Central Oregon Irrigation District
Pilot Butte Canal EIS
Draft Neighborhoods and Socioeconomics Technical Report
Deschutes County, Oregon

Prepared for

Central Oregon Irrigation District

March 2025

Prepared by

Parametrix

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Pilot Butte Canal EIS
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Prepared for

Central Oregon Irrigation District
1055 SW Lake Road
Redmond, OR 97756

Prepared by

Parametrix
150 NW Pacific Park Lane, Suite 110
Bend, OR 97701
T. 541.508.7710 F. 1.206.649.6353
www.parametrix.com

Highland Economics
2425 NE 50th Avenue, Suite 13103
Portland, OR 97213
T. 503.954.1741

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CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned.

Prepared by Sabrina Robinson (Planner)	Signature reserved for final version
Prepared by Barbara Wyse (Principal and Senior Economist – Highland Economics)	Signature reserved for final version
Checked by Jennifer Hughes (Senior Planner)	Signature reserved for final version
Approved by Shane Phelps (Consultant Project Manager)	Signature reserved for final version

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ACRONYMS, INITIALISMS, AND ABBREVIATIONS

AV	Assessed value
BEA	Bureau of Economic Analysis
COID	Central Oregon Irrigation District
DBHCP	Deschutes Basin Habitat Conservation Plan
EIS	Environmental impact statement
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
GDP	Gross domestic product
MAV	Maximum assessed value
MSAV	Maximum specially assessed value
NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NUID	North Unit Irrigation District
PBC	Pilot Butte Canal
RMV	Real market value
SAV	Specially assessed value
USDA	U.S. Department of Agriculture

EXECUTIVE SUMMARY

Piping the canal and removing the seasonal water associated with the open canal under the Modernization Alternative would not alter the overall characteristics of adjacent neighborhoods or impact neighborhood cohesion. Piping would also not create any long-term adverse impacts to community resources. Piping is expected to improve neighborhood safety and reduce flood risk by removing the open canals and water. Piping is also expected to enhance the agricultural economy in Jefferson County by improving agricultural water supply. Other than temporary construction impacts affecting neighborhood and community resource access, the Pilot Butte Canal Project would not create long-term access impacts.

No significant effects on socioeconomics values for recreational or biological resources are expected from the Modernization Alternative. The Modernization Alternative also indirectly supports agriculture-reliant economic communities through maintaining farm employment due to conserving and increasing water supplies that benefit agricultural production and reduce flood risks.

1. INTRODUCTION

As a part of the preparation of the environmental impact statement (EIS) for the Pilot Butte Canal (PBC) Project (Project), this technical report identifies and evaluates neighborhoods and socioeconomics) within the project's Study Area. The neighborhoods analysis addresses how the Project would directly or indirectly affect neighborhoods, community gathering spaces, social interactions, and community cohesion, while the socioeconomics analysis addresses local and regional demographics and economic trends.

1.1 Project Location

The Central Oregon Irrigation District (COID or District) is analyzing piping approximately 18 to 21 miles of the PBC from NE 17th Street in Redmond, Oregon, to the diversion point from the Deschutes River in Bend, Oregon (Figure 1). The piping would extend from the piped section of the PBC approved under the 2020 *Smith Rock-King Way Infrastructure Modernization Project Final Watershed Plan-Environmental Assessment* (USDA, NRCS 2020). Additional portions along the existing alignment that have been piped or converted to box culverts during previous construction projects include the following:

- Major freeway or roadway crossings of US 97, Hwy 20, and Hwy 126, in Bend and Redmond (0.2 miles)
- Within the City of Bend and Deschutes County for the Juniper Ridge hydroelectric facility (3.3 miles)
- Within Deschutes County north of the Juniper Ridge hydroelectric plant (0.1 miles)
- Within urbanized Redmond (1.5 miles)

The portions to be piped for this Project are shown in Figure 1.

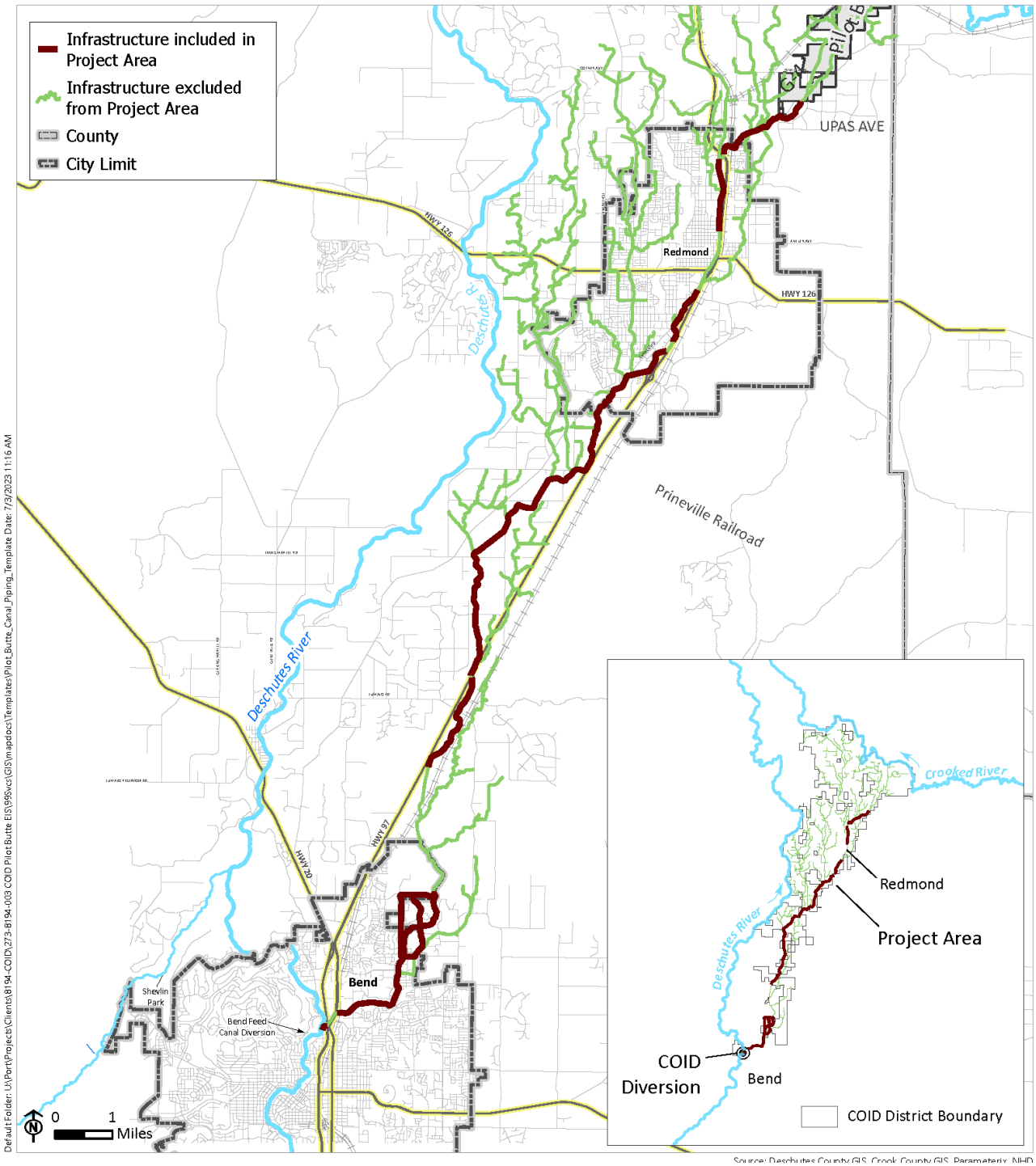

Figure 1. Project Area

1.2 Project Purpose and Need

The purpose of this Project is Agricultural Water Management through irrigation water conservation in District-owned infrastructure, improvement of water delivery reliability to District patrons, and reduction of long-term operation and maintenance costs on approximately 21 miles of the District owned PBC. The Project is needed to address the following watershed problems and resource concerns: water loss in District conveyance systems and water delivery and operation and maintenance inefficiencies. Implementation of the proposed action would address the sponsors' objectives and goals to reduce seepage loss and provide better-managed water diversions for farm use; support agricultural land use; improve streamflow for fish, aquatic, and riparian habitat; and increase public safety.

2. PROJECT ALTERNATIVES

2.1 No Action (Future without Federal Investment)

Under the No Action Alternative, the District would continue to operate and maintain the existing delivery system within the Project Area in its current condition. This alternative assumes that modernization of the District's infrastructure would not be reasonably certain to occur, as funding at the scale necessary to modernize District infrastructure is not anticipated from other sources. The No Action Alternative would be a continuation of the District's current operations and maintenance.

The No Action Alternative would not meet the project purpose and need. Water would continue to be lost to seepage and evaporation in District infrastructure. Inefficiencies in water delivery reliability for farmers; streamflow and habitat conditions for fish and aquatic species; public safety; and sediment levels in irrigation water would not improve. The No Action Alternative would fail to achieve the goal of maximizing sustainable economic development, as identified in the Federal Objective to protect the environment. It would not resolve current water supply problems stemming from the loss of water from District infrastructure. It would not resolve the public safety risk posed by the potential failure of canal walls and resulting flooding. Further, it would not foster the economic well-being of present and future generations through sustainable use and management of water resources to provide water supply and water quality for irrigated agriculture in the Deschutes Basin.

2.2 Modernization Alternative (Future with Federal Investment)

The Modernization Alternative would focus on a single priority infrastructure modernization project: the District would replace the existing open PBC within the Project Area with a pressurized, closed conduit pipeline system (see Figure 2). When completed, the pipe would extend over approximately 18 to 21 miles of the COID system from the diversion point from the Deschutes River in Bend, Oregon, to NE 17th Street in Redmond, Oregon. Pipeline construction would begin in the northern portion of the Project Area at the piped section of the PBC that was approved under the 2020 *Smith Rock-King Way Infrastructure Modernization Project Final Watershed Plan-Environmental Assessment* (USDA, NRCS 2020), and progress south to the North Canal Dam. Construction of the Modernization Alternative would occur over the course of 3 years; two project groups would be constructed each construction season. The six segments are described in Table 1.

Table 1. Project Group Construction Sequence

Project Groups	Project Group Length (feet)	Construction Year	Construction Start	Construction End
1 – King Way	11,000	0	October 2026	April 2027
2 – Redmond				
Pilot Butte Canal Alignment Option	13,500	1	October 2027	April 2028
Watermaster Road Alignment Option	13,500	1	October 2027	April 2028
NW Canal Boulevard Alignment Option	13,500	1	October 2027	April 2028
3 – Veterans Way	16,700	2	October 2028	April 2029
4 – Canal	13,900	2	October 2028	April 2029
5 – Deschutes Market	22,000	1	October 2027	April 2028
6 – Rivers Edge				
Pilot Butte Canal Alignment Option	18,100	0	October 2026	April 2027
18th Street Alignment Option	19,300	0	October 2026	April 2027
Old Deschutes Road Alignment Option	19,800	0	October 2026	April 2027

Construction would occur during the non-irrigation season (October to April), with Project Group 1 (King Way) and Project Group 6 (Rivers Edge) construction beginning as early as the 2026–2027 non-irrigation season. The construction sequencing may be changed to provide flexibility for the construction contractor. Construction of each project group is anticipated to require one non-irrigation season to complete, and all six project groups would be completed over the course of three construction seasons. Two project groups—Redmond and Rivers Edge—each contain a segment with multiple alignment options. The alignment options are discussed below. Under the Modernization Alternative, federal funding through Public Law 83-566 would be available and would be expected to cover approximately 75% of total costs. The District would secure other funding to cover the 25% match obligation.

A section of the PBC in Deschutes County just south of the Juniper Ridge hydroelectric facility, in the Rivers Edge project group, and another section in the downtown area of Redmond, in the Redmond project group, include historic features listed in the National Register of Historic Places (NRHP). In 2019, a Section 106 programmatic agreement was signed by COID, the Oregon State Historic Preservation Office, and the Bureau of Reclamation. The Natural Resources Conservation Service (NRCS) was added as a signatory in 2023. The programmatic agreement identified that COID will maintain the downtown Redmond reach "such that the historic integrity of and identification of the historic property as representative of an irrigation conveyance system will not be adversely affected." The alignment options for the Deschutes County/North Bend (in the Rivers Edge project group) and the City of Redmond (in the Redmond project group) NRHP-listed historic sections of the Project Area are described in Section 2.2.1 and Section 2.2.2, respectively.

