at each point of delivery. The reduced flow rates in the open canal and laterals make it much more challenging for the District to deliver the sufficient amount of water that patrons need when they need it. For example, a point of delivery near the end of a lateral may receive no water in the morning and excess water in the evening. The District also has to pass excess water, known as carry water, to ensure that adequate water reaches all points-of-delivery when required by patrons according to their water rights. When the patrons' demand subsides, this excess water is spilled onto

non-productive lands at the ends of the conveyance system; the water does not return instream. This excess water is another example of the inefficiencies in the current conveyance system.

Operating and maintaining the District’s open canals and laterals requires staff to clean ditches and canals, clean debris from trash racks, and adjust flows to patrons. The District now serves small-sized parcels through a canal and lateral system originally designed for larger parcels. Approximately 28 percent of SID’s accounts are now 5-acre or smaller parcels. District staff invest proportionally more time to manage water delivery for these smaller-sized parcels than they would for larger parcels; smaller deliveries on an unpressurized canal and lateral system are more sensitive to fluctuations in system operations caused by changes in streamflow, diversion amounts, or other patron deliveries.

2.1.3 Instream Flow for Fish and Aquatic Habitat

The Deschutes River and its tributaries experience low streamflow every year due to the storage and diversion of water for agricultural use. Resource agencies have identified streamflow as a primary concern in the Deschutes River (Upper Deschutes Watershed Council [UDWC] 2014). Reservoir operations lead to low winter streamflow and high summer streamflow in the upper Deschutes River upstream from SID’s diversion. The combined diversions of the seven major irrigation districts and the cities that divert water in or near the City of Bend lead to low spring, summer, and fall streamflow in the middle Deschutes River, downstream of SID’s diversion.

The Deschutes River and its tributaries support sensitive species, including the Oregon spotted frog, bull trout, steelhead trout, redband trout, Chinook salmon, as well as many other fish, bird, and wildlife species. Major efforts have been made to restore anadromous fish⁴ passage around and through the series of dams that make up the Pelton Round Butte Hydroelectric Project and into Lake Billy Chinook where anadromous fish can continue upstream to spawn (ODFW 2003). Despite these efforts, low streamflow in the Deschutes River and its tributaries limit habitat for many of these species. Reduced habitat associated with low streamflow increases competition among populations, which often favors non-native brown trout over native redband trout and can concentrate fish populations and increase susceptibility to predators and disease.

The Deschutes River is listed as an impaired waterway under Section 303(d) of the Clean Water Act (CWA) because it does not meet one or more of the State of Oregon’s water quality standards for salmon and trout, as well as other beneficial uses throughout the year. Water management along the entire length of the Deschutes River affects temperature, dissolved oxygen, pH, and other water quality parameters, which in turn affects habitat conditions (see Section 4.10.3 for a more detailed description of water quality issues).

Low streamflow in late fall, winter, and early spring associated with upstream reservoir storage limits riparian vegetation along the Deschutes River (River Design Group, Inc. [RDG] 2005). As riparian areas become hydrologically disconnected from their adjacent stream channels, they lose many of their ecological functions.

⁴ Anadromous fish refer to fish that spend most of their adult lives at sea but return to freshwater to spawn.

2.1.4 Risks to Public Safety

Open canals pose a risk to public safety during the irrigation season. In addition to multiple instances of injury, several drowning deaths, or near drowning instances, have occurred in adjacent district canals in 1996, 1997, 2004, 2016, and 2018 (Flowers 2004, Matsumoto 2016, Beechem 2016). The District's location in a partly urbanized area heightens the potential for an accident, as the canals and laterals pass through urban areas, rural residences, private lands, public lands, and irrigated fields.

During the summer, water depths in the District's canals range from 2 to 6 feet, with velocities up to 6 feet per second in places. These conditions make it difficult for a healthy, strong adult to stand in or climb out of a canal without assistance. A child or non- and weak-swimmer would be at an even higher risk of drowning in a canal with these attributes. Due to the volume and speed of the moving water, a person or animal that fell into a District canal could have serious difficulty gaining hold on the banks in order to climb out. Barriers or fences at the top banks of the canals are not currently installed.

Deschutes County was the fastest growing county in Oregon in 2015 based on the Oregon Population Report (Portland State University 2015). Public safety risks associated with open canals would continue to grow as urbanization expands into previously rural areas, such as SID's service area.

2.2 Watershed and Resource Opportunities

The following list of resource opportunities would be realized through project implementation. Quantification of these opportunities is provided in other sections of this Plan-EA. The project would realize the following opportunities:

- Provide a more reliable source of irrigation water to SID patrons by enabling SID to better deliver the amount of water that patrons need when they need it. Piping open canals and laterals would eliminate the need for carry water so that more water would be available for patrons and further reduce the need to spill excess water as the system becomes on-demand. Modernizing SID's system would improve operational efficiencies to ensure that patrons receive the water they need at the time that they need it. A modern conveyance system would reduce the District's diversion rate while fulfilling patron water rights.
- Improve streamflow, water quality, and habitat availability in the Deschutes River downstream from SID's diversion by legally protecting conserved water instream under the State of Oregon's Allocation of Conserved Water Program (described below).
- Reduce the O&M costs involved in delivering irrigation water to SID patrons.
- Minimize the potential for injury and loss of life associated with the open SID canals.

- Reduce energy costs by removing the need for most patrons’ individual pumps. Currently, SID patrons use individual pumps to pressurize water from their private ditch or pond. Cumulatively, these individual pumps serving farms across the District use approximately 2,455 megawatt-hours per year with annual electricity costs of approximately \$241,000.

2.2.1 Using Oregon’s Allocation of Conserved Water Program

The District has determined that implementation of the proposed action could save up to 6,172 acre-feet of water annually that is currently lost through seepage and evaporation. The District would use the State of Oregon’s Allocation of Conserved Water Program (Oregon Revised Statute [ORS] 537.470) to legally protect 75 percent of the total water saved by the project from April 1 to October 31 as instream flow in the middle Deschutes River. The other 25 percent of the total water saved by the project would allow SID to address delivery shortages for patrons throughout the irrigation season and maintain a reliable supply of irrigation water for agricultural needs; no water saved by the project would be used to irrigate new acreage.

The Conserved Water Program creates new water rights for water conserved as the result of an efficiency project (see Oregon Water Resources Department [OWRD] 2017 and Appendix E for more information about the Conserved Water Program). Through the Conserved Water Program, a new water right certificate would be issued to the District with the original irrigation season and priority date of 1899; this water right would reflect the reduced quantity of water needed after the project. An additional certificate would then be issued to the State of Oregon for the new instream water right. The water allocated instream through the program would be legally protected against any out-of-stream use; the District would no longer be able to divert the water. OWRD would continue to measure streamflow at existing diversions and stream gaging stations to ensure that the water conserved by the project remains instream.

3 Scope of the Plan-EA

The scoping process followed the general procedures consistent with NRCS guidance and PL 83-566 requirements. Both NRCS procedures and NEPA regulations (40 CFR 1500 to 1508) require that NRCS use scoping early in the planning process to identify issues, concerns, and potential effects that require detailed analysis.

Using input obtained during scoping, NRCS refined the project to focus on relevant resource concerns and issues, and eliminated concerns and issues from further detailed study that were not relevant. Relevant resource concerns are carried forward for further study and discussion.

3.1 Agency, Tribal, and Public Outreach

Federal, state, and local agencies and representatives, as well as non-governmental organizations, received an invitation to participate in scoping of the Plan-EA. Advertisements announcing the scoping period and the associated scoping meeting were placed in two local and regional newspapers in addition to multiple online locations including NRCS', the District's, and DBBC's websites. In addition, the scoping meetings were featured by KTVZ Channel 21 and KBND News.

Tribal consultation was conducted in accordance with the National Historic Preservation Act (NHPA) of 1966 and Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, to maintain NRCS' government-to-government relationship between native villages and tribes. NRCS sent a letter to the Confederated Tribes of Warm Springs (CTWS) requesting input and notifying them of the scoping process. CTWS responded and requested that they be consulted during the planning phase of the project.

3.2 Scoping Meeting

A scoping meeting was held on July 6, 2017, at the Tumalo Community Church Meeting Room (64671 Bruce Avenue, Bend, Oregon). Presenters at the meeting included Tom Makowski, NRCS; Jer Camarata, Manager of SID; Margi Hoffmann, Farmers Conservation Alliance (FCA); and Bridget Moran, U.S. Fish and Wildlife Service (USFWS). The presentations covered the financial assistance available through PL 83-566, the project purpose and need, the Watershed Plan-EA process, and ways in which the public could get involved. After the presentations, attendees asked questions and provided comments for the public record. A total of 57 people attended the meeting, excluding staff from SID, NRCS, USFWS, and FCA.

3.3 Scoping Comments

Scoping comments were accepted from July 6 to July 24, 2017. Comments were submitted via the following methods:

- At the public meeting on July 6, 2017
- Email, swalleycomments@gmail.com or margi.hoffman@fcasolutions.org

- Mail, Farmers Conservation Alliance, Attention Watershed Plan-EA, 11 3rd Street Suite #101, Hood River, OR 97031
- Phone, Farmers Conservation Alliance, (541) 716-6085

Comments generally supported the project. Comments included the following items:

- Importance of instream flows for the health of the Deschutes River, its tributaries, and the associated fish, aquatic species, and general wildlife
- Request to permanently commit 100 percent of water conserved through the project instream
- Amount of water conserved by the project, mechanism by which water would be conserved, and how the conserved water would be distributed
- Whether conserved water would be used for groundwater mitigation credits
- Request to include an analysis of the efficient use of dollars, quantifying the public cost per cfs of water conserved
- Request to work with farmers to adopt on-farm water conservation measures as a result of pressurized delivery
- Importance of preparing for the potential effects of climate change
- Concern for wildlife along the canals and laterals
- Concern for private ponds and associated wildlife
- Concern for groundwater, aquifer recharge, and water availability for private wells
- Concern for vegetation along the canals and laterals, especially mature trees
- Removal cost and responsibility for trees that do not survive the project
- Concern for property values of adjacent landowners
- Request to avoid any new irrigation on previously non-irrigated land
- Cost effectiveness and engineering considerations of a top-down versus bottom-up piping design
- Effect on water meters and measuring water use
- Effect of the project cost on District water rates
- Effect on maintenance and access roads along canals
- Recreation possibilities and potential trail network

- Trail development and proximity to private homes
- Effect on patron deliveries, including amount of water and timing
- Ability of patrons to lease their water to other users or for other purposes
- Request for all adjacent landowners to be notified of the project, including those who are not District water users
- Relation of the project to hydroelectric development
- Relation of the project to the floodplain

Federal, state, tribal, and local agency consultation and other public participation activities are further described in Section 7 of this Plan-EA.

3.4 Identification of Resource Concerns

Resource concerns identified through scoping included aquatic resources, cultural resources, groundwater, fish, recreation, socioeconomics, soils, surface water, terrestrial wildlife, vegetation, visual resources, water quality and quantity, and wetlands. Table 3-1 provides a summary of resource concerns and their relevancy to the proposed action. Resources determined to be non-relevant were eliminated from detailed study, and those resources determined to be relevant have been carried forward for analysis.

Table 3-1. Summary of Resource Concerns for the Swalley Irrigation District – Irrigation Modernization Project.

Resource	Relevant to the Proposed Action?		Justification
	Yes	No	
Air			
Air Quality		X	Review of 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 proposed action activities would occur; however, such emissions are considered negligible when compared to background levels and the application of best management practices (BMPs).
Geology and Soils			
Erosion	X		Soil disturbance during construction could contribute to erosion.

Resource	Relevant to the Proposed Action?		Justification
	Yes	No	
Landslides	X		There are some areas of low to moderate landslide risk within the project area.
Prime Farmlands	X		Prime farmlands occur in the project area and could be affected by the project.
Human Environment			
Archaeological Resources	X		Archaeological resources have not been found in the project area that has been surveyed to date; however, they could be inadvertently discovered during construction.
Environmental Justice		X	The project would comply with Executive Order 12898.
Historical Resources	X		The project area is a National Register-eligible historic property. Consultation with the State Historic Preservation Office (SHPO) is required for compliance with Section 106 of the NHPA.
Land Use	X		While no effects on property ownership would occur, construction activities would temporarily affect traffic, and agricultural land use would be indirectly affected.
National Parks and Monuments		X	No national parks or monuments occur within the project area.
Noise		X	Effects associated with noise were considered but eliminated from detailed analysis because the potential for any effect is low.
Parklands		X	The project area does not pass through any parks.
Public Safety	X		Implementation of the proposed action would affect the risk of drowning in open canals.
Recreation Trails	X		Construction activities would temporarily affect recreational use of trails, roads, and bikeways.
Visual Resources	X		Visual resources of the project area would be affected by project construction where open canals would be altered.

Resource	Relevant to the Proposed Action?		Justification
	Yes	No	
Socioeconomics			
Local and Regional Economy	X		The proposed action involves an expenditure of public funds that could affect the local and regional economy. An evaluation of the effects of providing NRCS funding is included.
National Economic Development (NED)	X		A NED analysis was completed as required by the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies.
Vegetation			
Invasive Species/Noxious Weeds	X		Construction activities could spread noxious weeds and/or create conditions for them to establish.
Mature Trees	X		Direct and indirect effects to mature trees could occur.
Special Status/Threatened or Endangered Species	X		No special status, threatened, or endangered plant species are known to occur in the project area, and no designated critical habitat occurs in the project area. It is possible that Peck's milkvetch, a federal species of concern, could occur in the project vicinity.
Water			
Coastal Zones		X	No coastal zones occur within or near the project area.
Coral Reefs		X	No coral reefs occur within or near the project area.
Conserved Water	X		A portion of the water saved by the proposed action would be allocated to instream uses.
Floodplain Management		X	The proposed action does not occur in the 100-year floodplain as represented by the Federal Emergency Management Agency's (FEMA's) Flood Insurance Rate Maps (FEMA 2013), and would not directly or indirectly support floodplain development; as such, effects to the floodplain are not further considered or addressed.

Resource	Relevant to the Proposed Action?		Justification
	Yes	No	
Groundwater Mitigation Credits		X	The proposed action would not use groundwater mitigation credits.
Groundwater Quality		X	Groundwater quality would not be affected by the proposed action.
Groundwater Quantity, Aquifer Recharge	X		Reduced seepage from canals and increased instream flows could affect groundwater quantity and aquifer recharge.
Hydroelectric Development		X	The proposed action does not consider developing hydroelectric facilities and cannot use the existing authorization of PL 83-566 for such development.
Hydrology	X		Reduced seepage could affect hydrology. The proposed action would allocate water instream.
Private Water Features and Ponds		X	The proposed action would not remove or modify private water features and ponds.
Public Water Supply		X	The proposed action would not affect public water supply.
Regional Water Resources Plans		X	The proposed action does not consider altering the management of any regional water resources.
Surface Water Quality	X		Implementation of the proposed action could result in long-term effects by increasing river flows.
Water Leasing	X		Implementation of the proposed action would remove leasing limitations for patrons.
Water Rights	X		Transfers of water rights would occur under the Allocation of Conserved Water Program.
Wild and Scenic Rivers	X		Stretches of the Deschutes River downstream from SID's diversion are designated Wild and Scenic Rivers and would be indirectly affected by the proposed action.
Wetlands and Riparian Areas			
Wetlands and Riparian Areas	X		Wetlands and riparian areas could be indirectly affected.

Resource	Relevant to the Proposed Action?		Justification
	Yes	No	
Fish and Wildlife			
Bald and Golden Eagle Protection Act	X		Habitat for bald eagles and golden eagles could occur in the project area.
Endangered Species	X		The project would not affect yellow-billed cuckoo, northern spotted owl, endangered gray wolf, Oregon spotted frog, and their designated critical habitat due to species habitat preferences and range. Bull trout and steelhead are known to occur in waterways that could be affected by the project.
Essential Fish Habitat (EFH)		X	The Magnuson-Stevens Act established requirements for including EFH descriptions in federal fishery management plans, and requires federal agencies to consult with National Marine Fisheries Service (NMFS) on activities that may adversely affect EFH (Public Law 104-297). EFH could include all streams, lakes, ponds, wetlands, and other viable waterbodies, and most of the habitat historically accessible to salmon necessary for spawning, breeding, feeding, or growth to maturity. As the project would not affect EFH, consultation under the Magnuson Stevens Act is not 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 in the project vicinity.
Migratory Bird Treaty Act (MBTA) Species	X		Construction and operation of project components could affect migratory birds.

4 Affected Environment

The following sections describe the existing ecological, physical, biological, economic, and social environment of the project area and areas that are affected by operation of the SID system. The project area is defined in Section 1.2.

4.1 Cultural Resources

Archaeological and historical resources are also referred to as cultural resources, and are defined as physical or other expressions of human activity or occupation. Historic properties are defined as any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on, the National Register of Historic Places. The term “historic properties” includes traditional cultural properties and archaeological sites. Section 106 of the NHPA requires federal agencies to take into account the potential effects of a project on historic properties.

4.1.1 Archaeological Resources

A cultural resources survey was conducted for the Rogers Lateral in 2009. The survey identified and documented approximately 3.8 miles of the project area. The survey identified two refuse sites; however, these were determined ineligible for the National Register of Historic Places. No new archaeological resources listed in, or potentially eligible for, the National Register of Historic Places were found during the survey (Stuemke 2009).

4.1.2 Historical Resources

The District was originally organized by pioneers in 1899 as the Deschutes Reclamation and Irrigation Company (DRIC). The boundaries for the DRIC included much of the land that later became the City of Bend, with irrigation easements obtained through the federal Carey Act. Water rights were obtained for natural flow diversion from the Deschutes River with a priority date of September 1, 1899.

Charles and George Swalley were members of the eight families that pioneered the first irrigation ditches in Central Oregon. The early families built the original headworks and wooden flume for the Main Canal in 1900. The works were located approximately 0.5 mile upstream from the Steidl and Tweet Dam, and 1 mile north of downtown Bend. This dam was built in the current location of the North Canal Diversion Dam. From 1900 to 1909, landowners built ditches, flumes, and roads across the region. The wooden flumes helped to transport water over the challenging volcanic terrain. The Main Canal is considered one of the earliest completed Carey Act projects in Central Oregon. It has historical significance in Bend because of its importance in early irrigation development and its association with prominent pioneers in Central Oregon.

In 1994, DRIC landowners incorporated the company as a public, municipal corporation and took the name of Swalley Irrigation District. Over time, improvements have been made to failing structures, fish screens have been installed, and critical segments of canal have been piped for public safety and water conservation. Portions of the original system are still in use today. In 2007, the District’s irrigation system was determined to be a National Register-eligible historic property

(SID 2007). The 2009 survey of the Rogers Lateral described above also applied to historical resources.

4.2 Fish and Aquatic Resources

4.2.1 General Fish and Aquatic Species

The District's canals do not support game fish, salmonids, or threatened and endangered aquatic species. Fish screens compliant with Oregon Department of Fish and Wildlife (ODFW) standards were installed on the North Canal Diversion Dam in 2004. These fish screens separate water diverted for consumptive use from water left instream. The screens prevent fish from entering the District's irrigation conveyance system.

There are 18 species of fish documented in the waterbodies associated with District operations (the Deschutes River from North Canal Dam [RM 164.8] to the upper end of Lake Billy Chinook [RM 120]) (Table 4-1). Waterfalls within this 44-mile reach are considered passage barriers for certain species. From Steelhead Falls (RM 128) to Lake Billy Chinook (RM 120), all 18 of these fish species are potentially present. The summer steelhead, Chinook salmon, and sockeye salmon in this reach are part of a reintroduction effort that began in 2009 to mitigate for blockage of fish passage around the Pelton Round Butte Dam Complex (ODFW and CTWS 2008). Chinook and sockeye salmon are unable to navigate Steelhead Falls at RM 128, which creates the uppermost distribution limit for salmon in the Deschutes River. Summer steelhead are able to pass upstream of Steelhead Falls but are unable to navigate upstream of Big Falls (RM 132). Big Falls is considered the uppermost limit of anadromous fish distribution (ODFW 1996).

Both indigenous and introduced fish species are potentially present in the Deschutes River. Mountain whitefish and redband trout are indigenous salmonid species found in the Deschutes River from North Canal Dam (RM 164.8) to the upper end of Lake Billy Chinook (RM 120). Bridgelip sucker, chiselmouth, largescale sucker, longnose dace, northern pike minnow, and sculpin spp. are indigenous, non-salmonid species found between Big Falls (RM 132) and Lake Billy Chinook (RM 120). Brook trout, brown trout, and rainbow trout are introduced salmonid species that are also found in the 44-mile reach of the Deschutes River associated with SID operations. Brown trout and brook trout were introduced to the Deschutes Basin by state and federal agencies in the early 1900s. Rainbow trout is a managed species that has been stocked in the Deschutes River and its lakes and tributaries for over 100 years. In the 1990s, ODFW adopted a Wild Fish Policy and stopped stocking rivers with hatchery rainbow trout to protect populations of native redband trout (ODFW 1996). Rainbow trout are still found in the Deschutes River between North Canal Dam (RM 164.8) and Lake Billy Chinook (RM 120).

From 2012 to 2014, Carrasco and Moberly found fish assemblages in the middle Deschutes River (RM 120 to RM 164.8) to include mountain whitefish, redband trout, brown bullhead, mottled sculpin, brown trout, tui chub, and bridgelip sucker. Mountain whitefish, redband trout, and brown trout were found to be the dominant species (Carrasco and Moberly 2014). This species assemblage is similar to the species that ODFW found in an electrofishing occupancy study in the same reach of the Deschutes River (Starcevich 2016).

Table 4-1. Fish Species Potentially Occurring in Waterbodies Associated with District Operations.

Fish Species	Scientific Name	Origin
Bridgelip sucker	<i>Catostomus columbianus</i>	indigenous
Brook trout	<i>Salvelinus fontinalis</i>	introduced
Brown bullhead catfish	<i>Ictalurus nebulosus</i>	introduced
Brown trout	<i>Salmo trutta</i>	introduced
Bull trout	<i>Salvelinus confluentus</i>	indigenous
Chinook salmon	<i>Oncorhynchus tshawytscha</i>	indigenous
Chiselmouth	<i>Acrocheilus alutaceus</i>	indigenous
Largescale sucker	<i>Catostomus macrocheilus</i>	indigenous
Longnose dace	<i>Rhinichthys cataractae</i>	indigenous
Mountain whitefish	<i>Prosopium williamsoni</i>	indigenous
Northern pike minnow	<i>Ptychocheilus oregonensis</i>	indigenous
Rainbow trout	<i>Oncorhynchus mykiss</i>	introduced
Redband trout	<i>Oncorhynchus mykiss</i>	indigenous
Sculpin spp.	<i>Cottus</i> spp.	indigenous
Sockeye salmon/Kokanee	<i>Oncorhynchus nerka</i>	indigenous
Summer steelhead	<i>Oncorhynchus mykiss</i>	indigenous
Three-spined stickleback	<i>Gasterosteus aculeatus</i>	introduced
Tui chub	<i>Gila (Siphateles) bicolor</i>	introduced

Source: Adapted from Starcevich 2016

Historically, the Deschutes River had relatively consistent streamflow seasonally and annually (Section 4.10.2). The steady streamflow created fish habitat with cold, clear water, and consistent hydrology. Since the late 1800s, changes to Deschutes River surface water flows, construction of fish passage barriers, and water management has created a very different aquatic environment with resulting changes to the fish species assemblages.

Elevated water temperatures in the middle Deschutes River negatively affect salmonid growth and survival (Recsetar et al. 2012). Availability of cold-water refugia for temperature-sensitive fish species is of key importance when water temperatures in the main streams rise above acceptable standards. Water temperatures out of the normal range for fish can increase physiologic stress, increase susceptibility to predators, and influence growth rates, feeding, metabolism, and development. Water temperature in the Deschutes River (RM 164.8 to 120) is discussed in Section 4.10.3.1.

Other aquatic species potentially found in the project area and streams affected by SID operations include bullfrog, western toad, Pacific treefrog, and long-toed salamander. The western toad, Pacific treefrog, and long-toed salamander are native to Oregon and may be present in open irrigation canals and adjacent banks where there is suitable vegetation (S. Wray, personal communication,

November 17, 2017). The bullfrog is considered an invasive species that was introduced to Oregon in the early 1900s. Bullfrogs are voracious predators that eat any animal they can swallow. All of these amphibians are listed as species of least concern by the International Union for Conservation of Nature (2017).

4.2.2 Federally Listed Fish and Aquatic Species

A list of species protected under the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 et seq.), as amended in 1988, that have the potential to occur within waterbodies associated with District operations was obtained using the USFWS Environmental Conservation Online System Information for Planning and Conservation. Bull trout and steelhead are federally listed, threatened fish that are known to occur in the planning area (USFWS 2017).

Critical habitat for bull trout is designated in the Deschutes River from Big Falls (RM 132) to Lake Billy Chinook (RM 120) (Figure 4-1); however, recent electrofishing for an occupancy study did not find evidence of bull trout in this section of the Deschutes River (Starcevich 2016). Bull trout critical habitat is defined by Primary Constituent Elements identified by USFWS (70 *Federal Register* 56211, 2005). These elements represent biological and physical features essential to the conservation of a species, and they describe habitat components that support one or more life stages of the species. The PCEs for bull trout describe habitat that has aquatic connectivity, complex habitat structure, water temperatures ranging from 2 degrees Celsius (°C) to 15 °C, natural variability in streamflow, a sufficient food base, and absence of non-native predatory and competing fish. A detailed list of critical habitat PCEs for bull trout is provided in Appendix E.

Steelhead populations are listed as threatened under ESA and are present within the area affected by the project (Figure 4-2). NMFS has identified PCEs for steelhead critical habitat which include habitat components that support freshwater spawning, rearing, and migration (70 *Federal Register* 52630, 2005; Appendix E). However, no critical habitat is designated in the planning area for several reasons: 1) the population in the Deschutes River (Middle Columbia River steelhead) is classified as a non-essential experimental population under section 10(j) of ESA; 2) the non-essential experimental population is located outside of a National Wildlife Refuge System and a National Park System; 3) the population is treated as “proposed for listing” under ESA section 7 (76 *Federal Register* 28715, 2011; 81 *Federal Register* 33416, 2016).

4.2.3 State-Listed Species

ODFW maintains a list of native fish and wildlife species in Oregon that have been determined by the state to be either “threatened” or “endangered” according to criteria set forth by rule (Oregon Administrative Rule [OAR] 635-100-0105) (ODFW 2017a). There are no threatened, endangered, or candidate aquatic species known to occur within the irrigation canals, in other areas where work associated with the proposed action would occur, or in areas that are affected by SID operations.

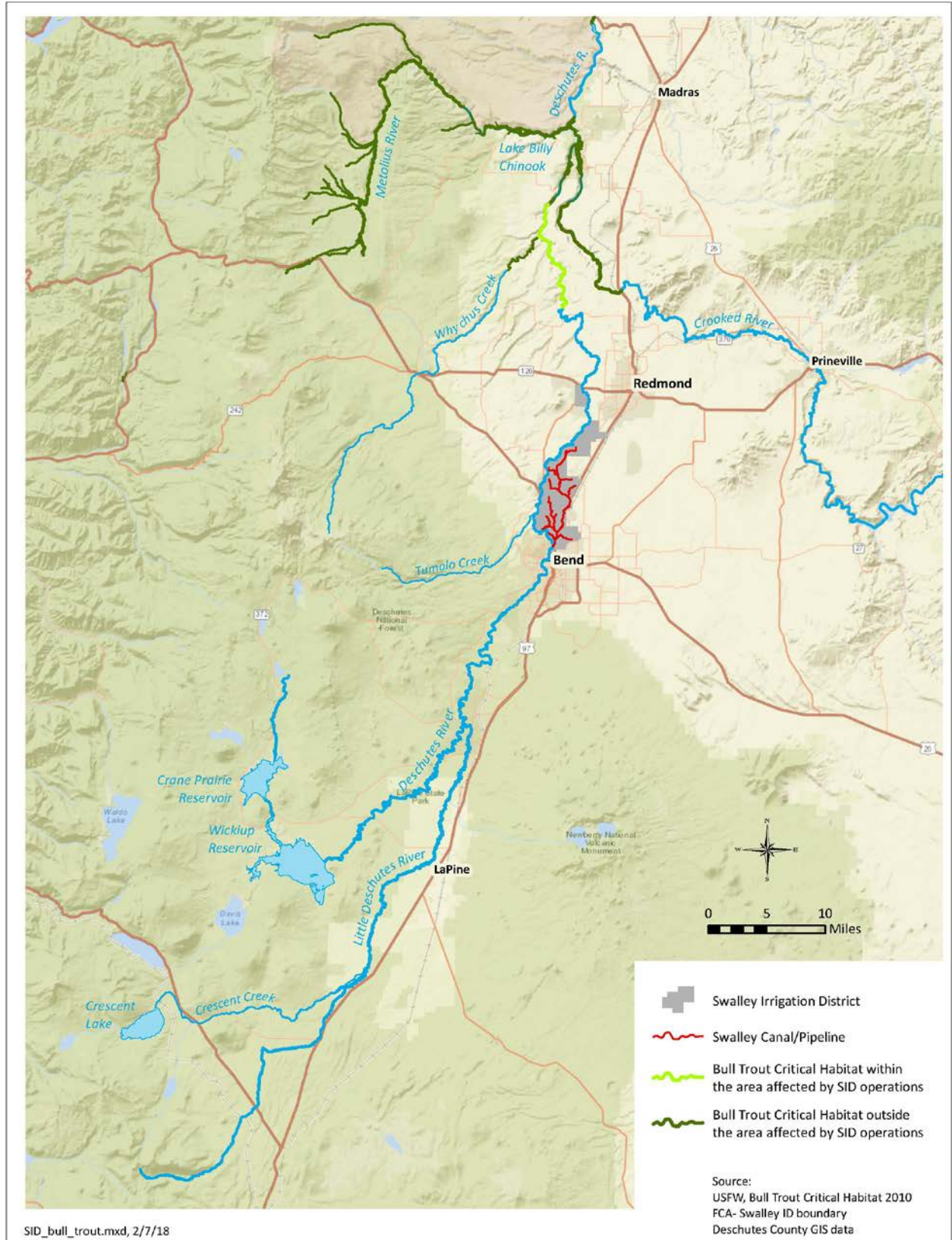


Figure 4-1. Bull trout critical habitat near Swalley Irrigation District.

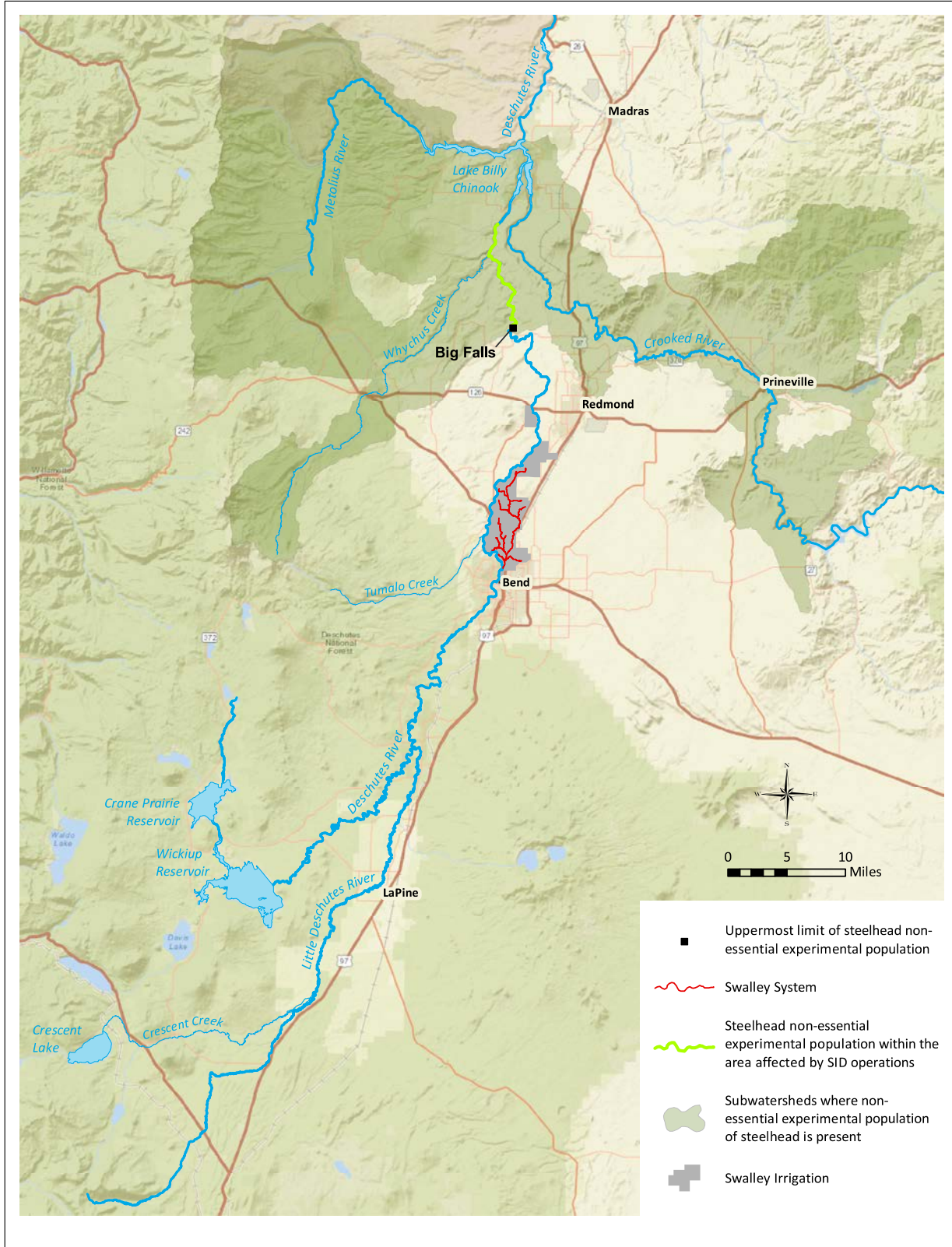


Figure 4-2. Middle Columbia River steelhead population boundaries near Swalley Irrigation District.

4.3 Geology and Soils

4.3.1 Geology

The project area is located within the Deschutes–Columbia Plateau, and is east of the High Cascade subprovince (Orr et al. 1992). The High Cascades were primarily formed 2 to 4 million years ago during the Pliocene and Pleistocene epochs, and they changed the landscape of the Deschutes Basin. This volcanic activity resulted in complex assemblages of vents, lava flows, pyroclastic deposits, and volcanically derived sedimentary deposits. Over the last 2 to 4 million years, erosion, sedimentation, and volcanic activity deposited additional layers of alluvium, ash, and andesite over the project area.