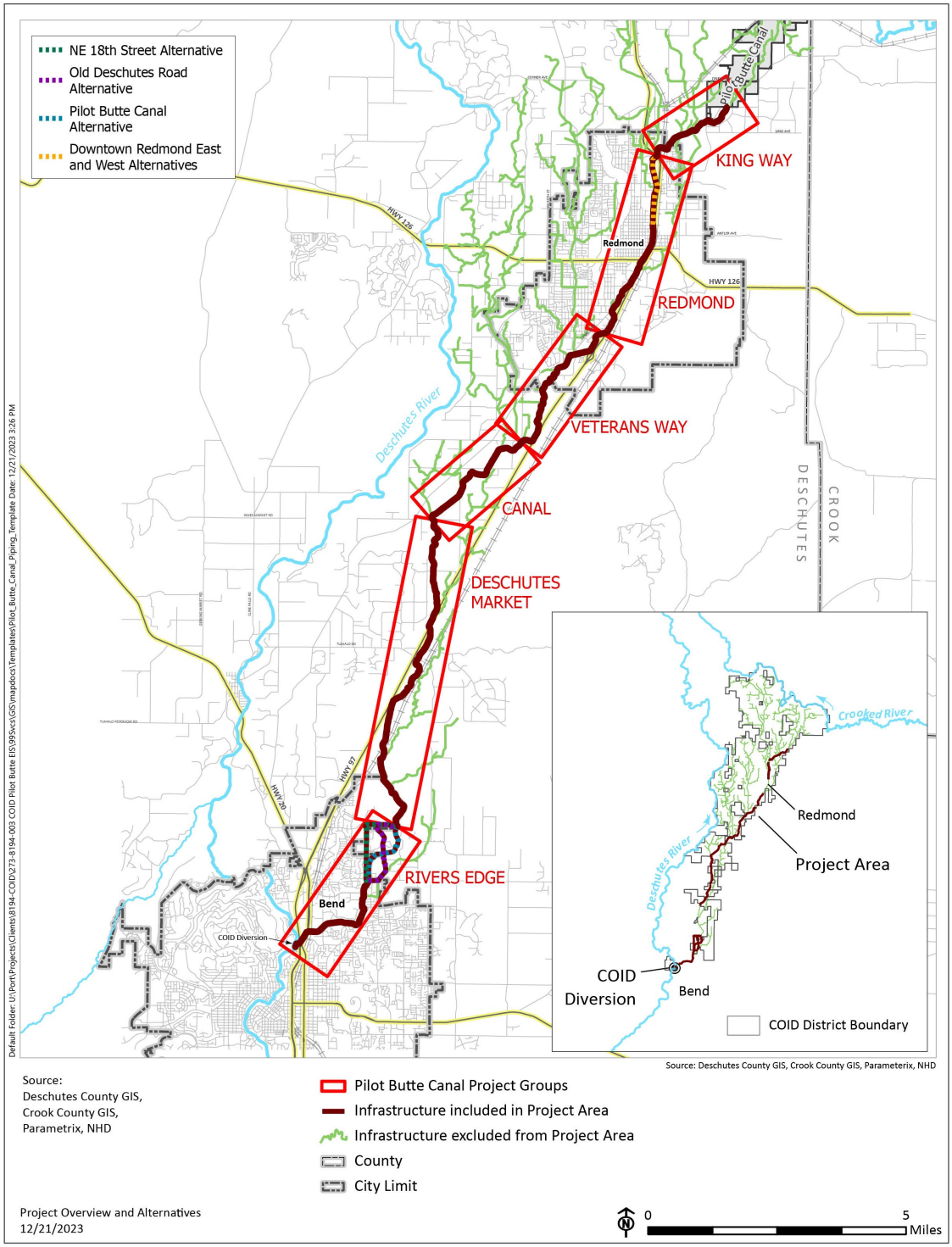

Figure 2. Project Groups

2.2.1 Deschutes County/North Bend Alignment Options

The Modernization Alternative has four options for piping between Yeoman Road and Cooley Road in Deschutes County and north Bend (see Figure 3).

- No Modernization within this Segment (no piping)
- Pilot Butte Canal Alignment (existing canal alignment)
- NE 18th Street Alignment
- Old Deschutes Road Alignment

2.2.1.1 No Modernization within this Segment (No Piping)

This alignment option would keep the 7,800-foot NRHP-listed stretch of the PBC between Yeoman and Cooley Roads in its current configuration and functionality as an open canal. This option would require installing a pressure reducing station south of Yeoman Road to slow the flow velocity as it exits the pressurized pipe so that the existing open canal can function as currently designed.

2.2.1.2 Pilot Butte Canal Alignment (Existing Canal Alignment)

This alignment option would replace the open channel with pipe directly within the existing open channel alignment. This alignment option would be built wholly within the section of canal that is listed in the NRHP. This option would not pipe the open channel section immediately south of the Juniper Ridge hydroelectric facility (approximately 170 feet), and it would require installing a pressure reducing station prior to where flow enters the hydroelectric facility.

2.2.1.3 NE 18th Street Alignment

This option would pipe the PBC within a new alignment beginning at the intersection of the existing alignment and Yeoman Road. It would travel west and then north to follow NE 18th Street to its intersection with Cooley Road. At Cooley Road, the alignment option would make an approximately 90-degree turn to follow an alignment extending from near the eastern terminus of Cooley Road to the existing PBC. This option would avoid impacts to a portion of the PBC that is listed in the NRHP. The historic section of canal would be left in place, but it would no longer receive irrigation water from the COID system.

2.2.1.4 Old Deschutes Road Alignment

The Old Deschutes Road Alignment option would place pipe in a new alignment beginning at Yeoman Road. It would travel east along Yeoman Road and then northeast to follow Old Deschutes Road. The alignment would travel generally north, cross the existing PBC, then continue north to Cooley Road. The alignment would make an approximately 90-degree turn to follow Cooley Road to the existing the PBC. This option would avoid impacts to the NRHP-listed portion of PBC. The historic section of canal would be left in place, but it would no longer receive irrigation water from the COID system.

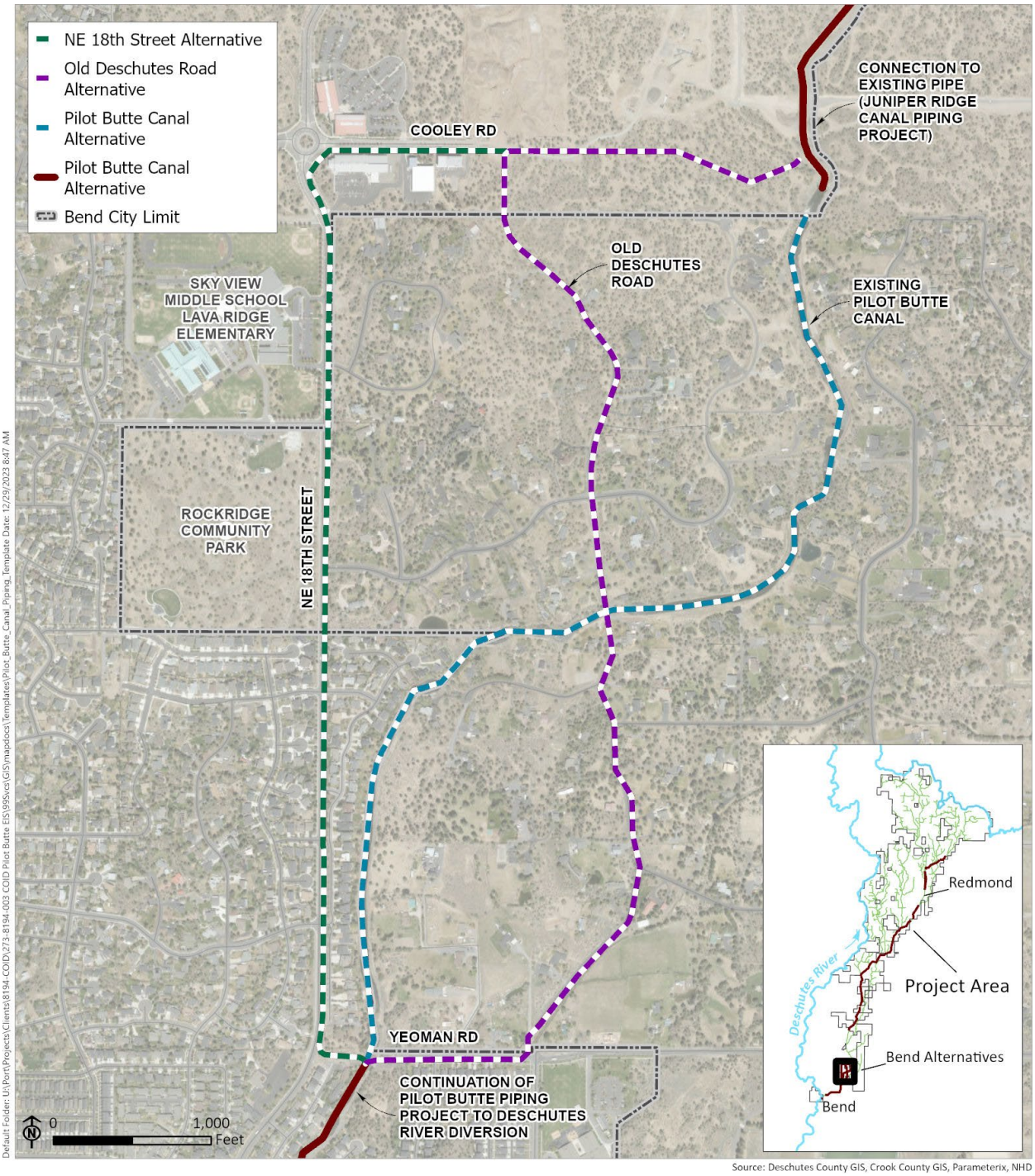

Figure 3. Deschutes County/North Bend Alignment Options

2.2.2 City of Redmond Alignment Options

The Modernization Alternative has four options for piping within the NRHP-listed historic Downtown Redmond section between NW Dogwood Avenue and NW Quince Avenue (see Figure 4).

- No Modernization within this Segment (no piping)
- Pilot Butte Canal Alignment (existing canal alignment)
- Piping to the east in the Watermaster's Access Road
- Piping to the west within Northwest Canal Boulevard

2.2.2.1 No Modernization within this Segment (No Piping)

This alignment option would keep the 6,800-foot NRHP-listed stretch of the PBC in Redmond in its current configuration and functionality as an open canal. This option would require installing a pressure reducing station near the intersection of SW Veteran's Way and US 97 to slow the flow velocity as it exits the pressurized pipe so that the existing open canal can function as currently designed.

2.2.2.2 Pilot Butte Canal Alignment (Existing Canal Route)

This alignment option would replace the open channel with pipe directly within the existing open channel alignment. This alignment option would be built wholly within the section of canal that is listed in the NRHP.

2.2.2.3 Piping to the East in the Watermaster's Access Road

This alignment option would install pipe to the east of the existing PBC and avoid impacts to the section of canal that is listed in the NRHP. The historic section of canal would be left in place, but it would no longer receive irrigation water from the COID system.

2.2.2.4 Piping to the West within Northwest Canal Boulevard

This alignment option would pipe to the west of the existing PBC, primarily within NW Canal Boulevard, and avoid impacts to the section of canal that is listed in the NRHP. The historic section of canal would be left in place, but it would no longer receive irrigation water from the COID system.

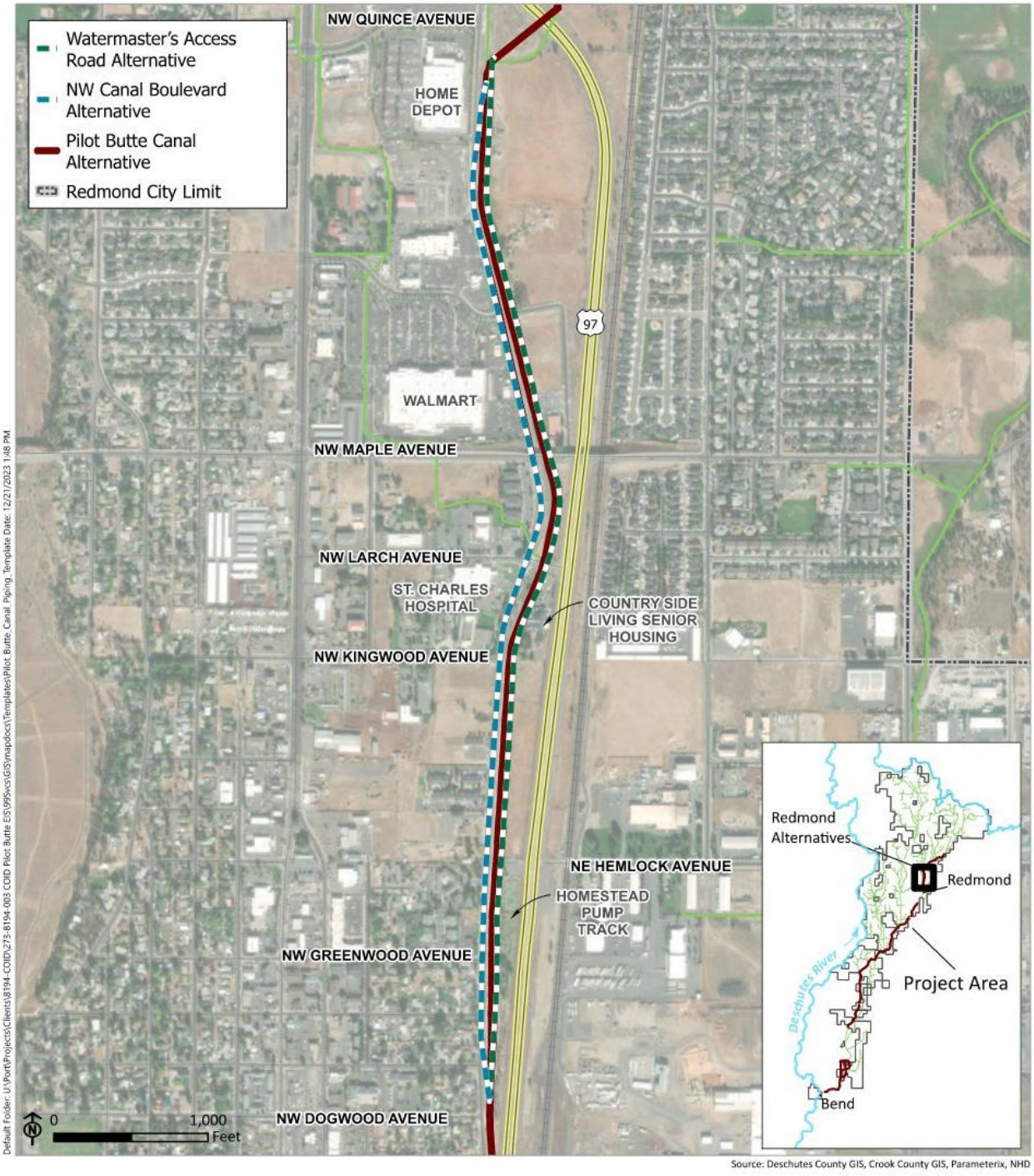

Figure 4. Redmond Alignment Options

3. DEFINITIONS

The following terminology is used when discussing geographic areas in the EIS.

Project Area – The area within which improvements associated with the project alignment options would occur and the area needed to construct these improvements. The Project Area includes the area needed to construct all permanent infrastructure including adjacent parcels where modifications would be required for associated work such as utility realignments or upgrades.

Study Area – This is the general geographic area within which physical impacts to the environment could occur with the project alternatives. The Study Area is resource-specific and differs depending on the environmental topic being addressed. For all topics, the Study Area encompasses the Project Area, and for some topics (such as for utilities) the geographic extent of the Study Area is the same as that for the Project Area. For other topics (such as transportation), the Study Area is substantially larger to account for impacts that could occur outside of the Project Area. The Study Area for the neighborhood and socioeconomics analysis is defined in Section 5.1.

Primary Alignment – The portion of the project alignment that is within the PBC that is not included in one of the alignment options in the Deschutes County/North Bend or Redmond segments. This term is used only for population data. See also Figure 9 in Section 5.3.2.

4. LEGAL REGULATIONS AND STANDARDS

4.1 Laws, Plans, Policies, and Regulations

The proposed Project would comply with all applicable local regulations related to neighborhood and socioeconomic concerns. These regulations would be considered when analyzing potential impacts from each alternative.

4.1.1 Local

4.1.1.1 Deschutes County Comprehensive Plan

Chapter 2 of the *Deschutes County Comprehensive Plan* (Deschutes County 2011) discusses resource management and its purpose to "effectively manage Deschutes County's agricultural, forest, natural and cultural resources to meet the needs of today while retaining their value for future generations."

4.1.1.2 City of Bend Comprehensive Plan

- Chapter 3 Community Connections (City of Bend 2021a)
- Chapter 5 Housing (City of Bend 2021a)
- Chapter 9 Community Appearance (City of Bend 2021a)

4.1.1.3 Redmond Comprehensive Plan

- 2040 *Redmond Comprehensive Plan*, including Goal 9 Economic Development, and Goal 15 Livability (City of Redmond 2020).

4.2 Design Standards

There are no design standards that apply to neighborhood or socioeconomic resources.

5. AFFECTED ENVIRONMENT

This section describes the neighborhood and socioeconomic conditions for the areas that could be affected by the proposed Project.

5.1 Study Area

The Study Area for the neighborhood and socioeconomic analysis of long- and short-term environmental impacts is the area within 0.5 miles of the Project Area. The entirety of all census tracts and block groups intersecting the Study Area were selected to constitute the *Direct Study Area*, denoting the area where direct environmental impacts are likely to occur as a result of the Project. Therefore, *Study Area* and *Direct Study Area* are used interchangeably throughout this report, as environmental effects are considered for all intersecting census geographies even if partially located outside the strict Study Area (the area within 0.5 miles of the Project Area). Figure 5 through Figure 8 show the Direct Study Area boundary.

Regional socioeconomic analysis (employment, jobs, tax, and associated impacts) included a larger Study Area encompassing both Deschutes and Jefferson Counties as the Project would impact agricultural production outside of the Direct Study Area. Specifically, the Project is expected to result in a greater volume of irrigation water being delivered to the North Unit Irrigation District (NUID) in Jefferson County; the greater volume is expected to enhance agricultural yields and have subsequent impacts on employment and income in Jefferson County.

5.2 Resource Identification and Evaluation Methods

5.2.1 Published Sources and Databases

The data used to determine and describe neighborhood and socioeconomic impacts are from the following resources:

- City of Bend Neighborhood Associations websites (City of Bend 2021b)
- American Community Survey Data Tables – 2017–2021 (U.S. Census Bureau 2021)
- United States Department of Agriculture (USDA), National Agricultural Statistics Service – 2022 Census of Agriculture (National Agricultural Statistics Service 2024)
- Jefferson County Oregon Summary of Assessment & Tax Roll 2023-24 (Jefferson County Assessor's Office 2023)
- The effect of rivers, streams, and canals on property values (Nicholls & Crompton 2017)
- Property assessement and taxation (Oregon Department of Revenue n.d.)
- County Employment and Income data (U.S. Bureau of Economic Analysis 2023)

- Analysis of Market Values of Properties Adjoining Arnold Irrigation District Infrastructure Modernization Project (USDA Natural Resources Conservation Service 2022)
- Farmworker Needs Assessment (Colibri Consulting 2022)
- Interview with Vidi Tejeda, Crew Leader for Central Oregon Seeds (Tejeda 2024)
- Estimates of Migrant and Seasonal Farmworkers in Agriculture (Rahe 2018)
- U.S. Department of Health and Human Services federal poverty guidelines (U.S. HHS 2023)
- Economics of Agricultural Overtime Pay in Oregon (Highland Economics 2021)
- Cultivating Home: A Study of Farmworker Housing in Hood River, Marion, Morrow, and Yamhill Counties in Oregon (Oregon Housing and Community Services Department 2023)
- Projected Future Conditions and Sector Background Information for the Deschutes River Basin of Central Oregon (Geos Institute, 2011)

5.2.2 Field Visits and Surveys

Field visits were not conducted for this Project. Online maps, census data, and local jurisdiction websites were used to identify existing conditions.

5.3 Existing Conditions

The following sections describe resources present along the project corridor.

5.3.1 Community Resources

This section discusses the existing conditions within the Study Area as they relate to neighborhoods, community facilities, parks, social service providers, and libraries (see Figure 5 through Figure 8 for locations). Parks and school recreation areas are discussed in detail in the Parks and Recreation Technical Report.

5.3.1.1 Neighborhoods

The Project Area runs through several neighborhoods in Bend. The neighborhoods are identified on the City's neighborhood association map, and include the following:

- River West. The River West neighborhood is located in the heart of Bend, and it includes a mixture of businesses and residences.
- Awbrey Butte. The Project Area runs adjacent to Awbrey Butte for a short distance along the Deschutes River. This neighborhood is primarily residential.
- Boyd Acres. Boyd Acres is located in northeast Bend, and it incorporates industrial, professional office, and residential uses.
- Orchard District. Located in east central Bend, this neighborhood is adjacent to the corridor running north of NE Butler Market Road. The Orchard District consists of local shops, restaurants, and businesses.

- Mountain View. This neighborhood is located in northeast Bend, and it is a mix of single-family, multifamily, senior housing, and commercial uses; the St. Charles Hospital and medical complex; and the Forum Shopping Center. The northern portion of the Mountain View neighborhood is adjacent to a segment of the alignment near NE Butler Market Road.

The Study Area in Deschutes County, outside the city limits of Bend and Redmond, is mainly residential and agricultural and there are no neighborhood associations identified.

There are also no neighborhood associations identified within the City of Redmond. The Project Area runs the length of the city of Redmond, south to north, mainly on the west side of US 97 before crossing the highway at the end of NW Canal Boulevard to run northeast along NE King Way. This part of the Project Area passes through residential, commercial, business (including the Greens at Redmond Golf Course, St. Charles of Redmond, and Eberhard's Dairy Products), and industrial use areas.

5.3.1.2 Community Facilities

Community facilities include nonprofit and private community gathering spaces within the Study Area. There are no community facilities located within the Bend portion of the Study Area. One church, the Saint Francis of Assisi Catholic Church, is located east of the Study Area. The Redmond Senior Center is the only community center located within the Study Area in Redmond. The Senior Center provides senior citizen services to improve the overall well-being of the elderly population.

5.3.1.3 Parks, Recreation, Trails

Several parks in Bend are located within the Study Area including Riverview Park, Canal Row Park, Lava Ridges Natural Area, Rock Ridge Park, and Sky View Middle and Lava Ridge Elementary Sports Fields. The Redmond-Bend Juniper State Scenic Corridor is between Bend and Redmond. Within Redmond are the Greens at Redmond, Yew Avenue Nature Trail, Homestead Park, and Homestead Canal Trail. Please refer to the Parks and Recreation Technical Report for additional information.

5.3.1.4 Social Service Providers

NeighborImpact and NeighborImpact Head Start are social service providers that serve economically disadvantaged residents of Deschutes, Crook, and Jefferson Counties and the Confederated Tribes of Warm Springs. The Bend facilities are located outside of the Study Area, as shown in Figure 5 through Figure 8. There are no identified social service providers within the Study Area.

5.3.1.5 Libraries

There are no libraries located within the Bend or Redmond portions of the Study Area. The Redmond Public Library is located to the west of the Study Area.