Basalt from Newberry volcano is the major geologic formation within SID. Geology along the Main Canal and Butte Lateral includes basalt and basaltic andesite. All existing pipelines in SID rest on basalt, with the exception of the Frakes Lateral pipeline, which overtops sand and gravel. The Rogers and Riley laterals rest exclusively on basalt; the Elder Lateral overtops basalt, sand, and gravel; and the Mickelson Lateral sits above basaltic andesite. Figure 4-3 presents a general geologic map of the District.

Geologic hazards in the project area include the potential liquefaction of soil that may occur during an earthquake or a landslide. Areas that are susceptible to liquefaction include wet or low-lying areas or unconsolidated sediments. In portions of the project area with basalt formations, liquefaction susceptibility is generally low. Portions of the project area that are primarily overlain with gravel and sand deposits are more susceptible to liquefaction.

Landslide susceptibility was identified using the State of Oregon Department of Geology and Mineral Industries Landslide Susceptibility Overview Map of Oregon (Burns et al. 2016). The State of Oregon determines landslide susceptibility using a generalized geologic map, landslide inventory maps, and slope maps. The majority of the project area has a low landslide risk. Areas of moderate landslide susceptibility exist along sections of Riley and Rogers Laterals, Kotzman Lateral, and the Main Canal. High landslide susceptibility occurs near the western border of the District paralleling the Deschutes River and along the Main Canal north of Frakes Lateral (Burns et al. 2016).

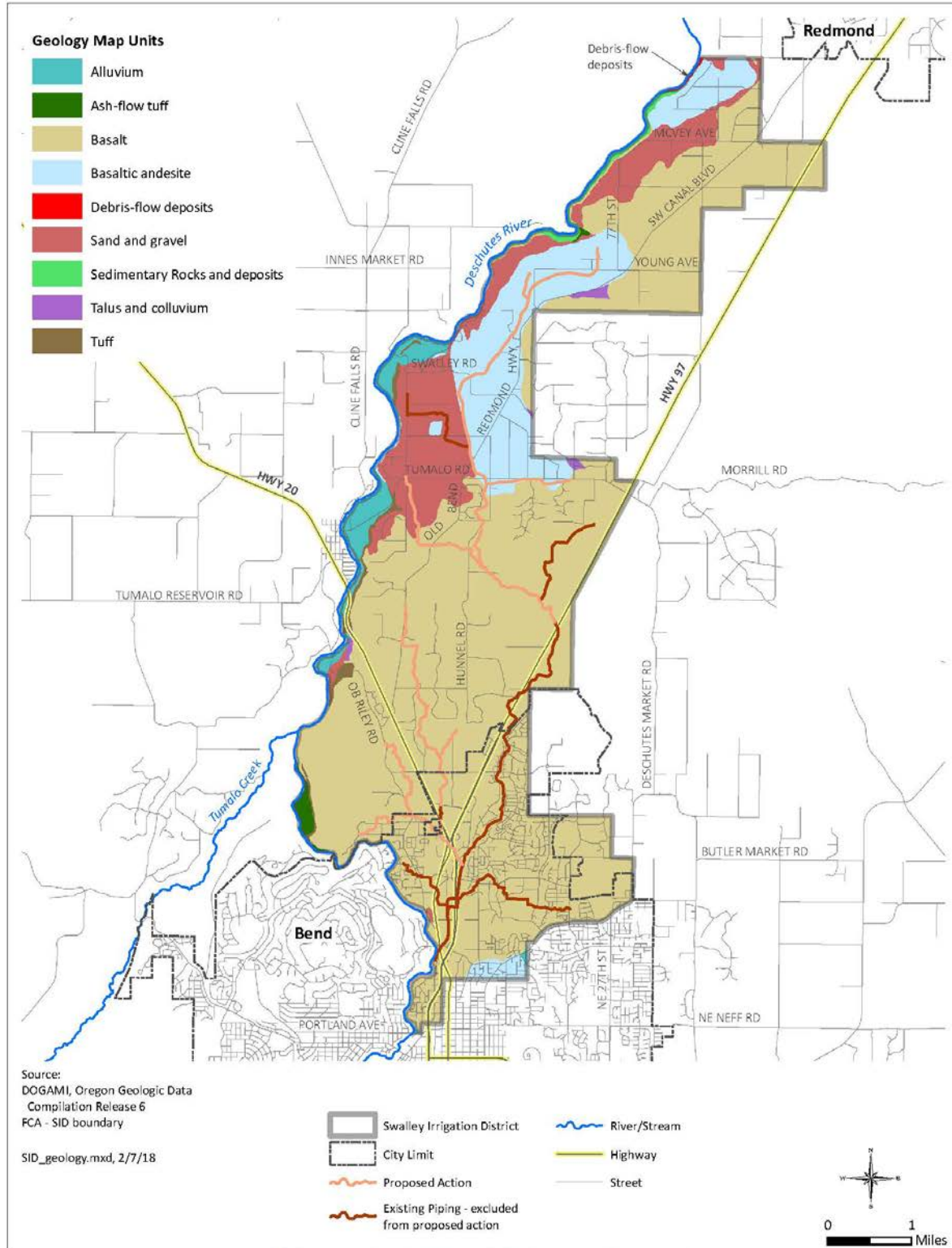


Figure 4-3. Geologic formations in Swalley Irrigation District.

4.3.2 Soils

The most common soil in the District is the Deskamp–Gosney complex, which is primarily loamy sand (NRCS 2015). The southern portion of the District has large areas of Scabland with 3 to 12 percent slopes. Throughout this area are pockets of Deschutes loamy sand, with 0 to 3 percent slopes. Loamy sand is the primary irrigated soil in the District, and is light colored from pumice material with moderately coarse textured subsoils. Soil depths vary from 2 to 3.5 feet (SID 2010). Noted for low water holding capacity, the drainage through the surface soil, subsoil, and underlying material is rapid. The ease of irrigation is rated as low. The natural fertility is low, but there is only a slight hazard of erosion under irrigation (SID 2010). Due to the high porosity of the ground, flood irrigation is marginal, and evaporation from the soil is substantial. Most of the area has been converted from flood irrigation to sprinkler irrigation in the last two decades (SID 2010).

The northerly portion of the District also has areas of scabland with 0 to 3 percent slopes and areas of rough, stony land with Deschutes soil materials having 0 to 15 percent slopes. Of the irrigated soils, much is the same Deschutes loamy sand that exists in the southern part of the District (SID 2010). The characteristics of soils in the irrigated areas include slopes from 0 to 7 percent and subsoils that are composed of gravel, stones, cobbles, and semi-cemented sandy material (SID 2010). The drainage is moderate to somewhat rapid except in the semi-cemented subsoils where drainage would occur at a more gradual rate (SID 2010). Figure 4-4 and Figure 4-5 present soil types within the District.

The parent materials for loamy sand soils within the District are primarily ash and pumice deposited from past volcanic eruptions (U.S. Department of Agriculture, Soil Science Division Staff 2017). Litter and duff on the soil surface is also found in variable depths throughout the District, primarily as a function of the aspect and plants associated with a given soil profile. Surface litter and duff are primary components of the productivity of the soils present within the area. Underlying glacial or volcanic materials affect the subsurface flow of water, but can also influence the availability and content of nutrients within the soil profile.

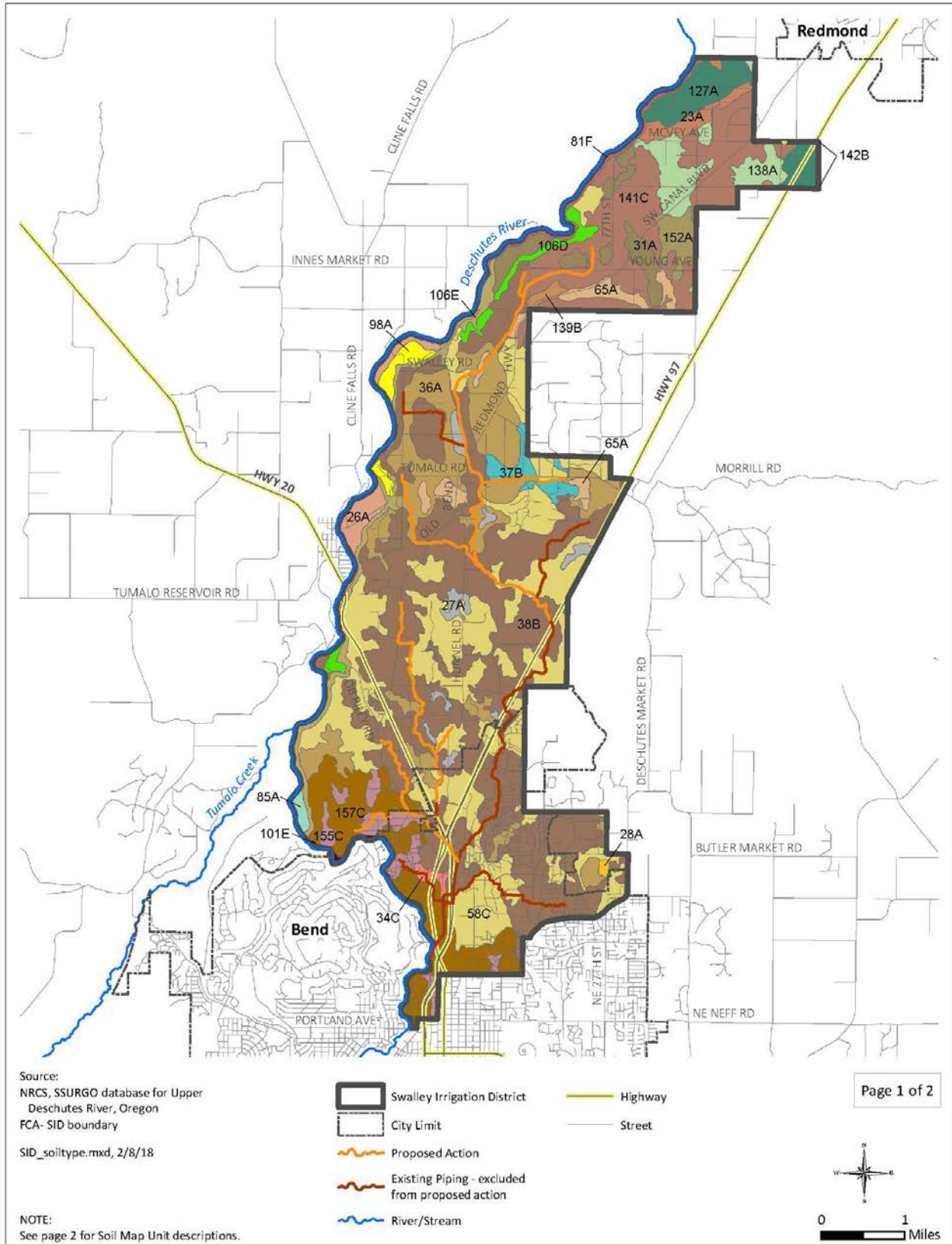


Figure 4-4. General soil types in Swalley Irrigation District.

NRCS Map Unit Descriptions

Map Unit Symbol	Map Unit Name
23A	Buckbert sandy loam, 0 to 3 percent slopes
26A	Clinefalls sandy loam, 0 to 3 percent slopes
27A	Covkamp loamy sand, 0 to 3 percent slopes
28A	Covkamp loamy sand, bedrock substratum, 0 to 3 percent slopes
31A	Deschutes sandy loam, 0 to 3 percent slopes
34C	Deschutes-Stukel complex, 0 to 15 percent slopes
36A	Deskamp loamy sand, 0 to 3 percent slopes
37B	Deskamp sandy loam, 3 to 8 percent slopes
38B	Deskamp-Gosney complex, 0 to 8 percent slopes
58C	Gosney-Rock outcrop-Deskamp complex, 0 to 15 percent slopes
65A	Houstake sandy loam, 0 to 3 percent slopes
81F	Licksillet-Rock outcrop complex, 45 to 80 percent slopes
85A	Lundgren sandy loam, 0 to 3 percent slopes
98A	Plainview sandy loam, 0 to 3 percent slopes
101E	Redcliff-Licksillet-Rock outcrop complex, 30 to 50 percent south slopes
106D	Redslide-Licksillet complex, 15 to 30 percent north slopes
106E	Redslide-Licksillet complex, 30 to 50 percent north slopes
127A	Statz sandy loam, 0 to 3 percent slopes
138A	Stukel sandy loam, 0 to 3 percent slopes
139B	Stukel sandy loam, dry, 3 to 8 percent slopes
141C	Stukel-Deschutes-Rock outcrop complex, 0 to 15 percent slopes
142B	Stukel-Rock outcrop-Deschutes complex, dry, 0 to 8 percent slopes
152A	Tumalo sandy loam, 0 to 3 percent slopes
155C	Wanoga sandy loam, 0 to 15 percent slopes
157C	Wanoga-Fremkle-Rock outcrop complex, 0 to 15 percent slopes
W	Water

Source:
 NRCS, SSURGO database for Upper
 Deschutes River, Oregon

SID_soiltypelegend.mxd, 2/8/18

Figure 4-5. Legend for general soil types in Swalley Irrigation District.

4.3.2.1 Farmland Classification

NRCS developed technical soil groups related to any environmental concerns that are associated with a particular soil type and a soil’s rating for agricultural commodity production (NRCS 2015). Using the NRCS soil mapping tool, the following soil groupings within SID were identified: prime farmland, farmland of statewide importance, and non-prime farmland.

Prime Farmland: These lands have soils with the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and are available for these uses. Soils are classified as prime when 50 percent or more of the components in the map unit composition are prime (NRCS 2017). NRCS has developed further classifications under prime farmland as follows:

- Prime farmland if irrigated
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and the product of soil erodibility times the climate factor does not exceed 60

Farmland of Statewide Importance: Soils are classified as “farmland of statewide importance” when less than 50 percent of the components in the map unit are prime, but a combination of lands of prime or statewide importance is 50 percent or more of the map unit composition (NRCS 2017). This land has characteristics that nearly meet prime farmland requirements and, when managed appropriately, can produce economically high crop yields.

Nearly 80 percent of the District is either considered prime farmland if irrigated or farmland of statewide importance (Table 4-2).

Table 4-2. NRCS Classification of Farmland Soils within Swalley Irrigation District.

NRCS Farmland Class	Area (acres)	Area (%)
Prime Farmland if Irrigated	3,284	20
Farmland of Statewide Importance	9,597	59
Non-Prime Farmland	3,404	21
Total	16,285	100

4.3.2.2 Erosion

Erosion hazard areas are those covered by soils with a high susceptibility to erosion as classified by NRCS. NRCS determines the erosion hazard class of an area by considering slope and select soil properties that may include cohesion, drainage, and the organic content of the soil. Within SID, approximately 93 percent of the soils are classified with a high erosion potential.

4.4 Land Use

4.4.1 Land Ownership

Within the project area, SID’s ROW traverses lands that are primarily privately owned. The ROW was granted through the Carey Act. The majority of the project area is adjacent to privately owned land (Table 4-3 and Figure 4-6). Approximately 1 mile of the project area crosses public land that is managed by Deschutes County (Table 4-3). Land managed by the Bureau of Land Management (BLM), Oregon Parks and Recreation Department, Oregon Department of State Lands, USDA Forest Service, and the National Park Service are present within the District; however, the project area does not traverse these lands. Therefore, they are not discussed further.

Table 4-3. Land Ownership within Swalley Irrigation District.

Land Owner	Acres within SID	Miles of Proposed Action Crossing the Area	Percentage of the Project Area Length (%)
Private	14,805	15.5	93
Deschutes County	602	1.1	7
City of Bend	389	0	0
Oregon Department of Parks and Recreation	229	0	0
State of Oregon	20	0	0
USDA Forest Service	32	0	0
U.S. Department of the Interior, BLM	208	0	0
Total	16,285	16.6	100

Source: Deschutes County 2017

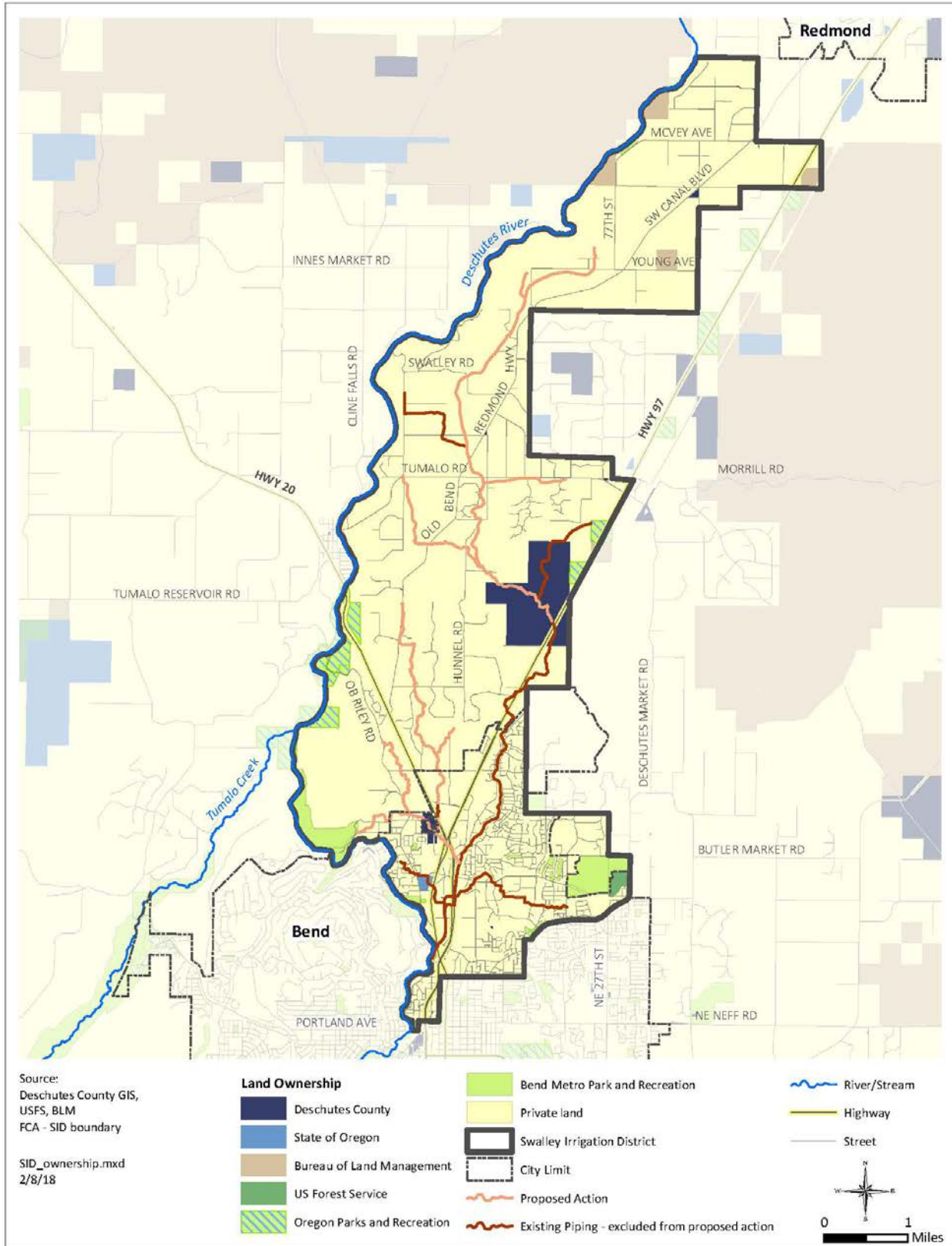


Figure 4-6. Land ownership within Swalley Irrigation District.

4.4.2 Land Uses

Land use within the project area consists of the conveyance of irrigation water as well as O&M of the irrigation system. Portions of the District’s ROW and easements are used formally and informally for recreation (Section 4.6).

Land use adjacent to the project area is primarily undeveloped land and irrigated agriculture. Data from SID’s SIP, the National Land Cover Dataset, and corresponding land cover classes were used to indicate land use (United States Geological Survey [USGS] 2011). Figure 4-7 illustrates land uses that the project area traverses, and Table 4-4 presents the project area lengths crossing those areas.

Table 4-4. Land Use within Swalley Irrigation District.

Land Use	Acres	Percent of the District	Project Area Length Crossing the Area (miles)⁵
Agriculture ¹ (irrigated acres) ²	3,745	23	4.7
Non-cultivated lands ³	7,426	46	7.7
Developed Use ⁴	5,114	31	4.2
Total	16,285	100	16.6

Notes:

¹ The NLCD data classified 3,449 acres as agriculture. Because more precise and current data on irrigated acres were available through the District, 3,745 acres were used to more accurately portray agricultural land use. The difference between these two numbers was taken out of the acres shown as Undeveloped Land.

² Irrigated acres in SID.

³ Shrub/scrub, barren land, evergreen forest, woody wetlands.

⁴ High, medium, low intensity development, developed open space.

⁵ These numbers are approximate; in multiple areas, lengths of the proposed action are simultaneously adjacent to both undeveloped land and agricultural land, but only one land use category could be considered in the calculations.

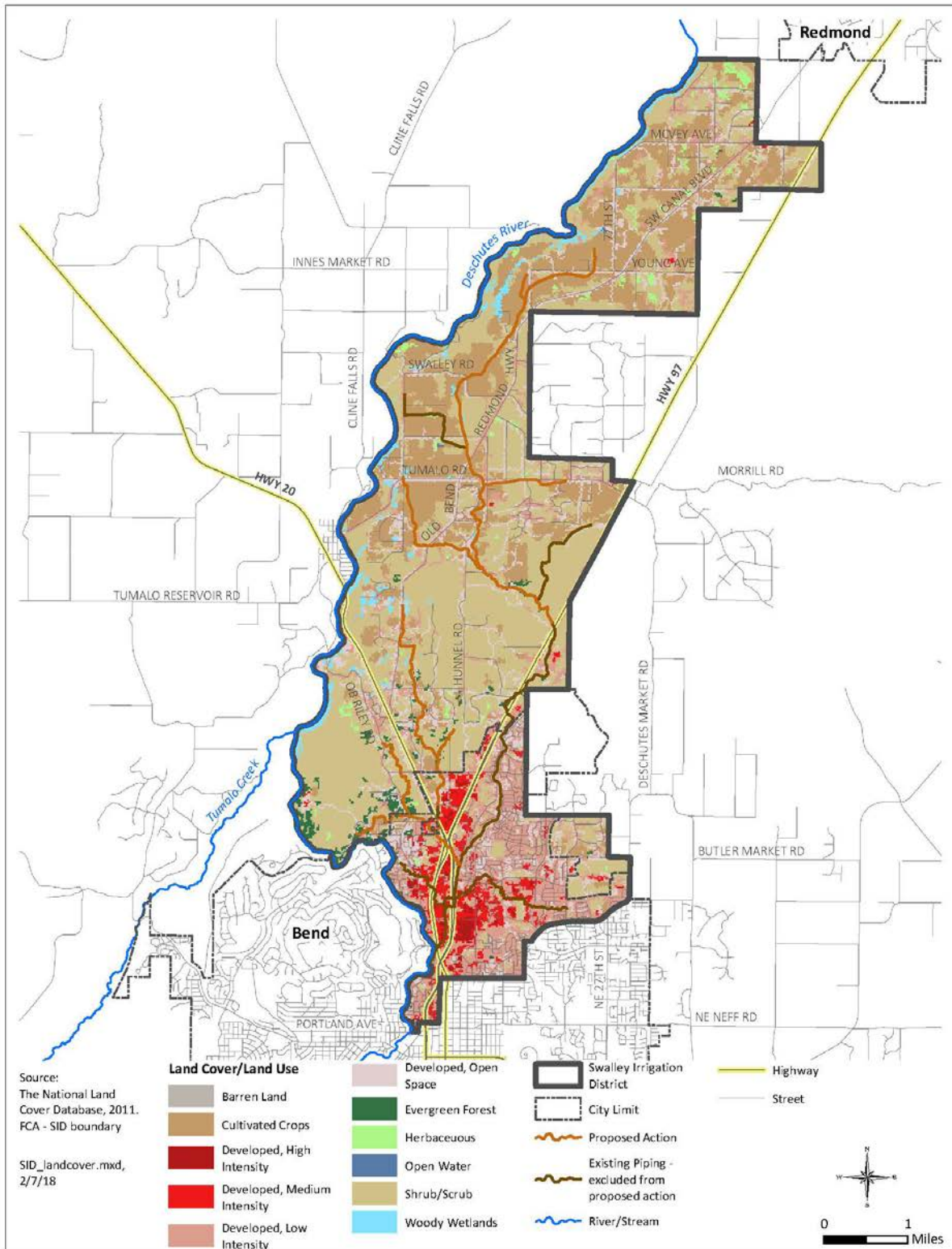


Figure 4-7. Land cover/use within Swalley Irrigation District.

The primary crops grown on lands served by canals and laterals associated with the proposed action are pasture grass and hay, and the average growing season is 214 days. Farmers typically get two to three cuttings per year on hay and pasture grass. SID’s on-farm systems are considered efficient, as only 4 out of 662 patrons use flood irrigation (at the time the data was collected, there were 662 patrons versus 668 cited elsewhere). This indicates that over 99 percent of water deliveries are sprinkler irrigated (SID 2010).

The majority of SID patrons irrigate parcels smaller than 6 acres (Table 4-5) that are primarily zoned as Exclusive Farm Use (EFU) or Multi-Use Agriculture. The EFU designation is meant to maintain the agricultural economy of the state as well as assure the adequate provision of healthy food. The county is required to inventory and protect farmlands under Statewide Goal 3, Agricultural Land, ORS 215 and OAR 660-033. In 1992, Deschutes County identified seven EFU subzones based on the average number of acres irrigated. The District includes lands within Alfalfa and Tumalo/Bend/Redmond Subzones. Parcels within the subzones must retain at minimum a specific number of irrigated acres per the type of farmland (Deschutes County 2010). Agricultural land zoned as Multi-Use Agriculture is similarly intended to preserve and maintain agricultural lands and to serve as a sanctuary for farm uses.

Table 4-5. Patron Parcel Size within Swalley Irrigation District.

Parcel Size	Total Acreage Amount	Percent of Total Acreage in SID	Number of Patrons	Percent of Patrons
Small (0-6 acres)	1,219	28	507	77
Medium (6-11 acres)	648	15	73	11
Large (11+ acres)	2,438	57	82	12
Total ¹	4,305	100	662	100

Source: SID 2010

Notes:

¹The Total Acreage and Number of Patrons differ from numbers presented elsewhere in the document because the table uses data from the time of the study in 2010.

Approximately 21 percent of SID’s lands fall within Bend’s Urban Growth Boundary (UGB) and Urban Area Reserve Boundary (URB). Water use within these boundaries include non-agricultural uses, such as for a cemetery and a recreational area. The UGB and URB are set to control urban sprawl by mandating that the area inside the UGB be used for higher-density urban development. The boundaries seek to manage the challenges posed by urban growth and the encroachment of cities upon agricultural and rural land. The UGB border identifies land that would be beneficial to urbanize. It generally represents and encompasses the space needed for potential growth for 20 years. It considers land needs for employment, housing, schools, and other urban infrastructure. The URB is land that is currently outside the existing UGB but is considered suitable for accommodating further urban development in longer-term city planning efforts. In addition to climate and weather challenges, because of the District’s proximity to Bend and land falling within the URB and UGB, farmers in the area are facing increased pressure for conversion of agricultural lands to urban

development. The District’s relatively small average acreage per account reflects its urbanizing nature.

4.5 Public Safety

The District has 16.6 miles of canal and laterals, of which approximately 15.3 miles are open and accessible to the public. These canals pose a risk to public safety when they carry water. During the summer months when water is at peak flow in the canals, water depths range from 2 to 6 feet, with velocities up to 6 feet per second. These conditions result in areas of deep, swift water that can make it difficult for a child or non/weak-swimmer to get to safety. In adjacent district canals, drowning deaths, or near drowning instances, have occurred in 1996, 1997, 2004, 2016, and 2018 in addition to multiple instances of injury (Flowers 2004, Matsumoto 2016, Beechem 2018). Because the District’s canals pass through urban areas, rural residences, and private lands, potential for accidents is heightened.

4.6 Recreation

In 2015, visitors spent \$660.2 million in Deschutes County, the fourth highest amount among Oregon counties (Dean Runyan Associates 2017). More specifically, river-related tourism, recreation, and hotel revenues contribute an estimated \$80 million to the local economy each year (Hartman et al. 2011). Recreation within SID includes biking on public roads. Any use of the District’s maintenance roads other than for maintenance and operation purposes is prohibited.

The Deschutes River downstream from the Main Canal Diversion (RM 164.8) is used for a variety of recreation activities. The District’s canals and laterals do not contain fish due to a functioning fish screen at the District’s diversion on the Deschutes River. Use of the canals and laterals to fish, swim, float, or pursue any other activities that are not a function of the District is prohibited.

4.6.1 Bikeway Activities

Biking occurs on public roads that intersect the project area at multiple points (Figure 4-8). Some of these roads, such as Tumalo Road and the Old Bend Redmond Highway, are designated as Deschutes County Bikeways.

4.6.2 Park Activities

No parks are within the project area.

4.6.3 River Activities

The Deschutes River downstream of SID’s diversion provides opportunities for many types of recreational activities including rafting, kayaking, floating, stand-up paddle boarding, and fishing. From the northern UGB of the City of Bend (RM 161), downstream to Tumalo State Park (RM 158), the Deschutes River is designated through the Oregon Scenic Waterways Act (ORS 390.826) as a Recreational River Area. This scenic waterway reach has been designated a Recreational River Area due to its accessibility and is managed to allow for compatible recreational uses (see Section 4.13 for further discussion).

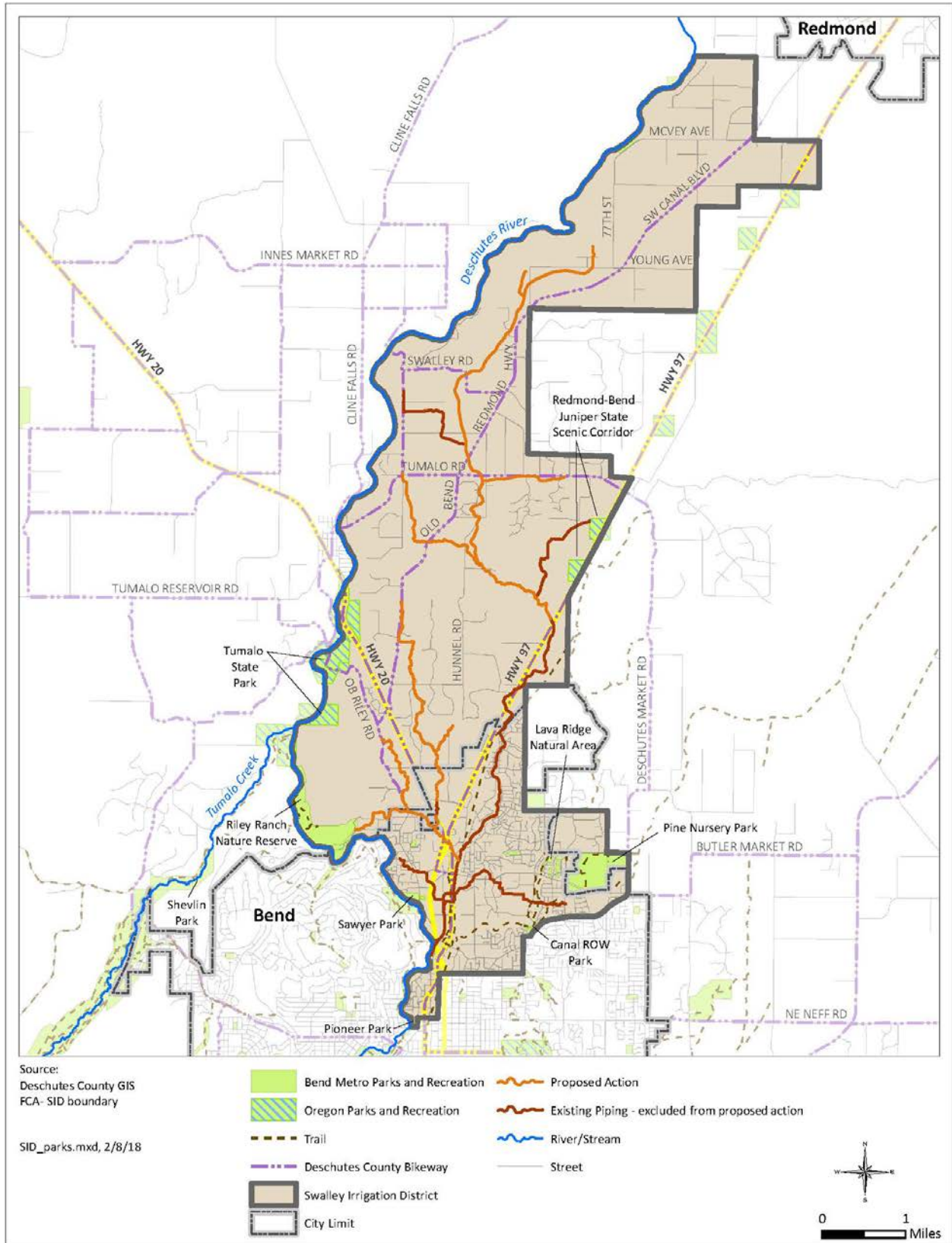


Figure 4-8. Recreation map of parks, trails, and bikeways in Swalley Irrigation District.

4.7 Socioeconomic Resources

Socioeconomic resources associated with District operations fall within Deschutes County and the communities of Bend, Redmond, and Tumalo.

4.7.1 Population

Generally, Deschutes County has seen consistent population growth over the past 10 years (2005 to 2015). The county grew by 14 percent between 2005 and 2015, while the state had a growth rate of 8 percent during the same period (U.S. Census Bureau 2015). The population is forecasted to continue growing into the future. Table 4-6 shows population estimates for Deschutes County; the nearby communities of Redmond, Bend, and Tumalo; and the state of Oregon.

Table 4-6. Population Characteristics by City, County, and State.