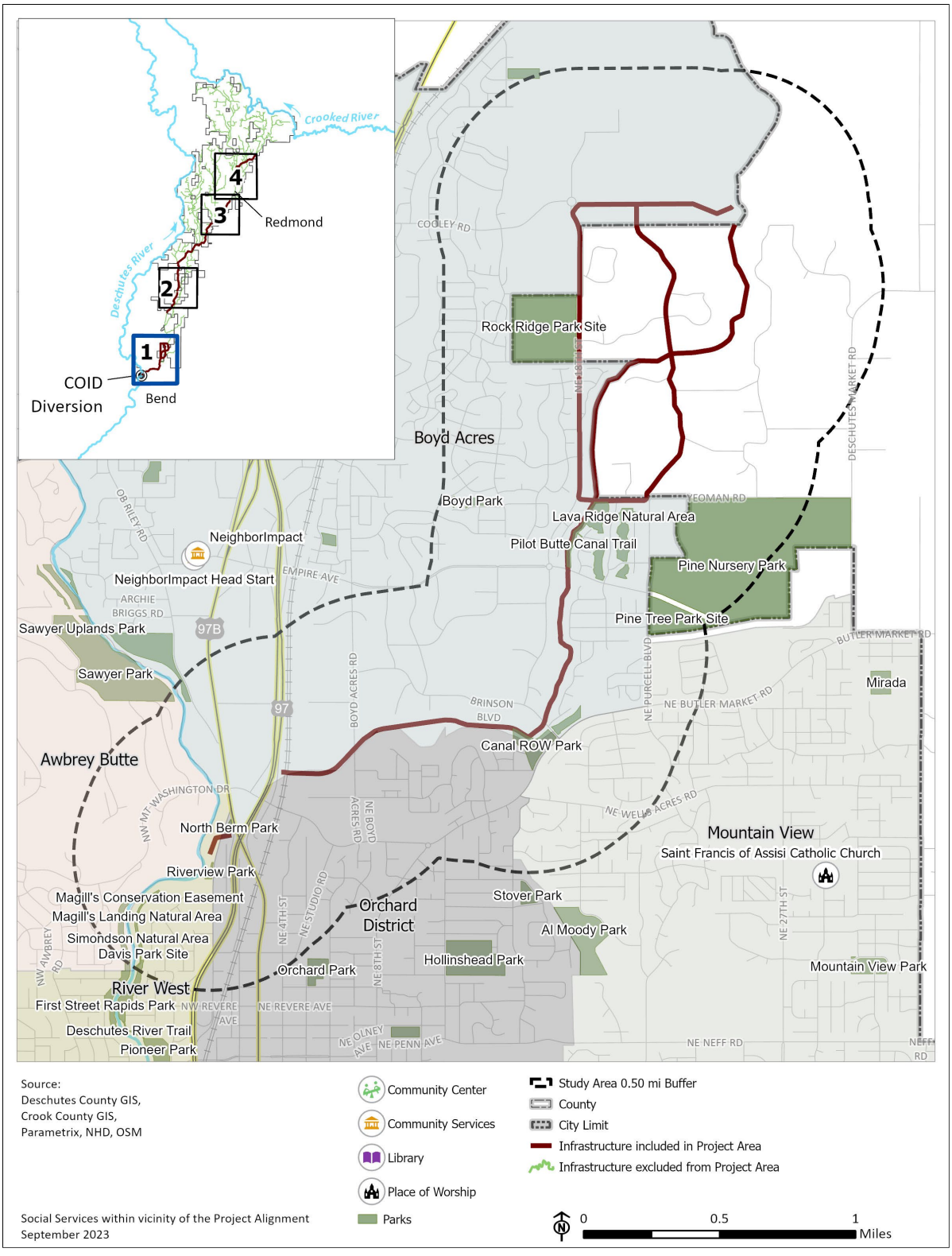

Figure 5. Neighborhoods and Social Services 1

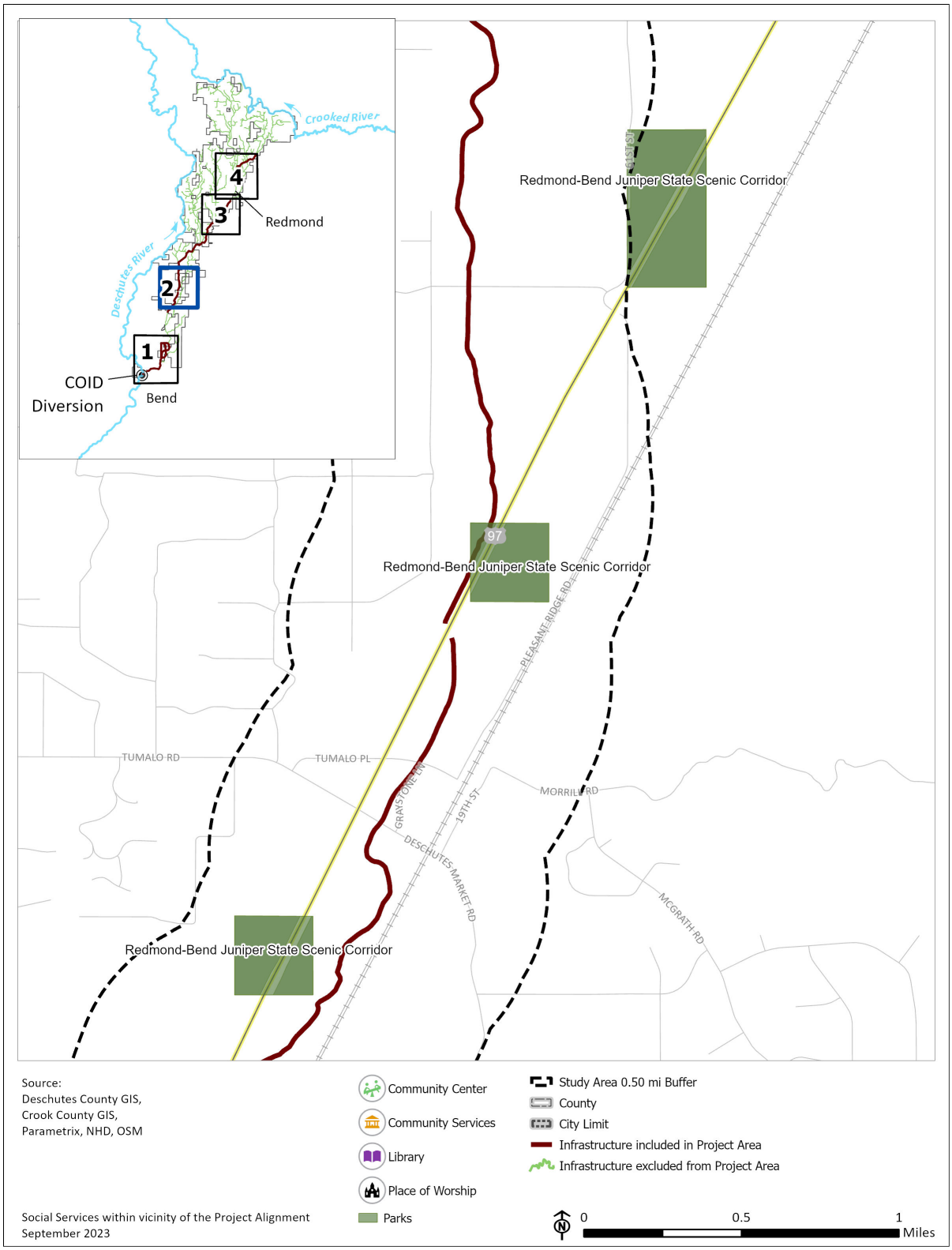

Figure 6. Neighborhoods and Social Services 2

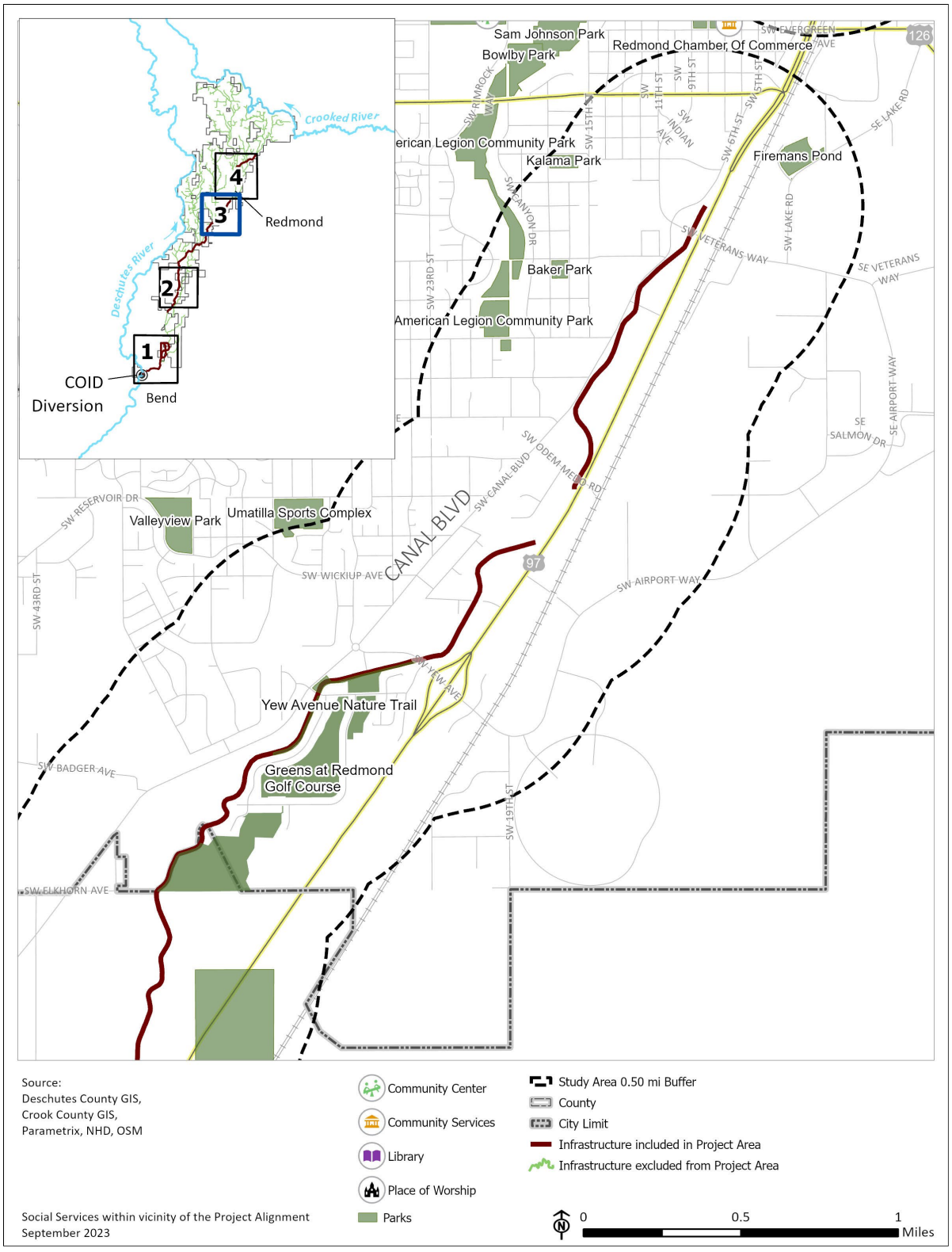

Figure 7. Neighborhoods and Social Services 3

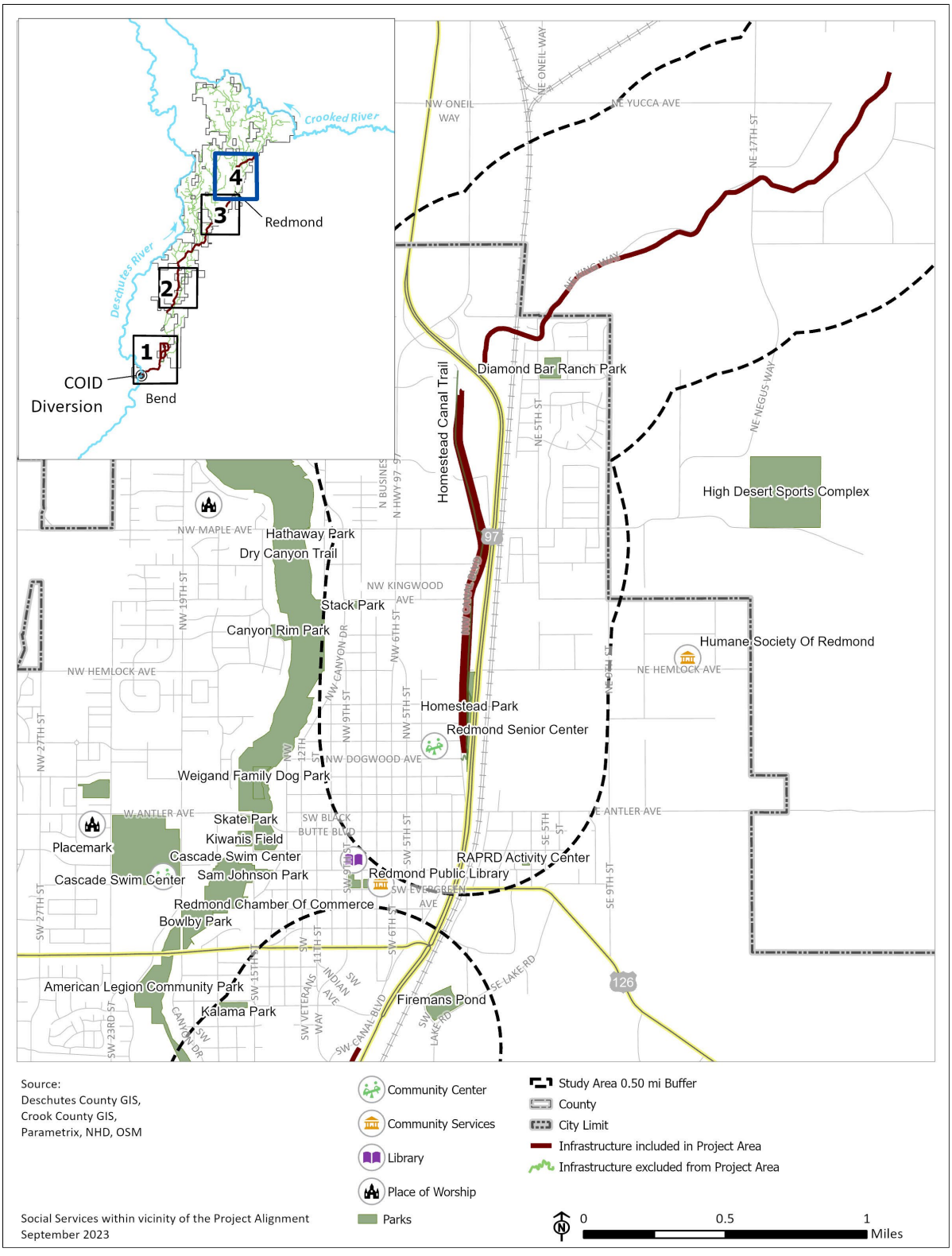

Figure 8. Neighborhoods and Social Services 4

5.3.2 Socioeconomic Resources

This section describes the socioeconomic conditions for the areas that could be affected by the proposed project in Deschutes County.