Area	Year 2005 Population (no. of people) ¹	Year 2015 Population (no. of people) ²	Population Growth Rate 2005 to 2015 (%) ³	Year 2050 Population Forecast (no. of people) ⁴	Population Growth Rate 2015 to 2050 (%) ³
County					
Deschutes County	143,490	166,622	14	262,958	58
Cities and Towns					
Redmond	20,010	27,450	37	--	--
Bend	70,330	87,017	24	--	--
Tumalo	393 ³	537	37	--	--
State					
Oregon	3,631,440	3,939,233	8	5,588,500	42

Notes:

¹ Source: U.S. Census Bureau 2005

² Source: U.S. Census Bureau 2015; U.S. Census Bureau 2010. Data for the population in 2005 was unavailable for Tumalo; population estimate shown is from 2010.

³ Source: Internal calculations.

⁴ Source: Portland State University 2013. Forecasts for Oregon Cities and Towns were not available.

Ethnicity and race are shown for the area in Table 4-7. Deschutes County is predominantly white, with all other races cumulatively accounting for less than 13 percent of the population. Deschutes County contains a lower percentage of persons identifying as Hispanic or Latino than the state and national average. In Deschutes County, the percentage of persons identifying as American Indian or Alaska Native exceeds the state percentage and is similar to the national level.

Table 4-7. Race by County, State, and United States, 2015.

Population Criteria	Unit	Deschutes County	State of Oregon	United States
White	Number	146,449	3,043,010	197,258,278
	Percent	87.9%	77.2%	62.3%
African American	Number	734	69,105	38,785,726
	Percent	0.4%	1.8%	12.2%
Hispanic or Latino	Number	12,831	485,646	54,232,205
	Percent	7.7%	12.3%	17.1%
Asian	Number	1,969	154,496	16,054,074
	Percent	1.2%	3.9%	5.1%
American Indian or Alaska Native	Number	890	36,347	2,078,613
	Percent	0.5%	0.9%	0.7%
Native Hawaiian or Pacific Islander	Number	166	14,334	499,531
	Percent	0.1%	0.4%	0.2%
Identified Two or More Races	Number	3,558	130,767	6,968,165
	Percent	2.1%	3.3%	2.2%
Some Other Race Alone	Number	25	5,528	638,429
	Percent	0.0%	0.1%	0.2%
Total Population		166,622	3,939,233	316,515,021

Source: U.S. Census Bureau 2015

Note: Totals may not sum due to displayed significant figures.

4.7.2 Area Employment and Income

The economy within the area associated with the proposed action is described through employment by industry, labor force, income and poverty rates, and agricultural activity. Table 4-8 summarizes employment by industry classification. Educational services, health care, and social assistance provide the highest number of employment positions throughout Deschutes County.

Table 4-8. Employment by Industry and Percent Employment Rates in the State of Oregon and Deschutes County, 2015.

Employment Sectors	State of Oregon		Deschutes County	
	Number of People	Percent of Oregon Employment	Number of People	Percent of County Employment
Agriculture, forestry, fishing and hunting, and mining	60,535	3.38	2,330	3.12
Construction	99,157	5.54	5,306	7.11

Employment Sectors	State of Oregon		Deschutes County	
	Number of People	Percent of Oregon Employment	Number of People	Percent of County Employment
Manufacturing	204,094	11.40	6,403	8.58
Wholesale trade	51,908	2.90	1,358	1.82
Retail Trade	215,805	12.06	9,619	12.89
Transportation, warehousing, and utilities	73,724	4.12	2,013	2.70
Information	33,058	1.85	2,159	2.89
Finance and insurance, real estate, rental, and leasing	102,145	5.71	4,327	5.80
Professional, scientific, management, and administrative and waste management services	190,080	10.62	8,554	11.47
Educational services, health care, and social assistance	413,562	23.11	15,472	20.74
Arts, entertainment, recreation, accommodation, and food services	176,909	9.88	10,046	13.47
Other services (except public administration)	88,177	4.93	4,450	5.97
Public administration	80,653	4.51	2,562	3.43
Total Employed, all sectors	1,789,807	100%	74,599	100%

Source: U.S. Census Bureau 2015

Note: Totals may not sum due to displayed significant figures.

Table 4-9 demonstrates the labor force characteristics for Deschutes County and Oregon in 2017. Unemployment is lower in Deschutes County than the state average.

Table 4-9. Labor Force Characteristics in Deschutes County and the State of Oregon, 2017.

Indicator	Deschutes County	State of Oregon
Labor Force	93,300	2,116,102
Employed	90,287	2,038,674
Unemployed	3,013	77,428
Unemployment Rate	3.2%	3.7%

Source: U.S. Bureau of Labor Statistics 2017

Household income and persons living below the poverty level are summarized in Table 4-10. Information is presented for two income indicators: median household income and per capita income. Income in Deschutes County is the same as median income in the State of Oregon; however, both are comparable to the median income in the United States. The percentage of persons living below the poverty level in Deschutes County is similar to that of the United States, but slightly lower than the state.

Table 4-10. Income and Poverty Rates in Deschutes County, the State of Oregon, and the United States, 2015.

Indicator	Deschutes County	State of Oregon	United States
Median Household Income	\$51,223	\$51,243	\$53,889
Per Capita Income	\$29,158	\$27,684	\$28,930
Persons in Poverty (%)	14.6%	16.5%	15.5%

Source: U.S. Census Bureau 2015

4.7.3 Agricultural Statistics

Table 4-11 presents summarized agricultural information for Deschutes County from the 2012 USDA Census of Agriculture (USDA 2012). The top crop item produced in the county by acreage is forage (defined as all hay and haylage, grass silage, and greenchop).

Table 4-11. Agricultural Statistics for Deschutes County.

Agricultural Statistic	2007	2012	Percent Change
Number of Farms	1,405	1,283	-9.5
Land in Farms (acres)	129,369	131,036	1.3
Average Size of Farm (acres)	92	102	9.8
Median Size of Farm (acres)	20	20	0
Market Value of Products Sold	\$19,759,000	\$20,570,000	3.9
Crop Sales	\$9,051,000	\$11,127,000	18.7
Livestock Sales	\$10,708,000	\$9,442,000	-13.4
Average Sales per Farm	\$14,063	\$16,033	12.2

Sources: USDA 2007 and 2012

4.8 Vegetation

4.8.1 General Vegetation

The common upland vegetation found within the project area is big sagebrush and low sagebrush, western juniper, and rubber rabbit bush. Within the project area, ponderosa pine, wild rye and bunch grasses, some species of wildflowers, and other plant species commonly found in the dry Central Oregon steppe environment are also present (Table 4-12). The District outside the project area primarily consists of scrub–shrub vegetation including bitterbrush, Idaho fescue, Sandberg

bluegrass, and cheatgrass. Figure 4-9 provides a visual example of typical vegetation surrounding a lateral.

Table 4-12. General Vegetation within Swalley Irrigation District.

Vegetation Species	Scientific Name
Big sagebrush	<i>Artemisia tridentata</i>
Bitterbrush	<i>Pseudoroegneria spicata</i>
Black cottonwood	<i>Populus balsamifera</i>
Bulrush	<i>Scirpus spp.</i>
Idaho fescue	<i>Festuca idahoensis</i>
Low sagebrush	<i>Artemisia arbuscula</i>
Ponderosa pine	<i>Pinus ponderosa</i>
Rabbit brush	<i>Ericameria nauseosa</i>
Sandberg bluegrass	<i>Poa sandbergii</i>
Western juniper	<i>Juniperus occidentalis</i>

Source: J. Camarata, personal communication, September 22, 2017.



Figure 4-9. Vegetation growing along a lateral in Swalley Irrigation District.

In some sections of the project area, a fringe of hydrophytic (water-loving) plants has formed along the margins of the top of the canal bank represented predominately by bulrush, black cottonwood, and willow. Occurring sporadically, the fringe is a few feet wide in scattered locations and does not function as a habitat type due in part to infrastructure maintenance activities. The District infrastructure is maintained during the off-season by grading and clearing, and no vegetation is allowed to develop within the canals.

4.8.2 Special Status Species

No endangered or threatened ESA species are known to occur within the project area. Additionally, no Oregon species of concern, candidate plant species and their designated critical habitats, or BLM Special Status Species are known to occur within the project area either. Three special status species could potentially occur in Deschutes County: federal candidate whitebark pine (*Pinus albicaulis*), Oregon threatened pumice grape-fern (*Botrychium pumicola*), and federal species of concern and Oregon threatened Peck’s milkvetch (*Astragalus Peckii*) (OAR 603-073-0070, 81 *Federal Register* 232, 2016). Both whitebark pine and pumice grape fern typically occur in subalpine and timberline zones. Based on the USFWS Information for Planning and Conservation database, District observations, the Oregon Department of Agriculture (ODA) identification of species population centers, and due to the elevation and plant communities that these two species generally inhabit, it is unlikely that the pumice grape-fern and whitebark pine would occur within the project area. Therefore, these two special status plant species will not be discussed further.

Peck’s milkvetch generally occurs in the barren openings of sagebrush–juniper woodlands, ponderosa pine forests, and lodgepole pine forests, preferring sandy soils with minimal organic matter and pumice in varying amounts from Mt. Mazama’s eruption. In Oregon, Peck’s milkvetch is broadly grouped by the ODA into three population centers: barren pumice flats near Chemult (60 miles south of the project area), open ponderosa pine stands east of Chiloquin (100 miles south of the project area), and in Deschutes County between Sisters and Bend (ODA 2017a). Although SID is located between Sisters and Bend, based on District observations, data from the Oregon Biodiversity Information Center (2017), and lack of preferred barren open habitat, Peck’s milkvetch is unlikely to occur within the project area. Therefore, this special status plant species will not be discussed further.

4.8.3 Noxious Weeds

The Deschutes Basin Board of County Commissioners determines a weed to be noxious if it is “injurious to public health, agriculture, recreation, wildlife, or any public or private property,” and “impacts and displaces desirable vegetation.” Furthermore, it is recognized that certain noxious weeds are so pervasive that they have been classified by ORS 569.350 to be a menace to public welfare (ODA 2017b). The Deschutes County Noxious Weed Policy and Classification System designates three weed categories. “A” designated weeds are of highest priority for control and are subject to intensive eradication, containment, or control measures using county resources. “B” designated weeds have a limited distribution; intensive containment control and monitoring by landowners is required; and support from the county is provided when resources allow. “C” designated weeds are the lowest priority for control; they have a widespread distribution and

landowner control and monitoring is recommended (Deschutes County 2017). Table 4-13 lists the noxious weeds and corresponding classifications known to occur in the project area.

Table 4-13. Noxious Weeds Occurring in the Project Area.

Vegetation Species	Scientific Name	Deschutes County Noxious Weed Rating
Bull thistle	<i>Cirsium vulgare</i>	C
Cheatgrass	<i>Bromus tectorum</i>	C
Common mullein	<i>Verbascum thapsus</i>	C
Diffuse knapweed	<i>Centaurea diffusa</i>	B
Kochia	<i>Kochia scoparia</i>	B
Poison hemlock	<i>Conium maculatum</i>	B
Russian thistle	<i>Salsola spp.</i>	B
Spotted knapweed	<i>Centaurea stoebe</i>	B
Yellow flag iris	<i>Iris pseudacorus</i>	B

Source: J. Camarata, personal communication, September 22, 2017.

The District combats noxious and invasive weeds through minimal mechanical and chemical management techniques, limited primarily to trouble spot applications. Chemicals, when applied, are not applied closer than 3 feet from the canal water edge. Using Oregon Watershed Enhancement Board funding, SID has recently begun working in cooperation with the local Soil and Water Conservation District to remove a small section of noxious weeds and revegetate those areas with native seed mixes that include species such as lupine and other native grasses; this would potentially avoid the need for future chemical application.

4.9 Visual Resources

4.9.1 Regional Context

Located in the northeast portion of Deschutes County, SID is part of a larger region that is valued by residents and visitors for its open spaces including extensive farms and forests, and scenic views. The Deschutes County Comprehensive Plan, adopted in Ordinance 2011-003, identified the scenic resources in the county as, "... high mountain peaks, open meadows, riparian corridors, wetlands and forests. These areas contribute to the high quality of life for county residents."

4.9.2 Project Area and Adjacent Landscape

Generally speaking, canals and laterals are flat against the landscape; in some sections of the project area, the canals and laterals are a few feet lower than the landscape level; therefore, the canal and lateral banks are part of the landscape. The project area, in addition to canals and laterals, includes vegetation and a dirt or gravel maintenance road used by SID for canal and lateral maintenance. Herbaceous vegetation, grasses, shrubs, and trees growing within the project area can obscure the view of the canal and laterals from adjacent lands.

Views of the canal and laterals differ throughout the year. The District’s irrigation season typically extends from April through mid-October. During this time, the District’s canals and laterals carry water. Outside the irrigation season, typically from mid-October through March, SID’s canals and laterals do not carry water and are dry. Three times outside the irrigation season, the District provides “stock runs,” which is water delivered through the system to fill patron ponds. Although the canals are not naturally formed waterways, some viewers may consider them to be water features during the irrigation season.

In some sections of the project area, SID’s maintenance roads have been posted with No Trespassing signs by SID because the roads are not managed or designated for public use.

Approximately 79 percent of the project area’s length passes through agricultural and undeveloped lands (see Figure 4-10 for a visual example). Throughout these lands, the visual landscape elements of the canal alignments (position and path of canals, laterals, and banks through the surrounding area) vary greatly with differing land-management practices. The alignments have a more dominant visual characteristic through some areas, while in other areas the canal features are obscured by vegetation. Some rural residences are located adjacent to the project area. The open canal and laterals can be seen from these rural residences as well as public road crossings.

Approximately 21 percent of the project area’s length passes developed areas consisting of commercial warehouses and low-density residential development within Bend. In the low-density residential area that the project area traverses, there is very little visual distinction between the lateral and canal alignments and the adjacent residential properties.

The District’s hydropower facility, part of the project area, is located on the Swalley Main Canal north of Fort Thompson Lane, off U.S. Highway 97. The building can be seen by motorists on U.S. Highway 97 and is surrounded by upland vegetation (Figure 4-11).



Figure 4-10. A lateral passing through agricultural lands in Swalley Irrigation District.



Figure 4-11. Swalley Irrigation District's Ponderosa Power Plant, as seen from U.S. Highway 97.

4.10 Water Resources

The waterbody associated with District operations is the Deschutes River downstream from the Main Canal Diversion at North Canal Dam (RM 164.8). The upstream end of Lake Billy Chinook at the confluence of the Deschutes, Crooked, and Metolius rivers is the downstream boundary of the

area associated with District operations (Figure 4-12). Groundwater resources associated with District operations is limited to the upper Deschutes Basin.

The District diverts live flow from the Deschutes River near Bend, Oregon, to meet patron water needs. The District's water rights are considered "natural flow" and do not depend on the use of any reservoir or pumping facilities.

The District holds a water right to divert live flow from the Deschutes River from April 1 through October 31. These rights allow for a peak diversion rate of 82.079 cfs from May 15 through September 14 and reduced diversion rates during the shoulder seasons (April 1 through May 14 and September 15 through October 31). The majority of the District's water right is diverted through the Main Canal Diversion; however, there are also 15 other diversion points along the Deschutes River, which are used and maintained by individual SID water users. These privately maintained individual diversions are not included in the proposed action. OWRD and USGS have a meter/gage on SID's Main Canal pipeline intake downstream from the diversion point and fish screen. The District regulates all withdrawals for irrigation from its canal system to ensure deliveries are within available adjudication rates for each season. The District requires new deliveries to include an accurate measurement device; when piping projects are implemented, accurate and state-of-the-art meter measurement devices are installed.

The District is responsible for delivering a patron's allotted water to their point of delivery. Conveyances beyond the point of delivery are private and are the responsibility of the water users and, to a lesser extent, the few non-water users whose land the private canal traverses. Per ORS 545 that outlines the authorities of irrigation districts, the District has the authority and responsibility to protect water rights and private conveyance where a water user is in jeopardy of not meeting state beneficial use requirements because the private conveyance is not functioning adequately.

The District has been working to modify its infrastructure to be as efficient as possible with limited funds. In addition to prior water conservation projects, the District completed construction of the Ponderosa Hydroelectric Facility in 2010. This facility produces an average of 2,282 megawatt-hours per year by employing only the water needed by SID water users downstream from the plant's location. Although conveyances beyond a water user's point of delivery are the responsibility of the water user, patron irrigation methods within SID are considered efficient, with only 4 out of 668 patrons flood irrigating.

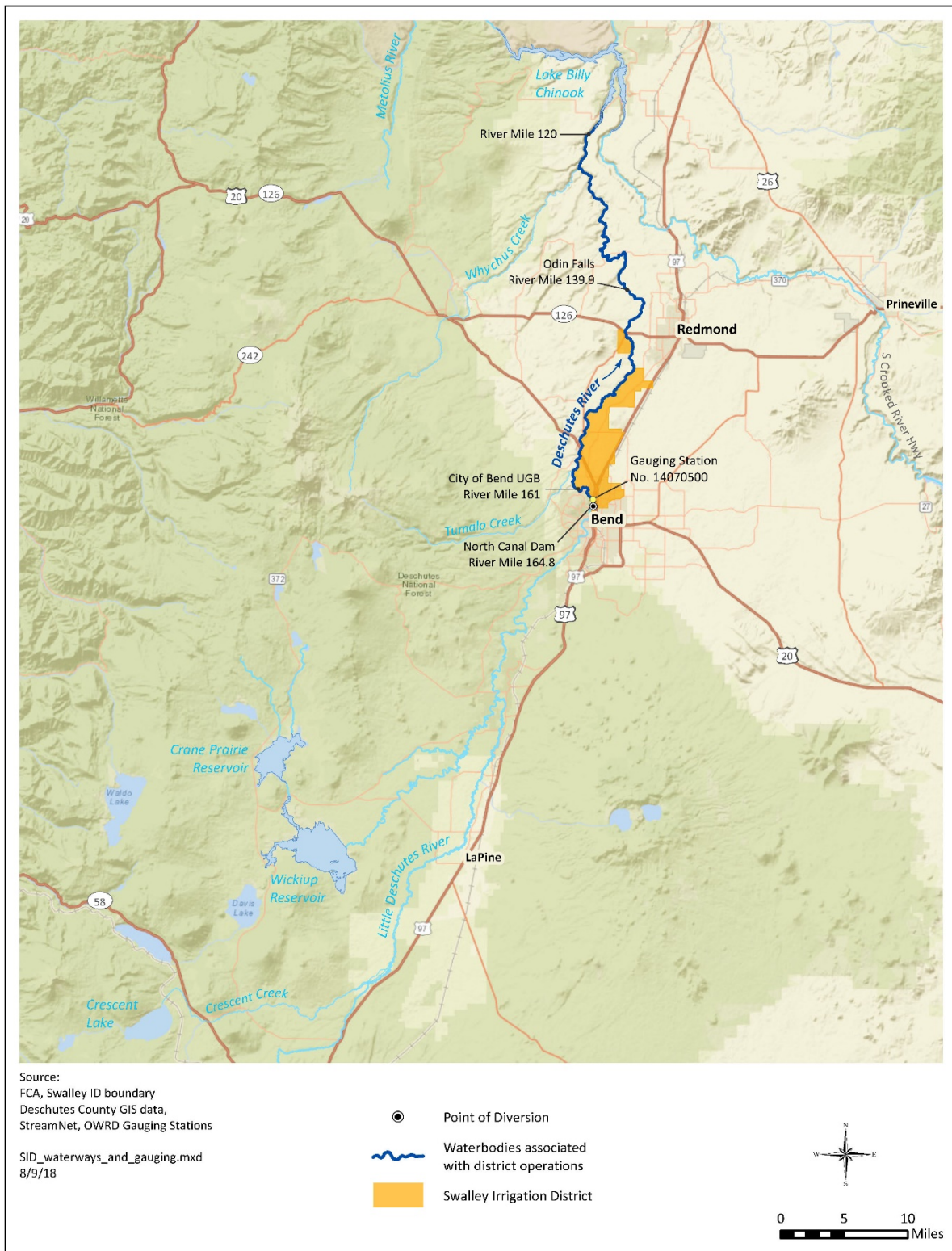


Figure 4-12. Waterbodies and location of the OWRD streamflow gaging station associated with district operations.

4.10.1 Water Rights

4.10.1.1 District Water Rights

Swalley Irrigation District provides irrigation water to 4,333 acres for both agricultural and industrial uses. The District is a senior water right holder on the Deschutes River, operating under water right Certificate 74145 with a September 1, 1899, priority date. During the peak irrigation season (May 15 through September 14), the District's water rights allow for a peak diversion rate of 82.079 cfs and reduced diversion rates during the shoulder seasons (April 1 through May 14 and September 15 through October 31).

Water right transfers associated with canal piping projects over the past 20 years have modified the District's water rights and allocated water rights to instream use. Despite being one of the smallest irrigation districts in Central Oregon, SID has allocated the largest amount of conserved water instream to date through the Allocation of Conserved Water Program. Completed conservation projects include piping over 8 miles of canal and protecting approximately 43 cfs of water (about one-third of SID's original water right) in the Deschutes River during the irrigation season.

Recently, the District has grown increasingly concerned with its ability to deliver the full amount of water for which irrigators have water rights, while also voluntarily addressing threatened and endangered species issues. Following implementation of past major conservation projects and the subsequent largest cumulative instream water right transfers made in the state to-date, the District's water supply during the shoulder seasons (April 1 through May 14 and September 15 through October 31) has been in a deficit, and water users do not receive their full allotment. During the peak irrigation season (May 15 through September 14), when it's major producers come online, the District operates with tight restrictions on the allowable number of instream leases it is able to accommodate in order to provide adequate irrigation supply, a function of the inefficiencies of the earthen canal system; therefore, in some years, as evidenced in the 2018 irrigation season, the District cannot fulfill patron demands throughout the entire peak season despite many fields laying fallow and out of production. If a higher percentage of fallowed fields came into production at once, and the District experienced full demand, the District would not be able to meet peak season demands.

4.10.1.2 Deschutes River Water Rights

In 1987, the Oregon legislature passed the Instream Water Rights Act and created the statutory framework necessary to establish instream water rights. OWRD holds these rights in trust for the public, but they can be purchased, leased, or gifted to the state by anyone within Oregon looking to either obtain water rights for their property, lease their water rights instream, or gift their water rights to the state for permanent instream use (Golden and Aylward 2006; OAR 690-077). OWRD regulates instream rights based on a rate, duty, and priority date in the same manner that they regulate traditional water rights. Instream water rights created through permanent transfers have the same priority date as the originating water right that was transferred instream and is facilitated through Oregon's Allocation of Conserved Water Program (OAR 690-018). The Deschutes River has a pending instream right of 250 cfs year-round that serves as a preliminary streamflow restoration target (Appendix E).

4.10.2 Surface Water Hydrology

Historically, the spring-fed Deschutes River had relatively consistent seasonal and annual streamflow (Deschutes River Conservancy [DRC] 2012). Hydrological conditions and channel morphology have changed with the construction and operation of reservoirs, dams, and diversions on the river and its tributaries. Water is now managed for irrigation use, resulting in lower flows downstream from reservoirs during the winter months, higher flows downstream from reservoirs during the summer months, and lower flows downstream from irrigation diversions during the spring, summer, and fall.

The Central Oregon, Lone Pine, North Unit, and Swalley irrigation districts divert water from the Deschutes River at the North Canal Dam (RM 164.8). These irrigation diversions drive streamflow patterns in the Deschutes River downstream from the City of Bend. Historically, these irrigation districts maintained a minimum of 30 cfs instream in this reach under a voluntary agreement. Extensive conservation efforts by the irrigation districts and their partners starting in the 2000s have enhanced streamflow during the irrigation season. July median streamflow in the Deschutes River at North Canal Dam more than tripled from 2002 to 2012, from 47 cfs to 158 cfs (Mork 2016). In response to a reduction in instream leases and water voluntarily left instream by irrigation districts, the July median streamflow dropped in 2013 to 129 cfs. It has steadily crept upward since 2013 to a 2015 July median flow of 136 cfs (Mork 2016). OWRD measures this streamflow at stream gaging stations and ensures that leases, transfers, and conserved water remain instream.

In 2016, local irrigation districts that store water in reservoirs upstream of SID's diversion agreed to voluntarily release additional streamflow from Wickiup Reservoir, Crane Prairie Reservoir, and Crescent Lake outside the irrigation season to benefit Oregon spotted frog populations in the Deschutes River (*Center for Biological Diversity et al. v. U.S. Bureau of Reclamation and Arnold Irrigation District et al.* 2016). Under this Stipulated Settlement Agreement with the Center for Biological Diversity,⁵ the districts agreed to maintain a minimum of 100 cfs in the Deschutes River outside the irrigation season. These conditions have been maintained since the expiration of the Settlement Agreement in compliance with the 2017 Biological Opinion for Bureau of Reclamation dam operations (Reclamation 2017). These additional water releases are not legally protected instream.

Figure 4-13 illustrates the daily⁶ average baseline streamflow prior to the 2016 Settlement Agreement and the modified daily average baseline streamflow following the 2016 Settlement Agreement. The daily average baseline streamflow prior to the 2016 Settlement Agreement was calculated from the 1994-2015 water years⁷ and the daily average baseline streamflow following the 2016 Settlement Agreement. Figure 4-12 shows the location of the stream gage used for these analyses.

The upper Deschutes Basin has experienced a general drying trend for several decades (Gannett and Lite 2013) and is susceptible to future changes in precipitation and the amount and timing of spring

⁵ In addition to interim operation adjustments to Crescent Lake, Crane Prairie, and Wickiup dams and reservoirs, this Stipulated Settlement Agreement prompted a completion of the consultation and biological opinion by USFWS on effects of such operations on the Oregon spotted frog (Reclamation 2017).

⁶ The daily average streamflow is the mean streamflow over a whole day.

⁷ A water year is defined as the 12-month period from October 1 for any given year through September 30 of the following year.

runoff (Shelton and Fridirici 2001). Models suggest that increased rain and a decrease in snowpack combined with an accelerated rate of spring snowmelt would have a greater influence on the future water supply in the area; these changes would make managing the water supply more difficult (Shelton and Fridirici 2001; Reclamation 2016). This trend has the potential for a decrease in annual mean streamflow as well as decreases in groundwater discharge to spring-fed streams (Gannett and Lite 2013).

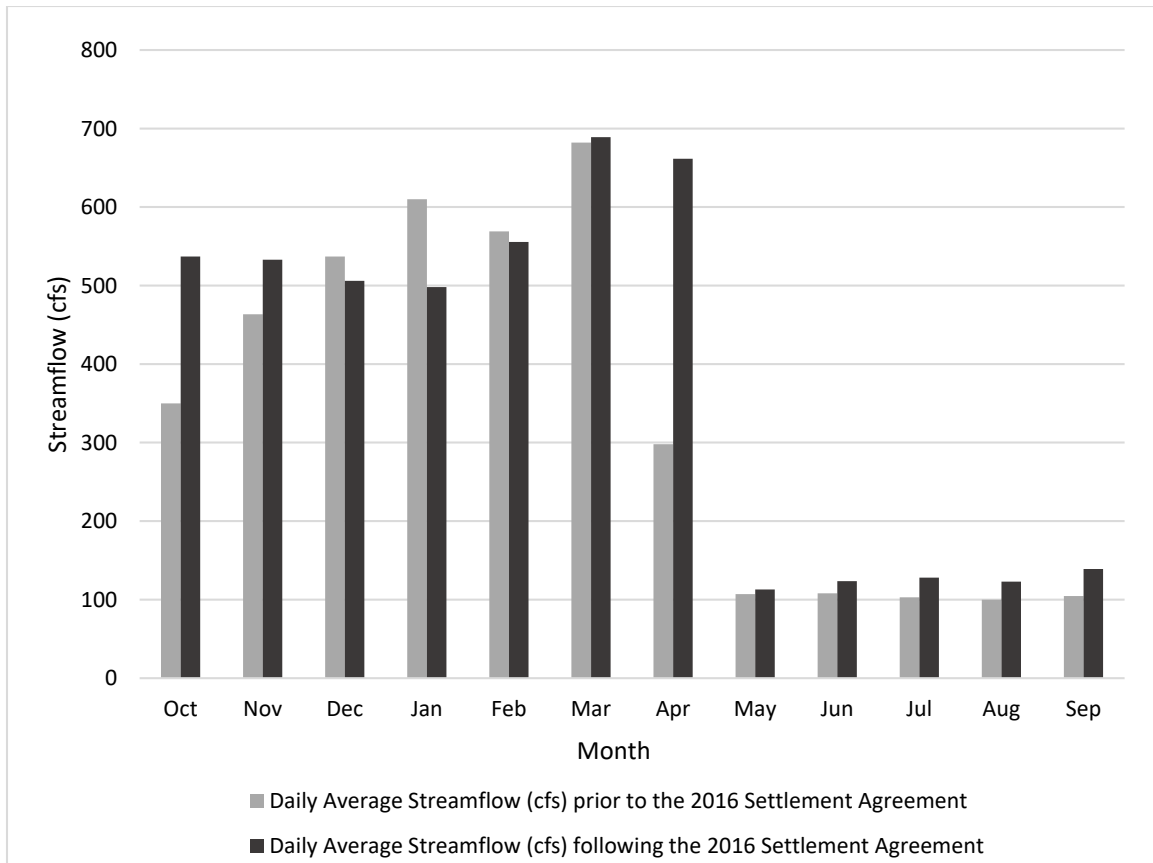


Figure 4-13. Streamflow in the Deschutes River downstream from the City of Bend at OWRD Gage No. 14070500.

Note: The streamflows represent conditions in the river downstream from Arnold, Central Oregon, Lone Pine, North Unit, and Swalley Irrigation Districts’ diversions. Data for historic streamflow represent the 1994 through 2014 water years. Data for the modified streamflow represent October 2016 through September 2017. Average streamflow represent the 50 percent exceedance streamflow.

4.10.3 Surface Water Quality

The Oregon Department of Environmental Quality (ODEQ) maintains a list of all surface waters in the state that are considered impaired because they do not meet water quality standards under Section 303(d) of the CWA (33 U.S.C. 1251 et seq.) The 2012 303(d) list is currently effective for CWA purposes. The Deschutes River is included on Oregon’s 303(d) list for not meeting water quality standards for temperature, pH, or dissolved oxygen (Table 4-14).

Water management in the Deschutes Basin has resulted in low winter flows and high summer flows. Low flows affect water quality in the Deschutes River by exacerbating temperature and dissolved

oxygen problems. Water quality often dictates the spread and extent of aquatic invasive species, and these problems interact synergistically to degrade wildlife habitat within and around the Deschutes River (USFWS 2017). The following sections describe existing 303(d)-listed impairments in the surface water area associated with District operations. These impairments may extend upstream or downstream of the reaches included in Table 4-14.

Table 4-14. Impaired Waterbodies Associated with District Operations.

Waterbody Name	Study Reach	Parameters Included on Oregon’s 303(d) List
Deschutes River	Swalley Irrigation District diversion at North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120)	Temperature, pH, and dissolved oxygen

Source: ODEQ 2012

4.10.3.1 Temperature

The Deschutes River does not meet stream temperature criteria within the area associated with District operations (Table 4-14). The temperature criterion that applies in this reach is 18 °C (64.4 degrees Fahrenheit [°F]). These standards are set to protect designated beneficial uses within the Deschutes Basin including salmon and trout rearing and/or migration, public and private domestic water supply, wildlife and hunting, and aesthetic quality (ODEQ 1995). Elevated stream temperatures affect aquatic life including native fish by exacerbating conditions that cause stress and disease, raise their metabolism, and reduce growth rates. Low streamflow, reduced streamside vegetation, and widened channels can all contribute to elevated stream temperatures.

4.10.3.2 pH

The Deschutes River does not meet Oregon’s standards for pH year-round. The pH levels in the area associated with District operations fall outside of the set criteria of 6.5 to 8.5 (ODEQ 2012). Levels of pH in the Deschutes River exceeds ODEQ standards in part because of the volcanic geology of the basin (L. Mork, personal communication, August 10, 2018). Chronic high pH levels in freshwater streams can decrease activity levels of salmonids, create stress responses, decrease or cease feeding, and lead to a loss of equilibrium; if pH reaches extremely low or high levels, death can occur (Murray and Ziebell 1984; Wagner et al. 1997).

4.10.3.3 Dissolved Oxygen

The Deschutes River does not meet Oregon’s standards for dissolved oxygen. The dissolved oxygen levels in these reaches are not high enough to meet Oregon’s standards during trout spawning season from January 1 to May 15 (ODEQ 2012). Low dissolved oxygen levels can affect aquatic life by reducing habitat quality and quantity, changing behavior, or reducing growth rates. Excess nutrient inputs, associated algae growth and die-off, and elevated stream temperatures can all contribute to lower dissolved oxygen levels.

4.10.4 Groundwater

Groundwater resources associated with District operations are limited to the upper Deschutes Basin and are bounded on the north by Jefferson Creek, the Metolius River, the Deschutes River, and

Trout Creek; on the east by the geological change between the Deschutes Formation and the much less permeable John Day Formation; on the south by the drainage divides between the Deschutes Basin and the Fort Rock and Klamath Basins; and on the west by the Cascade Mountain Range. Previous studies define groundwater in the upper Deschutes Basin and provide context for groundwater within the area (Gannett et al. 2001; Gannett and Lite 2013; Figure 4-14).

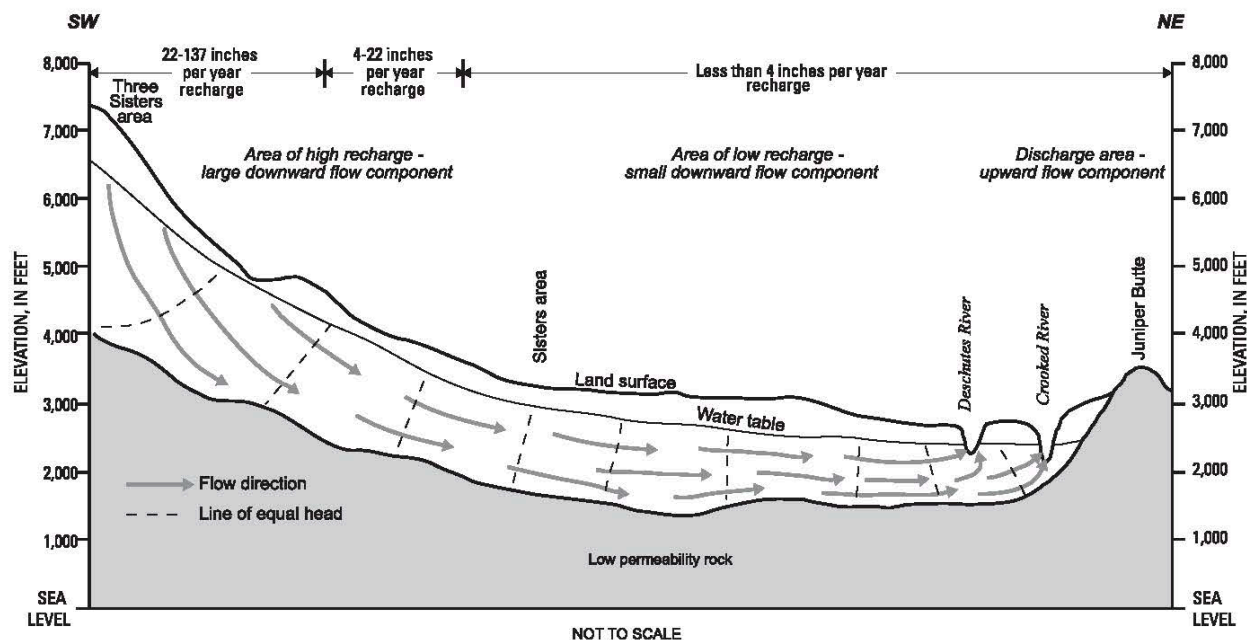


Figure 4-14. Precipitation recharge in the Deschutes Basin regional aquifer.

Note: Flow generally moves east, then north before discharging to the streams along the edge of the Cascade Range or the streams and rivers near the confluence of the Metolius, Deschutes, and Crooked rivers (Gannett et al. 2001).

Within the upper Deschutes Basin, precipitation in the Cascade Mountain Range provides 3,500 cfs of annual groundwater recharge. Inflows from outside the upper Deschutes provide an additional 850 cfs of recharge. Canal seepage across the region provided approximately 411 cfs of additional recharge in 2008 (Gannett et al. 2001; Gannett and Lite 2013). Subsequent canal lining and piping projects have further reduced canal seepage.

Groundwater primarily enters the regional aquifer as precipitation in the Cascade Mountain Range. It generally flows east and then north through the basin. Approximately half of this groundwater discharges into streams through springs along the edge of the Cascade Mountain Range. The remainder of this groundwater discharges into streams and rivers near the confluence of the Metolius, Deschutes, and Crooked rivers (Gannett et al. 2001; Figure 4-14).

Due to the porous geology of the area, groundwater levels and stream discharge are associated with movement of water between surface and groundwater systems. The rivers, streams, and irrigation canals in the Upper Deschutes watershed all show seepage losses indicative of the area's permeable geology (Gannett et al. 2001). A loss assessment study in 2016 measured up to 19.2 cfs of peak-

season loss⁸ in SID’s canals due to seepage and evaporation (SID 2017). The canal seepage likely enters the regional groundwater system that discharges near or into Lake Billy Chinook (Gannett and Lite 2013).

Cascade Range aquifers in the upper Deschutes Basin have experienced a general drying trend since the 1950s. Climate oscillations remain the primary driver of these declines (Gannett et al. 2001; Gannett et al. 2003). A USGS study from 1997 to 2008 investigated the influence of canal lining, groundwater pumping, and climate on water level trends in the region. The study found an approximate 5- to 14-foot decline in groundwater levels in the central part of the region, which includes the project area; and that 60 to 70 percent of the measured decline was associated with climate variations, 20 to 30 percent of the measured decline was associated with increased groundwater pumping, and 10 percent was associated with canal lining and piping (Gannett and Lite 2013). At the basin scale, natural fluctuations in groundwater discharge largely mask the effects of development on discharge from the regional aquifer (Gannett et al. 2001).

4.11 Wetlands and Riparian Areas

Wetlands perform a number of valuable functions including water storage, water filtration, and biological productivity. They can also support complex food chains that provide sources of nutrients to plants and animals and specialized habitat for a wide variety of aquatic and terrestrial species. Wetlands in the area associated with the proposed action may be subject to federal or state regulations depending on their characteristics. Within Oregon, wetlands are managed under two laws, the CWA, and the Oregon Removal-Fill Law (ORS 196.795-990). The U.S. Army Corps of Engineers (USACE) administers Section 404 of the CWA with the oversight of the U.S. Environmental Protection Agency (USEPA). This law regulates the dredging or filling of wetlands over which the USACE has jurisdiction (or “jurisdictional wetlands”).

Section 404 of the CWA defines wetlands as “those areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions” (USACE 1986).

The Oregon Department of State Lands (ODSL) implements the Removal-Fill Law (ORS 196.800-990), which regulates the removal or fill of material in wetlands or waterways, requiring any person who plans to “remove or fill” material within “waters of the state” to obtain a permit from ODSL.

According to the 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 (ODSL 2013):

- The ditch is operated and maintained for the primary purpose of irrigation; and

⁸ The difference between the total loss shown in the SIP and the loss shown in this Plan-EA is due to piping projects that have occurred in District since the time the water loss assessment occurred.

- The ditch is dewatered⁹ outside the irrigation season except for isolated puddles in low areas.

Language provided in the 1986 Final Rule for Regulatory Programs of the Corps of Engineers (1986 Final Rule) identified that irrigation ditches are generally not considered Waters of the United States for the purpose of determining CWA Section 404(f)(1)(C) applicability. However, USEPA reserved the “right to determine on a case-by-case basis if any of these waters are Waters of the United States...” including, “...irrigation ditches excavated on dry land...” (USACE 1986). In 2006, a “significant nexus” jurisdiction standard from *Rapanos v. United States* (547 U.S. 715 (2006)) was established, which has been used to determine if identified waters are Waters of the United States (Supreme Court 2006).

In 2015, the Clean Water Rule: Definition of “Waters of the United States” (2015 Final Rule) (USEPA 2015) was published and provided clear exclusions for certain types of ditches. However, the U.S. Court of Appeals for the Sixth Circuit stayed the 2015 Final Rule nationwide pending further action of the court. This reinstated the “significant nexus” jurisdiction standard from *Rapanos v. United States*.

The National Wetland Inventory (NWI) geographic information systems data (USFWS 2016) does not describe any natural wetland resources within the project area; however, there are approximately 65.6 acres of seasonally flooded, artificial wetland features classified as either “PUSC_x (Palustrine, Unconsolidated Shore, Seasonally Flooded, and excavated by humans)” and “R4SBC_x (Riverine, Intermittent, Streambed Seasonally, and excavated by humans)” within and adjacent to the project area (USFWS 2016). Water typically flows through the canals and laterals in the project area during the irrigation season, between April 1 and October 31. Water may also occasionally flow through these canals outside the irrigation season for stock water deliveries or be present as standing water following rain or snow events. Although some canals and laterals may have hydrology and vegetation indicative of a wetland, they only contain water during the irrigation season and do not meet functional criteria of wetlands, nor are they regulated as wetlands by ODSL or USACE. These canals and laterals meet exemptions under the Oregon Removal-Fill statute (OAR 141-085-0515(9)) for specific agricultural activities in wetlands and other waters of the state.

Wetlands, including riverine and palustrine types, are also found within and sporadically adjacent to the 44.8 miles of the Deschutes River associated with District operations (Section 4.10).

Riparian areas are transition zones between waterbodies and adjacent upland areas that support hydrophytic vegetation that is dependent upon the hydrology of the waterbody. Riparian areas as defined by Section 404 of the CWA are “areas next to or substantially influenced by water. These may include areas adjacent to rivers, lakes, or estuaries” (USEPA 2015).

Riparian areas are typically associated with high water tables due to the close proximity to aquatic ecosystems, certain soil characteristics, and a range of vegetation that requires free water or

⁹ “Dewatered” means that the source of the irrigation water is turned off or diverted from the irrigation ditch. A ditch that is dewatered outside the irrigation season may be used for temporary flows associated with stormwater collection, stock water runs, or fire suppression.

conditions that are moister than normal (Oakley et al. 1985). These zones are transitional between aquatic and upland zones and have a variety of vegetation ranging from grasses and sedges to willows, alder, and aspen with minimal conifer encroachment.

Riparian areas of varying size and quality occur adjacent to the 44.8 miles of the Deschutes River associated with District operations. Low late fall, winter, and early spring streamflow associated with upstream reservoir storage limits riparian vegetation in the Deschutes River (RDG 2005). Low streamflow along these reaches can expose the channel bed and riverbanks, facilitating increased erosion and fine sediment delivery following freeze-thaw processes and increased spring streamflow (RDG 2005). Downstream of SID's diversion, low streamflow associated with irrigation withdrawals in late spring, summer, and early fall further limit riparian vegetation in the Deschutes River. Because streamflow is strongly correlated with critical physical and biological characteristics of the river, it influences the functions of associated riparian areas (National Research Council 2002). Re-establishing a more natural hydrologic regime in these reaches allows the river channel to supply water to riparian areas via infiltration through channel banks, thus enhancing riparian function by facilitating processes such as hyporheic¹⁰ exchange, physical and chemical transformations, and supporting riparian plant communities and aquatic habitat (National Research Council 2002).

4.12 Wildlife Resources

4.12.1 General Wildlife

Many terrestrial wildlife species have the potential to occur in the project area. Generally, wildlife consists of habitat generalists or edge species, with the ability to adapt or exploit the urban environment. These species are tolerant of fragmentation, disturbance, and urbanization, and include species such as deer, coyote, skunk, grey squirrel, raccoon, and red-tailed hawk (Blair 1996; Ditchkoff et al. 2006; McKinney 2002; and Shochat et al. 2006).

Wildlife within the project area may use the canal and lateral system as a water source and dispersal corridor. Additionally, where not cleared, vegetation along canals and laterals can provide food, cover, and breeding sites for many wildlife species throughout the year. However, given the fragmented, disturbed nature of habitat, and continued urbanization and biotic homogenization, habitat within the project area likely supports less species diversity and a greater percentage of exotic flora and fauna than native, intact, undisturbed habitat types. Table 4-15 lists wildlife species commonly seen within the project area.

¹⁰ The hyporheic zone is a region beneath and alongside a stream bed, where there is mixing of shallow groundwater and surface water.

Table 4-15. Wildlife Species Likely to Occur within the Project Area.

Wildlife Species	Scientific Name
Bat	<i>Vespertilionidae</i> spp.
Coyote	<i>Canis latrans</i>
Desert horned lizard	<i>Phrynosoma platyrhinos</i>
Golden mantled ground squirrel	<i>Spermophilus lateralis</i>
Mule deer	<i>Odocoileus hemionus</i>
Northern flicker	<i>Colaptes auratus</i>
Osprey	<i>Pandion haliaetus</i>
Pygmy rabbit	<i>Brachylagus idahoensis</i>
Pygmy short-horned lizard	<i>Phrynosoma douglasii</i>
Raccoon	<i>Procyon lotor</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
Rufous hummingbird	<i>Selasphorus rufus</i>
Turkey vulture	<i>Cathartes aura</i>
Western gray squirrel	<i>Sciurus griseus</i>
Western rattlesnake	<i>Crotalus viridis</i>
Western skink	<i>Eumeces skiltonianus</i>
Yellow pine chipmunk	<i>Eutamias amoenus</i>

Source: ODFW 2017b

4.12.2 MBTA/BGEPA Species

Bird species listed in Table 4-16 potentially occur within the project area and are protected under the MBTA or the Bald and Golden Eagle Protection Act (BGEPA). Although migratory birds are known to occur in the project area and its vicinity, limited habitat is provided within the project area and SID's ROW due to maintenance activities that remove vegetation on an annual basis.

Table 4-16. Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act Species Potentially Occurring within the Project Area.

MBTA/BGEPA Species¹	Scientific Name
Bald eagle	<i>Haliaeetus leucocephalus</i>
Brewer’s sparrow	<i>Spizella breweri</i>
Calliope hummingbird	<i>Stellula calliope</i>
Cassin’s finch	<i>Carpodacus cassinii</i>
Eared grebe	<i>Podiceps nigricollis</i>
Flammulated owl	<i>Otus flammeolus</i>
Fox sparrow	<i>Passerella iliaca</i>
Golden eagle	<i>Aquila chrysaetos</i>
Green-tailed towhee	<i>Pipilo chlorurus</i>
Lewis’s woodpecker	<i>Melanerpes lewis</i>
Loggerhead shrike	<i>Lanius ludovicianus</i>
Long-billed curlew	<i>Numenius americanus</i>
Olive-sided flycatcher	<i>Cantopus cooperi</i>
Peregrine falcon	<i>Falco peregrinus</i>
Pinyon jay	<i>Gymnorhinus cyanocephalus</i>
Rufous hummingbird	<i>Selasphorus rufus</i>
Sage thrasher	<i>Oreoscoptes montanus</i>
Short-eared owl	<i>Asio flammeus</i>
Swainson’s hawk	<i>Buteo swainsoni</i>
Western grebe	<i>Aechmophorus occidentalis</i>
White-headed woodpecker	<i>Picooides albolarvatus</i>
Williamson’s sapsucker	<i>Sphyrapicus thyroideus</i>
Willow flycatcher	<i>Empidonax traillii</i>

Source: USFWS 2017

Note:

¹ This is only a partial list of migratory birds that potentially occur within the project area.

4.12.3 Federally Listed Species

USFWS maintains a list of wildlife species protected under the ESA that may occur in Deschutes County (USFWS 2017). As noted previously, no listed animals or federally designated critical habitat occurs within the project area or area associated with District operations that may be affected by the proposed action.

4.12.4 State-Listed Species

ODFW maintains a list of native wildlife species in Oregon that have been determined to be either threatened or endangered according to criteria set forth by rule (OAR 635-100-0105) (ODFW 2017a). There are no state-listed terrestrial species known to occur within the project area.

4.13 Wild and Scenic Rivers

The Deschutes River from Odin Falls (RM 139.9) to the upper end of Lake Billy Chinook (RM 120) is a federally designated Wild and Scenic River (Public Law 90-542; 16 U.S.C. 1271 et seq.) and is within the project's watershed planning area. This segment of the Deschutes River is classified as "Scenic" with Outstandingly Remarkable Values (ORV) including (U.S. Department of Interior 1992):

- **Cultural**—related to prehistoric and historic sites found along the river corridor and the traditional uses associated with the area,
- **Fish**—due to the quality and importance of the fisheries habitat and its resulting diversity of resident and remnant anadromous species,
- **Geologic**—history visible along the river,
- **Recreation**—due to year-round, semi-primitive recreation opportunities
- **Scenery**—with rugged natural character and diversity,
- **Wildlife**—habitat,
- **Hydrology**—providing stream habitat and a riparian zone created by the stable flows and increase of water from springs, and the river's prominent features such as Odin, Big, and Steelhead Falls; springs and seeps; white-water rapids; water-sculpted rock; and the river canyons,
- **Botanical and Ecological**—conditions that are unusual compared to the surrounding area, and
- **Wilderness**—availability in the Deschutes Canyon/Steelhead Falls Wilderness Study Area.

Additional information regarding the ORVs is provided in Appendix E.

The overall goal of the Middle Deschutes/Lower Crooked Wild and Scenic River Management Plan is to maintain the current character of the river area and provide long-term protection and enhancement of its ORVs. Additional goals include protecting and enhancing instream and land-based biological, cultural, and physical resources; protecting and enhancing instream and land-based biological, cultural, and physical resources; and providing for appropriate recreational use and public access while maintaining the wild and scenic nature of the river (U.S. Department of Interior 1992).

In addition to federally designated Wild and Scenic Rivers, several reaches of the middle Deschutes River within the project’s planning area are designated Oregon State Scenic Waterways (ORS 390.826). These locations, with specific exclusions and classifications, are detailed in Table 4-17.

Table 4-17. Designated Oregon Scenic River Waterways Associated with District Operations.

Waterbody Name	Classification	Reach
Middle Deschutes River	River Community Area ¹	From RM 164 to approximately RM 161; from RM 129.9 to RM 131.5; and from RM 124.3 to RM 125.25.
	Recreational River Area ²	From the northern Bend Urban Growth Boundary (RM 161) to Tumalo State Park (RM 158).
	Scenic River Area ³	From Deschutes Market Road (approximately RM 157) to the south boundary of the Wilderness Study Area (approximately RM 131), with the exception of the Clines Falls Dam and powerhouse between the State Highway 126 Bridge (RM 144.9) and RM 144, and the Crooked River Ranch River Community Area (RM 129.9 to RM 131.5).
	Natural River Area ⁴	From the south boundary of the Wilderness Study Area at approximately RM 131 to Lake Billy Chinook (RM 120), with the exception of RM 129.9 to RM 131.5.

Notes:

¹ Those designated areas of a scenic waterway where density of structures or other developments already exist and precludes application of a more restrictive classification.

² Those designated scenic waterways that are readily accessible by road or railroad, that allow a wide range of compatible, river-oriented, public, outdoor-recreation opportunities, to the extent that these do not substantially impair the natural beauty of the scenic waterway or diminish its aesthetic, fish and wildlife, scientific, and recreational values.

³ Those designated scenic waterways or segments with related adjacent lands and shorelines still largely primitive and largely undeveloped, except for agriculture and grazing, but accessible in places by roads. These classified areas will be administered to maintain or enhance their high scenic quality, recreational value, and fishery and wildlife habitat, while preserving their largely undeveloped character and allowing continuing agricultural uses.

⁴ Those designated scenic waterways that are generally inaccessible except by trail or the river, with related adjacent lands and shorelines essentially primitive. These classified scenic waterways will be administered to preserve their natural, wild, and primitive condition, essentially unaltered by the effects of humans, while allowing compatible recreational uses, other compatible existing uses, and protection of fish and wildlife.

5 Alternatives

5.1 Formulation Process

In order to determine the most viable alternatives to meet the project’s purpose and need, SID considered the needs of the water users, goals for conservation and restoration, available resources and funding, and the current status of the District’s previous improvements. The comments received during the scoping period were incorporated into the alternatives formulation process. Alternatives considered during project development, but eliminated from the detailed study, were evaluated based on the criteria in USDA’s *Guidance for Conducting Analysis under the Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies and Federal Water and Resource Investments* (USDA 2017). Pursuant to this guidance, alternatives that become “unreasonable due to cost, logistics, existing technology, social or environmental reasons,” or general inability to address the purpose and need for action, may be removed from consideration. The alternatives eliminated from detailed study are discussed in Section 5.2. Two separate alternatives were selected for further consideration and are presented in Section 5.3.

5.2 Alternatives Eliminated from Detailed Study

Ten alternatives were considered but eliminated from detailed study during the scoping period because they did not fully meet the sponsors’ objectives, were not consistent with PL 83-566 requirements, or they became unreasonable due to the four criteria discussed above: costs, logistics, existing technology, or social or environmental reasons.

Pursuant to PL 83-566, project sponsors must have the legal authority and resources to carry out, operate, and maintain works of improvement (Public Law 83-566, Section 2 and Section 4(3)). Alternatives that are not within the scope of actions that SID can entertain as the project sponsor, consistent with PL 83-566 authorities under which this plan was prepared, were eliminated from further study.

The following subsections describe each of the eliminated alternatives, if each eliminated alternative meets the sponsors’ objectives, and upon which criteria each alternative’s elimination was based. For alternatives that were eliminated due to costs, the analysis was conducted with constant dollars as per the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (P&G). Additionally, Section 5.2.11 provides a side-by-side comparison of the net present value of each of the alternatives that were eliminated due to costs.

5.2.1 Pipeline Realignment

Pipeline realignment would convert the District’s system to pipes. However, in some places, instead of following the same path as the existing canals and laterals, the pipes would be laid in a new alignment (or path across the landscape). New alignments would be selected to still serve all patrons but would take a more direct route to decrease the piping length needed where possible. Approximately 93 percent of land adjacent to SID’s current system is privately owned. Realignment would involve acquiring new easements or ROW across these private lands, which have been

divided into smaller parcels with many different owners over time. Depending on the proposed alignment, a ROW across public land could potentially be necessary.

New easements would disrupt prime farmland and residential living areas, and the easements would be difficult to secure from enough landowners to be feasible. Pipeline realignment outside the existing ROW would require SID to pay market price for the easements and negotiate with multiple landowners, which would be a complex, expensive, and time-consuming process. Pipeline realignment would meet sponsor objectives; however, this alternative was eliminated due to logistical complexity, legal costs, and social effects on adjacent landowners.

5.2.2 Conversion to Dryland Farming

The lack of rainfall throughout the growing season coupled with hot temperatures, desiccating winds, and generally shallow and well-to-excessively drained soils with low storage potentials makes dryland farming infeasible within the District (Daly et al. 1994; Gannett et al. 2001). This is supported by William Renwick’s “Changes in Deschutes County Irrigated Agriculture Since 1950” (Renwick 1975). In this report, Renwick described the formation of irrigation districts after new farmers found dryland farming to be impossible and concluded, “The calculated net irrigation requirements vary with annual and monthly fluctuation in precipitation, but it is evident that irrigation is necessary for raising the area’s major crops.”

In dryland farming systems where rainfall is approximately 12 inches per year, a fallow every other year is necessary (Golden and Aylward 2006; Granatstein 1992). In SID, production would substantially decrease if dryland farming were implemented, and farmers would potentially sell their land due to the development pressure Deschutes County is experiencing. Dryland farming would be inconsistent with ensuring agricultural production is maintained in an area undergoing rapid urbanization.

Project sponsors must have the legal authority and resources to carry out, operate, and maintain works of improvement (Public Law 83-566 1954). Because SID lacks the statutory authority or responsibility to carry out, operate, and maintain dryland farming by SID patrons, conversion to dryland farmland is not within the scope of actions that SID can entertain as project sponsor.

Dryland farming would meet the sponsors’ objective to improve water conservation. This alternative was eliminated because it would not be pursuant with PL 83-566 requirements, would not meet the objectives to improve water delivery reliability and public safety for District-owned canal and lateral infrastructure, and it would be inconsistent with public policy supporting and maintaining existing agricultural land uses (Section 4.4.2).

5.2.3 Fallowing Farm Fields

Fallowing farm fields includes permanently transferring or temporarily leasing water rights from irrigated lands or otherwise not using water rights appurtenant to irrigated lands. Fallowing farm fields would use less irrigation water within the District and would therefore allow more water to be kept instream for fish, wildlife, and habitat. This water would be legally protected instream if the associated water rights were leased or transferred instream. Fallowing farm fields would exacerbate

the water conveyance challenges that the District already experiences (Section 2.1.1 and Section 2.1.2) because it would affect flow rates across the District and water reliability to certain patrons.

The District lacks the statutory authority or responsibility to carry out, operate, and maintain fallowing farm fields by SID patrons. Fallowing farm fields is therefore not within the scope of actions that SID can entertain as the PL 83-566 project sponsor.

Fallowing farm fields would meet the sponsors' objective to conserve water. However, this alternative was eliminated from further study because it would not be pursuant with PL 83-566 requirements, would not meet the purpose and need to improve water delivery reliability and public safety for District-owned canal and lateral infrastructure, and it would be contrary with public policy supporting and maintaining existing agricultural land uses (Section 4.4.2).

5.2.4 Voluntary Duty Reduction

Voluntary duty reduction refers to patrons voluntarily accepting less than their full water delivery rate from the District. A reduction in duty could mean the District diverts less water, which would leave more water instream. This water would not be permanently protected instream through a new instream water right.

Because this alternative would be voluntary and at the discretion of individual landowners, there would be no certainty that water would be saved and that streamflow would be restored. Furthermore, SID lacks the statutory authority or responsibility to carry out, operate, and maintain voluntary duty reduction by SID patrons. Voluntary duty reduction is therefore not within the scope of actions that SID can entertain as the PL 83-566 project sponsor. If duty reductions by patrons were substantial enough, they would exacerbate the water conveyance challenges that the District already experiences in its open canals and laterals, which would be similar to the challenges associated with fallowing farm fields (Section 5.2.3).

Voluntary duty reduction was eliminated from further study because it would not be pursuant with PL 83-566 requirements, would not meet the purpose and need to improve water delivery reliability and public safety for District-owned canal and lateral infrastructure, and would have the potential to exacerbate water conveyance challenges in the District.

5.2.5 On-Farm Efficiency Upgrades

On-farm efficiency upgrades refers to SID patrons upgrading their on-farm infrastructure to use irrigation technologies that provide a more precise application of water. These technologies can have greater application efficiencies. On-farm infrastructure is distinct from District canals and laterals because it is owned and operated by patrons. Once delivered by the District and arriving on-farm, water can either be released to flow over the land for flood irrigation or stored in a holding pond for sprinkler irrigation systems. Typical on-farm irrigation systems include center-pivots, wheel-lines, hand-lines, K-lines, drip systems, and flood irrigation. Each irrigation practice has a different irrigation efficiency (i.e., its ability to deliver the irrigation water to the crop root system across the full field being irrigated). Farms within the District primarily use pump and sprinkler systems. On average, the irrigation efficiency of farms within SID is estimated at 73 percent (SID 2015).

On-farm efficiency upgrades are not within the scope of actions that SID can entertain as the project sponsor because SID lacks the statutory authority or responsibility to carry out, operate, and maintain on-farm infrastructure owned by SID patrons. Improving on-farm efficiency is, therefore, not consistent with PL 83-566 and was eliminated from further study.

5.2.6 Canal Lining

Canal lining would involve covering the bottom and sides of the currently open canal and laterals with a geotextile liner and shotcrete to prevent water from seeping into the underlying soils and rock. Canal lining would require subgrade preparation, geotextile liner installation, and application of a layer of shotcrete to protect the geotextile liner across the District's 15.3 miles¹¹ of open canal and laterals.

Lining would increase water velocity in the canal and laterals because the shotcrete cover is a smoother surface than the existing underlying rock. This makes the sides of the canal and laterals slippery and more difficult for people in the water to grasp onto and climb out. To address the increased public safety concerns caused by the installation of lining, standard chain link fences with 3-wire barbed wire cap would be installed along the length of the canal and laterals to prevent public access to the channel and reduce District liability. In channels deeper than 2 feet, safety ladders would be installed every 750 feet to provide the opportunity for human and animal escape.

Canal lining would meet the objective of conserving water; lining would reduce water loss from seepage by 14.5 cfs (29 acre-feet) per day. Water loss in an open, lined system is estimated to be 10 percent based on studies of canal lining (Swihart 2002). Lined canals are vulnerable to tears or cracks in the lining; seepage from torn or cracked lined canals is similar to that from unlined canals.

The lining materials would be expected to have a lifespan of 33 years before needing to be replaced. Before replacement, as the system aged it would likely require progressively increasing maintenance to account for lining cracks and tears. Additionally, canal lining would require energy use and associated costs for farmers similar to current operations. The use of individual pumps across the District requires an energy use of over 3,146 megawatt-hours per year at a cost of approximately \$241,000 per year. This energy use emits about 2,367 metric tons of carbon dioxide per year (USEPA 2018).

Capital costs of canal lining were estimated based on the size of the existing open canal and laterals, and material unit costs were based on the experience of nearby Three Sisters Irrigation District. Annual operating costs associated with canal lining were estimated based on SID's current operating budget, with a 20 percent increase in equipment, maintenance, and labor costs due to the relatively fragile nature of a lined canal compared to an unlined canal. Assuming a 33-year design life, the estimated capital costs, replacement costs, and annual O&M costs for canal lining, the net present value cost for each project group ranged from \$29,735,000 to \$38,169,000 (2018 dollars) over

¹¹ Canal lining refers to lining 15.3 miles of currently open canals and laterals while the steel, PVC, and HDPE piping alternatives refer to piping 16.6 miles of canals and laterals. The piping alternatives would upgrade 1.3 miles of existing pipe with pressure-rated pipe, while canal lining would not.

100 years. Based on this cost, which is more expensive than the proposed alternative, canal lining was eliminated from further study (see Appendix D for cost details).

5.2.7 Piping Private Laterals

Piping private laterals refers to converting patron-owned, open laterals to piped laterals from the District's point of delivery to the point of use on-farm. Private laterals are owned and operated by patrons; the District does not have responsibility for the operation or maintenance of private laterals.

Project sponsors must have the legal authority and resources to carry out, operate, and maintain works of improvement (Public Law 83-566 1954). SID lacks the statutory authority or responsibility to carry out, operate, and maintain private laterals owned by SID patrons. Piping private laterals is therefore not consistent with PL 83-566 and was eliminated from further study.

5.2.8 Piping with Steel or Polyvinyl Chloride (PVC)

Under the piping alternative, the District would pipe 16.6 miles of its system. The lengths, diameters, and range of pressure ratings used for the piping alternative were estimated based on the engineering analysis completed in the District's SIP.

5.2.8.1 Steel Piping

Under the steel piping alternative, spiral welded steel pipe would be installed in 16.6 miles of canals and laterals. A spiral welded steel was selected that conforms to requirements of the American Water Works Association C200 standard. This steel pipe was selected because it is considered an industry consensus standard and is a prominent guide for the manufacture of steel pipe for water and wastewater applications in North America (Bambie and Keil 2013).

Steel pipe typically has a design life of 50 years under irrigation water delivery applications (M. Thalacker, personal communication, November 8, 2017). Pipe diameters of the spiral welded steel pipe would range in size from 8 to 48 inches and pressure ratings would accommodate a range of pressures from 997 up to 1,111 pounds per square inch (psi), depending on the pipe diameter and thickness. Unlike HDPE, steel pipe cannot be shaped to conform into canal alignments; therefore, additional elbows would be required. Annual operating costs associated with the steel piping alternative were estimated based on SID's current operating budget and assumed that equipment, maintenance, and labor costs would decrease. Assuming a design life of 50 years, capital costs, replacement costs, and annual O&M costs, the net present value for each project group ranged from \$19,279,000 to \$22,367,000 (2018 dollars) over 100 years. Based on this cost, the steel piping alternative was eliminated from further study (see Appendix D for cost details).

5.2.8.2 PVC Piping

Under the PVC piping alternative, 16.6 miles of the delivery system would be piped with PVC in diameters from 8 to 48 inches. Schedule 41 PVC was selected for this alternative, which can accommodate working pressures up to 100 psi.

The lifespan of a piping system depends on many different factors. Proper installation and operation of the piping system are key to achieving a long service life. Assuming a piping system is ideally installed and operated, the main factor affecting the pipe's service life is the number and magnitude of surge/water hammer events the system experiences. Surge/water hammer events are caused by valve operations, changing irrigation demand in the system, pump startup and shutdown, quick hydropower turbine shutdowns due to power failures, and any other factors causing fast changes in the piping system flow rate (B. Cronin, personal communication, July 27, 2018).

USDA NRCS's standard practice lifespan for irrigation pipeline is 20 years (NRCS n.d.). This lifespan is based on long-term experience with primarily PVC pipe irrigation system installations (B. Cronin, personal communication, July 27, 2018). The Plastics Pipe Institute's online software indicates that with the average number of surge/water hammer events expected in a pipeline network, the lifespan of a typical 24-inch, 125 psi pressure-rated PVC pipe would be 14 years with a safety factor of 2 (Plastics Pipe Institute 2015). PVC is also more prone to failure under freezing conditions, and the SID system is used to delivering water several times during the winter for livestock. During these periods, the PVC pipe system would be more likely to freeze and potentially rupture and fail. PVC piping has been installed in irrigation districts in the Deschutes Basin and experienced premature failure, especially in districts where stock water is delivered during the winter (M. Thalacker, personal communication, November 8, 2017). Considering all of the information above, a PVC design life of 33 years was assumed for purposes of this analysis.

In assessing PVC as a potential piping material, other factors were taken into consideration. PVC joints have a higher potential to leak, which would result in additional replacement costs. In terms of earthquake resiliency, pipe material such as HDPE has been shown to be more resilient than PVC in both lab tests (Oliphant et al. 2012; Cornell University et al. 2009) and in seismic events in places such as New Zealand and Japan (Ballantyne 2013).

The annual O&M costs associated with the PVC piping alternative are expected to be the same as the steel piping alternative. The capital costs were estimated based on the lengths and diameters of the PVC piping. Capital costs also account for additional elbow fittings that will be necessary to conform the PVC pipe into the existing canal alignments. The cost of elbow fittings was determined by assuming an elbow every 100 feet at a cost of \$1,000 per elbow. Thrust blocks, which transfer thrust forces at bends in the pipeline to the surrounding soil to prevent separation of joints and pipe movements, would also be required, but are not included in the capital costs.

These costs reflect constant dollars as per the P&G. Assuming a design life of 33 years, the estimated capital costs, replacement costs, and annual O&M costs, the net present value for the PVC alternative for each project group ranged between \$13,224,000 to \$16,301,000 (2018 dollars) over 100 years (see Appendix D for cost details). Although PVC piping would meet the sponsors' objectives, the PVC alternative was eliminated based on the availability of a more resilient and longer lasting material that would achieve the sponsors' objectives at a lower cost (see Appendix D for cost details).

5.2.9 Exclusive or Partial Use of Groundwater

The exclusive or partial conversion from surface water sourced to groundwater sourced irrigation was also initially considered as a possible alternative. To use groundwater in the Deschutes Basin, the District would have to apply for groundwater rights under OWRD's Deschutes Basin Groundwater Mitigation (DBGM) program pursuant to OAR 690-505-0500. The DBGM program is part of OWRD's goal to limit groundwater use by imposing restrictions to new users obtaining groundwater rights. Under the DBGM program, only 32.98 cfs is available for the entire Deschutes Basin, and it is unlikely the District could obtain rights to all the remaining water (S. Henderson, personal communication, August 14, 2017). Given that only 32.98 cfs is available under this program, the District's exclusive use of groundwater to entirely replace their use of surface water is not feasible.

The partial use of groundwater for irrigation would have logistical and legal constraints. The District and patrons could use their surface water rights for groundwater mitigation credits required by the DBGM program; however, the District would need the authority from each patron to convert surface rights to groundwater rights, and there would be no guarantee of gaining this approval from patrons. Converting from surface water rights to groundwater rights would also affect the seniority and, therefore, the reliability of the District's water rights. The District currently has senior surface water rights that minimize the chance of being impacted during drought years; however, new groundwater rights would be junior (dated the year of the application and construction) and could be subject to curtailment. This would not meet the purpose and need of the project to improve water delivery reliability for patrons. Additionally, the District lacks the statutory authority or responsibility to carry out, operate, and maintain groundwater wells on private lands owned by SID patrons. Exclusive or partial use of groundwater is therefore not within the scope of actions that SID can entertain as the PL 83-566 project sponsor.

The partial use of groundwater would use the groundwater available under the DBGM program, and the District would, in practice, trade 27.4 cfs of their surface water rights for groundwater rights. The following laterals would be selected for the conversion to groundwater use: Rogers Lateral, Rogers Sublateral, Riley Lateral, Riley Sublateral, Mickelson Lateral, Elder lateral, and Butte Lateral. These would account for 10.1 miles of the delivery system. These laterals selected for groundwater use serve approximately 1,750 irrigated acres and 129 points of delivery to individual users. Assuming an application rate of 7 gallons per minute per acre that was used in SID's SIP, groundwater would need to meet a demand of 12,271 gallons per minute over the irrigation season for the portion of the District that would be converted to groundwater use. The District would decommission the laterals and corresponding 129 points-of-diversion and construct 129 individual wells. Patrons would need to give consent to the District for well construction, as the District does not own land in the locations needed for new wells. A well depth of 240 feet was assumed based on the average well depth of existing wells in the District. The 6.5 remaining miles of the delivery system would be replaced with HDPE pipe.