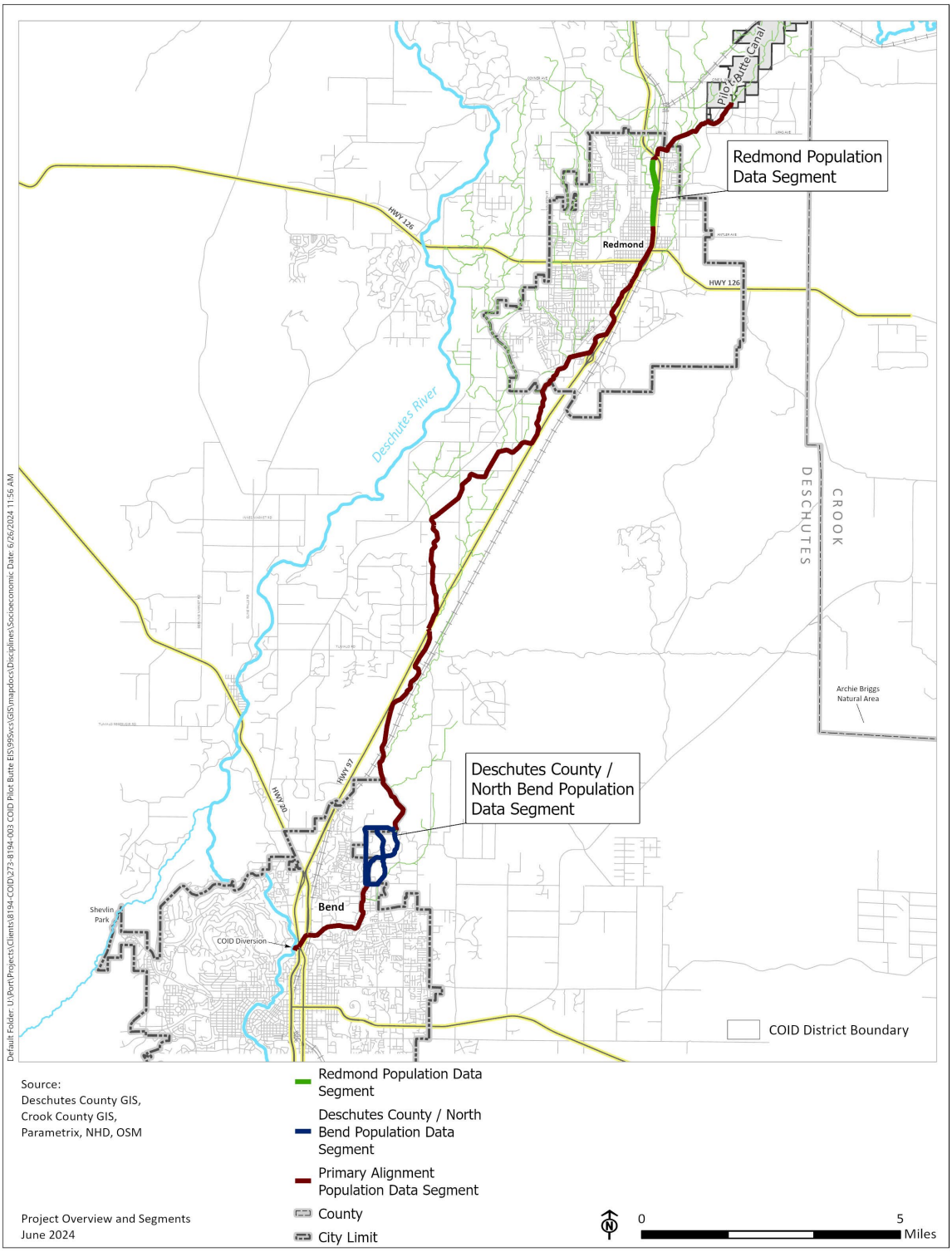

Figure 9. Population Data Segments

5.3.2.1 Population

The Project Area is located within Deschutes County with alignment sections within the city of Bend and the city of Redmond. The region is rapidly growing with the county expected to reach a forecasted population of 275,905[1] by 2040; this is a 41.5% increase from the County's 2021 population shown in Table 2.

The following population data were compiled from the American Community Survey 2017–2021 5-year Data Release. The *primary alignment* (the portion of the alignment that is within the PBC that is not included in one of the alignment options in the Deschutes County/North Bend or Redmond segments) consists of 3,299 households. The Deschutes County/North Bend segment study area has 934 households within the alignment, and there are 772 households within the Redmond segment study area.

Table 2. Population Characteristics by State, County, and City (2017–2021)

Demographic	Oregon State	Deschutes County	City of Bend	City of Redmond	Primary Alignment	Deschutes County/ N Bend Segment	Redmond Segment
Total Population	4,207,177	194,964	97,042	33,160	7,923	2,788	1,678
Total Families	1,037,580	52,620	25,162	8,154	2,099	747	424
Total Households	1,658,091	79,329	40,158	12,765	3,299	934	772

Source: American Community Survey 2017–2021 5-Year Data Release.

5.3.2.2 Agricultural Production

Table 6 provides agricultural statistics for Deschutes County and Jefferson County, and it shows the change from 2017 data. Most farmland in Deschutes County is used for pastureland (95,995 acres) followed by cropland (32,209 acres). Deschutes County's top agricultural crop is forage (hay/haylage) at 20,768 acres and accounts for 65% of sales. Cattle comprises most livestock at 12,246 head of cattle, and livestock and poultry account for 35% of sales (National Agricultural Statistics Service 2024). The vast majority of the water conserved from piping COID canals would be made available to NUID in Jefferson County. As in Deschutes County in 2022, pastureland makes up the largest acreage of Jefferson County's farmland at 449,605 acres followed by cropland with 66,351 acres. Cattle and calves make up the largest share of livestock at 18,862 head of cattle, and livestock and poultry account for 38% of sales. Crops make up 62% of sales with forage (hay) as the top crop in Jefferson County using 14,727 acres (National Agricultural Statistics Service 2024).

Irrigation water supplies currently available to NUID are lower than historical levels due to recent changes in water management under the Deschutes Basin Habitat Conservation Plan (DBHCP). The

[1] Coordinated Population Forecast for Deschutes County, its Urban Growth Boundaries (UGB), and Area Outside UGBs 2022 Through 2072. Portland State University, Population Research Center. https://www.pdx.edu/population-research/sites/populationresearch.web.wdt.pdx.edu/files/2022-06/Deschutes.pdf. June 30, 2022.

Project would conserve water and pass this conserved water savings to irrigators in NUID, thereby helping farms to return to the historical level of agricultural production in NUID and Jefferson County (see the Water Resources Technical Report for information specific to irrigation water).

Table 3. Agricultural Statistics for Deschutes County and Jefferson County

	Deschutes County		Jefferson County	
Agricultural Statistic	**2022**	**Percentage Change Since 2017**	**2022**	**Percentage Change Since 2017**
Number of Farms	1,572	+ 6	348	- 12
Land in Farms (acres)	153,000	+14	542,344	-32
Average Size of Farm (acres)	97	+7	1,558	-22
Market Value of Products Sold	$39,986,000	+39	$62,653,000	-7
Crop Sales	$26,043,000	N/A	$38,724,000	N/A
Livestock Sales	$13,943,000	N/A	$23,929,000	N/A

Source: National Agricultural Statistics Service (2024).

N/A = not applicable

5.3.2.3 Area Employment and Income

Table 7 presents the labor force characteristics for Oregon, Deschutes County, the city of Bend, the city of Redmond, and the Study Area. The primary alignment study area includes an unemployment rate of 5%, while the Deschutes County/North Bend segment study area has a 3% unemployment rate. The Redmond segment study area has the highest unemployment rate at 9%.

Income Populations

Deschutes County, the city of Bend, and the city of Redmond have an overall higher median household income compared to the state median; however, 20% of the primary alignment study area population is considered low-income with 6% of families below the federal poverty line (see Table 8). The Deschutes County/North Bend segment study area has the highest median household income at $93,463, while the Redmond segment study area is lower at $48,500. The Redmond segment study area has the highest rate of renter-occupied households at 45%.

Table 4. Employment Characteristics by State, County, City, and Study Area

Demographic	Oregon State	State %	Deschutes County	County %	City of Bend	City %	City of Redmond	City %	Primary Alignment	Primary Alignment %	Deschutes County/ N Bend Segment	Deschutes County/ N Bend Segment %	Redmond Segment	Redmond Segment %
Labor Force	2,146,963	N/A	101,278	N/A	52,469	N/A	17,751	N/A	4,669	N/A	1,268	N/A	856	N/A
Unemployment	120,586	6	5,530	5	2,097	4	1,241	7	226	5	44	3	78	9

American Community Survey 2017–2021 5-Year Data Release.

N/A = not applicable

Table 5. Income and Household Owner/Renter Characteristics by State, County, City, and Study Area

Demographic	Oregon State	State %	Deschutes County	County %	City of Bend	City %	City of Redmond	City %	Primary Alignment Total	Primary %	Deschutes County/ N Bend Segment	Deschutes County/ N Bend Segment %	Redmond Segment	Redmond Segment %
Median Household Income	$70,084	N/A	$74,082	N/A	$74,253	N/A	$70,129	N/A	$77,830	N/A	$93,463	N/A	$48,500	N/A
Population for Whom Poverty Status is Determined	4,128,333	N/A	193,647	N/A	96,681	N/A	32,975	N/A	7,909	N/A	2,788	N/A	1,672	N/A
Low-Income Population	1,183,371	29	49,357	25	23,408	24	9,844	30	1,605	20	436	16	528	32
Families Below Federal Poverty Level	77,819	8	3,157	6	1,535	6	448	6	129	6	19	2	24	6
Renter-Occupied Households	610,926	37	24,051	30	15,537	39	4,409	35	1,299	39	188	20	348	45
Owner-Occupied Households	1,047,165	63	55,278	70	24,621	61	8,356	65	2,000	61	746	80	424	55

American Community Survey 2017–2021 5-Year Data Release.

N/A = not applicable.

Agricultural Employment and Income

As described above, the Project has the potential to impact agricultural production in the larger Study Area, specifically Jefferson County, by increasing agricultural water supply and associated agricultural production value. In addition to being important components of the community way of life and identity in the larger Study Area, agriculture is a primary industry in Jefferson County and an important source of employment and income. Table 10 summarizes U.S. Bureau of Economic Analysis (BEA) economic data for farm workers and proprietors compared to all workers in Jefferson County in 2022.[2] BEA data provide a consistent basis for comparing sectors, as these data include income and employment data for both workers and proprietors for all economic sectors. On average over the years 2018 to 2022, BEA data indicate there were 345 farm workers, 458 proprietors, and approximately $20 million in total farm earnings (to proprietors and farm workers) in Jefferson County (note that in 2022, total farm income according to the BEA was $24 million). The 2017 Census of Agriculture reported that net cash farm income (net income to farm proprietors) in the County was roughly $12.4 million (2017 dollars).

Table 6. Farm Employment and Income for Jefferson County, 2018 to 2022 Average

County/Sector	Employment (full- and part-time jobs)	Earnings
Farm Workers and Proprietors	803	$19,886,000
Other Sectors	8,986	$472,312,000
Total	9,789	$492,198,000
Percentage Farm-Related	8.2%	4.2%

Sources: Highland Economics analysis of U.S. Bureau of Economic Analysis (2023)

As shown in Table 10, BEA data indicate that agricultural employment accounts for approximately 8% of all jobs in Jefferson County and approximately 4% of income. However, estimates of agricultural employment from the Oregon Employment Department suggest fewer agricultural jobs, with an estimated 626 agricultural jobs in Jefferson County over the 2018 to 2022 time period. This lower estimate of agricultural employment may be related to a fairly high number of farm proprietors in Jefferson County (216 in the 2017 Census of Agriculture) that operate small farms with sales of less than $10,000 that may not be included in the estimate from the Oregon Employment Department.

5.3.2.4 Agricultural Property Values

Access to irrigation water supply increases the value of farmland, when all other economic parameters are equal. Water supplies in the larger Study Area, particularly in Jefferson County, are increasingly constrained due to changes in hydrology and water management in the basin. By changing the availability or cost of irrigation water, the Project has the potential to increase farmland values. The agricultural income-generating value of access to irrigation water is reflected in the cropland cash rental

[2] Only Jefferson County agricultural employment and income were examined since all the agricultural production impacts from the Project are expected to occur in Jefferson County.

values for irrigated lands versus non-irrigated lands. For example, for the state as a whole, irrigated cropland rented for an average of $259 per acre in 2023, while dryland cropland rented for $107 per acre (this difference may reflect not just the value of water but also soils and topography). For Jefferson County in 2023, cash rent for irrigated cropland was $162 per acre (data on non-irrigated cropland were not available).

5.3.2.5 Residential Property Values

Amenities such as nearby parks, recreation sites, or scenic views can increase property values of nearby residential homes if proximity to such amenities is valued by local homeowners. The PBC may serve as this type of scenic amenity to nearby residences. Some property owners may value the view of the canal from their property, and this value may be reflected in increased property values for properties proximate to the canal.

As described in the Visual Resources Technical Report, approximately 589 parcels, of which 182 are residential, have a direct view of the canal in the cities of Bend and Redmond and the unincorporated areas of Deschutes County. An additional 14 residential parcels (and a total of 156 parcels) may have an indirect view of the canal (residence is located on a parcel that is not adjacent to the canal but may have a view of the canal across a road right-of-way or undeveloped parcel). Finally, an additional 760 residential parcels (and a total of 994 parcels) may have a "territorial" view of the canal (residence is located on an elevated parcel and may have a distant view of the canal). Table 11 summarizes parcels by type of view of the canal by city and county.

Table 7. Views of the Canal by Residential Properties

City/County	Direct	Indirect	Territorial	Total
City of Bend				
Number of Parcels	214	48	979	1,241
Percentage of Residential Parcels	13%	3%	78%	64%
Number of Residential Parcels	29	1	760	790
Deschutes County				
Number of Parcels	154	39	15	208
Percentage of Residential Parcels	30%	8%	0%	24%
Number of Residential Parcels	46	3	0	49
City of Redmond				
Number of Parcels	221	69	0	290
Percentage of Residential Parcels	49%	15%	0%	41%
Number of Residential Parcels	107	10	0	118
Total				
Number of Parcels	589	156	994	1739
Percentage of Residential Parcels	31%	9%	76%	55%
Number of Residential Parcels	182	14	760	956

6. IMPACT ASSESSMENT METHODOLOGY AND DATA SOURCES

This technical report describes the analysis of the effects on neighborhoods and socioeconomic values that are expected to occur due to the changes to the built and natural environments described in other technical reports for the Project. Socioeconomic values are broadly defined to include measures of change in social or economic well-being related to how people use and interact with natural resources and the environment. This includes resource uses and values related to agriculture, recreation, aesthetics, historic preservation, quality of life, and public safety.