Capital costs were estimated based on the well construction costs for the 129 wells and HDPE piping costs for the remaining 6.5 miles of the delivery system. These costs reflect constant dollars as per the P&G. Annual O&M costs associated with partial groundwater use are expected to be

higher than O&M costs associated with piping due to the increased energy requirements to pump groundwater. A design life of 50 years for each well was selected based on well design guidance provided in NRCS’s Engineering Handbook (NRCS 2010). Based on common engineering experience, each well pump was assumed to have a lifespan of 25 years and each well casing 50 years. The HDPE pipe has a lifespan of 100 years. Assuming the lifespans mentioned above, the estimated capital costs, replacement costs, and annual O&M costs, the net present value for the partial use of groundwater alternative for each project group ranged between \$15,429,000 to \$23,556,000 (2018 dollars) over 100 years. Based on this cost, the non-compliance with PL 83-566 requirements, the logistical and legal constraints associated with obtaining groundwater rights, and not meeting the purpose and need of the project to improve water delivery reliability, the partial use of groundwater was eliminated from further study (see Appendix D for cost details).

5.2.10 Combination of Alternatives

A combination of the ten eliminated alternatives (Section 5.2.1 through Section 5.2.9) were rejected based on the same reasons the alternatives were eliminated individually. Six of these alternatives were eliminated due to their inability to meet the purpose and need of the project or because SID lacks the legal authority to carry out, operate, and maintain works of improvement, which are requirements of project sponsors (Public Law 83-566 1954): pipeline realignment, conversion to dryland farming, fallowing farm fields, voluntary duty reduction, on-farm efficiency upgrades, and piping private laterals. Canal lining, piping with steel or PVC, and exclusive or partial use of groundwater were eliminated due to cost.

5.2.11 Cost Comparison of Eliminated Alternatives

Table 5-1 shows the net present value of the canal lining, steel piping, PVC piping, and partial groundwater use for the two project groups over a 100-year period.

Table 5-1. Net Present Value of Eliminated Alternatives for the Swalley Irrigation District Irrigation Modernization Project.

Project Group	Canal Lining	Steel Piping	PVC Piping	Partial Groundwater
1	\$29,735,000	\$19,279,000	\$13,224,000	\$23,556,000
2	\$38,169,000	\$22,367,000	\$16,301,000	\$15,429,000

Note: Costs are rounded to the nearest \$1,000.

5.3 Alternatives Description

Of the project alternatives that were considered for SID’s Irrigation Modernization Project, two were selected for further evaluation:

- No Action (Future without Project): Improvements to existing open canals and laterals occur as funding becomes available and are not reasonably certain to occur; and

- **HDPE Piping Alternative:** Replace existing open, canal, lateral, and aging pipe with a closed conduit HDPE pressurized pipeline system.

These alternatives are discussed further in the following sections and include only SID-owned infrastructure.

5.3.1 No Action (Future without Project)

Under the No Action Alternative, the District would continue to operate and maintain its existing canal, lateral, and pipe system in its current condition. This alternative assumes that modernization of the District's system to meet the purposes and needs of the project would not be reasonably certain to occur. Under this alternative, the District would only modernize its infrastructure on a project-by-project basis if grant funding became available. This funding is not reasonably certain to be available under a project-by-project approach at the large scale necessary to fully modernize the District's infrastructure.

Without PL 83-566 funding, the project would not occur in the foreseeable future. Therefore, for the purposes of this Plan-EA, the No Action Alternative is a near-term continuation of the standard operation procedures. Instream flows would not be enhanced for fish, and patron energy use and associated costs would remain high. Agriculture in the area would continue to be susceptible to inconsistent water supply and increased production costs.

The No Action Alternative does not contribute to the sponsors' objectives. Water loss to seepage and evaporation in District infrastructure, water delivery reliability for farmers, O&M costs, existing energy use and associated costs for farmers, streamflow and habitat conditions for fish and aquatic species, and public safety would not improve.

5.3.2 HDPE Piping Alternative

Under the HDPE Piping Alternative, the District would pipe approximately 16.6 miles of their system, replacing 15.3 miles of open canals/laterals and upgrading 1.3 miles of existing pipes (Figure 5-1). The delivery system would be piped using HDPE solid-wall pipe ranging in diameter from 8 to 48 inches (SID 2017). HDPE pipes were selected because they are resistant to ultraviolet light and pressure from water hammer and have high tensile strength (Najafi et al. 2015). During installation HDPE pipes are welded together; therefore, the need for expensive fittings and thrust blocks are minimized. HDPE pipe is easy to install, bendable, retains its properties between -220°F and 180°F, and has a design life of 100 years. Construction of the HDPE Piping Alternative would occur in two project groups over the course of 7 years. The order of project groups was selected based on prioritizing public safety, water loss, urban development pressures, and available match funding. These factors may vary over time and the District's order and timing of piping would adjust to reflect these changes.

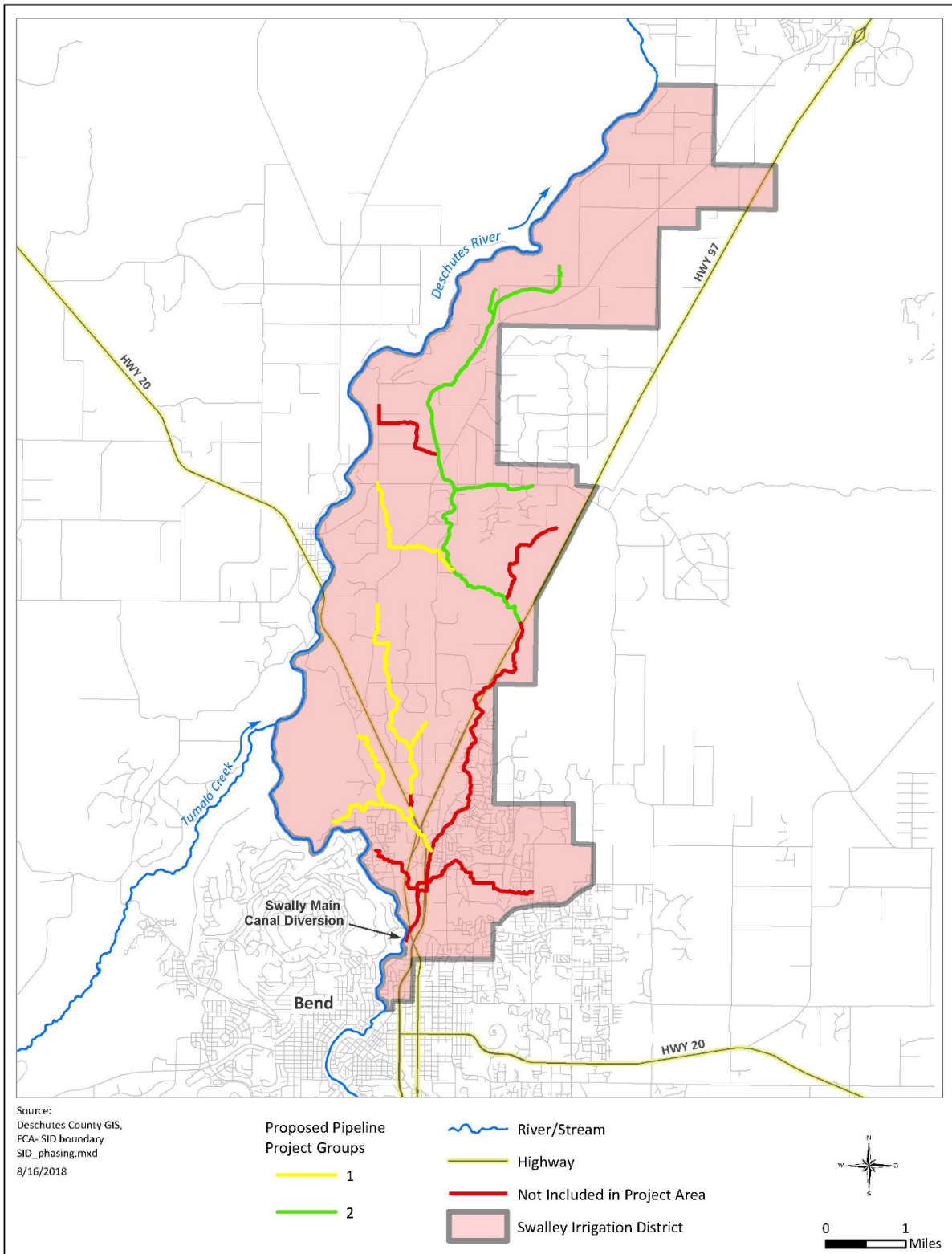


Figure 5-1. The HDPE Piping Alternative project groups for the Swalley Irrigation District Irrigation Modernization Project.

Under this alternative, 178 district turnouts would be upgraded to pressurized delivery systems. Modifications to each turnout would include an appropriately-sized tee from the mainline or lateral, a pressure relief valve, a gear-actuated plug valve, a meter, a combination air and vacuum relief valve, and associated hardware and spool pipe segments (SID 2017). Immediately downstream of the hydroelectric plant, an in-line, variable frequency drive booster pump station would be installed to provide pressurization to the District's north end.

Construction of this alternative would include: mobilization and staging of construction equipment, delivery of pipe to construction areas, excavations of trenches, fusing of pipelines, placement of pipe, compaction of backfill, and restoration and reseeded of the disturbed areas. In some locations, construction access would need to be created before delivering pipe or equipment into construction areas. This 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 most likely require some borrow or fill material and storage areas for pipe, other materials, and construction equipment. These areas have not yet been identified. Areas that have been previously disturbed and are accessible through existing access routes would be selected.

Canals and laterals identified for piping would be accessed from SID's existing maintenance roads when possible. Existing maintenance roads and overland access routes commonly used for O&M may require some improvements for use during construction.

Temporary overland travel routes within SID's existing ROW would be necessary to access certain canals and laterals associated with the proposed action that do not have established maintenance roads. To facilitate restoration, temporary travel routes would be left in their natural condition, with only minimal altering when necessary to allow travel during construction. The most direct route possible would be used to access the construction area. Any work needed to create equipment access would occur prior to, or concurrently with piping.

Vegetation clearing before construction, vegetation and weed management during construction, and reseeded after construction of SID's ROW would be completed according to SID's current vegetation management practices and NRCS' Oregon and Washington Guide for Conservation Seedings and Plantings (NRCS 2000). 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 avoid trees and other slow-growing vegetation. Trees would only be removed if there were no other alternative to access the construction site or if they pose a safety threat to construction crews working in the canal or lateral trench. After construction, all disturbed areas would be reseeded in consultation with NRCS and weeds would be managed according to NRCS's Oregon and Washington Guide for Conservations Seedings and Plantings (NRCS 2000).

O&M under the HDPE piping alternative would consist of an ongoing pipe inspection program that would systematically cover the entire system over a period of several years (most likely a 10-year cycle). During the irrigation season from April to October, work would be performed on an as-needed basis. Outside the irrigation season, SID would perform system component maintenance and/or repairs to District meters, valves, and air and vacuum infrastructure.

The HDPE Piping Alternative contributes to the sponsors' objectives as follows:

- Improve water conservation: This alternative would reduce water loss from canal seepage and evaporation and result in an estimated annual savings of 6,172 acre-feet (Table 5-2) through installing pressurized HDPE pipe for all open canals and laterals.
- Increase water delivery reliability to farms: Modernizing the system would improve irrigation water delivery reliability for 3,204 acres of irrigated land. This alternative would improve operational efficiencies to ensure that patrons receive the water they need at the time they need it. A piped and pressurized system greatly increases conveyance efficiency, allowing existing carry water to be available for patrons and further reducing the need to spill excess water as the system becomes on-demand.
- Reduce O&M costs: A piped system would eliminate the need to inspect, repair, and remove obstructions from open canals and laterals. This alternative would greatly reduce the need for staff to manually adjust diversion amounts throughout the system. In addition, the booster pump and pressurized pipeline allows for the reduction of many individual pumps serving farms across the District. This would reduce patron pumping by approximately 2,365 megawatt-hours per year and save patrons up to \$228,000 annually. After accounting for the booster pump's energy use, this would have a net energy conservation of approximately 1,056 megawatt-hours per year, avoiding about 516 metric tons¹² of carbon dioxide emissions per year (USEPA 2018).
- Enhance streamflow and habitat conditions for fish and aquatic species: This alternative would enhance streamflow and habitat conditions for fish and aquatic species by creating instream water rights through the State of Oregon's Allocation of Conserved Water Program. The District would allocate up to 15.2 cfs instream (Table 5-2) and legally reduce its water right by the amount of conserved water. The District would allocate the conserved water instream incrementally following completion of each project group and verification and measurement of the total water savings. Streamflow and habitat conditions along the Deschutes River would benefit incrementally.
- Improve public safety: Converting open canals and laterals to buried pipe would eliminate the risk of drowning, flooding, and other serious accidents.

The estimated project installation cost for the HDPE Piping Alternative is \$13,468,000¹³. Assuming a design life of 100 years, the estimated capital costs, replacement costs, and annual O&M costs, the net present value for each HDPE Piping Alternative project group ranged between \$10,836,000 to \$14,496,000 (2018 dollars) over 100 years.

¹² The 516 metric tons of carbon avoided is after SID would update the runner in their hydro plant to account for decreased flows through the plant. Prior to the runner installation, which would be installed after the last Project Group two is completed, 227 metric tons would be avoided.

¹³ Numbers shown elsewhere in the document include an additional 3 percent for in-kind project administration from SID, 8 percent for technical assistance from NRCS, and \$27,000 for permitting costs. This results in an estimated total cost for the HDPE Piping Alternative in 2018 dollars of \$14,975,000.

Table 5-2. Projected Water to Ensure District Water Supply Following Implementation of the HDPE Piping Alternative.

Season	Season Dates	Total Water Saved with HDPE Piping Alternative by Season	Projected Use of Saved Water to Secure District Water Supply	Projected Use of Saved Water to Allocate Instream
1	April 1 – April 30 & October 1 – October 31	7.6 cfs 920.94 acre-feet /year	2.8 cfs 339.78 acre-feet /year	4.8 cfs 581.16 acre-feet /year
2	May 1 – May 14 & September 15 – September 30	10.2 cfs 605.52 acre-feet /year	4.0 cfs 238.02 acre-feet /year	6.2 cfs 367.50 acre-feet /year
3	May 15 – September 14	19.2 cfs 4646.15 acre-feet /year	4.0 cfs 967.95 acre-feet /year	15.2 cfs 3,678.20 acre-feet /year
Total volume of water saved over seasons		6,171.61 acre-feet/year	1,544.75 acre-feet /year	4626.86 acre-feet /year

Notes: These projected instream flows are estimates based on data provided by a water loss assessment performed in 2016 by Black Rock Engineering and discussions with SID. Detailed calculations on how these projections were determined are available in Appendix E. Detailed information on the 2016 water loss assessment can be found in the SIP (Appendix D).

5.4 Summary and Comparison of Alternatives

Table 5-3 compares the No Action/Future without Project (Alternative 1) and the HDPE Piping Alternative (Alternative 2). The table summarizes measures addressed as well as environmental, social, cultural, and economic effects.

Table 5-3. Summary and Comparisons Table.

Watershed Plan Element	Item or Concern	Alternative 1 No Action	Alternative 2 HDPE Piping (NED Recommended)
Measures to address	Habitat for Fish and Wildlife	Instream flows would not increase downstream of the SID diversion during the irrigation season, and therefore, neither aquatic habitat or water quality would improve.	Up to 6,172 acre-feet per year saved. Seventy-five percent of the saved water will be allocated to instream water rights ¹⁴ and legally protected, improving water quality and enhancing aquatic habitat downstream from SID’s diversion during the irrigation season.
	Public Safety	Canals and laterals would be left open and drowning, flooding, and other serious accidents would remain a risk.	Canals and laterals would be replaced with underground pipe which would eliminate the risk for drowning, flooding, or other serious accident.
	Water Delivery Reliability for Agriculture	Water delivery reliability for agriculture would not be improved as infrastructure and operations would not change. SID would continue being unable to meet patron demands.	Water delivery reliability for agriculture would improve for irrigators within the District. Supply shortages resulting from the over-allocation of instream water rights from previous conservation projects would be met and pressurized water would be available to irrigators when they need it.
Installation Costs	NRCS Contribution	\$0	\$11,231,000
	Sponsoring Local Organization (SLO) Contribution	\$0	\$3,744,000
	Total	\$0	\$14,975,000

¹⁴ The estimated annual volume saved is 6,172 acre-feet. SID is allocating seventy-five percent of the saved water to instream water rights. The resulting estimated increased instream flow rates are 4.80 cfs for April 1 through April 30 and October 1 through October 31, 6.18 cfs for May 1 through May 14 and September 15 through September 30, and 15.20 cfs for May 15 through September 14. These volumes and flows are estimations based on a water loss assessment performed in 2016. The project water savings will be measured and verified following the completion of each project group prior to creating instream water rights.

Watershed Plan Element	Item or Concern	Alternative 1 No Action	Alternative 2 HDPE Piping (NED Recommended)
Project Group 1¹			
NED Account	Average Annual Cost		
	Installation	\$0	\$149,000
	OM&R ²	\$0	\$18,000
	Other ³	\$0	\$5,000
	Total	\$0	\$172,000
	Annual Benefits ⁴	\$0	\$320,000
	Annual Costs	\$0	\$172,000
	Annual Net Benefits ⁵	\$0	\$148,000
	Annual Remaining Flood Damage	N/A	N/A
Project Group 2¹			
NED Account	Average Annual Cost		
	Installation	\$0	\$250,000
	OM&R ²	\$0	\$74,000
	Other ³	\$0	\$8,000
	Total	\$0	\$332,000
	Annual Benefits ⁴	\$0	\$451,000
	Annual Costs	\$0	\$332,000
	Annual Net Benefits ⁵	\$0	\$119,000
	Annual Remaining Flood Damage	N/A	N/A
Notes:			
<ol style="list-style-type: none"> All Costs and Benefits presented in the table for the HDPE Alternative are included as a change from the No Action Alternative. Costs and Benefits for the No Action Alternative are shown as \$0 to represent there would be no change to the existing costs and benefits. Operation, maintenance, and replacement (OM&R) for the HDPE Piping Alternative includes operational energy costs of the proposed pump station and replacement costs for pump and hydropower infrastructure. A decrease in O&M costs of the canals and laterals for the HDPE Piping Alternative was included in the benefits, rather than the costs “Other” direct costs include increased pumping costs from increased depth to groundwater due to reduced recharge and reduced energy sales resulting from a temporary hydropower production loss. For the HDPE Piping Alternative, quantified benefits include instream flow benefits, reduced OM&R costs, reduced carbon outputs, and reduced energy costs from pumping. Annual Net Benefits shown for the HDPE Piping Alternative are the additional net benefits compared to the No Action Alternative. 			

Watershed Plan Element	Item or Concern	Alternative 1 No Action	Alternative 2 HDPE Piping (NED Recommended)
Environmental Quality (EQ) Account	Geology and Soils		
	Geology	No effect	No effect
	Erosion	No effect	Minor, short-term effects on soils due to construction.
	Prime Farmlands	No effect	Minor, beneficial effects in the long term from improved water reliability.
Environmental Quality (EQ) Account	Water		
	Surface Water Quality	No effect	Negligible to minor beneficial effects over the long term due to potential reduction in water temperature.
	Surface Water Quantity	No effect	Minor to moderate, long-term effects during the irrigation season.
	Groundwater Quantity	No effect	Minor, long-term effect on groundwater based on the amount of reduced canal recharge relative to climate factors and groundwater pumping.
	Wild and Scenic Rivers	No effect	No effects on Wild and Scenic Rivers and State Scenic Waterways designations.
Environmental Quality (EQ) Account	Wetland and Riparian Areas		
	Wetlands	No effect	Minor effect; wetlands directly impacted or eliminated are limited to the non-jurisdictional man-made canals themselves. Wetlands downstream from the SID diversion may experience some benefit from improved streamflow.
	Riparian Areas	No effect	Minor, long-term, beneficial effects on riparian areas along the Deschutes River downstream from SID's diversion.

Watershed Plan Element	Item or Concern	Alternative 1 No Action	Alternative 2 HDPE Piping (NED Recommended)
Environmental Quality (EQ) Account	Fish and Wildlife		
	Bald and Golden Eagle Protection Act	No effect	No effect; construction would occur outside the USFWS-approved buffer distances. If construction is needed within the buffer distance, it would occur outside the nesting season.
	Terrestrial Endangered and Threatened Species	No effect	No effect
	Fish and Fish Habitat	No effect	Minor, beneficial effects over the long-term due to improved fish habitat.
	Aquatic Endangered and Threatened Species	No effect	No effect; due to timing and magnitude of increased streamflow during the irrigation season summer months, there would be no effect on steelhead, bull trout populations or critical habitat.
	General Wildlife and Wildlife Habitat	No effect	Minor, long-term effects due to removal of water source for wildlife and loss of seasonal, artificial wetlands and opportunistic hydrophytic plants along canals could change the distribution patterns of wildlife. These changes would occur over time. Reseeding with native vegetation would increase habitat for some species and increased streamflow would improve riparian habitat along the Deschutes River.
	MBTA Species	No effect	No effect as construction would occur outside the nesting period for migratory birds of concern (April 15–July 15) and raptors (April–July).

Watershed Plan Element	Item or Concern	Alternative 1 No Action	Alternative 2 HDPE Piping (NED Recommended)
Environmental Quality (EQ) Account	Vegetation		
	General Vegetation	No effect	Minor, short-term effects to approximately 47 acres of vegetation due to construction.
	Noxious Weeds	No effect	Minor, long-term effects resulting from decreased noxious weeds transport through pipes.
	Special Status Species	No effect	No effects expected. If surveys detect plants in the project area, there would be negligible long-term effects based on proposed mitigation measures.
Environmental Quality (EQ) Account	Human Environment		
	Land Use	No effect	No direct effect on land adjacent to the project area. Long-term, indirect effects would occur due to the support of current agricultural land use and existing zoning designations. Negligible to minor effects on land within the project area and SID's ROW.
	Public Safety	No effect	Moderate, long-term effects on public safety, since the possibility of a serious accident would be eliminated.
	Recreation	No effect	Minor, short-term effects to trails in the project area during construction.
	Socioeconomics	No effect	Minor, short-term effects on employment and income in Deschutes County from construction activities. Minor, long-term effect on agricultural production and related farm household income.

Watershed Plan Element	Item or Concern	Alternative 1 No Action	Alternative 2 HDPE Piping (NED Recommended)
	Historic, Cultural, and Scientific Resources	No effect	Long-term effects on historic properties require consultation with State Historic Preservation Office and appropriate mitigation measures, which would be identified prior to construction and completed concurrent with, or after construction. Mitigation would limit effects to moderate.
Other Social Effects Account	Visual Resources	No effect	Minor, short-term effects due to construction activities. Minor, long-term effects due to change in appearance from open canals and riparian plants to buried pipe with upland vegetation.
	Tribal, Religious, Sacred, or Cultural Site	No effect	No anticipated effects as an inadvertent discovery plan would be followed to avoid effects on archaeological resources.
Regional Economic Development (RED) Account	Local Jobs During Construction	0	20
	Annual Jobs from Recreation	N/A	Magnitude and/or direction of recreation visitation impacts are not known, so no RED benefits quantified.
	Other Economic Sector Jobs	50	50
	Beneficial Effects Annualized (Millions, 2018\$)		
	Region	\$1.54	\$1.76
	Rest of Nation	N/A	N/A
	Adverse Effects Annualized¹ (Millions, 2018\$)		
	Region	\$0.52	\$0.56
	Rest of Nation	N/A	\$0.38
	Note: ¹ Adverse Effect Annualized includes only the direct costs (no indirect/induced costs included).		

6 Environmental Consequences

This section evaluates the environmental consequences of the No Action Alternative and the HDPE Piping Alternative. The effects of the two alternatives were evaluated with respect to each resource in Chapter 4. When considering each resource, the intensity and duration of effects were evaluated using either a quantitative or a qualitative approach. The intensity of an effect was classified as either negligible, minor, moderate, or major. The duration of an effect was classified as temporary, short-term, or long-term, where the period of an effect is dependent on the resource. Table E-1 in Appendix E presents the intensity threshold matrix used to categorize and define the range of expected effects.

6.1 Cultural Resources

Pursuant to the NHPA of 1966, as amended, federal agencies must take into account the potential effect of an undertaking on historic properties, which refers to cultural resources listed in, or eligible for, listing in the National Register of Historic Places. Recommendations of eligibility require consultation with Oregon SHPO and a determination of effects must be agreed upon by the consulting parties. A finding of historic properties adversely affected requires that the consulting parties enter into a Memorandum of Agreement (MOA) with stipulations for certain actions and timelines that mitigate the adverse effect and are acceptable to all consulting parties. Adverse effects could include physical destruction; alteration through repair or maintenance; removal from original location; neglect; visual, audible, or atmospheric changes; or transfer, lease, or sale. The purpose of the MOA is to ensure that effects on cultural resources as a result of the proposed action are successfully mitigated.

The District signed a MOA with SHPO in 2007 to meet Section 106 requirements for piping a portion of the Main Canal (SID 2007). The MOA and Section 106 requirement satisfaction applies to the District's entire system, including all laterals, except for the last 4.5 miles of the Main Canal, which at the time was to remain unpiPED and in its existing condition. The MOA states that maintaining the last 4.5 miles of the Main Canal in its existing condition serves to mitigate future modifications to all other canal and lateral segments in the District.

In 2018, the District and SHPO drafted an amendment to the 2007 MOA. The Amendment recognizes the District's intent to pipe the entire District, including the last 4.5 miles of the Main Canal. It amends the mitigation measures in Stipulation 2 to include the following:

- Within 1 year of piping the last 4.5 miles of the Main Canal, SID would erect five interpretive signs along the original Main Canal that describe the history of the canal and its role in the development of Deschutes County.
- SID would create a "Historical Records" section on its website to house original maps, photos, written history, century-old ledger books, and other primary documents that demonstrate the history of the District.
- SID would display a section of historic wood stave pipe in front of their office (SID 2018).

6.1.1 No Action (Future without Project)

6.1.1.1 Archaeological Resources

Under the No Action Alternative, the canal and laterals would remain open. Until the canal and laterals are modernized, there would be no opportunity to disturb archaeological resources. O&M activities would continue and may potentially increase in frequency and severity as the water conveyance system deteriorates over time. Eventually, system failures may cause disturbances that could inadvertently affect archaeological resources.

6.1.1.2 Historical Resources

The District would not utilize PL 83-566 funding to modernize canals and laterals. Until the canal and laterals are modernized, there would be no effects on historical resources other than operational and maintenance needs.

6.1.2 HDPE Piping Alternative

Converting the District’s canal and laterals to buried pipe would alter the design, materials, and workmanship of SID’s infrastructure, which has the potential to adversely affect cultural and historical resources.

6.1.2.1 Archaeological Resources

No archaeological resources eligible for the National Register were found during a 2009 survey of the Rogers Lateral (Stuemke 2009). All construction would take place in previously disturbed areas, minimizing the likelihood of encountering archaeological resources. If archeological resources were discovered during project excavation, an Inadvertent Discovery Plan would be followed. Effects to archaeological resources are not anticipated as the project area has been previously disturbed and the survey of the Rogers Lateral found no archaeological resources.

6.1.2.2 Historical Resources

The mitigation measures described in the Amendment to the MOA (SID 2018) would limit effects from the proposed action to moderate and long term in intensity.

6.1.3 Compliance and Best Management Practices

Effects on cultural resources would be minimized by implementation of the following practices:

- The measures described in Stipulation 2 of the Amendment to the MOA would be implemented within 1 year of construction.
- An Inadvertent Discovery Plan would be followed if archaeological or historical materials, including human remains, are encountered during construction. The plan would require construction to stop accordingly, consultation with SHPO and NRCS cultural resources staff, and notification to appropriate Tribes. Continuation of construction would occur in accordance with applicable guidance and law.

6.2 Fish and Aquatic Resources

6.2.1 No Action (Future without Project)

6.2.1.1 General Fish and Aquatic Species

The No Action Alternative would have no effect on fish and aquatic species in the waterbodies affected by District operations. The District would continue to divert water at the current rate from the Deschutes River at the North Canal Dam for consumptive use. The project area canals and laterals would continue to leak water. This would continue to alter the hydrologic pattern of instream flow in the middle Deschutes River similar to the last 50 years. The reduced flow during the irrigation season in this stretch of the Deschutes River would continue to alter fish habitat and compromise water quality for fish and aquatic species.

6.2.1.2 Federally Listed Fish and Aquatic Species

Steelhead and bull trout populations would continue to be managed by state and federal agencies in the No Action Alternative. Habitat would likely not change substantially from its current state.

6.2.2 HDPE Piping Alternative

6.2.2.1 General Fish and Aquatic Species

During and following project construction, there would be no direct or indirect effects on any fish or aquatic species in the project area. In the area affected by the project, there would be beneficial, indirect effects on fish and aquatic species in the Deschutes River downstream of the North Canal Diversion Dam due to improved streamflow and water quality. Streamflow would be minor to moderately improved over the duration of the irrigation season and would not affect streamflow during the non-irrigation season (Section 6.10.2.2). Water quality, particularly water temperature, is expected to have negligible to minor improvements (Section 6.10.2.3) following completion of the proposed action (L. Mork, personal communication, August 10, 2018; B. Hodgson, personal communication, August 18, 2018). ODFW has applied for instream water rights for the Deschutes River (Appendix E). Currently, these water rights are not always met downstream of the North Canal Diversion Dam during the irrigation season.

The District has identified that an estimated annual volume of 4,627 acre-feet of water (75 percent of the total water saved) will be allocated instream over the duration of the entire irrigation season following implementation of the proposed action as shown in Table 5-2. The action would enhance streamflow up to 15.2 cfs in the middle Deschutes downstream from SID's diversion at North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120) throughout the irrigation season from April 1st – October 31st.

The proposed action would have a minor, beneficial, and long-term effect on fish and aquatic species because increased streamflow would improve available habitat for fish and aquatic species, especially during the spring, summer, and fall when streamflow in the Deschutes River are low (B. Hodgson, personal communication August 16, 2018). Additionally, increased streamflow during the irrigation season may potentially reduce water temperature (Section 6.10.2.3), which would be beneficial particularly for juvenile salmonids (B. Hodgson, personal communication August 16,

2018). The effects would be easier to discern closer to the North Canal Diversion Dam. Further downstream from the diversion, the effects would be diluted due to other incoming tributaries.

6.2.2.2 Federally Listed Fish and Aquatic Species

There would be no direct or indirect effects on any federally listed fish or aquatic species and their habitat as a result of the proposed action.

The Middle Columbia River steelhead population can potentially access the Deschutes River as far upstream as Big Falls (RM 132, Section 4.2.1). Due to the magnitude of increased flow in this reach, as a result of the HDPE Piping Alternative, there would be no effect on this population.

Increased instream flow during the irrigation season, as a result of the HDPE Piping Alternative, would not affect bull trout in the middle Deschutes River. Bull trout forage in the middle Deschutes River upstream as far as Big Falls (roughly 30 miles downstream of Bend) during the winter, and are believed to be absent from that river reach the rest of the year. Therefore, because of the timing and magnitude of this increased flow during the irrigation season summer months, there would be no effect on bull trout populations or the PCEs identified in the critical habitat designations for bull trout (USFWS, 2005). Consequently, NRCS has determined that no effects would occur to federally designated critical habitat for bull trout and Section 7 consultation under the ESA as amended is not warranted for this project.

6.2.3 Compliance and Best Management Practices

The ESA establishes a national program for the conservation of threatened and endangered species, and the preservation of the ecosystems on which they depend. The ESA is administered by USFWS for wildlife and freshwater species and by NMFS for marine and anadromous species. The ESA defines procedures for listing species, designating critical habitat for listed species, and preparing recovery plans. It also specifies prohibited actions and exceptions. Section 7 of the ESA, called “Interagency Cooperation,” is the mechanism by which federal agencies ensure the actions they take, including those they fund or authorize, do not jeopardize the existence of any listed species. Under Section 7, federal agencies must consult with USFWS when any action the agency carries out, funds, or authorizes (such as through a permit) may affect a listed endangered or threatened species.

Implementation of the HDPE Piping Alternative would have no effect on the federally listed bull trout population. Although the Middle Columbia River steelhead population is potentially present in the Deschutes River as far upstream as Big Falls (RM 132), this population is classified as a non-essential experimental population under section 10(j) of ESA (76 *Federal Register* 28715, 2011). Because the non-essential experimental population is located outside a National Wildlife Refuge or National Park, and because implementation of the HDPE Piping Alternative would not affect the continued existence of the species, consultation with NMFS is not necessary (76 *Federal Register* 28715, 2011; 81 *Federal Register* 33416, 2016).

6.3 Geology and Soils

6.3.1 No Action (Future without Project)

Under the No Action Alternative, continued operation of the canal system would have no effects on geology and minor effects on soils. Ongoing erosion of canals and laterals, as well as any erosion that might be occurring on farms that use flood irrigation, would persist.

6.3.2 HDPE Piping Alternative

6.3.2.1 Geology

The implementation of the HDPE Piping Alternative would not alter underlying lithology or geologic formations in the project area; therefore, no effects to the geology are expected to occur.

6.3.2.2 Soils

Construction activities would include soils excavation, pipe placement, and pipe burial with excavated and imported soil material. The volume of soil disturbed, which includes soils excavated and soils imported, would vary for each canal and lateral depending on its width and depth, and the diameter of the proposed pipe that would be installed. Using the designed pipe diameters that were determined in the SIP and applying general assumptions for the depth and width of excavation that would be required, the maximum volume of soil that would be disturbed under the HDPE Piping Alternative was estimated to be 45,928 cubic yards (see Appendix E for detailed calculations).

After construction, soil layers would be permanently disturbed and the pipe would be buried. Areas disturbed by construction would be covered by soil and replanted. Overall, minor, short-term effects on soil resources are anticipated because soil stabilization measures would be in place and the effect would occur to small portions of the larger project area over time.

Farmland Classification

The installation of buried pipelines would result in the temporary disturbance of approximately 41 acres of the project area that are classified as prime farmlands if irrigated and farmlands of state importance. These lands are currently not being cultivated; therefore, no farmlands would be removed from production as a result of the HDPE Piping Alternative.

The District's open delivery system would be converted to a gravity-pressurized system. Increased system efficiencies may increase crop production, which is particularly important in the 20 percent of District land classified as prime farmland if irrigated. In addition, piping the canal and laterals prevents sediment and other contaminants, such as herbicides and pesticides, from entering the water supply for SID's patrons. As a result, soil quality would improve with reduced pollutants in the irrigation water.

No long-term effect would be expected to any federal or state-level farmland designations. Minor, short-term effects on agriculturally important soils would be expected during construction, but adherence to best management practices (BMPs) would minimize these effects. There would be a minor, long-term beneficial effect on farmlands due to improved irrigation water quantity.

Erosion

Erosion resulting from precipitation events may occur in disturbed and cleared areas within the project area. Since none of the project groups discharge to a public waterbody, an ODEQ 1200-C General Construction Stormwater Permit would not be required.

During construction, soil compaction would occur under the weight of vehicles and other construction equipment, causing temporary increases in construction-related erosion. However, silt fencing, straw wattles, geotextile filters, straw bales, or other erosion control measures would be used to minimize soil erosion and disturbed areas would be revegetated as soon as possible after disturbance. Therefore, minor, short-term effects on soils would be anticipated. Reduced on-farm soil erosion and reduced deep percolation losses could also occur depending on management decisions.

6.3.3 Compliance and Best Management Practices

The following BMPs would be implemented to reduce effects on soils:

- Ground disturbances would be limited to only those areas necessary to safely implement the HDPE Piping Alternative.
- Work would be confined within existing ROW whenever possible to preserve existing vegetation and private property. The ROW would be clearly marked in the field prior to construction.
- Silt fencing, straw wattles, geotextile filters, straw bales, or other erosion control measures would be used to minimize soil erosion and prevent soil erosion from entering water bodies during construction.
- Project construction activities would be conducted in accordance with the project's spill prevention and cleanup plan.
- Immediately after construction, areas with disturbed soils would be planted with a seed mix of native grasses and forbs.

6.4 Land Use

6.4.1 No Action (Future without Project)

The No Action Alternative would not have a direct effect on land use within the project area. The District's canals and laterals would continue to operate as an open system. Irrigated agriculture producers would continue to face increasing water supply uncertainty. Water supplies would continue to be unreliable, and agriculture producers would likely continue to irrigate fewer acres of land or grow different crops. Compounded with anticipated population and associated developmental pressures, agricultural lands would continue to be increasingly vulnerable to transitioning to a different land use.

6.4.2 HDPE Piping Alternative

The HDPE Piping Alternative would have negligible to minor effects on land use in the project area and SID's ROW; the ROW would continue to be used for the conveyance of irrigation water and operations maintenance, including the pump house installation. There would be no change in property ownership. During system O&M, the presence of District staff would decrease in the ROW, as they would no longer need to patrol the open canals or laterals on a daily basis.

During and after construction of the HDPE Piping Alternative, there would be no direct effect to agricultural, developed, or undeveloped land use adjacent to the project area or served by project canals and laterals. Construction would take place outside the irrigation season, causing no interruption to water deliveries or long-term change in the agricultural land use. Increased water delivery reliability would have long-term indirect effects on agricultural land served by the project, as it would reduce water uncertainty for farmers. Water supply uncertainty and ongoing drought can limit the type of crops grown as farmers choose drought resistant species or convert more water intensive crops to less water intensive crops. Implementation of the HDPE Piping Alternative would allow for more diversity in the types of crops grown in the District because of water supply security.

Reducing pumping costs and increasing the reliability of water delivery could decrease pressure to convert agricultural land to other uses, particularly in areas of SID that fall within the URB and UGB that have been identified for urban growth. This alternative would support current zoning designations and state land use goals because the resulting certainty of agricultural water would assure that the minimum irrigated acre requirements for parcels within EFU subzones are met. Implementation of the HDPE Piping Alternative would also similarly promote Statewide Planning Goal 3: to maintain agricultural lands (ODLCD 2017). Increased water supply security would allow irrigated farmland to be protected and to not be removed from production due to water scarcity.

6.4.3 Compliance and Best Management Practices

The following BMPs would be implemented to reduce effects on land use:

- Lane closures on roadways would be avoided during peak travel periods where possible to reduce potential traffic delays from construction vehicles.
- The condition of roadways and work zones would be communicated to travelers via the District's website, or other communication channels.
- Construction would occur during the off-irrigation season.
- Adjacent landowners would be provided a construction schedule prior to beginning construction.

6.5 Public Safety

6.5.1 No Action (Future without Project)

Under the No Action Alternative, the canals and laterals would remain open. The District would not convert the remaining canal and laterals to pipe using funding from PL 83-566. The No Action Alternative would provide no immediate or foreseeable changes to the current delivery infrastructure. The risk of drowning, flooding, and other serious accidents would increase as urban and suburban areas grow and surround more of the District.

6.5.2 HDPE Piping Alternative

During construction of the HDPE Piping Alternative, there would be a short-term, minor effect to public safety from vehicle and heavy equipment traffic entering and leaving the project area. Construction traffic could interact with motor vehicles, pedestrians, and bicyclists traveling through farmlands and urban and suburban zones along U.S. Highway 20 and U.S. Highway 97 as well as along county and community roads that intersect the project area. Standard safety protocols and BMPs would be followed during construction to minimize any risk to public safety.

Following project completion, the occurrence of drowning and other serious accidents in open canals would be eliminated. This would result in minor, beneficial effects in the long term on public safety, since the possibility of a serious accident would be eliminated. The HDPE Piping Alternative would also eliminate any potential flooding risk from canal overflow or breaching, and the durability of the HDPE pipe would increase seismic resiliency.

6.5.3 Compliance and Best Management Practices

The following BMPs would be implemented during construction as part of the proposed action to reduce effects on public safety:

- Standard construction safety procedures and traffic control measures would be employed to reduce the risk of collisions between construction vehicles and other vehicles, pedestrians, or bicyclists while construction is ongoing.
- Traffic control measures would be coordinated by the construction contractor with the Oregon Department of Transportation, the Deschutes County Sheriff, and local emergency services prior to working in the U.S. Highway 20 ROW.
- Roadway lane closures would be avoided during peak travel periods where possible to reduce potential traffic and pedestrian safety issues.
- Construction would occur during the off-irrigation season when there is no water within the canals or trenches.
- Ground disturbances would be limited to only those areas necessary to safely implement the action.

- Work would be confined within existing ROW whenever possible to preserve existing vegetation and private property. The ROW would be clearly marked in the field before construction.
- Work crews would carry spill cleanup kits, and in times of burn bans or wildfire concerns, each crew would have a fire suppression kit.

6.6 Recreation Resources

6.6.1 No Action (Future without Project)

The No Action Alternative would have no effect on recreation resources.

6.6.2 HDPE Piping Alternative

Construction would have minor, short-term effects for bikeway users because of reroutes or delays. These effects would be minor and short term because construction would occur during the winter season when use is at its lowest.

The view of the canal and laterals from public road crossings would change from an open channel (with or without water depending on the season) with opportunistic hydrophytic plants growing on the margins, to a corridor of native upland vegetation (Section 6.8.2). The visual change for recreationists was not monetized due to insufficient data; further discussion can be found in Appendix D.

During construction, recreational activities along and on the Deschutes River would not be effected. After construction, river activities, including recreational fishing, would be indirectly effected by an increase in streamflow from the allocation of conserved water. Overall, there would be a negligible, long-term effect on recreational resources because effects would be localized in scope and would not alter any existing recreational uses.

6.6.3 Compliance and Best Management Practices

The following BMPs would be implemented to reduce effects on recreation resources:

- Construction would occur during the off-irrigation season.
- Roadway lane closures would be avoided during peak travel periods where possible to reduce potential traffic delays from construction vehicles.
- The condition of roadways, work zones, and maintenance roads would be communicated to travelers via the District's website, or other communication channels.

6.7 Socioeconomic Resources

To estimate the total economic effects of the No Action Alternative and HDPE Piping Alternative in terms of jobs and income supported, this analysis uses a 2015 IMPLAN economic impact model of Deschutes County.¹⁵

6.7.1 No Action (Future without Project)

Under the No Action Alternative, the total economic activity supported by SID agricultural production is estimated at approximately 50 jobs (approximately 40 jobs in agriculture and an additional 10 jobs in other economic sectors) and \$1.54 million in average annualized income (\$0.96 million in agricultural income and an additional \$0.70 million in income in other sectors benefiting from agricultural expenditures and income).

6.7.2 HDPE Piping Alternative

Implementation of the HDPE Piping Alternative would have a minor, short-term localized effect on employment and income in Deschutes County from construction activities, and a minor, long-term effect on agricultural production and related farm household income in the County. The sections below provide a rationale for these effects.

6.7.2.1 Regional Economic Development

The HDPE Piping Alternative construction expenditures of approximately \$15 million would support construction sector jobs and income, as well as economic ripple effects increasing jobs and income in other economic sectors in Deschutes County. Economic ripple effects would result from the construction sector spending more on labor, materials, and services, which would spur increased sales and economic activity in other sectors (such as hardware stores and construction equipment businesses supplying construction businesses). Effects of construction sector spending in these other sectors are known as indirect effects. As household income rises in construction and indirectly affected economic sectors, household spending would also increase and generate increased economic activity in such sectors as retail, wholesale trade, personal services industries, and real estate (known as induced effects). Total job and income effect of the economic activity that would be supported by the HDPE Piping Alternative are the sum of the direct effects (construction sector) and the indirect/induced effects (in other economic sectors).

The approximately \$15.0 million in construction expenditure would be spread over 7 years, supporting approximately 30 jobs and \$1.25 million in average income over the 7-year construction period (annualized over 107 years,¹⁶ this would equate to approximately \$0.22 million in annualized average income benefits). Of these effects, approximately 20 jobs and \$0.87 million in annual income would be in the construction sector (direct effects), while the remaining 10 jobs and \$0.38 million income would be in other sectors.

¹⁵ Total construction expenditures were modeled in IMPLAN Construction Sector 57, construction of new commercial structures, including farm structures.

¹⁶ Note that each project has a 100-year life, but that since construction takes 7 years, the analysis period for all project groups is 107 years (Year 0 to Year 107).

The HDPE Piping Alternative would also result in slightly increased operation, maintenance, and replacement (OM&R) expenses for SID, but these would be more than offset by reduced patron pumping costs. The effects on District wages and employment are expected to be minimal, and effects on the electricity generation sector are also expected to be minimal. As such, there are expected to be limited Regional Economic Development (RED) effects of these changes in expenditure, so effects are not quantified in this RED analysis.

6.7.2.2 National Economic Development Benefits

A NED benefit cost analysis has been performed to evaluate the benefits of the HDPE Piping Alternative (Appendix D). This evaluation includes identification of the Without Project economic damages, and estimation of the NED benefits of the alternatives to the identified problems. The analysis uses NRCS guidelines for the evaluation of NED benefits as outlined in the Economic and Environmental Principles and Guidelines for Water Related Land Resources Implementation Studies, and NRCS' Natural Resources Economics Handbook.

6.8 Vegetation

6.8.1 No Action (Future without Project)

Under the No Action Alternative, vegetation associated with the network of open irrigation canals and laterals would persist, and adjacent native upland vegetation would remain in its current condition.

6.8.2 HDPE Piping Alternative

6.8.2.1 General Vegetation

Construction of the HDPE Piping Alternative would involve trenching for pipe placement primarily in existing canals, disturbance of lands adjacent to canals for construction equipment access, and use of existing ROW for moving and staging construction equipment and materials.

During construction, existing maintenance roads within the ROW would provide access to most of the project area Figure 6-1. Given that the pipe segments would be installed in 50- or 100-foot lengths, some temporary travel routes within the ROW would be necessary along canals and laterals that are not accessible by existing roads. Selection of construction areas adjacent to canals and travel routes would consider existing vegetation and avoid mature trees to the extent practicable.



Figure 6-1. An example of construction on a Tumalo Irrigation District lateral using an existing maintenance road.

During construction, herbaceous, shrub, and woody vegetation along the canals, laterals, turnouts, and within the project area would be temporarily disturbed through activities such as clearing, crushing, and digging. These activities would potentially temporarily disturb approximately 47 acres of existing vegetation within the 16,285-acre District boundary (Table 6-1 and Table 6-2). This includes removal of opportunistic hydrophytic plants along canals and laterals.

Table 6-1. Potential Vegetation Disturbance along Canals and Laterals in the HDPE Piping Alternative.

System Element	Proposed Piping (feet)	Total Width of Disturbance Adjacent to the System (feet)	Additional Width of Disturbance Adjacent to Maintenance Roads (feet)	Subtotal Disturbed Vegetation Area (acres)
Canals	34,174	16	15	24
Laterals	53,390	10	8	22
Total				46

Table 6-2. Potential Turnout Vegetation Disturbance in the HDPE Piping Alternative.

System Element	Units	Disturbance Width (feet)	Disturbance Length (feet)	Total Disturbed Vegetation Area (acres)
Turnouts	178	10	30	1

After construction, the project area would be recontoured and planted with a seed mix of native grasses and forbs (Figure 6-2 to Figure 6-4). Planting would be done in consultation with NRCS.

Vegetation within the ROW would return to the historic upland habitat. Some trees that are dependent upon the canal for water may not survive the construction of the HDPE Piping Alternative. Prior experience with piping projects has shown that 70 to 80 percent of the well-established trees within the project area would survive after piping with active irrigation by the property owner (20 to 30 percent of the trees that do not normally survive in such a location without the canal did not survive after piping).

In the long term, at least 11 acres of native vegetation would be gained because open canals and laterals would be piped and then covered with topsoil and seeded, with a double track dirt access/maintenance trail left for District access. Over the project's life, vegetation within the ROW would be maintained according to SID's vegetation management program and NRCS Oregon and Washington Guide for Conservation Seedings and Plantings (NRCS 2000). Trees would not be allowed to establish above the buried pipe because roots may interfere with future O&M activities.

Implementation of the HDPE Piping Alternative would have a minor, short-term effect on vegetation because disturbance occurs over less than half of 1 percent of the District and measures designed to minimize effects on vegetation, such as revegetating with natural grasses and forbs in consultation with NRCS, would be implemented (other measures are identified in Sections 6.8.3 and 8.4).



Figure 6-2. A section of the Bend Feed Canal after a piping project.



Source: Reclamation 2010.

Figure 6-3. A section of the Bend Feed Canal approximately four months after a piping project.



Source: DRC 2013.

Figure 6-4. A section of the Tumalo Feed Canal after a piping project.

6.8.2.2 Noxious Weeds

During construction, exposed soils would create temporarily susceptible areas where weeds could establish themselves. The movement of construction vehicles could provide opportunities to transport weeds to new locations. During construction, the contractor would use BMPs such as avoiding unnecessary ground disturbances and use erosion control measures that are free of weeds and weed seeds.

After construction, weeds would be managed according to the protocol in NRCS Oregon and Washington Guide for Conservation Seedings and Plantings (NRCS 2000). After construction, the closed system no longer presents opportunities for aquatic noxious weeds to grow or be washed to other areas of the District.

Implementation of the HDPE Piping Alternative would have a minor, long-term effect on noxious weeds because the spread of noxious weeds during construction would be controlled through BMPs, and the conversion to a piped system would reduce the spread of noxious weeds through the open canals system.

6.8.3 Compliance and Best Management Practices

To reduce the disruption to existing vegetation and minimize the spread of invasive plants as a result of the proposed action, the following BMPs would be implemented:

- If detected, Peck's milkvetch would be incorporated into the seeding mixture used to stabilize disturbed soils and individual plants affected by construction would be excavated, potted, cared for, and replanted during the appropriate planting window. Surveys and mitigation would be done in consultation with the ODA.
- Construction limits would be clearly flagged onsite to avoid unnecessary plant loss or ground disturbance.
- Ground disturbances would be limited to only those areas necessary to safely implement the proposed action.
- Work would be confined within existing ROW whenever possible to preserve existing vegetation and private property. The ROW would be clearly marked in the field before construction.
- Temporary travel routes would be selected and used to minimize effects on vegetation and avoid the removal of trees.
- After construction, the project area would be recontoured and planted with a seed mix of native grasses and forbs. Planting would be done in consultation with NRCS.
- After reseeding, vegetation within the ROW would be maintained according to SID's vegetation management program and NRCS Oregon and Washington's Guide for Conservation Seedings and Plantings (NRCS 2000).

- Pruning would occur entirely within SID’s ROW and would not exceed what is required for equipment clearance.
- At adjacent landowners’ requests and during maintenance season, the District would remove trees in the ROW that do not survive piping for 2 years following construction.

6.9 Visual Resources

Effects on visual resources occur when project activities visually stand out from the existing landscape or introduce disruptive visual characteristics. The visibility of the activity or modification and the sensitivity of the viewer influence the magnitude of the effect. For example, there would be less effect from an action surrounded by thick vegetation or an action that blends into the landscape. This visual analysis was based on evaluations of aerial and ground-based photographs of the proposed project sites, and preliminary design information.

Visual effects were assessed based on the potential of the proposed action to alter scenic resources or to degrade the visual character of the project area. The evaluation of temporary or short-term visual effects considered whether construction activities could substantially degrade the existing visual character or quality of the site or surrounding area, as well as the duration over which any such changes would occur. Because of their short-term nature, construction activities occurring in an area for less than 1 year are typically considered to have a less-than-major effect on visual quality.

Actions with long-term visual effects, such as constructing new or altered structures, grading roads, removing trees, and introducing new sources of light and glare can permanently alter the landscape in a manner that could affect the existing visual character or quality of the area, depending on the perspective of the viewer. Since damaging scenic resources such as trees, rock outcroppings, and other features typically constitute a long-term effect, the potential for project implementation to damage scenic resources was evaluated solely as a long-term effect, differentiated from construction-related effects.

6.9.1 No Action (Future without Project)

Under the No Action Alternative, there would be no effect on visual resources.

6.9.2 HDPE Piping Alternative

Under the HDPE Piping Alternative, construction activities, including use of heavy equipment and pipe laying, would be visible to residents, motorists, and recreationists adjacent to the project area. Vegetation would be cleared within the project area in some areas where pipe is installed, the pump building is erected, or access for construction equipment is necessary. Disturbance to existing mature trees would be minimized to the extent possible. Trees growing along the edge of open canals and laterals would only be removed if they posed a safety risk to crews working within the project area. There would be minor, short-term effects to visual resources because the construction activities would draw attention to the setting. However, similar large equipment is used for agricultural production and in canals maintenance, and is therefore not an uncommon feature in the landscape. Construction would be scheduled in the winter off-season during daytime hours, and the BMPs discussed below would further minimize any visual disruptions.

After construction, areas adjacent to the canal would be restored to near-prior contours, and the area over the pipe would be graded to blend with the side of the canal. Disturbed areas, including the newly buried pipes, would be planted with a seed mix of native grasses and forbs in consultation with NRCS. The view of the canal and laterals would change from an open channel (with or without water depending on the season) with opportunistic hydrophytic plants growing on the margins, to a corridor of native upland vegetation including trees that did not pose a safety risk during construction. The visual change for recreationists and property owners was not monetized due to insufficient data; further discussion can be found in Appendix D.

The new pump house would be a permanent fixture in the landscape. The building would be located in an already modified landscape that houses the existing hydropower plant. Although the pump house would require installation of utility poles, these would be consistent with the already existing utility poles for the hydropower plant. The pump house would not be visible from the road; it would be obscured by the hydropower plant. BMPs, such as the use of muted or matching colors for permanent visible equipment and the building exterior, would further reduce visual contrast.

Overall, the visual change from canal to buried pipe and new pump house would be expected to have a minor, long-term effect because the revegetated corridor would blend in with the natural landscape and the pump house would be in an already modified environment and would not dominate the landscape.

6.9.3 Compliance and Best Management Practices

The following BMPs would be implemented as part of the proposed action to reduce effects on visual resources:

- Muted or matching colors would be used for permanent visible equipment and the pump house building exterior.
- Construction would occur during the daytime to minimize disturbance to any recreationists, landowners, or other individuals in the project area vicinity.
- Ground disturbances would be limited to only those areas necessary to safely implement the proposed action.
- Work would be confined within the existing ROW whenever possible to preserve existing vegetation and private property. The ROW would be clearly marked in the field before construction.
- Construction limits would be clearly flagged onsite to avoid unnecessary plant loss or ground disturbance.
- Temporary travel routes would be selected and used to minimize effects to vegetation and avoid the removal of trees.
- Selection and use of staging areas and travel routes would consider existing vegetation and avoid mature trees to the extent practicable.

- During construction, the contractor would use erosion control measures free of weeds and weed seeds.
- Immediately after construction, areas with disturbed soils including newly covered pipes would be planted with a seed mix of native grasses and forbs.

6.10 Water Resources

6.10.1 No Action (Future without Project)

6.10.1.1 Surface Water Rights

Under the No Action Alternative, SID would not create instream water rights through Oregon's Allocation of Conserved Water Program. The District would not permanently reduce its water right or permanently protect water instream in the Deschutes River. A portion of the water diverted at the SID diversion would continue to seep into the ground before reaching any farms and the District would continue to experience delivery shortages and operate with tight restrictions on water use and instream leases throughout the irrigation season during most years.

During the peak irrigation season (May 15 through September 14), the District operates with tight restrictions on the allowable number of instream leases in order to provide adequate irrigation supply to patrons due to the inefficiencies of the earthen canal system; therefore, in some years, including the 2018 irrigation season, the District cannot fulfill patron demands throughout the entire season.

6.10.1.2 Surface Water Hydrology

The No Action Alternative would not be reasonably certain to convert the District's open canal and laterals to a modernized system. There would be no effect on water resources in the Deschutes River from North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120) as the District would continue to divert water in volumes that calculate for water loss due to seepage and evaporation. No additional water would be protected instream, and streamflow in this stretch of the Deschutes River would continue to fall short of the 250 cfs pending instream water right that serves as an instream flow target.

6.10.1.3 Surface Water Quality

There would be no effect on surface water quality in the Deschutes River downstream from SID's diversion. The Deschutes River would continue to be included on Oregon's 303(d) list for not meeting temperature, pH, or dissolved oxygen water quality standards (Table 4-14).

Water in the canal and lateral system would continue to collect irrigation tailwater, subsequently delivering contaminants, such as herbicides and pesticides, to patrons downgradient in the system. This would continue to be a concern as this could affect the safety of the local food system, especially for patron farmers that sell food products to the local farmers' markets.

6.10.1.4 Groundwater

There would be no effect on groundwater in the project area or the upper Deschutes Basin.

6.10.2 HDPE Piping Alternative

6.10.2.1 Surface Water Rights

Following construction, SID would create permanent instream water rights in the Deschutes River through Oregon's Allocation of Conserved Water Program (ORS 537.470). The amount of water allocated instream through the program would be determined based on the amount of water saved throughout the irrigation season (April 1 to October 31). The District has identified that the proposed action would save an estimated 6,172 acre-feet over the duration of the irrigation season. Under this alternative, the District would legally reduce their water right and protect 75 percent of the total water saved instream, or an estimated 4,627 acre-feet annually, through Oregon's Allocation of Conserved Water Program (see Table 5-2 for the distribution of the estimated allocated instream flows in cfs throughout the irrigation season). The District would incrementally allocate the water instream following completion of each project group, permanently protecting the water downstream from SID's diversion at North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120) (see Section 2.2.1 for how the conserved water would be permanently protected). Following the completion of each project group, SID would work with OWRD and its partners to verify and measure all water savings prior to creating instream water rights.

This alternative would benefit SID patrons by ensuring the delivery of water rights throughout the irrigation season. As project groups are completed, 25 percent of the total water saved would be used by the District to alleviate supply shortages that lead to water management and delivery challenges. As sections of the District become piped, the conveyance system would convert to an on-demand system, allowing water to remain instream when not being used.

6.10.2.2 Surface Water Hydrology

Minor to moderate, long-term effects on surface water hydrology would occur during the irrigation season from implementation of the HDPE Piping Alternative. These environmental effects would benefit the Deschutes River downstream from SID's diversion at North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120).

In an effort to address the identified watershed problems and resource concerns, the District would allocate 75 percent of the total water saved to instream water rights, increasing streamflow in the middle Deschutes River. These increases would be distributed over the irrigation season, with a maximum of 15.2 cfs in the peak irrigation season (May 15-September 14), 6.18 cfs in season 2 (May 1-May 14 and September 15-September 30), and 4.80 cfs in season 1 (April 1-April 30 and October 1-October 31). These additional flows would assist in meeting ODFW's junior water rights (see Table 5-2 for the estimated distribution of the allocated instream flows in cfs and estimated volumes in acre-feet throughout the irrigation season).

6.10.2.3 Surface Water Quality

Additional streamflow would affect water quality in this reach of the Deschutes River which currently does not meet water quality standards under Section 303(d) of the CWA (33 U.S.C. 1251 et seq.). Section 4.10.3 provides more detail on these impaired reaches.

Although the increased volume would not provide sufficient water to decrease temperatures enough to meet DEQ’s water temperature standards, increasing streamflow in the middle Deschutes River could have a negligible to minor effect on water temperatures downstream of SID’s diversion (B. Hodgson, personal communication, August 16, 2018). A negligible to minor decrease in water temperature could have indirect, beneficial effects on other water quality components including pH and dissolved oxygen. Increasing streamflow would also benefit wetland and riparian areas within this reach by improving their ecological function, subsequently enhancing water quality.

Piping the canal and laterals also prevents contaminants, such as herbicides and pesticides, from entering the canal and laterals and therefore, prevents contaminants from entering the water delivered to SID’s patrons. The potential for these contaminants to remain on-farm or get carried by wind deposition, infiltration, groundwater flow, and groundwater recharge to surface water would continue, however, the HDPE Piping Alternative would eliminate nonpoint source contamination carried on-farm through irrigation water delivery.

If the proposed action decreases water temperature in the middle Deschutes River, it would have a minor, long-term, and beneficial effect on water quality within this reach.

6.10.2.4 Groundwater

No groundwater would be used as part of the HDPE Piping Alternative; however, piping irrigation canals and laterals would affect groundwater hydrology by reducing canal seepage. Following project implementation, reduction in canal seepage is expected to result in reduced groundwater recharge during the irrigation season. A seepage loss assessment performed in 2016 calculated a water loss¹⁷ of 19.2 cfs throughout the entire District (SID 2017). This estimate includes evaporation, so it is anticipated that the entire 19.2 cfs does not contribute to groundwater recharge. Prior studies have found that canal lining and piping have a relatively small effect on groundwater recharge in the upper Deschutes Basin (Gannett and Lite 2013; Gannett et al. 2003; Gannett et al. 2001).

Extrapolating from prior study data (Gannett and Lite 2013), the average relationship between canal recharge and groundwater levels in the central part of the Deschutes Basin is approximately 1 foot of groundwater elevation drop per 377,000 acre-feet of reduced canal recharge. The HDPE Piping Alternative would reduce canal seepage and associated groundwater recharge by up to approximately 6,172 acre-feet annually in this part of the Deschutes Basin. On average, for this part of the Deschutes Basin, this decrease in recharge translates into a decreased groundwater elevation of approximately 0.016 feet annually. An important caveat is that localized effects on groundwater would differ throughout the area associated with District operations. Over the course of 100 years, this annual drop would result in a cumulative decreased average groundwater elevation of 1.64 feet.

As described in Section 4.10.4, changes in canal and lateral seepage account for only a small portion of changes in groundwater recharge in this part of the Deschutes Basin. Climate remains the primary factor affecting groundwater levels in the region. The USGS estimated that the combined effects of climate and groundwater pumping accounted for approximately 90 percent of the observed decrease

¹⁷ This number differs slightly from the number in the SIP. This is due to conservation projects that have been completed since the 2016 water loss assessment occurred.

in groundwater levels in the region, and canal piping and lining accounted for 10 percent of that observed decrease (Gannett and Lite 2013). Based on the amount of reduced canal recharge relative to climate factors and groundwater pumping, the proposed action would have a minor, long-term effect on groundwater. The economic effect of a change in groundwater levels and pumping is discussed in the NED in Appendix D.

6.10.3 Compliance and Best Management Practices

The following compliance measures and BMPs would be implemented to mitigate any effects on water resources:

- Proper erosion and sedimentation controls would be implemented during project construction including silt fences in construction areas near the Deschutes River.
- Immediately after construction, areas with disturbed soils and newly covered pipes would be planted with a seed mix of native grasses and forbs to stabilize soils and minimize erosion.
- Seventy-five percent of the total saved water would be allocated to instream water rights. Twenty-five percent of the total saved water would be used by the District to alleviate water supply shortages that lead to water management and delivery challenges. Following the completion of each project group, SID would work with OWRD and its partners to measure and verify all water savings.

6.11 Wetlands and Riparian Areas

6.11.1 No Action (Future without Project)

6.11.1.1 Wetlands

The No Action Alternative would not provide a more natural hydrograph to support wetlands adjacent to the 44.8 miles of the Deschutes River downstream from SID's diversion. Conditions that have allowed seasonal opportunistic hydrophytic plants to opportunistically grow along open canals and laterals would continue.

6.11.1.2 Riparian Areas

This alternative would not provide a more natural hydrograph to enhance flows and benefit riparian areas occurring along the 44.8 miles of the Deschutes River associated with District operations. Low streamflow associated with irrigation withdrawals during the late spring, summer, and early fall in the Deschutes River downstream from SID's diversion would continue to further limit riparian vegetation.

6.11.2 HDPE Piping Alternative

6.11.2.1 Wetlands

Based on a review of the NWI geographic information systems data, there are no natural wetland features within 350 feet of the project canals or laterals, however, the canals themselves are classified as seasonally flooded, artificial wetland features, specifically within the categories of "PUSC_x (Palustrine, Unconsolidated Shore, Seasonally Flooded, and excavated by humans)" or "R4SBC_x

(Riverine, Intermittent, Streambed Seasonally, and excavated by humans)” within and adjacent to the project area (USFWS 2016). Canals and lands immediately adjacent with these NWI designations total approximately 65.6 acres within the project area. These features are not anticipated to be jurisdictional based on a review of the exemptions under the Oregon Removal-Fill statute (OAR 141-085-0515(9)) and language provided in the 1986 Final Rule for Regulatory Programs of the Corps of Engineers (1986 Final Rule) (see Section 4.11 for language). Consultation with USACE and ODSL would be completed prior to construction to ensure that these exemptions apply.

The HDPE Piping Alternative would have no effect on excavated water storage ponds that occur in the project area. Seasonal opportunistic hydrophytic plants directly adjacent to canals and laterals in some sections of the project area could be removed or buried during construction activity. Short-term effects would occur including potential erosion from the construction sites, access, and temporary use areas in addition to the potential for spills or leaks of industrial fluids during construction. Following construction, the District would follow appropriate reclamation procedures to revegetate disturbed areas as uplands, and the opportunity for hydrophytic plants to grow alongside the canals would no longer exist.

Increased instream flows in the 44.8 miles of the Deschutes River associated with District operations would contribute toward a more natural hydrologic regime and increased hydrologic connectivity with wetland vegetation, particularly in the lower gradient areas (B. Hodgson, personal communication, August 16, 2018). Overall, the HPDE Piping Alternative would have a minor effect on wetlands, as those directly impacted or eliminated are limited to the non-jurisdictional, man-made canals themselves, and wetlands downstream from the SID diversion may experience some benefit from improved streamflow.

6.11.2.2 Riparian Areas

Changes in a stream’s hydrologic regime alter streambank structure, sediment transport dynamics, and hydrologic connectivity with riparian vegetation (National Research Council 2002). The project would help hydrologic connectivity with riparian vegetation in the lower gradient areas along the Deschutes River downstream from SID’s diversion by providing additional flows that will contribute to the creation of a hydrograph more similar to natural conditions (B. Hodgson, personal communication, August 16, 2018). Reduced bank erosion along the Deschutes River could occur if riparian vegetation became more established and functionality of the riparian areas increases.

Re-establishing a more natural hydrologic regime in this reach would allow the river channel to supply water to riparian areas via infiltration through channel banks. This infiltration would enhance riparian function by facilitating processes such as hyporheic exchange, physical and chemical transformations, and support of riparian plant communities. This would have a minor, long-term, beneficial effect on riparian areas along the Deschutes River downstream from SID’s diversion.

6.11.3 Compliance and Best Management Practices

The replacement of an open channel with a pipe is considered an irrigation exemption under USACE’s Regulatory Guidance Letter No. 07-02, Exemption for Construction or Maintenance of Irrigation Ditches and Maintenance of Drainage under Section 404 Part 323.4(a)(3) of the CWA.

Under this exemption, no Nationwide Permit is required for the disturbance to wetlands within the project area. Coordination and consultation with USACE would occur prior to project implementation to ensure the project meets exemption criteria.

Executive Order 11988 requires federal agencies to avoid to the extent possible the long- and short-term effects associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. The District's canal and laterals are not located within the 100-year floodplain and would be compliant with Executive Order 11988.

The following BMPs would be implemented to mitigate any effects on wetlands and riparian areas:

- Work would be confined within the existing ROW whenever possible to preserve existing vegetation and private property. The ROW would be clearly marked in the field before construction.
- Construction limits would be clearly flagged onsite to avoid unnecessary plant loss or ground disturbance.
- Disturbance of jurisdictional wetlands would be avoided during construction.
- Following project implementation, appropriate reclamation procedures would be used to revegetate disturbed areas as uplands while controlling noxious weeds.

6.12 Wildlife Resources

6.12.1 No Action (Future without Project)

Under the No Action Alternative, the wildlife communities in the project area would continue to use the artificial wetland habitat with opportunistic hydrophytic plants created by the District's open canal and lateral system. Wildlife dependent on the wetland and riparian habitat along the middle Deschutes River would not benefit from the increased summer flows and enhanced riparian function created by the proposed action.

6.12.2 HDPE Piping Alternative

During construction, terrestrial wildlife could experience noise disturbance due to heavy equipment operation, habitat removal due to tree cutting and other vegetation removal, or injury due to collision with construction equipment or habitat removal. Canals are located in agricultural areas where heavy equipment use is commonplace; therefore, most wildlife in the area is accustomed to noise and these disturbances are anticipated to be minor.