The approach to the analysis of socioeconomic effects was as follows.

1. Identify changes to natural resource management and natural resource availability and quality that may affect socioeconomic values.
2. Identify potentially affected socioeconomic values.
3. Qualitatively and quantitatively describe the change in socioeconomic values, based on the change in natural resource availability and quality, the affected social groups, and the anticipated magnitude of effect. Some types of socioeconomic values, particularly those associated with economic activity and market prices such as agricultural production, are more easily quantified than other values (such as cultural and social values associated with recreation and historic preservation). Values that are quantitatively analyzed in this report are not more important than values that are qualitatively discussed. Detailed methodology for the quantitative analysis of agricultural resources and the associated effects on agricultural socioeconomic values is presented in Appendix D to the Draft EIS. Results from this analysis focus on the economic contribution of agricultural production in terms of the direct, indirect, and induced jobs and income supported under existing conditions and the EIS alternatives.[3]

The EIS alternatives could affect numerous resources (e.g., irrigation water availability, recreation, aesthetics, and historic resources). Changes in access to or changes in quality and abundance of these resources may affect the socioeconomic use and enjoyment of these resources by social groups in the Study Area, which in turn, may affect diverse socioeconomic values. This report describes the analysis of the following types of potentially affected socioeconomic values: economic opportunity and vitality (local jobs and income), government fiscal stability (tax revenues), property value (related to changes in aesthetics and irrigation water supply), and the socioeconomic value supported by cultural, historic, biological, and recreational resources.

[3] Agricultural production spurs economic activity in the local economy through on-farm income generation and farm worker employment, as well as through farm spending at local businesses for agricultural supplies, services, and equipment (indirect impacts). Agricultural support businesses, in turn, purchase goods and services from other businesses in the local area, generating other local economic activity (more indirect impacts). Furthermore, employees and proprietors in the farm sector and all supporting industries spend their income at local businesses such as retail stores and service businesses, which further supports economic activity (induced impacts). The sum of direct, indirect, and induced impacts represents the total economic contribution of agricultural production to the local economy.

6.1 Long-Term Impact Assessment Methods

Existing neighborhood and socioeconomic conditions were evaluated for potential long-term impacts. Potential effects on neighborhood cohesion and identity, neighborhood quality of life (including social connectedness, health and safety, community identity, leisure and recreation, environmental quality, and community facilities), property values, economic opportunity, government revenues, and socioeconomic values related to environmental quality (biological, recreational, and cultural resources) were evaluated for each alternative. The analysis considered findings from other technical reports on topics including displacements and relocations, land use, parks and recreation, public services and utilities, water, and visual resources. For socioeconomic effects, published literature and publicly available data were combined with analysis methods to estimate effects on employment, income, taxes, and property values. The analytical methods included crop enterprise budgeting (which models the typical revenues and costs associated with crop production) and economic impact analysis (which models how economic activity in one sector such as agriculture affects economic activity in other sectors of the economy). The economic impact analysis was conducted with IMPLAN, proprietary software that models the relationships between different sectors of the economy. For example, an IMPLAN model can show how increased agricultural production translates to increased economic activity in agricultural supply sectors.

6.2 Short-Term Impact Assessment Methods

The analysis of short-term impacts considered the potential for construction impacts from each alternative to temporarily impact neighborhood cohesion, or neighborhood quality of life (including social connectedness, health and safety, community identity, leisure and recreation, environmental quality, and community facilities). Similar to the long-term impacts analysis, impacts from other environmental topics in the Draft EIS technical reports were considered. The socioeconomic effects of construction on economic activity and economic opportunity in terms of short-term employment and income supported were estimated using an IMPLAN model of Deschutes and Jefferson Counties.

6.3 Indirect Impact Assessment Methods

The indirect impacts assessment incorporated short-term and long-term impacts to neighborhood quality of life (including social connectedness, health and safety, community identity, leisure and recreation, environmental quality, and community facilities), and socioeconomic conditions. Indirect impacts could include potential indirect effects to neighborhood quality of life and the economy over time from the project alternatives.

6.4 Cumulative Impact Assessment Methods

The cumulative impacts analysis addressed the long-term and short-term cumulative impacts of the project alternatives. Other projects considered in the analysis include major transportation, development, utility infrastructure, and environmental enhancement projects recently constructed, under development, or scheduled for construction, as well as the planned projects that are reasonably likely to be constructed.

7. ENVIRONMENTAL CONSEQUENCES

7.1 Long-Term Impacts

7.1.1 Neighborhood Services

7.1.1.1 No Action Alternative

Under the No Action Alternative, there would be no conversion of community resources to another use. There would be no changes in access to neighborhoods, community facilities, parks and leisure destinations, social service providers, businesses, and libraries; no change in community property or infrastructure; no change in emergency response; and no change in recreation opportunity or quality. However, as discussed in more detail below, under the No Action Alternative, the risk of flooding of neighborhoods and community facilities from open canals would continue, with expected adverse effects (during and immediately after flood events) on neighborhood safety, access, and services.

7.1.1.2 Modernization Alternative (Full Piping)

Piping under the Modernization Alternative would remove the existing open canal that runs through or adjacent to several community resources. Piping the canal under the Modernization Alternative would have negligible to minor, long-term impacts for the Boyd Acres, Orchard District, and Mountain View neighborhoods. Although piping the canals would remove the seasonal open water for some abutting properties and adjacent parks (see the Parks and Recreation Technical Report for more information), overall neighborhood characteristics and cohesion would not be impacted. Other community resources would also not be affected by the piping project.

Piping the canal could provide an increase in neighborhood safety by removing the canal and seasonal fast-flowing open water. See the Public Safety section of the EIS for additional information.

The Modernization Alternative would not have a long-term effect on vehicle, pedestrian, or cyclist access to neighborhoods or other community resources. See the Transportation Technical Report for additional information.

The Modernization Alternative would not have long-term adverse impacts on agriculture-reliant economic communities because piping would not impact neighborhood cohesiveness, remove neighborhood or community access or community resources, and would improve neighborhood safety. The Modernization Alternative would improve irrigation water delivery that allows the agricultural community, and the persons who live in rural areas, to continue to thrive into the next century.

Deschutes County/North Bend Alignment Options

No Modernization within this Segment (No Piping)

Under this option, this PBC segment alignment would remain as is. There would be no change from the existing conditions to community resources within the Project Area.

At Yeoman Road, this option would require installing a pressure reducing station to slow the flow velocity such that the existing open canal could function as currently designed. The location of the pond

is currently undetermined; if it were to be located at the southeastern portion of the PBC intersection with Yeoman Road, it might impact the Lava Ridges Natural Area.

Pilot Butte Canal Alignment (Existing Canal Route)

This option would pipe the existing alignment, thus impacting views of the canal area for adjacent properties and parks. See the Visual Resources Technical Report for additional information. The remaining community resources would not experience long-term impacts from piping the PBC canal alignment.

NE 18th Street Alignment

Under the NE 18th Street option, the existing PBC would remain in its current state in this segment, but it would no longer receive irrigation water from COID facilities. The new pipe would be placed underground within the existing NE 18th Street road prism, and the road would be reconstructed. Water would be removed from the canal, and it would be permanently dry, mimicking the non-irrigation season conditions year-round. This would create a long-term negligible impact on the adjacent neighborhoods and parks abutting the canal by altering the irrigation season view and aesthetic qualities from the canal. Other community resources would not be impacted by this option.

Old Deschutes Road Alignment

This option would place pipe in a new alignment. Similar to the NE 18th Street option, it would abandon the existing canal in place, and the canal would no longer receive irrigation water from the COID system. The new pipe would be placed underground and backfilled. The permanently empty canal would alter the views and aesthetic features of the abutting neighborhoods and parks, resulting in a negligible impact.

City of Redmond Alignment Options

No Modernization within this Segment (No Piping)

Under this option, the alignment in this area would remain as is. There would be no change from the existing conditions to neighborhoods or community resources.

At Dogwood Avenue, this option would require installing a pressure-reducing station to slow the flow velocity such that the existing open canal could function as currently designed. The location of the pond is currently undetermined; if it were to be located at the eastern portion of the PBC intersection with Dogwood Avenue, it might impact the Homestead Canal Trail.

Pilot Butte Canal Alignment (Existing Canal Route)

This alignment option would replace the existing open channel with pipe, creating a long-term negligible to minor impact by altering the views from adjacent properties and Homestead Park Pump Track. There would be no long-term access impacts to community resources.

Piping to the East in the Watermaster's Access Road

Under this alignment option, the existing canal route would be left in place. The seasonal water would be permanently removed and diverted to the new pipe located to the east. Views would be altered for adjacent properties and the park, resulting in negligible to minor impacts, but there would not be any long-term access impacts to community resources.

Piping to the West within Northwest Canal Boulevard

This alignment would place pipe west of the canal, primarily in NW Canal Boulevard. The historic section of the existing canal would be left in place, but it would no longer receive irrigation water from the COID system. Views would be altered for adjacent neighborhoods and the park, resulting in negligible to minor impacts, but there would not be any long-term access impacts on community resources.

7.1.2 Socioeconomics

In addition to the socioeconomic information presented below, Appendix D to the EIS presents a cost-benefit (or tradeoff) analysis of the effects of the Modernization Alternative relative to No Action. The overall findings of the analysis show that the economic benefits of the Modernization Alternative exceed the costs (see Appendix D to the EIS for details). The sections below describe the effects of the alternatives on economic opportunity (employment and income), property values, local government fiscal stability (tax revenues), and values related to cultural, biological, and recreational resources.

7.1.2.1 No Action Alternative

Under the No Action Alternative, the Project would not be constructed and there would be no changes in aesthetics or neighborhoods. However, under the No Action Alternative, agricultural water would not be conserved and irrigation water supplies to NUID would decline from historical levels due to implementation of the DBHCP. The DBHCP requires that increasing amounts of water over time be released for in-stream flow purposes (300 cubic feet per second beginning in 2028 and 400 cfs beginning in 2033). This will reduce the irrigation water supply going to NUID under the No Action Alternative. With reduced irrigation water supply reliability, adverse effects on farm employment and income, regional employment and income, government fiscal stability (tax revenues), and agricultural property values in Jefferson County are expected. Further, under No Action, the risk of flooding from open canals in residential areas would continue, with potential adverse impacts on property value and homes sold, local economic activity, and socioeconomic values related to resources in the floodplains that could be adversely impacted (such as recreation or historic resources).

Economic Opportunity: Employment and Income

Irrigation water supplies currently available to NUID are lower than historical levels due to recent changes in water management under the DBHCP. Under the No Action Alternative, these reduced water supplies in NUID are expected to result in reduced agricultural production and fallowing in all but wet years. Reduced agricultural production value (gross farm revenues) is expected to result in reduced agricultural income and employment, which would have ripple effects in other economic sectors in Jefferson and Deschutes Counties. The analysis of agricultural economic impacts is described in detail in the National Economic Development Analysis presented in Appendix D to the Draft EIS. Table 12 shows the estimated potential change in regional economic activity in terms of annual jobs and income (direct, indirect, and induced). With the No Action Alternative, compared to historical baseline conditions the Jefferson County economy could face a reduction of approximately 140 jobs (up to approximately 1.5%

of county employment)[4] and $7.6 million in labor income due to a long-term reduction in the availability of irrigation water and the associated reduction in farm production.

These are average annual estimates based on recent cropping patterns, crop prices, and associated farm employment and income in the Study Area. Employment and income impacts would vary in any given year due to annual variations in cropping patterns, crop prices, and other factors. Changes in agricultural production are not expected to result in measurable changes in the overall cost of living in the Study Area.

Table 8. Range of Estimated Change in Total Annual Economic Contribution from Agricultural Production, No Action Alternative Compared to Baseline (Historical Levels)

Metric	Value
Farm Production Value (millions)	-$16.0
Employment	
Farm Sector Employment (Full- and Part-Time Jobs)	-100
Other Sector Employment (Full and Part-Time Jobs)	-40
Total Employment (Farm and other Sectors)	-140
Income	
Farm Sector Income (Farmworkers and Proprietors, millions)	-$4.8
Other Sector Income (millions)	-$2.8
Total Income (Farm and other Sectors, millions)	-$7.6

Source: Highland Economics analysis using 2023 IMPLAN data and models of Jefferson County, customized to reflect local income and employment from farming in Jefferson County.

Under the No Action Alternative, all NUID farms would experience reduced irrigation water supplies. Reduced farm production and income opportunities could diminish the long-term viability of farms as farm operators are less able to meet loan repayment obligations on farm equipment, land, and other capital, and operating expenses. Reduced employment opportunities and lower incomes would likely adversely impact farm workers, who are predominantly Hispanic (as outlined in Section 5.3.2.1).