The canal and laterals within the project area provide seasonal, artificial wetlands and elements of riparian habitat across the landscape, as well as a source of water for wildlife. As canal and lateral systems are piped and habitats shift from artificial wetlands with opportunistic hydrophytic plants to uplands, the distribution patterns of wildlife within the area could change. Large ungulates could alter their land use patterns in response to removal of these water sources and the vegetation they

support. Densities of smaller species dependent on these habitats could decrease locally and shift to other more suitable habitat in the area. This alternative would have no effect on excavated water storage ponds in the project area and these would still allow for summer drinking water and habitat availability to wildlife. Wintering or migrating birds would be minimally affected by construction disturbance because they have the flexibility to move away from disturbances to other suitable areas. There is no expected effect on breeding migratory songbirds or waterbirds as construction activities would occur outside the nesting season.

The District is working with USFWS to ensure minimal disturbance to bald or golden eagles nesting near the project area. The critical nesting period for bald and golden eagles is January 1 through August 31. No known golden eagle nests are near the project area and although no bald eagle nests are documented, it is possible that a bald eagle nest could be located near a proposed pipeline or irrigation pond (J. Cordova, personal communication, August 23, 2017). A site visit with a USFWS biologist was conducted to assess potential habitat disturbance and the District would continue to work with USFWS to ensure that appropriate buffers are maintained between project construction activities and active nests or that construction in areas with known nests is avoided during the critical nesting period.

Construction activities would cause short-term, negligible effects on wildlife due to increased human presence. Regarding long-term effects, piping of irrigation systems would potentially reduce human presence through the project area, as fewer trips to maintain ditches and headgates would be necessary. This would result in less human–wildlife conflicts and improve seclusion for wildlife. In addition, the HDPE Piping Alternative could remove barriers to ungulates and other terrestrial wildlife within the project area as open canals are converted to buried pipelines. Although some species may use canals as a water source, canals and laterals can have adverse effects on wildlife due to risk of drowning and the barrier that they create to terrestrial movement (Beier et al. 2008). As this alternative would be implemented over time, ungulates and other terrestrial wildlife would have ample time to adjust and find new water sources.

Project implementation would provide increased instream flows in the Deschutes River that would enhance riparian habitat in these reaches. Improved streamflow would allow more consistent access to water for hydrophytic plants, and this would in turn enhance riparian wildlife habitat. Overall, the HDPE Piping Alternative would have a minor, long-term effect on general wildlife in the project area.

6.12.2.1 Threatened and Endangered Species

The HDPE Piping Alternative would have no effect on threatened or endangered terrestrial species. As noted in Sections 4.12.3 and 4.12.4, no federally or state designated species or federally designated critical habitat occurs within the project area or planning area with the exception of bull trout and steelhead, which are discussed in Section 6.2.2.2.

6.12.3 Compliance and Best Management Practices

The following BMPs would be implemented to reduce effects on wildlife:

- Bald and golden eagles typically use the same nest sites year after year. The District is working with a USFWS biologist to determine the most recent locations of active nests and how best to operate within the project area to minimize any potential effects. Construction would occur outside USFWS-approved buffer distances where possible. If operating within the recommended buffer distance, the District would operate outside the nesting season.
- Construction would occur outside the primary nesting period for migratory birds of concern (April 15 through July 15) and raptors (April through July). For rare occasions where construction would occur during the primary nesting period, construction would occur outside the recommended buffer distance of any known nests. Should an active nest be found, construction would be paused and a consultation with a local USFWS biologist would occur to determine the following steps.
- The District would complete timely and appropriate revegetation of the construction area. Seed mixes would consist of native vegetation and would be approved by the local Soil and Water Conservation District or NRCS.
- Ramps would be placed in open trenches during construction to allow wildlife to escape. Ramps would be appropriately sized by a USFWS biologist and strong enough to support large animals.

6.13 Wild and Scenic Rivers

6.13.1 No Action (Future without Project)

The No Action Alternative would have no effect on the values that support the designation of Wild and Scenic Rivers or on State Scenic Waterways downstream from SID's diversion at the North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120). The No Action Alternative would also have no effect on the Outstandingly Remarkable Values listed in Section 4.13.

6.13.2 HDPE Piping Alternative

Implementation of the HDPE Piping Alternative would have no effect on the Wild and Scenic River or State Scenic Waterways designation, or the free-flowing condition of the designated reaches downstream from SID's diversion at the North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120). Construction activities would not occur in the designated Wild and Scenic reaches (see Section 1.2 for a description of the project area) and the increased streamflow during the irrigation season, permanently protected through Oregon's Allocation of Conserved Water Program, is expected to be consistent with Wild and Scenic River management goals (U.S. Department of Interior 1992). The proposed action would have negligible, beneficial effects on some of the qualities that support these designations. Specifically, any effect of increased streamflow would be an enhancement to fish, recreation, scenery, wildlife, hydrological, and botanical/ecological values. ORVs unrelated to the quantity and quality of river flow, including cultural, geologic, and wilderness, will be unaffected by the proposed action.

Since adverse effects are not expected to occur in the designated Wild and Scenic River reaches or in the State Scenic Waterways, consultation with OPRD, BLS, USFS, or USFWS is not warranted.

6.13.3 Compliance and Best Management Practices

The following compliance measures and BMPs would be implemented to mitigate any effects on Wild and Scenic River areas or State Scenic Waterways:

- Appropriate erosion control measures would be utilized.
- The District will transfer 75 percent of the total saved water to instream water rights in the Deschutes River through Oregon’s Allocation of Conserved Water Program (ORS 537.470).

6.14 Cumulative Effects

This section includes a description of past, current, reasonably foreseeable future actions, and cumulative effects organized by resource.

6.14.1 Past Actions

Past actions are summarized as land development activities that include irrigated agriculture (consisting of construction of the canal system, previous piping projects, and diversions), urban and suburban development, industrial land and water uses, commercial development, water diversions for non-agricultural uses, and transportation infrastructure. The nature and extent of these past actions and how they have influenced the existing environment are described for each resource in Chapter 4.

SID’s Main Canal was constructed between 1891 and 1923 by SID’s predecessor DRIC to provide water to surrounding farms and ranches for crops and livestock. In 1994, DRIC incorporated as an irrigation district and became SID. Seven other irrigation districts were developed within the Deschutes Basin during this timeframe, collectively altering the hydrology of the Deschutes River and its tributaries. Over time there has been increasing pressure to reduce the effects of irrigation needs on the natural water cycle in the Deschutes Basin.

6.14.2 Current and Reasonably Foreseeable Future Actions

Current actions are those projects, developments, and other actions that are presently underway, either because they are under construction or are occurring on an ongoing basis. Reasonably foreseeable future actions generally include those actions formally proposed or planned, or highly likely to occur based on available information. Various sources including local, state, and federal agency websites and city and county staff were consulted to obtain information about current and potential future development in the project area. The following sections describe these current actions and reasonably foreseeable future actions.

6.14.2.1 Land Use and Development

Ongoing agricultural activities including farming and grazing in the project area are not expected to change from current conditions. Land use development in the project area is managed according to the Deschutes County Comprehensive Plan and Deschutes County zoning regulations and is implemented by Deschutes County Planning Department. Within Bend city limits, land use is managed according to the Bend Comprehensive Plan implemented by the City of Bend Community Development Department. Land development activities are expected to continue into the future,

and would include agricultural, residential, commercial, and industrial land uses, as well as maintenance of public lands for their intended uses.

6.14.2.2 Habitat Conservation Plan

The District, other irrigation districts in the Deschutes Basin, state and federal agencies, local municipalities, and environmental groups are collaborating to develop a multi-species Habitat Conservation Plan (HCP) for the upper Deschutes Basin for listed species and those that may become listed during the 20 to 50-year life of the HCP: Oregon spotted frog, bull trout, chinook salmon, steelhead salmon, and sockeye salmon. The HCP is anticipated to be completed in 2019. The HCP is still in draft form; covered activities will likely include:

- Storage and release of irrigation water from:
 - Crane Prairie Reservoir
 - Wickiup Reservoir
 - Crescent Lake Reservoir
 - Prineville Reservoir
 - Ochoco Reservoir
- Diversion of irrigation water
- Conveyance and delivery of irrigation water
- Irrigation return flows
- Existing hydropower
- City of Prineville water use activities.

6.14.2.3 Deschutes Basin Irrigation District Modernization

Other irrigation districts in the Deschutes Basin are working to modernize their infrastructure, and would implement projects similar to those proposed by SID in this Plan-EA. Districts most likely to obtain necessary funding and permitting in the next 2 years are Tumalo Irrigation District (TID) and COID. Modernization of TID's irrigation infrastructure would involve piping approximately 68.8 miles of canals and laterals occurring over the course of 11 years. Modernization of COID's Pilot Butte Canal system would involve a total of 174 miles of canals, over the course of 12 years starting in 2019. Each of these projects is contingent on the availability of funding. Over the next 10-15 years these two projects are anticipated to cumulatively convert approximately 243 miles of open canals and ditches to piped systems and conserve up to 204 cfs of water that would otherwise be lost to seepage, evaporation, and other conveyance inefficiencies.

6.14.3 Cumulative Effects by Resource

Cumulative effects are considered for each resource in consideration of past, present, and reasonably foreseeable future actions.

6.14.3.1 Cultural Resources

Cultural resources in the project area have likely been affected due to past, present, and ongoing development activities such as agriculture, land development, forestry, and any other ground disturbing projects. Like the proposed action, other reasonably foreseeable future actions in the project area vicinity have the potential to disturb previously undiscovered cultural resources. The proposed action would likely have moderate cumulative effects on historic properties because any potential effects on historic canal structures would be completed in compliance with NHPA and any previously undiscovered archaeological resources would be managed as directed by SHPO. Mitigation measures for reasonably foreseeable future projects would likely be similar to those identified for the proposed action and would minimize effects on cultural resources. Cumulative effects on cultural resources from the proposed action in combination with other past, present, and reasonably foreseeable projects are therefore considered moderate.

6.14.3.2 Fish and Aquatic Species

Past actions including road construction, road maintenance, and urban and suburban development projects would have minor effects on fish in combination with the proposed action. The potential effects from these past projects in SID and the Deschutes Basin, such as sediment entering waterbodies or aquatic habitat disturbance, would be temporary and likely complete before construction of the proposed action.

Because SID irrigation diversions are screened and the conveyance systems do not provide fish habitat, they do not have a direct effect on fish and aquatic species in the irrigation infrastructure itself. Irrigation diversions and reservoir operations are responsible for most of the past and ongoing direct and indirect effects related to water availability and seasonality on fish communities and associated riverine habitat in the area affected by District operations.

Ongoing land use activities in the project area are not expected to change from current conditions. Future land developments and irrigation district modernization projects may cause indirect effects on fish, such as sediment inputs or aquatic habitat disturbance, and could potentially affect waters within the same watershed as the proposed action. However, reasonably foreseeable future actions are all proposed for the purpose of improving aquatic habitat conditions. These actions include the HCP and installation of other irrigation modernization programs in the Deschutes Basin.

The cumulative effects of the proposed action and other foreseeable projects (Section 6.14.2.3) would be minor downstream of the North Canal Diversion. Although no saved water from the proposed COID piping project would be returned instream below the North Canal Diversion during the irrigation season, increased streamflow in Tumalo Creek, as a result of TID's proposed project implementation, would affect streamflow in the middle Deschutes River downstream of Tumalo Creek confluence during the irrigation season. Together, the effects of SID and TID's proposed actions would result in cumulative increases in streamflow in the middle Deschutes River downstream of the confluence with Tumalo Creek during the irrigation season.

Implementation of the proposed action, when combined with other future actions, is anticipated to have a minor, beneficial cumulative effect on fish and aquatic species and available habitat. Implementation of other irrigation modernization programs could have an additive effect on the

amount of water conserved, and therefore would provide additional flexibility in managing water rights in the Deschutes Basin.

6.14.3.3 Geology and Soils

Past, ongoing, and future actions in the surrounding area that affect geology and soils include agricultural uses, land development, and water management activities, as discussed above. The amount of soil affected by the proposed action is small compared to the area affected by other past, present, and reasonably foreseeable future actions in the area; the proposed action would have minor, cumulative effects on geology and soils.

6.14.3.4 Land Use

The project area has been substantially altered over the past century by a variety of human activities, including agricultural development, livestock grazing, urban and suburban development, and road construction. Implementation of the proposed action would support existing land uses, as would implementation of future actions, including the HCP and additional irrigation district modernization. Since these actions would collectively support existing land uses, implementation of the proposed action would have negligible cumulative effects on land use.

6.14.3.5 Public Safety

Past and ongoing operation of agricultural equipment and vehicle traffic in the project area would continue to create risks to public safety, but these risks are not expected to change from current conditions. Implementation of additional irrigation modernization would improve public safety by eliminating the risk of drowning in open canals. In combination with past, present, and reasonably foreseeable future actions, the proposed action is anticipated to have minor cumulative effects on public safety.

6.14.3.6 Recreation

In general, canals in the proposed action do not support any recreational pursuits; however, increased streamflow resulting from implementation of the proposed action would have a negligible, indirect effect on recreation in areas away from these canals. Past, ongoing, and future land uses and developments in the project area would be expected to support recreation in the same way that it is currently supported. Effects on recreation from the proposed action would be negligible, and, since other actions are anticipated to be negligible, the cumulative effects on recreational resources are expected to be negligible.

6.14.3.7 Socioeconomic Resources

Past actions including agricultural and other land development, and recently completed projects, have had minor effects on socioeconomics. There are no other known future projects that would affect socioeconomic resources in the area affected by the project. Since the effects on socioeconomics from the proposed action are considered minor, the cumulative effects on socioeconomics from the proposed action in combination with other past, present, and reasonably foreseeable projects are also considered minor.

6.14.3.8 Vegetation

Agricultural activities, livestock grazing, vegetation control along roads, and urban and suburban development are responsible for most of the past and ongoing effects on vegetation in the project area and in the region. Livestock grazing can introduce and spread weed species, degrade native vegetation communities, and trample riparian and wetland areas. In addition, vegetation control activities generally include herbicide applications to control vegetation and noxious weeds, and mechanical cutting of vegetation. The amount of vegetation that would be affected by the proposed action is small compared to the area affected by past and ongoing agricultural activities, livestock grazing, vegetation control along roads, and other utility corridors in the area. In addition, these past actions are not expected to change measurably from current conditions, resulting in minor additional cumulative effects.

6.14.3.9 Visual Resources

Past land use actions have changed the visual character of the project area. Agricultural and urbanization activities have altered the visual resources in the region by removing native vegetation, adding new infrastructure, and creating increased human activity within the landscape. Agricultural and urban land uses are anticipated to continue and become more prominent as the region is one of the fastest growing in the state and nation. There would be minor effects on the rural agricultural visual character of the landscape in the project area, resulting in minor cumulative effects when combined with other past, present, and reasonably foreseeable future actions.

6.14.3.10 Water Resources

Past actions over the last 120 years that have affected water resources include urban and agricultural development, road construction, road maintenance, and other irrigation projects. Since the early 1990s, there has been increasing interest in conserving water in the Deschutes River. The District and other Deschutes area irrigation districts have implemented various water conservation projects. These efforts have included piping existing irrigation canals, on-farm conservation, water management changes, and changes to crop production. These recent past actions have resulted in increased streamflow in the Deschutes River.

Ongoing and potential reasonably foreseeable future actions that could affect water resources include additional irrigation piping projects for other irrigation districts that divert water from the Deschutes River, on-farm water conservation work, and implementation of the HCP. These actions, accompanied by the proposed action, would cumulatively increase streamflow in the Deschutes River and its tributaries, resulting in moderate cumulative effects on water resources.

Water quality could be affected due to nonpoint source pollution such as erosion and runoff associated with ongoing and potential construction and land development activities. The proposed action would be constructed when there is no water in the canal system. The proposed action is anticipated to affect water quality by reducing erosion from the District's canals and increasing streamflow in waterbodies affected by District operations. The proposed action is expected to have minor cumulative effects on water quality.

6.14.3.11 Wetlands and Riparian Areas

Past actions that may have affected wetlands, riparian areas, and floodplains consist of the original construction of the irrigation canals as well as agricultural activities, livestock grazing, vegetation control, and development. Seepage from the canal and laterals has contributed to localized riparian areas adjacent to the project area as described in Section 4.11. The NWI database does not list any wetland features adjacent to the project area, however, there are approximately 65.6 acres of channels that are classified as seasonally flooded, artificial wetland features (USFWS 2016). The proposed project would reduce the amount of water available to these wetland features and riparian areas during the irrigation season. The canals and laterals within the project area are not jurisdictional (ODSL 2013). Reasonably foreseeable future actions in the project area that could affect riparian areas include agricultural activities, livestock grazing, vegetation control along roads and utility corridors, and urban and suburban development. Changes to riparian area vegetation caused by the proposed action would be relatively minor compared to these activities. The cumulative effect of the proposed action and other past, present, and reasonably foreseeable future projects on wetlands and riparian areas would be minor.

6.14.3.12 Wildlife

Agriculture, urban, and suburban development have affected wildlife and wildlife habitat in the project area since the late 1800s. Agricultural activities have substantially altered the habitat in the region by removing native vegetation communities in some areas and diverting streamflow. Livestock grazing occurs in much of the region around the project area and can result in the introduction and spread of weed species, the degradation of native habitat, and trampling of riparian and wetland areas. Some native habitats have been replaced with disturbance-tolerant or introduced species assemblages that may support different wildlife than previously existed. These ongoing activities would continue to affect wildlife and wildlife habitat in the project area.

Some wildlife currently use open canals and laterals as a water source. Implementation of the proposed action would cause wildlife to find other water sources, as they did prior to installation of the canals. Since other past, present, and reasonably foreseeable future actions would have different effects on wildlife, and effects of the proposed action on wildlife would happen over a period of time in which animals would be able to adapt, the cumulative effect on wildlife from implementation of the proposed action would be minor.

In addition, vegetation control activities, including herbicide applications to control noxious weeds and mechanical cutting of vegetation, are ongoing actions that contribute to wildlife habitat changes. The amount of wildlife habitat that would be affected by the proposed action is small compared to the area affected by past and ongoing agricultural activities, livestock grazing, vegetation control, and urban and suburban development in the area. In addition, the intensity of these ongoing actions is not expected to change measurably in the future, resulting in minor additional cumulative effects.

6.14.3.13 Wild and Scenic Rivers

Sections of the Deschutes River have been designated as Wild and Scenic under the National Wild and Scenic River Act and one section of the river is also designated as an Oregon State Scenic Waterway. These designations aim to protect these areas from changes that generally alter the scenic,

recreational, and ecological qualities of these areas. Changes to the current and future management of these river sections, which are in areas affected by District operations, are expected to be negligible. These wild and scenic waterways would continue to be managed by federal and state agencies consistent with their designations.

7 Consultation, Coordination, and Public Participation

The District and its partners planned and conducted numerous agency coordination and public involvement activities throughout the development of the Plan-EA. These activities included public meetings, informational sessions, presentations, press announcements, and frequent correspondence with federal, state, and local resource agencies; agriculture interests; drainage districts; and other interest groups and individuals. The project development process was designed to work collaboratively with partners, agencies, tribes, and stakeholders to ensure transparency and cooperation toward a solution that fits within the framework of the purpose and need for action.

A Preliminary Investigative Report (PIR; FCA 2017) was prepared to provide sponsors, local partners, agencies, and the public with information to evaluate the goals and objectives of the project. During the development of the PIR, project sponsors conducted initial consultation with natural resource agencies and stakeholders in the Deschutes Basin.

Public participation activities prior to preparation of the Plan-EA included:

Announcements for the public scoping meeting and scoping comment period

- Natural Resources Conservation Service public notice (June 16, 2017)
<https://www.nrcs.usda.gov/wps/portal/nrcs/detail/or/newsroom/pnotice/?cid=nrcseprd1333640>
- These public notices were also published in the Capital Press Agriculture Weekly Newspaper and the Bend Bulletin. Ads were published in the Capital Press once a week for 3 weeks; ads were published in the Bend Bulletin twice a week for 3 weeks.
- Natural Resources Conservation Service press release (June 19, 2017)
<https://www.nrcs.usda.gov/wps/portal/nrcs/detail/or/newsroom/releases/?cid=NRCSEP RD1334010>
- KTVZ Channel 21 news story (June 19, 2017) <http://www.ktvz.com/news/irrigation-district-canal-piping-plans-up-for-public-input/551703403>
- District notice and flyer mailed to all patrons (week of June 19, 2017)
- Deschutes Basin Board of Control Facebook post (June 21, 2017)
- Bend Bulletin article (June 26, 2017) <http://www.bendbulletin.com/localstate/5400420-151/change-coming-to-central-oregon-irrigation-districts>
- Natural Resources Conservation Service letter to Confederated Tribes of Warm Springs for invitation to public scoping meetings and offer to set up consultation with the Tribe, signed by the NRCS State Conservationist (June 30, 2017)
- Bend Bulletin guest column (July 6, 2017) by Craig Horrell, Central Oregon Irrigation District Manager <http://www.bendbulletin.com/opinion/5427265-151/guest-column-watershed-plan-needs-public-involvement?referrer=section>

- KBND News article (July 6, 2017) <http://kbnd.com/kbnd-news/local-news-feed/312557>
- Farmers Conservation Alliance Facebook post (July 6, 2017)
- Natural Resources Conservation Service Oregon Twitter post (July 10, 2017)
- Deschutes Basin Board of Control Facebook post (July 20, 2017)

Public involvement website

A website was launched on June 16, 2017 to inform the public and share project information. Oregonwatershedplans.org includes the following information:

- Overview of NRCS' PL 83-566 funding program
- Overview of NEPA and Watershed Plan-EA public participation process
- Frequently Asked Questions about the Watershed Plan-EA process
- Background on the District, the Draft Plan-EA and appendices, the PIR and appendices, and presentations and handouts from public meetings
- Contact information and how to submit public comments
- Email signup option for more information; subscribers receive updates over the course of project development

Public information session/environmental stakeholder meeting

- June 22, 2017 at 6:00 p.m. at Trinity Episcopal Church, 469 NW Wall Street, Bend, OR 97701
- Members of the public were invited to hear an overview of NRCS' PL 83-566 funding program, NEPA and the Watershed Plan-EA process, and an overview of the proposed project scope and water conservation need. Attendees had an opportunity to ask questions and were given the oregonwatershedplans.org website for more information about how they can participate in the Watershed Plan-EA process.
- Presenters: Margi Hoffmann, Farmers Conservation Alliance

SID Public Scoping Meeting

- July 6, 2017 from 6:30 p.m. to 7:30 p.m. at Tumalo Community Church Meeting Room, 64671 Bruce Avenue, Bend, Oregon 97703
- Participants had an opportunity to learn more about the proposed irrigation improvements and discuss their comments, ideas, and concerns.
- Presenters:
 - Tom Makowski, NRCS
 - Jer Camarata, Manager, SID

- Margi Hoffmann, FCA
- Bridget Moran, USFWS

Basin Study Work Group Steering Committee Meeting (open to the public)

- July 13, 2017 at Deschutes Services Building, 1300 NW Wall Street, Bend, OR 97701
- Participants heard about the PL 83-566 funding opportunity and the proposed irrigation improvements, and were given information on how to submit comments for the public record.
- Presenter: Brett Golden, FCA

Swalley Irrigation District Board Meetings (open to the public)

The District Board has discussed PL 83-566 funding and related projects at Board meetings dating to October 2016. The most recent Board meeting minutes that relate to PL 83-566 funding, watershed plan, and public participation include:

- May 17, 2017
 - Margi Hoffmann of FCA gave an overview of the PL 83-566 funding program and status. The Board was advised that a Public Watershed Plan Scoping Meeting would need to be conducted in the coming weeks to gather comments from the public. The importance of patron outreach and notification was discussed at length.
- June 21, 2017
 - The Board discussed PL 83-566 funding, potential match funding, the need for a Watershed Plan-EA, use of the Conserved Water Program, and the overall timing of these efforts.
 - The District has publicly announced a Watershed Plan Public Scoping Meeting for July 6, 2017, to inform the local community of the proposed modernization plans to pipe its canals, conserve water, improve fish habitat, and enable irrigation pump energy efficiencies, and to gather community comments on the proposed project. Flyers and notices are being mailed to all District patrons this week.
- July 10, 2017
 - The Board discussed the Watershed Planning Public Scoping Meeting of July 6, 2017.
 - Manager Jer Camarata presented a draft project timeline and draft project *pro forma* for piping the Rogers Lateral as it relates to the District's opportunity to compete for PL 83-566 dollars this year.
 - A motion was unanimously approved to authorize \$15,000 to complete the ongoing Plan-EA, and to authorize management to prepare a contract for future approval with Kevin Crew, the District's Engineer of Record, to move forward with survey and engineering design expenses for the Rogers Lateral Piping Project.

- July 19, 2017
 - Manager Jer Camarata reported that the District had received over 100 public comments for the watershed planning effort.

Informational materials available to the public

- Preliminary Investigative Report and Appendices, made available before public scoping meetings.
- Four-page public handouts, made available prior to public scoping meetings.
- Meeting presentation slides, made available after public scoping meetings.

7.1 List of Persons and Agencies Consulted

The following lists include persons and agencies with a vested interest in the Plan-EA or those consulted during the planning process. This includes agencies that provided formal or required consultation, or individuals who were conferred with and who provided substantial input. Coordination with state and local agencies has been ongoing since project inception.

Local entities that have land ownership or a shared resource within the District include:

- Bend Park and Recreation District
- City of Bend
- Deschutes County

Agencies that have been involved with the project include the following state and federal resource agencies:

- Oregon Department of Environmental Quality
- Oregon Department of Fish and Wildlife
- Oregon Department of State Lands
- Oregon Governor’s Office
- Oregon Water Resources Department
- Oregon Watershed Enhancement Board
- State Historic Preservation Office
- U.S. Army Corps of Engineers
- U.S. Bureau of Land Management
- U.S. Fish and Wildlife Service

Tribes that have been consulted regarding the project include:

- Confederated Tribes of Warm Springs

Other stakeholders for this project include:

- SID patrons
- Adjacent landowners

- Central Oregon Land Watch
- Coalition for the Deschutes
- Deschutes River Conservancy
- Interested public
- Trout Unlimited
- Upper Deschutes Watershed Council
- WaterWatch of Oregon

Table 7-1 describes communications with agency personnel that were consulted during development of the Plan-EA.

Table 7-1. Agency Consultation Record.

Date	Contact, Agency	Communication
October 21, 2016	Bridget Moran, USFWS	<ul style="list-style-type: none"> • Overview of PL 83-566 Watershed Planning Program • Overview of Tumalo, Swalley, and Central Oregon Irrigation districts proposed SIPs • Discussion of basin-wide fish and wildlife concerns/needs
November 6, 2016	Kyle Gorman, OWRD	<ul style="list-style-type: none"> • Overview of PL 83-566 Watershed Planning Program • Overview of Tumalo, Swalley, and Central Oregon Irrigation districts proposed SIPs • Discussion of basin-wide fish and wildlife concerns/needs
December 2, 2016	Brett Hodgson, ODFW	<ul style="list-style-type: none"> • Overview of PL 83-566 Watershed Planning Program • Overview of Tumalo, Swalley, and Central Oregon Irrigation districts proposed SIPs • Discussion of basin-wide fish and wildlife concerns/needs
January 6, 2017	Greg Ciannella, Oregon Watershed Enhancement Board	<ul style="list-style-type: none"> • Overview of PL 83-566 Watershed Planning Program • Overview of Tumalo, Swalley, and Central Oregon Irrigation districts proposed SIPs • Discussion of basin-wide fish and wildlife concerns/needs
January 27, 2017	Kyle Gorman, OWRD	<ul style="list-style-type: none"> • Overview of PL 83-566 Watershed Planning Program • Overview of Tumalo, Swalley, and Central Oregon Irrigation districts proposed SIPs • Discussion of basin-wide fish and wildlife concerns/needs

Date	Contact, Agency	Communication
June 14, 2017	Bridget Moran, USFWS	<ul style="list-style-type: none"> • Overview of ESA
June 23, 2017	Bridget Moran, USFWS	<ul style="list-style-type: none"> • Overview of Watershed Planning process for Tumalo, Swalley, and Central Oregon Irrigation districts • Overview of PIRs • Overview of the Public Scoping meetings on July 6, 2017 (Tumalo and Swalley) and July 10, 2017 (Central Oregon)
July 6, 2017	Bridget Moran, USFWS Tom Makowski, NRCS Annette Liebe, Oregon Governor's Office Rob DelMar, Oregon Department of Energy Kelly Hill, ODEQ Kyle Gorman, OWRD Ian Johnson, Oregon SHPO Jessica Gabriel, Oregon SHPO Tom DiCorcia, Business Oregon Brett Hodgson, ODFW	<ul style="list-style-type: none"> • Overview of the Watershed Planning process for Tumalo, Swalley, and Central Oregon Irrigation districts • Overview of PIRs • Overview of public participation website – oregonwatershedplans.org • Overview of Public Participation meetings July 6, 2017 (Tumalo and Swalley) and July 10, 2017 (Central Oregon)
July 2017	Eric Nigg, ODEQ	<ul style="list-style-type: none"> • Overview of the Watershed Planning process for Tumalo, Swalley, and Central Oregon Irrigation districts • Overview of PIRs • Overview of public participation website – oregonwatershedplans.org • Overview of Public Participation meetings July 6, 2017 (Tumalo and Swalley) and July 10, 2017 (Central Oregon)
July 11, 2017	Annette Liebe, Oregon Governor's Office	<ul style="list-style-type: none"> • Update on Tumalo, Swalley, and Central Oregon Irrigation District watershed plans
July 20, 2017	Paul Henson, State Supervisor, USFWS Bridget Moran, USFWS	<ul style="list-style-type: none"> • Letter from NRCS to USFWS requesting PL 83-566 Section 12 consultation
July 20, 2017	Bridget Moran, USFWS	<ul style="list-style-type: none"> • Overview of Watershed Planning process next steps for Tumalo, Swalley, and Central Oregon Irrigation districts • Habitat Conservation Plan process and next steps
August 11, 2017	Teal Purrington, BLM Alice Beals, OPRD	<ul style="list-style-type: none"> • Overview of the Watershed Planning process for Tumalo, Swalley, and Central Oregon Irrigation districts and public agency managed lands falling within the project area

Date	Contact, Agency	Communication
August 14, 2017	Sasha Sulia, BPRD	<ul style="list-style-type: none"> • Overview of the Watershed Planning process for Tumalo, Swalley, and Central Oregon Irrigation districts and public agency managed lands falling within the project area
August 14, 2017	Sarah Henderson, OWRD	<ul style="list-style-type: none"> • Discussion of the Deschutes Basin Groundwater Mitigation Program.
August 17, 2017	Nancy Pustis, ODSL	<ul style="list-style-type: none"> • Overview of the Watershed Planning process for Tumalo, Swalley, and Central Oregon Irrigation districts and public agency managed lands falling within the project area
August 29, 2017	Jerry Cordova, USFWS	<ul style="list-style-type: none"> • Discussion of eagle habitat and construction mitigation for Tumalo, Swalley, and Central Oregon Irrigation districts
September 5, 2017	Teal Purrington, BLM Jamie Rhoades, BLM	<ul style="list-style-type: none"> • Discussion of ROW crossing BLM land
September 19, 2017	Anita Andazola, USACE	<ul style="list-style-type: none"> • Email exchange between NRCS about upcoming Plan-EA
September 27, 2017	Jerry Cordova, USFWS	<ul style="list-style-type: none"> • Field work in SID to view eagle nest locations and their proximity to future construction activities
October 5, 2017	Annette Liebe, Oregon Governor's Office Kyle Gorman, OWRD Ami Keiffer, Business Oregon Tom Rowley, Business Oregon Bridget Moran, USFWS	<ul style="list-style-type: none"> • Update on HCP process • Update on Basin Study Work Group process • Update on PL 83-566 watershed plans for Tumalo, Swalley, and Central Oregon Irrigation districts • Update on NHPA Section 106 and ESA Section 7 compliance
March 20, 2018	Anita Andazola, USACE	<ul style="list-style-type: none"> • Email from NRCS about upcoming release of the Plan-EA and uploading the document to the USACE site.
April 27, 2018	Gregg Garnett, Reclamation	<ul style="list-style-type: none"> • Invitation to be a cooperating agency for Tumalo, Swalley, and Central Oregon Irrigation districts
June 26, 2018	Bridget Moran, USFWS Jennifer O'Reilly, USFWS Gary Diridoni, NRCS	<ul style="list-style-type: none"> • Discussion about NEPA and ESA Section 7 compliance • Informal discussion about SID's modernization plan and if Oregon spotted frog would be affected
July 13, 2018	Anita Andazola, USACE	<ul style="list-style-type: none"> • Email exchange between USACE and NRCS regarding consultation on implementation scale projects

Date	Contact, Agency	Communication
August 10, 2018	Lauren Mork, UDWC	<ul style="list-style-type: none">• Discussion about water quality in the middle Deschutes River
August 16, 2018	Brett Hodgson, ODFW	<ul style="list-style-type: none">• Discussion about SID’s modernization plan and the effects of adding water instream on general fish and aquatic species

7.2 Review of the Draft Plan-EA

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

8 Preferred Alternative

8.1 Selection of the Preferred Alternative

The project sponsors selected the HDPE Piping Alternative as the Preferred Alternative, based on its ability to meet the purpose and need for the project and provide the most beneficial effects on environmental and social resources. The Preferred Alternative is the only alternative that meets the Sponsoring Local Organization’s (SLO) purpose and needs and meets the NED benefit–cost ratio.

8.2 Rationale for the Preferred Alternative

The SID Irrigation Modernization Project is a large agricultural water efficiency project focused on the Deschutes River. The project would address natural resource concerns by improving water conservation, increasing water delivery reliability to farms, reducing O&M costs, enhancing streamflow and habitat conditions for fish and aquatic species in the Deschutes Basin, and improving public safety. Implementation of the Preferred Alternative would accomplish these purposes through piping and pressurizing 16.6 miles of SID’s canal and lateral system.

NRCS PL 83-566 funds can be applied to projects that meet any of the eight authorized project purposes outlined in Sections 3 and 4 of that law. The Preferred Alternative meets one of these eight purposes: Agricultural Water Management (Purpose 5) through irrigation water conservation, water quality improvement, and agricultural water supply; fish and wildlife habitats would be conserved and improved through associated increases in streamflow.

8.3 Measures to be Installed

The District would pipe and pressurize 16.6 miles of its system with HDPE single-walled pipe ranging in diameter from 8 to 48 inches. The Preferred Alternative would upgrade small segments of the system that were previously piped due to sizing, age, and inability to withstand higher pressures.