This analysis modeled economic effects by assuming that reductions in NUID water supply under the No Action Alternative would primarily affect hay crop production in NUID. However, other crops grown in NUID include higher-value crops such as peppermint, grass seed, and carrot seed. Approximately 55% of the U.S. market and 45% of the global market for carrot seed comes from Jefferson County (Jefferson County Seed Growers Association 2024). In 2017, sales of vegetable seed in Jefferson County totaled approximately $15.8 million, which disproportionately (relative to acreage) contributed to the local economy (National Agricultural Statistics Service 2019). To the extent that high-value crops benefit by improvements in water supplies (i.e., an individual farmer does not have sufficient hay crop acreage to

[4] Reduced agricultural production could also result in fewer hours worked per job and a smaller decrease in the number of jobs.

enable on-farm re-allocation of water to high-value crops or is not able to purchase water from other forage and grain crop growers), this analysis may underestimate impacts.

This analysis focused on the change in agricultural production due to reduced water supplies, and how this change in production would affect employment and income in the Study Area. However, it is important to note that there would also be effects on farm producers that are not explicitly modeled in the analysis. First, no multiyear impacts are estimated. Hay crops are multiyear crops and improved irrigation one year may affect crop yield the next year. Irrigation shortages may require additional costs if the crop needs to be reestablished the subsequent year (before it would normally be reestablished), which may be avoided with additional water supplies.

Second, farmers may incur costs, such as additional weed control, associated with short-term fallowing or with fields that go dormant midway through the irrigation season due to inadequate irrigation supplies. Incurring such additional cost, combined with decreased income from agricultural production, could make some farm operations economically nonviable. This in turn could result in further diminished economic opportunity in the Study Area if changes in individual farm financial viability further reduce agricultural production in the short term.

In interpreting impacts on economic contribution, such as those presented in Table 12, it is important to note that the economic contribution of agricultural production does not equal the economic impact (i.e., the change in jobs and income in the local economy) that would result from improved agricultural production. The actual economic impact, particularly in the long term, would be smaller as at least some portion of the affected workers and businesses may find alternative sources of income and employment. However, to the extent that decreased farm employment leads to farm workers or proprietors relocating outside of the Study Area or not finding long-term alternative employment, the contraction in the local economy would be a long-term impact.

Property Values

Agricultural Property Values

Irrigated farmland has more value than dryland, so farmland values would decrease with diminished irrigation water supplies. Under the No Action Alternative, agricultural property values would likely fall in proportion to the decrease in income-generating potential from producing crops with irrigation water (as estimated above), barring conversion of the land for other uses. The agricultural income-generating value is reflected in the cropland cash rental values for irrigated lands versus non-irrigated lands. As irrigation is necessary to produce crops in Central Oregon, the decrease in annual cash rents for lands without access to water may be nearly equal to the $162 average cash rent for irrigated acres in Jefferson County. Over time, this change in income-generating potential could translate to approximately $3,000 or more of reduced property value for lands that are long-term fallowed.[5] Agricultural real estate is also often used as collateral in agricultural loans, and reduced value of agricultural land could also diminish a farm's ability to secure operating loans or other financial loans.

[5] Using a 5% interest rate, the present value of an annual payment of $162 over time equates to $3,240 per acre. For comparison, the average farm real estate value in Oregon is $3,180 per acre. However, the average irrigated cropland value is $6,600 per acre. These property values include not just the farm-income generating potential but also the development potential.

Residential Property Values

No effects on residential property values are expected related to aesthetic features or neighborhoods as these features would not change under the No Action Alternative. However, there may be adverse effects on property values related to continued and increased flood risk under No Action Alternative. Under the No Action Alternative, 18.23 miles of open canals in the Project Area would present a continued flood risk to surrounding communities that include homes, businesses, transportation and utility infrastructure, and agricultural land. Canals in the Project Area run through the cities of Bend and Redmond and the rural areas between Terrebonne, Redmond, and Bend. Since 2005, there have been two incidents of canal failure that resulted in flood damage claims against COID. The first incident damaged 10 homes at a total cost of approximately $2.35 million.[6] The second incident damaged one home and agricultural land at a cost totaling roughly $522,000 (Horrell 2023).[7] While past COID flood damage claims have impacted homes and agricultural land, future canal failures under the No Action Alternative could impact roads, utility infrastructure, schools, and commercial and industrial structures.

In the recent past, the annual risk of a COID canal failure causing flood damage has been 11% (two incidents in 18 years), with an average damage cost of $1.4 million per incident. If each mile of canal in the Project Area has a roughly equal probability of failing, the risk of canal failure in many segments to be piped is estimated to be approximately 1% to 2% annually. However, the canal segment running through the city of Redmond has a much higher risk of canal failure, estimated at 15% to 20% annually (Horrell 2023). This section of canal commonly experiences burrowing by rodents, which weakens the canal banks and increases the likelihood of canal failure (Horrell 2022). The flood risk from canal failure is expected to increase over time due to continued degradation as the canal ages.

The Redmond segment of the canal extends for over 2 miles through the densely developed east side of the city of Redmond. Specific to infrastructure costs, a GIS[8] analysis of the potential flooding that could occur if the canal were to fail in the Redmond segment indicated that 330 homes could experience 1 foot of flooding, as would the Ridgeview High School (Crew 2023). Federal Emergency Management Agency (FEMA) guidelines indicate that 1 foot of flooding in the average home may cause an average damage of over $87,000 (FEMA 2019). Since the median value of homes near the canal is nearly twice the market value of the average U.S. home, the damages per home from flooding may be even higher (i.e., exceed $87,000 per home). Potential flood damage to the high school, which cost $63 million to construct between 2009 and 2012 (Skanska 2024), would also be high and would disrupt educational, social, and community activities. Other neighborhood amenities and infrastructure such as utilities and roads may also suffer damage and disrupt daily life and neighborhood activity and connection to other areas.

While the potential damage in the Redmond segment of the Project Area is exceptionally high, flooding in the other parts of the Project Area could also cause significant damage. Flooding in urban areas can

[6] The original value of $1.5 million in 2005 dollars was adjusted for inflation to 2023 dollars using the Gross Domestic Product Implicit Price Deflator.

[7] The original value of $500,000 in 2022 dollars was adjusted for inflation to 2023 dollars using the Gross Domestic Product Implicit Price Deflator.

[8] geographic information system

have numerous adverse socioeconomic impacts including those related to public safety and loss of life, damage to infrastructure and residential homes, disruption of business and school activities, and effects on overall quality of life. Flooding in rural areas is likely to cause less damage to infrastructure, but it still has the potential to damage homes, infrastructure, and agricultural land and disrupt transportation and daily life.

Government Fiscal Stability

Jefferson County government revenues fund public services such as highways and streets, public safety, economic development, health and welfare, culture and recreation, and education. County revenue sources are predominantly from property taxes and intergovernmental revenues from the state and federal governments. Of these two key revenue sources, only property taxes could measurably be affected by the alternatives. In the 2023–2024 tax year, Jefferson County property had a total assessed value of $2.38 billion and collected $39.8 million in taxes (Jefferson County Assessors Office 2023). Taxes paid on farm property comprised 9% of the total, or roughly $3.58 million. As noted above, irrigated farmland has more value than dryland, so farmland values would likely decrease with diminished irrigation water supplies.

Property taxes in Oregon are a function of two factors: tax rates and assessed value (Oregon Department of Revenue n.d.). County governments, in conjunction with local governments set the property tax rates, which can vary significantly by location and time due to local levies and bonds. In Oregon, the taxable value of land that qualifies for farm-use tax assessment is the lesser of the specially assessed value (SAV) and the maximum specially assessed value (MSAV) (Oregon Department of Revenue 2014). The SAV of qualified farmland is based on net income per acre of agriculture (Oregon Department of Revenue 2014). The MSAV is the greater of the prior year's MSAV or a 3% increase over the prior year's SAV (Oregon Department of Revenue 2014b). Availability of irrigation water is one factor that affects the value of farmland income and SAV. Thus, a change in irrigation water supply could potentially affect the SAV and resulting property taxes from farmland.

In the No Action Alternative relative to baseline or historical conditions, agricultural production value is expected to decrease in Jefferson County. A decrease in the average annual production value would tend to decrease an agricultural property's SAV and associated property taxes. Effects on SAV and property values would depend on whether any lands were permanently moved from irrigated status to dryland status, as SAV would likely be affected only if lands were permanently moved to dryland status in the No Action Alternative.

To project the potential change on property tax rates, this analysis assumed that SAV changes proportionately with the projected potential change in total average annual agricultural revenues (i.e., as shown in Table 13, that SAV changes by 19% in the No Action Alternative), and that SAV is the basis for property tax assessment (and not MSAV). As noted above, agricultural/forestry lands comprise 9% of the county property tax receipts. Accordingly, the potential adverse effect of the No Action Alternative on Jefferson County overall property tax receipts could be a decrease of up to 1.7% (9% of 19%), as shown in Table 13, or a decrease of up to approximately $700,000 annually in property taxes.

Table 9. Potential Agricultural Property Tax Effects in Jefferson County – No Action

Metric	Value
Average effect on total agricultural production value (millions)	-$16.0
2017 Total agricultural production value (millions, 2017$)	$67.4
2017 Total agricultural production value (millions, 2023$) [a]	$82.8
% Effect on total 2023 County estimated agricultural production value	-19%
% Property tax revenue from agricultural/ forestry lands	9%
% Potential effect on total county property tax receipts	-1.7%

Source: Highland Economics analysis of 2017 Census of Agriculture, Jefferson County Assessor's Office, 2023

a This was converted to 2023 dollars based on the GDP implicit price deflator. However, if the value is inflated using the ratio of agricultural prices received index for 2023 and 2017, the 2023 value would be $94.1 million (since agricultural prices have increased more than inflation over the last 6 years). The GDP implicit price deflator indexed value was used, conservatively, to estimate the current total agricultural production value for Jefferson County.

Socioeconomic Values for Recreational, Biological, Cultural, and Historic Resources

No impacts to recreational, biological, cultural, or historic resources are expected under the No Action Alternative, so no socioeconomic effects related to these resources are expected. However, as discussed above, the risk of flooding from open canals would continue. To the extent that these flood events adversely affect recreational resources or other resources, there may be adverse effects on socioeconomic activities and values associated with these resources.

7.1.2.2 Modernization Alternative (Full Piping)

The Modernization Alternative would change the availability of irrigation water for agricultural production and would change aesthetics due to removal of the canal. These changes would have potential impacts on the following socioeconomic resources and values: economic opportunity (jobs and income), agricultural property values, residential property values, and fiscal government stability. These are described below.

Economic Opportunity – Employment and Income

The Modernization Alternative would conserve water and increase water availability to NUID irrigators in Jefferson County. This conserved water is expected to offset the decrease in water availability that NUID irrigators would otherwise experience due to changes in water management under the DBHCP. The Project would thereby help sustain the historical level of agricultural production in NUID and Jefferson County and avoid the adverse agricultural and economic impacts described above in the No Action Alternative. Table 14 summarizes the estimated employment and income effect (direct, indirect, and induced) of the proposed action compared to the No Action Alternative. As shown in the table, in the Modernization Alternative compared to the No Action Alternative, the Jefferson County economy would maintain approximately 120 to 140 jobs (up to approximately 1.5% of county employment) and $6.4 to $7.6 million in labor income due to avoiding a long-term reduction in availability of irrigation water and associated reduction in farm production. These are average annual estimates based on recent cropping patterns, crop prices, and associated farm employment and income in the Study Area. Employment and income impacts would vary based on alignment and associated water savings, and in any given year due to annual variations in cropping patterns, crop prices, and other

factors. Changes in agricultural production are not expected to result in measurable changes in the overall cost of living in the Study Area.

Table 10. Change in Total Annual Economic Contribution from Agricultural Production (Action Alternatives Compared to No Action Alternative)

Metric	Value
Farm Production Value (millions)	$13.6 - $16.0
Employment	
Farm Sector Employment (Full- and Part-Time Jobs)	90 - 100
Other Sector Employment (Full and Part-Time Jobs)	30 - 40
Total Employment (Farm and other Sectors)	120 - 140
Income	
Farm Sector Income (Farmworkers and Proprietors, millions)	$4.1 - $4.8
Other Sector Income (millions)	$2.3 - $2.8
Total Income (Farm and other Sectors, millions)	$6.4 - $7.6

Source: Highland Economics analysis using 2023 IMPLAN data and models of Jefferson County, customized to reflect local income and employment from farming in Jefferson County.

All NUID farm proprietors and farm workers would benefit from more reliable irrigation water supplies and associated greater income and employment opportunities compared to the No Action Alternative. Greater income enhances the long-term viability of farms as farm operators are better able to meet loan repayment obligations on farm equipment, land and other capital, and operating expenses. Increased farm employment opportunities and farm incomes would beneficially impact farm workers, who often have low incomes; this increase would support an economically vulnerable population.

This analysis assumed that the additional water from the Project would primarily affect hay crops in Jefferson County. However, other crops grown in NUID include higher-value crops such as peppermint, grass seed, and carrot seed. To the extent that high-value crops benefit from improvements in water supplies (i.e., an individual farmer does not have sufficient hay crop acreage to enable on-farm reallocation of water to high-value crops or is not able to purchase water from other forage and grain crop growers), this analysis may underestimate impacts.