In total, 178 turnouts would be upgraded to pressurized delivery systems. These turnouts are District owned infrastructure. The pressure of water deliveries can vary depending on the demands of other patrons and overall diversion flow into the system. On-farm piping, fittings, and other appurtenances for each patron may not be rated to accommodate these pressure fluctuations; therefore, a pressure relief valve was included for each upgrade. Modifications to each turnout would also include an appropriately sized tee from the mainline or lateral, a gear-actuated plug valve, a meter, a combination air and vacuum relief valve, and associated hardware and spool pipe segments (SID 2017).

Immediately downstream of the existing hydroelectric plant on the Swalley Main Canal, an in-line 400 horsepower, variable-frequency drive booster pump would be installed to provide pressurization to the north end of the District. The pump would have an associated control panel; both the pump and control panel would be housed within a 300-square-foot, single-story cinderblock building built on Deschutes County–owned land. The pump would be interconnected to the electric grid, with the powerline and utility poles installed within the existing ROW.

The improvements described above would be broken into two project groups as summarized in Table 8-1. At the time the SIP was finalized, the number assigned to each group reflected the sequential order that each project group would be completed. Since the completion of the SIP, SID has decided to combine project groups; the naming of project groups in the Plan-EA reflects those combinations and therefore the project group names are different from those in the SIP. The order of project groups was selected based on prioritizing public safety, water loss, urban development pressures, and available match funding. These factors may vary over time and the District’s order and timing of piping would adjust to reflect these changes.

Table 8-1. Summary of the Swalley Irrigation District Canals and Laterals to be Piped under the Preferred Alternative for the Swalley Irrigation District Irrigation Modernization Project.

Project Group	Canal(s) and/or Lateral(s) in Project Group	Project Components			
		Diameter (inches)	Pressure Rating Index	Length of Piping (feet)	Upgraded Turnouts
1	Rogers Lateral	10-30	21-32.5	19,892	49
	Rogers Sublateral	8-10	32.5	2,235	4
	Riley Lateral	12-20	32.5	7,272	30
	Riley Sublateral	8-12	32.5	6,623	11
	Elder Lateral	8-18	32.5	10,057	25
2	Mickelson Lateral	10	26	1,877	2
	Butte Lateral	8	26-32.5	5,434	8
	Main Canal	8-48	21-32.5	34,174	49
	Main Canal Pump Station	N/A	N/A	N/A	N/A
Total Quantity				87,564	178

Note: N/A: not applicable

The construction of the HDPE Piping Alternative would include construction equipment mobilization and staging, piping delivery to construction areas, trench excavation, pipeline fusing, pipe placement, backfill compaction, and disturbed area restoration and reseeding. In some locations, construction access would need to be created before bringing pipe or equipment into construction areas. This could include vegetation removal within the construction area. Appropriately sized construction equipment would be used to minimize disturbance in the construction area. Borrow material would most likely be needed to backfill the canal surrounding the pipeline, assuming little to no material is available from prior canal dredging activities.

Construction of the booster pump station would not involve heavy construction activity. The site would be graded and prepared to raise a small building. Construction would involve concrete construction, masonry, installing the pumping equipment including ductile iron piping and valves, installation of utility poles, and electrical work including interconnecting to the nearby utility grid.

Construction would generally occur during the off-irrigation season (November through March) with the majority of construction taking place during the first quarter of each calendar year. Project Group 1 construction could begin as early as 2019.

Implementation of this project would be one component of a broader natural resource management effort by SID and other organizations in the area. Despite being one of the smallest irrigation districts in Central Oregon, SID has dedicated the largest amount of conserved water instream to date. Prior to 2010, SID diverted approximately 125 cfs of water from the Deschutes River. A series of previous piping projects has permanently returned approximately 43 cubic feet per second (cfs) to the Deschutes River. The District permanently dedicated this water to the Deschutes River to improve aquatic habitat for fish and wildlife. Additionally, through its membership with seven other irrigation districts in DBBC, SID is working to coordinate assets and resources to improve patron services, conserve water, and enhance river conditions for wildlife and recreation throughout the Deschutes Basin. Other DBBC districts are concurrently pursuing system modernization through piping and pressurization and are collaborating with state and federal agencies, local municipalities, and environmental groups to develop a multispecies HCP anticipated to be completed in 2019.

8.4 Minimization, Avoidance, and Compensatory Mitigation Measures

Project design features and BMPs that would be applied during construction of the proposed project to avoid and minimize effects on environmental and social resources are described below.

8.4.1 Pre-Construction

- Ground disturbances would only be limited to those areas necessary to safely implement the Preferred Alternative.
- Work would be confined within the existing ROW whenever possible to preserve existing vegetation and private property. The ROW would be clearly marked in the field before construction.
- Construction limits would be clearly flagged onsite to avoid unnecessary plant loss or ground disturbance.
- Disturbance of jurisdictional wetlands would be avoided during construction.
- Appropriate erosion control measures would be used.
- The condition of roadways and work zones would be communicated to travelers via the District's website, or other communication channels.
- Adjacent landowners would be provided a construction schedule before construction begins.

8.4.2 Construction

- Stormwater and erosion BMPs would be implemented as appropriate.

- The construction would occur during the daytime and winter off-season to minimize disturbance to any recreationists, landowners, or other individuals in the construction area vicinity.
- Construction would occur outside USFWS-approved buffer distances for any known bald and golden eagle nests. Should an active bald or golden eagle nest be found during construction, construction would be paused and consultation with a local USFWS biologist would occur to determine the following steps.
- In appropriate cases and under consultation with USFWS, ramps would be placed in pipeline trenches to avoid the potential for wildlife to become trapped overnight.
- Appropriate emission control devices would be required for all construction equipment.
- When needed, water or other dust suppressants would be used on unpaved roads and areas of ground disturbance to minimize dust and any effects on air quality.
- Work crews would carry spill cleanup kits, and in times of burn bans or wildfire concerns, each crew would have a fire suppression kit.
- Project construction activities would be conducted in accordance with the project's spill prevention and cleanup plan.
- Temporary travel routes would be selected and used to minimize effects on vegetation and avoid the removal of trees.
- Selection of construction areas adjacent to canals and travel routes would consider existing vegetation and avoid mature trees to the extent practicable.
- Pruning would occur entirely within SID's Carey Act ROW and would not exceed what is required for equipment clearance.
- If detected, Peck's milkvetch would be incorporated into the seeding mixture used to stabilize disturbed soils. Individual plants affected by construction would be excavated, potted, cared for, and replanted during the appropriate planting window. Surveys and mitigation would be done in consultation with the ODA.
- Immediately after construction, areas with disturbed soils and newly covered pipes would be planted with a seed mix of native grasses and forbs.
- The contractor would use erosion control measures that are free of weeds and weed seeds.
- Standard construction safety procedures and traffic control measures would be employed to reduce the risk of collisions between construction vehicles and other vehicles, pedestrians, or bicyclists while construction is ongoing.
- Traffic control measures would be coordinated by the construction contractor with the Oregon Department of Transportation, the Deschutes County Sheriff, and local emergency services prior to working in the U.S. Highway 20 ROW.

- Lane closures on roadways would be avoided during peak travel periods where possible to reduce potential traffic delays from construction vehicles.
- After construction, areas adjacent to the canal would be restored to near-prior contours to blend with the surrounding landscape.
- Muted or matching colors would be used for permanent visible equipment and the pumphouse building exterior.
- An Inadvertent Discovery Plan would be followed if cultural materials including human remains were encountered during construction. Construction would stop accordingly, SHPO and NRCS cultural resources staff would be consulted, and appropriate tribes would be notified. Continuation of construction would occur in accordance with applicable guidance and law.

8.4.3 Operations and Maintenance

- Vegetation within the project area would be maintained according to SID's vegetation management program and NRCS' Oregon and Washington's Guide for Conservation Seedings and Plantings (NRCS 2000).
- Weeds would be controlled within the project area using hand pulling during the first year after reseeding, and a combination of hand-pulling and herbicide application in the second year if weeds become problematic. Thereafter, weeds would be managed per county standards.
- At adjacent landowners' requests and during maintenance season, the District would remove trees in the ROW that do not survive piping for 2 years following construction.

8.5 Land Rights and Easements

The Preferred Alternative and construction activities would be located entirely within the District's ROW, which were granted under the Carey Act. The District's ROW under the Carey Act extends 50 feet on each side of the canal from the toe of the bank for a total easement width of 100 feet plus the canal width.

8.6 Permits and Compliance

As discussed in Section 8.3, the Preferred Alternative would be implemented in project groups. Permitting specific to each project group would be conducted at the time that funding is available for implementation. Before implementing each project group, NRCS would complete an onsite EE using the NRCS-CPA-52 form. This process would determine if that project group meets the applicable project specifications and other conditions as developed in this Plan-EA and assess the environmental effects of any alternatives to the project group. If it is determined that there are significant issues or concerns, or if resource concerns have not been adequately evaluated through the programmatic approach in this Plan-EA, a separate analysis and appropriate agency consultation would be prepared as necessary.

Further, SID would acquire all necessary permits prior to construction. These may include the following permits.

8.6.1 Local and County

- **Deschutes County Planning:** Under OAR Chapter 340, Division 18, a Land Use Compatibility Statement would be submitted for county approval before construction.
- **Deschutes County Floodplain Administrator:** All work would be outside the 100-year floodplain; no permitting requirement has been identified.

8.6.2 State

- **Department of Environmental Quality:** The National Pollutant Discharge Elimination System program, implemented by ODEQ, would require a permit for construction activities including clearing, grading, excavation, materials or equipment staging and stock piling that would disturb one or more acres of land and have the potential to discharge into a public waterbody. The two project groups of the Preferred Alternative would each disturb more than 5 acres, but neither of them discharges into a public waterbody.
- **Oregon Water Resources Department:** To change the place of use, character of use, and/or point of diversion/appropriation of a water right, a water right transfer application must be approved by OWRD. The District would apply for an Allocation of Conserved Water under ORS 537 for 75 percent of the water saved through the implementation of the Preferred Alternative. The remaining 25 percent of the saved water would be used to alleviate water supply shortages within the District that lead to water management and delivery challenges. Although the application will need to be reviewed and approved by OWRD prior to issuing the instream water right, the estimated water allocated instream is 4.80 cfs during season 1 (April 1 - April 30 & October 1 – October 31), 6.18 cfs during season 2 (May 1 – May 14 & September 15 – September 30) and 15.20 cfs during season 3 (May 15 – September 14).
- **Department of State Lands:** A removal-fill permit from ODSL would not be required for work in existing canals and laterals. Before beginning construction of each project group, a wetland determination and/or delineation would be conducted, and wetlands would be avoided to the extent practicable. If jurisdictional wetlands occur in areas outside canals where work would be done, a removal-fill permit from ODSL would be obtained.
- **Oregon Fish Passage Law:** Since August 2001, the owner or operator of an artificial obstruction located in waters in which native migratory fish are currently or were historically present must address fish passage requirements prior to certain trigger events, such as the construction, installation, replacement, extension, or repair of culverts, roads, or any other hydraulic facilities. Laws regarding fish passage are found in ORS 509.580 through ORS 509.910 and in OAR 635, Division 412. A functioning ODFW and National Oceanic and Atmospheric Administration–NMFS approved contemporary fish screen is present at SID’s irrigation diversion; therefore, no fish are present within existing canals and laterals, and no additional consultation or permitting is required.

8.6.3 Federal

- **National Historic Preservation Act Section 106:** Pursuant to 36 CFR Part 800 of the NHPA (1966, as amended in 2000), and the regulations of the Advisory Council on Historic Preservation implementing Section 106 of the NHPA (54 U.S.C. 306108), federal agencies must take into account the potential effect of an undertaking on “historic properties,” which refers to cultural resources listed, or eligible for listing, in the National Register of Historic Places. Consultation with SHPO to fulfill Section 106 obligations would be completed for each project group prior to implementation. SID has a 2018 amended MOA with SHPO stating that the piping of all District canals and laterals are considered Section 106 compliant so long as specific listed mitigation activities are carried out (SID 2018).

- **Clean Water Act:**

- **Section 404:** Under Section 404(f)(1)(C) of the CWA, discharges of dredged or fill material associated with construction or maintenance of irrigation ditches, or 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 CFR 323.4(a)(1)(iii)(C)(1)(i), “[c]onstruction 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 United States, and as such never require a Section 404 permit.”

The construction and maintenance of irrigation ditches 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 CFR 323.4(a)(6) and 40 CFR 232.3(c)(6), there must be assurance that flow and circulation patterns and chemical and biological characteristics of Waters of the United States are not impaired, that the reach of the Waters of the United States is not reduced, and that any adverse effect on the aquatic environment would be otherwise minimized. Prior to construction activities, continued coordination and consultation with USACE will occur and measures taken as required to identify and mitigate impacts to potential jurisdictional wetlands and waters of the United States.

- **Section 401:** Implemented by ODEQ, see above.

- **Farmland Protection Policy Act:** The Farmland Protection Policy Act (7 U.S.C. 4201 et seq.) directs federal agencies to identify and quantify adverse effects of federal programs on farmlands. The Act’s purpose is to minimize the number of federal programs that contribute to the unnecessary and irreversible conversion of agricultural land to nonagricultural uses. The project occurs primarily in EFU zones; however, all work would be done within SID’s easements and ROW. The project would support agricultural productivity and the intention of the Act.
- **Endangered Species Act:** The ESA establishes a national program for the conservation of threatened and endangered species and the preservation of the ecosystems on which they depend. The ESA is administered by the USFWS for wildlife and freshwater species, and by NMFS for marine and anadromous species. The ESA defines procedures for listing species, designating critical habitat for listed species, and preparing recovery plans. It also specifies prohibited actions and exceptions. Section 7 of the ESA, called “Interagency Cooperation,” is the mechanism by which federal agencies ensure the actions they take, including those they fund or authorize, do not jeopardize the existence of any listed species. Under Section 7 of the ESA, federal agencies must consult with USFWS when any action the agency carries out, funds, or authorizes (such as through a permit) *may affect* a listed endangered or threatened species.
 - Due to the location of bull trout populations at the very downstream end of the area affected by district operations, bull trout would not be affected by implementation of the HDPE Piping Alternative under consideration. Consequently, Section 7 consultation under the ESA as amended is not warranted for this project. Additionally, it has been determined that the project would not affect the PCEs identified for critical habitat for bull trout (70 *Federal Register* 56211, 2005). Therefore, it has been determined by NRCS that no effects would occur to federally designated critical habitat for bull trout. Although ESA Section 7 consultation is not warranted, NRCS has regularly engaged with USFWS regarding the effects of this project.
 - The Middle Columbia River steelhead population, present in the Deschutes River upstream from the Pelton Round Butte Dam complex, is classified as a non-essential experimental population under section 10(j) of ESA. NRCS has determined that engagement with NMFS to obtain a conference report is not necessary because this population is located outside of a National Wildlife Refuge System and a National Park System, the action alternatives would have no effect on the continued existence of the species, and the population is treated as “proposed for listing” (76 *Federal Register* 28715, 2011; 81 *Federal Register* 33416, 2016).

- **Magnuson-Stevens Act:** The Magnuson-Stevens Act established requirements for including EFH descriptions in federal fishery management plans, and requires federal agencies to consult with NMFS on activities that may adversely affect EFH (Pub. L. No. 104-297). EFH can include all streams, lakes, ponds, wetlands, and other viable waterbodies, and most of the habitat historically accessible to salmon necessary for spawning, breeding, feeding, or growth to maturity. As the project would not affect EFH, consultation under the Magnuson-Stevens Act is not required.
- **Safe Drinking Water Act:** Since the project would have no direct or indirect discharge to groundwater, permitting under the Safe Drinking Water Act is not required.
- **Migratory Bird Treaty Act:** The MBTA implements various treaties and conventions between the United States and other countries, including Canada, Japan, Mexico, and the former Soviet Union, for the protection of migratory birds (16 U.S.C. 703–712). Under the Act, taking, killing, or possessing migratory birds, or taking, destroying, or possessing their eggs or nests, is unlawful. The Act classifies most species of birds as migratory, except for upland and nonnative birds such as pheasant, chukar, gray partridge, house sparrow, European starling, and rock dove.
- **Bald and Golden Eagle Protection Act:** The BGEPA prohibits the taking or possessing of, and commerce in, bald and golden eagles, with limited exceptions (16 U.S.C. 668–668d). The Act only covers international acts or acts in “wanton disregard” of the safety of bald or golden eagles.

8.7 Costs

As described in Section 8.10, the total project cost is \$14,975,000 for the Preferred Alternative. PL 83-566 funds would support \$11.2 million of the total project cost where the remainder of the cost, \$3.7 million, would be contributed by other non-federal, funds. Section 8.10 also lists the costs for each project feature and the distribution of how the costs would be shared by the sponsors and NRCS for each cost item.

- Construction cost accounts for all material, labor, and equipment necessary for the installation of piping associated with the Preferred Alternative. These costs were estimated based on costs for similar installations at irrigation districts in Central Oregon. The planning construction costs are estimated using the best available information about the project without having detailed design information.
- Engineering costs were estimated as a percentage of the cost of construction. The percentage applied for engineering costs ranged depending on the scale of the particular pipe installation.
- The costs presented are planning level estimates and do not reflect final costs. Detailed designs and construction cost estimates would be completed prior to initiating the project. Final construction costs would only reflect the time and materials to perform the work.

8.8 Installation and Financing

The following subsections present the installation and financing of the Preferred Alternative. Included in this section is a framework for implementing the Preferred Alternative, the sequence of installation, responsibilities, contracting, real property and relocations, other agencies, cultural resources, financing, and conditions for providing assistance.

8.8.1 Framework for Carrying out the Plan

The SID piping project would be implemented in a planned sequence as discussed in Section 8.8.2. The responsibilities of NRCS and the sponsors for the project are outlined in Section 8.8.3. No cost-shared on-farm measures are involved with this project; therefore, the responsibilities of individual participants do not need to be discussed. No preconditions are anticipated for installing the project.

8.8.2 Planned Sequence of Installation

The District would obtain all approvals and permits for the project before the start of construction. The Preferred Alternative would be implemented in two project groups as presented in Table 8-1. The entire project (both project groups) would be completed over a 7-year period commencing in 2019 and ending in 2027. Table 8-2 below presents a further detailed estimation of when construction would occur. The years are dependent on accessibility to funding.

Table 8-2. Project Installation Sequence.

Name	Project Group	Year of Construction Completion
Rogers Lateral	1	2019
Rogers Sublateral	1	2019
Elder Lateral	1	2020
Riley Lateral	1	2021
Riley Sublateral	1	2021
Butte Lateral	2	2022
Mickelson Lateral	2	2023
Main Canal	2	2024
Main Canal Pump Station	2	2025

8.8.3 Responsibilities

NRCS is responsible for leading the planning efforts, providing engineering design and construction oversight assistance, and certifying completion of the project. The District would be responsible for engineering design, project administration, environmental permitting, contracting, and construction implementation. The District has the needed authorities as an irrigation district organized under ORS 545 and has agreed to exercise those authorities to implement the actions described in the Plan-EA.

8.8.4 Contracting

The piping and pressurization of the delivery system would be completed using NRCS funding mechanisms. The District would be primarily responsible for overseeing and administering the construction of the project in coordination with NRCS.

8.8.5 Real Property and Relocations

Real property acquisition or relocations would not be required for the Preferred Alternative. All construction would be completed under SID's existing ROW as described in Section 8.5.

8.8.6 Financing

NRCS would provide 75 percent of the total project cost for the Preferred Alternative through PL 83-566 funding. The District is responsible for funding the remaining 25 percent of the costs, including funds that are not eligible under the National Watershed Program (project administration and technical assistance). Table A in the NED presents annual installation costs of each project piping group and the proportion of funding through PL 83-566 funding and other funding sources.

The District has a strong history of securing public and private funding through grants, loans, and patron assessments. Nearly all funding is expected to be provided through grants. If necessary, approximately 25 percent of the project would be financed in this manner. If financing is required, SID expects to apply for funding through the ODEQ Clean Water State Revolving Fund. The District expects that funding from this source would be at an interest rate of 2.5 percent with a 0.5 percent annual fee paid on the remaining loan balance. These financing costs are not included in the NED analysis.

O&M costs after project completion would be provided through the revenues of SID. O&M costs would not increase due to the project and would be budgeted on an annual basis.

NRCS reserves the authority and right to discontinue or reduce program benefits based on changes in agency priorities, funding availability, or the failure of SID to fulfill the provisions of their agreement.

8.8.7 Conditions for Providing Assistance

Conditions for the District to receive program funds for the proposed project include completion of a Final Watershed Plan Environmental Assessment and NRCS issuing a Finding of No Significant Impact.

8.9 Operation, Maintenance, and Replacement

The District would be responsible for the O&M of the project for the 100 years of its design life. Prior to construction, a separate O&M agreement based on NRCS' National Operation and Maintenance Manual would be made between NRCS and the District. The agreement would continue through the design life of the project and could be modified with NRCS approval.

Project sponsors and NRCS would make annual inspections of project measures to assure the quality of ongoing O&M. The District would be in charge of scheduling O&M inspections and responsible for any necessary work. The District's O&M would consist of an annual pump inspection program, every few-year pump performance test, and a pipe inspection program that would systematically cover inspection of the entire system over a period of several years.

The proposed system would continue its current operation schedule of April to October in which work would be performed on an as-needed basis and the central booster pump would be visited daily. During the winter months, outside the operation time, SID would perform system component maintenance including pump lubricant verification, valve and meter maintenance, air and vacuum valve maintenance, and pressure reducing station filter maintenance. The District would expand their current vegetation and weed management to include the areas on top of the newly piped system. All procedures would be followed as specified in the O&M agreement between project sponsors and NRCS.

8.10 Economic and Structural Tables

A summary of the economic analysis of the Preferred Alternative (NED Alternative) and No Action Alternative is provided in Section 5.4. The full NED analysis can be found in Appendix D. Implementing the Preferred Alternative would result in varying average annual benefits, costs, and benefit–cost ratios depending on if Project Group 1 or Project Group 2 is being implemented. Average annual benefits range between \$320,000 to \$451,000; average annual costs would be between \$172,000 to \$332,000, and benefit–cost ratios fall between 1.87 and 1.36. Additionally, Appendix D contains an incremental analysis of the benefits and costs of completing each additional increment of the Preferred Alternative. The following tables provide more detail on the costs and benefits associated with each individual project group.

Table 8-3 (NWPM 506.11, Economic Table 1) presents the projected installation costs and the percentages of costs to be shared by the sponsors and NRCS for each project group. Table 8-4 presents the project's cost distribution across project groups as well as the proportion of PL 83-566 funding and other funding sources. The average annual NED costs are shown in Table 8-5.

Table 8-3. Economic Table 1—Estimated Installation Cost of the HDPE Piping Alternative, Water Resource Project Measures, Deschutes Watershed, Oregon, 2018\$.

Works of Improvement	Unit	Number			Estimated Cost (dollars) ^{1,2}						
					Public Law 83-566 Funds			Other Funds			Total
		Federal Land	Non-Federal Land	Total	Federal Land NRCS	Non-Federal Land NRCS	Total	Federal Land	Non-Federal Land	Total	
Project Group 1	feet	0	46,079	46,079	\$0	\$3,929,000	\$3,929,000	\$0	\$1,217,000	\$1,217,000	\$5,146,000
Project Group 2	feet	0	41,485	41,485	\$0	\$7,302,000	\$7,302,000	\$0	\$2,527,000	\$2,527,000	\$9,829,000
Total project	feet	0	87,564	87,564	\$0	\$11,231,000	\$11,231,000	\$0	\$3,744,000	\$3,744,000	\$14,975,000

¹ Price base: 2018 dollars.

Prepared: August 2018

² Project cost as identified in an addendum to the SID SIP prepared by Black Rock Consulting, 2016, updated to 2018 dollars and including an additional 3 percent project administration cost and 8 percent technical assistance cost as well as permitting costs.

Table 8-4. Economic Table 2 —Estimated HDPE Piping Alternative Cost Distribution, Water Resource Project Measures, Deschutes Watershed, Oregon, 2018\$.

Works of Improvement	Installation Costs—PL 83-566 Funds ^{1,2}				Installation Cost—Other Funds ^{1,2}				Total ^{1,2}
	Construction	Engineering	Project Admin ³	Total PL 83-566	Construction	Engineering	Project Admin ³	Total Other	
Piping									
Project Group 1	\$3,322,000	\$145,000	\$462,000	\$3,929,000	\$1,108,000	\$48,000	\$61,000	\$1,217,000	\$5,146,000
Project Group 2	\$6,218,000	\$200,000	\$884,000	\$7,302,000	\$2,360,000	\$67,000	\$100,000	\$2,527,000	\$9,829,000
Total costs	\$9,540,000	\$345,000	\$1,346,000	\$11,231,000	\$3,468,000	\$115,000	\$161,000	\$3,744,000	\$14,975,000

Notes: Totals may not sum due to rounding.

Prepared: August 2018

¹ Price base: 2018 dollars

² Project cost as identified in an addendum to the SID SIP prepared by Black Rock Consulting, 2016, updated to 2018 dollars and including an additional 3 percent project administration cost and 8 percent technical assistance cost as well as permitting costs. Of total estimated costs presented in the SIP, Black Rock Consulting estimated 75 percent is for construction and 25 percent for engineering.

³ Project Admin includes project administration, technical assistance costs, and permitting costs.

Table 8-5. Economic Table 4—Estimated Average Annual NED Costs, Deschutes Watershed, Oregon, 2018\$.

Works of Improvement ¹	Project Outlays (Amortization of Installation Cost) ^{1,2}	Project Outlays (OM&R cost) ^{2,3}	Other Direct Costs ^{2,4}	Total ²
Project Group 1	\$149,000	\$18,000	\$5,000	\$172,000
Project Group 2	\$250,000	\$74,000	\$8,000	\$332,000
Total	\$399,000	\$92,000	\$13,000	\$504,000

Notes: Totals may not sum due to rounding.

Prepared: August 2018

¹ Project groups would be completed over the course of multiple years such that Project Group 1 would be completed in Year 2 and Project Group 2 would be completed in Year 7.

² Price base: 2018 dollars, amortized over 100 years at a discount rate of 2.75 percent.

³ This includes the expense of running SID and maintaining District infrastructure, increased energy costs associated with a proposed pump station, and the costs of replacing the pump station pump and the runner.

⁴ Other direct costs include the uncompensated economic losses due to changes in resource use or associated with installation, operation, or replacement of project structures. These include increased pumping costs elsewhere in the basin from reduced groundwater recharge (i.e., seepage from unlined canals), any increase in carbon emissions that is not offset, and a temporary reduction in hydropower generation.

The Preferred Alternative damage reduction benefits included agricultural yields, power cost savings, reduced O&M costs, improved fish and wildlife habitat, and avoided carbon emissions. Table 8-6 (NWPM 506.20, Economic Table 5a) presents the average annual watershed protection damage reduction benefits across all project groups.

Table 8-6. Economic Table 5a—Estimated Average Annual Watershed Protection Damage Reduction Benefits Swalley Irrigation District 2018 Watershed Plan, Deschutes Watershed, Oregon, 2018\$.

Item	Damage Reduction Benefit, Average Annual	
	Agricultural-Related ¹	Non-Agricultural- Related ¹
Project Group 1		
On-Site Damage Reduction Benefits		
Other - Reduced O&M	\$5,000	
Other - Power Cost Savings	\$171,000	
Subtotal	\$176,000	
Off-Site Damage Reduction Benefits		
Other - Social Value of Carbon (Avoided Carbon Emissions) ²		\$19,000
Water Conservation		\$125,000
Subtotal		\$144,000

Item	Damage Reduction Benefit, Average Annual	
	Agricultural-Related ¹	Non-Agricultural- Related ¹
Total Quantified Benefits	\$176,000	\$144,000
Project Group 2		
On-Site Damage Reduction Benefits		
Other - Reduced O&M	\$5,000	
Other - Power Cost Savings	\$239,000	
Subtotal	\$244,000	
Off-Site Damage Reduction Benefits		
Other - Social Value of Carbon (Avoided Carbon Emissions) ²		\$17,000
Water Conservation		\$190,000
Subtotal		\$207,000
Total Quantified Benefits	\$244,000	\$207,000

Notes: Totals may not sum due to rounding.

Prepared: August 2018

¹ Price base: 2018 dollars amortized over 100 years at a discount rate of 2.75 percent.

² Indicates the benefit of avoided carbon emissions. These benefits would also accrue to local residents, but the majority of the value would be experienced outside the proposed project area.

Using the resulting benefits and costs from the previous two tables, Table 8-7 (NWPM 506.21, Economic Table 6) presents a comparison of the NED average annual benefits and average annual costs.

Table 8-7. Economic Table 6— Comparison of Average Annual NED Costs and Benefits, Swalley Irrigation District 2018 Watershed Plan, Deschutes Watershed, Oregon, 2018\$.

Works of Improvement	Agriculture-Related ¹		Non-Agricultural ¹		Average Annual Benefits ¹	Average Annual Cost ^{1,2}	Benefit–Cost Ratio
	Reduced O&M	Patron Pumping Cost Savings	Carbon Value	Instream Flow Value			
Project Group 1	\$5,000	\$171,000	\$19,000	\$125,000	\$320,000	\$172,000	1.86
Project Group 2	\$5,000	\$239,000	\$17,000	\$190,000	\$448,000	\$332,000	1.36
Total	\$10,000	\$410,000	\$36,000	\$315,000	\$771,000	\$504,000	1.53

Notes: Totals may not sum due to rounding.

Prepared: August 2018

¹ Price base: 2018 dollars amortized over 100 years at a discount rate of 2.75 percent.

² From Economic Table 4.

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10 List of Preparers

Under the direction of NRCS, the Draft Watershed Plan-EA was primarily developed by Farmers Conservation Alliance and its subcontractor Highland Economics. The staff responsible for preparation of the Draft Watershed Plan-EA is included in Table 10-1.

Table 10-1. List of Preparers.

Name	Title	Education	Professional Experience	Area Responsible For
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Kate Hart	Program Specialist	M.S. Earth Science B.A. Earth Science	3 years	Geology and Soils, Recreation, Socioeconomics, Alternatives
David McKay	Program Specialist	M.P.A Environmental Policy B.A. Political Science	4 years	Introduction, Purpose and Need, Cultural Resources, Public Safety, Public Scoping
Amanda Schroeder	Program Specialist	B.S. Natural Resource Management	3 years	Water Resources, Wildlife Resources, Wetland and Riparian Areas, Wild and Scenic Rivers
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NRCS - Oregon				
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Name	Title	Education	Professional Experience	Area Responsible For
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Employees from Firms Under Contract with Farmers Conservation Alliance				
Company	Name	Education	Years of Experience	Area of Responsibility
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Highland Economics	Winston Oakley	M.S. Applied Economics B.S. Environmental Sciences, Policy, and Management	4 years	Economic Analysis
ERM	Sandy Slayton	M.A. Ecology B.A. Environmental Science	15 years	General

11 Distribution List

A Notice of Availability for the Draft Plan-EA will be distributed to federal, state, and local agencies, community representatives, and area non-governmental organizations. The agencies, representatives, and organizations on the mailing list include the following:

- Bend Park and Recreation District
- Business Oregon
- Central Oregon Land Watch
- City of Bend
- Coalition for the Deschutes
- Deschutes County
- Deschutes River Conservancy
- National Oceanic and Atmospheric Administration Fisheries
- Oregon Department of Agriculture
- Oregon Department of Energy
- Oregon Department of Environmental Quality
- Oregon Department of Fish and Wildlife
- Oregon Department of State Lands
- Oregon Governor’s Office
- Oregon Water Resources Department
- Oregon Watershed Enhancement Board
- State Historic Preservation Office
- Trout Unlimited
- U.S. Army Corps of Engineers
- U.S. Bureau of Land Management
- U.S. Department of Agriculture, Forest Service, Deschutes National Forest
- U.S. Fish and Wildlife Service
- Upper Deschutes Watershed Council
- WaterWatch of Oregon

In accordance with Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, NRCS will contact CTWS regarding the availability of the Draft Plan-EA.

The names of private stakeholders and members of the public who will receive notice of the Draft Plan-EA are not listed for privacy.

12 Acronyms, Abbreviations, and Short-forms

°C	degrees Celsius
°F	degrees Fahrenheit
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BMP	best management practice
Carey Act	Carey Desert Land Act of 1894, governing irrigation rights-of-way
CFR	Code of Federal Regulations
cfs	cubic feet per second
COID	Central Oregon Irrigation District
CTWS	Confederated Tribes of Warm Springs
CWA	Clean Water Act
DBBC	Deschutes Basin Board of Control
DBGM	Deschutes Basin Groundwater Mitigation program
District	Swalley Irrigation District
DRC	Deschutes River Conservancy
DRIC	Deschutes Reclamation and Irrigation Company
EA	Environmental Assessment
EAP	Emergency Action Plan
EE	Environmental Evaluation
EFH	Essential Fish Habitat
EFU	Exclusive Farm Use
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FCA	Farmers Conservation Alliance
FEMA	Federal Emergency Management Agency
HCP	Habitat Conservation Plan
HDPE	high-density polyethylene
IMPLAN	Impact analysis for Planning modeling software
MBTA	Migratory Bird Treaty Act
MOA	Memorandum of Agreement
N/A	not applicable
NED	National Economic Development

NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
NUID	North Unit Irrigation District
NWI	National Wetland Inventory
NWPM	National Watershed Program Manual
O&M	operation and maintenance
OAR	Oregon Administrative Rule
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
ODSL	Oregon Department of State Lands
OM&R	operation, maintenance, and replacement
OMB	Office of Management and Budget
ORS	Oregon Revised Statute
OWRD	Oregon Water Resources Department
P&G	Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies
PCE	Primary Constituent Element
PIR	Preliminary Investigative Report
PL 83-566	Watershed Protection and Flood Prevention Program, Public Law 83-566
Plan-EA project	Watershed Plan-Environmental Assessment Swalley Irrigation District Irrigation Modernization Project
psi	pounds per square inch
PVC	Polyvinyl Chloride
RDG	River Design Group, Inc.
Reclamation	United States Bureau of Reclamation
RED	Regional Economic Development
RM	River Mile
ROW	right-of-way
SHPO	State Historic Preservation Office
SID	Swalley Irrigation District

SIP	System Improvement Plan
SLO	Sponsoring Local Organization
Supreme Court	Supreme Court of the United States
U.S./US	United States
U.S.C.	United States Code
UDWC	Upper Deschutes Watershed Council
UGB	Urban Growth Boundary
URG	Urban Growth Boundary
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

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14 Appendices A-E

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Appendix A. Comments and Responses

Appendix B. Project Map

Appendix C. Supporting Maps

Appendix D. Investigations and Analysis Reports

Appendix E. Other Supporting Information