This analysis focused on the change in agricultural production due to increased water supplies and how this change in production would affect employment and income in the Study Area. However, it is important to note that there would also be benefits to farm producers that were not explicitly modeled in the analysis. First, no multiyear impacts were estimated. Forage crops are multiyear crops and improved irrigation one year may affect crop yield the next year. Irrigation shortages may require additional costs if the crop needs to be reestablished the subsequent year (before it would normally be reestablished), which may be avoided with additional water supplies.

Second, farmers may avoid costs, such as additional weed control, associated with short-term fallowing or with fields that go dormant midway through the irrigation season due to inadequate irrigation

supplies. Avoiding such cost increases, combined with increased income from agricultural production, could help some farm operations remain economically viable and continue to operate. This in turn could result in further-improved economic opportunity in the Study Area if farm financial viability helps to stabilize agricultural production in the short term.

Finally, irrigated farmland has more value than dryland, so farmland values would likely increase with improved irrigation water supplies. While increased land value is an economic benefit to farm owners selling farmland and may improve the viability of some farms, it is also an adverse impact to farmers who are purchasing or leasing land (who have to pay more). As such, changes in land values are not expected to affect the overall long-term economic contribution or viability of agriculture in the region.

For the nonagricultural economy, the Modernization Alternative would reduce the risk of flooding in areas adjacent to the canals and thus reduce the risk of economic dislocation that could occur due to flooding, including disruption of business activity and associated adverse effects on business revenue, employment, and income.

Property Values

Agricultural Property Values

By providing conserved irrigation water to support agricultural production in NUID, the Modernization Alternative would support higher long-term agricultural property values in NUID than under the No Action Alternative. Changes in property values under the No Action Alternative (described above) would be avoided under the Modernization Alternative (i.e., reduction in value of $3,000 or more per acre for lands that could be permanently fallowed under the No Action Alternative). Under the Modernization Alternative, future agricultural property values in NUID are expected to be consistent with historical trends in NUID agricultural land value. For agricultural lands in COID, property values could slightly increase due to operations and maintenance cost savings and provision of pressurized water due to piping (see the National Economic Development Analysis in Appendix D to the Draft EIS); this impact is expected to be minor.

Residential Property Values

As summarized in Table 11, there are approximately 182 residential parcels located adjacent to the PBC with a direct view of the canal in Bend, unincorporated areas of Deschutes County, and Redmond. There are an additional 14 parcels located near the canal but not adjacent to it (with indirect views of the canal) and 760 parcels located on elevated sites with possible territorial views of the canal. Under all route options, piping the canal would change the aesthetics and the view from these properties and it could affect property values.

Residential homes proximate to water features often have higher property values, reflecting the desirability and value held by homeowners for views of water or access to water. For example, one review of 25 economic studies that researched the impact of rivers, streams, and canals on nearby property values found that these water features increase property values in most cases (Nicholls and Crompton 2017). None of the studies in the review analyzed the property value effects of irrigation canals. Three studies that were part of the review focused on canals in the United States. However, these three studies were of boatable canals in urban settings in Texas and Florida. These canals are very different from seasonal irrigation canals such as the PBC. The three studies found that nearby canals increase residential property values by 10% to 30% (Nicholls and Crompton 2017).

More pertinent to this analysis, in 2022 NRCS conducted a study of residential properties close to the Arnold Main Canal and properties in other Central Oregon irrigational districts where an adjacent canal had been piped (USDA, NRCS 2022). The study found that the properties adjacent to an open canal had a sales value of 5% to 20% higher than properties not adjacent to an open canal (depending on the year and location of sale). The NRCS study also analyzed how property values in other Central Oregon irrigation districts changed after piping and concluded that the property value premium remained. This retention in value may be because once piping was completed, the land over the canal was converted to green space that may provide a similar value as the canal (see Appendix D to the Draft EIS for additional information). In other words, it is possible that any additional value in canal-adjacent properties reflects the value of open space or green space, with value similar regardless of whether the open space has a canal or other types of landscape. Properties adjacent to Central Oregon canals have a backyard next to open space, potentially providing increased privacy and a general sense of being in a less developed area. Properties not adjacent to the canal often have roads or other properties abutting their backyards, which may be less desirable. It may be that adjacency to open space, rather than to an irrigation canal, is the driver of price premium on properties adjacent to Central Oregon canals such as the PBC.

In sum, it is not clear if residential property values would be affected by piping the PBC. The value of some properties, particularly those immediately adjacent to the canal with direct views of the canal, could potentially decline. For these properties in particular, the canal could act as an aesthetic amenity with a positive economic value that increases property value. However, several factors could offset potential declines in value associated with the Project. First, the canal would be replaced by revegetated green space, which could provide aesthetic amenity and value. Second, some property owners or potential property buyers may not desire a canal adjacent to their property (and would potentially value such a property less) because of the safety hazard posed by an open canal. Third, as noted above there is a risk of canal failure and potential flooding to nearby properties (see the National Economic Development analysis in Appendix D to the Draft EIS). The risk of flooding may depress property values of parcels that are adjacent to the canal, particularly as the canal ages and the risk of such failures increases. In sum, while some individual homeowners and property values may be adversely impacted due to the change in aesthetic amenities, overall, across the Study Area no significant impact on property values from the Project would be expected. Similarly, there is no expected significant impact on other factors affecting the local housing market such as the number of homes constructed or for sale in the Study Area.

Local Government Revenues

Property taxes that support local government revenues are based on assessed value of property; if property values change, there is the potential for local government revenues to change. As described above, there would be little to no change in residential property taxes at the city and county level under the Modernization Alternative. However, long-term agricultural property value and associated taxes in NUID under the Modernization Alternative would be higher than under the No Action Alternative (although consistent to what would be expected under historical trends). Residential and agricultural property taxes are addressed in more detail separately below.

Residential Property Taxes

Local government revenues from property taxes may also be affected if residential property values change. Residential property taxes are based on the assessed value (AV) of the property, which is equal to the lesser of the real market value (RMV) of the property or the maximum assessed value (MAV). The

MAV can only increase by 3% annually, such that AV is often much lower than RMV. As discussed above, it is possible that residential RMV may decline for some parcels located adjacent to the PBC. If residential property values decline under the Modernization Alternative due to the change in aesthetics, and this decline is reflected in the AV, then this decline could result in lower property taxes in the Study Area.

However, the effects of the Modernization Alternative on residential property taxes would be little to none for three reasons. First, as discussed above, it is not certain that property values would be affected by the Modernization Alternative, and if they are affected, the effect may be small. Second, the AV in the Study Area has historically been less than the RMV (meaning that property value has been rising faster than the 3% maximum increase in MAV) such that a change in RMV may not affect the AV and the associated taxes. Finally, as the number of potentially affected parcels is relatively small (approximately 182 residential parcels with a direct view of the canal),[9] the effects on government revenues at the city or countywide scale would also be limited. As such, there would be little to no adverse effect on local government revenues from changes in residential property taxes.

Agricultural Property Taxes

Agricultural production value would increase under the Modernization Alternative relative to the No Action Alternative in the Study Area. As discussed in Section 7.1.2.1, an increase in the average annual production value would tend to increase an agricultural property's SAV and associated property taxes, particularly if the irrigation status of lands is permanently changed (i.e., such as moving from dryland to irrigated status). The Modernization Alternative would maintain irrigation water access on already irrigated lands, and it would offset reductions in irrigation water availability that would otherwise occur in the No Action Alternative due to changes in water management with the DBHCP. As such, under the Modernization Alternative all else equal, agricultural property taxes would be maintained at or near historical levels, and Jefferson County would avoid the potential decrease in property taxes estimated under the No Action Alternative of up to 1.7% (or approximately $700,000 annually). This is a beneficial effect on local government fiscal stability relative to the No Action Alternative.

Socioeconomic Values for Recreational, Biological, Cultural, and Historic Resources

Recreational resources support recreational enjoyment and provide direct value to local residents. Further, to the extent that recreational resources attract tourism to the local area, recreational resources can also increase local economic activity through related tourism spending. Long-term effects on recreation resources of the Modernization Alternative (as described in the Parks and Recreation Technical Report) would be limited to a minor to moderate change in aesthetics (i.e., removal of the existing open canal that runs through or adjacent to Homestead Park and Homestead Canal trail in Redmond, the Greens at Redmond, the Yew Nature Trail, and a trail in Lava Ridges Natural Area). Due to the abundant park and recreation resources in the Study Area and the limited number of parks and recreation facilities that would be affected, the potential long-term effects on overall recreation participation and enjoyment, tourism spending, and associated socioeconomic values in the Study Area are expected to be negligible to minor.

[9] There are an additional 14 residential parcels with an indirect view of the canal and 760 residential parcels with a possible territorial view of the canal; the effects of PBC piping on property values of these properties is likely very limited.

Management of biological resources can also affect socioeconomic activities and values. In addition to potential subsistence and recreation-related values of fish and wildlife species (related to hunting, angling, and wildlife-viewing), people may value habitat and species conservation due to personal beliefs and moral ethics (i.e., believe protecting a species and its habitat is the right thing to do), altruism (i.e., believing a resource should be protected so that others can use it or benefit from it), and/or a desire to bequest the resource (i.e., believing a resource should be protected for future generations). As described in the Biological Resources Technical Report, the Project is anticipated to have overall negligible to beneficial effects on biological resources in the long term. Due to the lack of expected long-term adverse impacts, effects on socioeconomic values and socioeconomics activities from project-related changes in biological resources are expected to be minor.

Cultural and historic resources are also valued by people and are important components to local community identity, sense of place, and quality of life. As described in EIS Section 10.1, Cultural Resources Environmental Consequences, effects on historic resources would vary by alignment option, but historic sections of the canal and two railway bridges would be removed or affected in all alignments with potential adverse effects on local socioeconomic values for these historic resources that may be important to sense of place, aesthetics, and community identity. These adverse effects are anticipated to be mitigated as described in EIS Section 12.3.

7.2 Construction Impacts

The Noise and Vibration Technical Report, Transportation Technical Report, and Parks and Recreation Technical Report provide more details specific to impacts to those resources.

7.2.1 Neighborhood Services

7.2.1.1 Modernization Alternative (Full Piping)

The Modernization Alternative would require blasting, excavating materials, mobilizing and staging construction equipment, removing vegetation before construction, backfilling, and restoring and reseeding disturbed areas. Trees would only be removed if there were no other way to access the construction site or if there were a safety threat to construction crews.

Adjacent neighborhoods would experience moderate temporary impacts from construction activities, which are anticipated to have a maximum duration in any one location of 6 months (from October through March outside of the irrigation season). The impacts could be visual, noise, vibration, and dust. Impacts from construction could temporarily affect access to neighborhoods and adjacent community resources, as well as temporarily affect community quality of life from increased traffic along detour routes, out-of-direction travel due to detours, and limited access to some residences, businesses, and recreational facilities near construction sites. Construction impacts could temporarily disrupt pedestrian and cycling routes along roadways and bridges. See the Right-of-Way Technical Report for more information on temporary impacts.

Temporary impacts (lasting up to 6 months in any one location) disrupting neighborhood and community resource access could have a moderate effect on residents in the Study Area as described in the following analysis by alignment option.

Deschutes County/North Bend Alignment Options

No Modernization within this Segment (No Piping)

This option would require installing a pressure-reducing station south of Yeoman Road to slow the flow velocity as it exits the pressurized pipe so that the existing open canal can function as currently designed.

While the final location has not yet been determined, construction of the pressure reducing station could restrict access to the Lava Ridges Natural Area or portions of the trail. Other construction impacts to the natural area would include visual and noise impacts from construction activities and equipment. This option would have the least impact to sensitive neighborhood and community resources.

Pilot Butte Canal Alignment

Temporary impacts from this option would be similar to the construction impacts from the Modernization Alternative. This option would reduce impacts to nearby schools and parks, compared to the NE 18th Street option. This option would also require installing a pressure-reducing station prior to where flow enters the existing hydroelectric facility.

NE 18th Street Alignment

This option would require construction adjacent to two schools (Lava Ridge Elementary and Sky View Middle) and Rockridge Community Park. Noise and vibration impacts could affect these noise-sensitive resources. Roadway and traffic impacts would temporarily affect neighborhood access and pedestrian and bicyclist routes. See the Transportation Technical Report for a complete discussion of temporary construction impacts for this option. It would require the complete reconstruction of NE 18th Street. This option would have the highest impacts to sensitive neighborhood and community resources for the route options in the North Bend area.

Old Deschutes Road Alignment

Similar to the NE 18th Street option, roadway reconstruction would impact neighborhood access and pedestrian and bicyclist routes. This alignment is farther away from the schools and parks in the area, reducing some of the noise-sensitive impacts compared to the NE 18th Street option.

City of Redmond Alignment Options

No Modernization within this Segment (No Piping)

Other than minor construction impacts from the installation of the pressure reducing station near the intersection of SW Veteran's Way and US 97, this option would have no construction impacts on community resources in the Project Area; it would have the least impact.

Pilot Butte Canal Alignment (Existing Canal Route)

This option would use the existing canal route and require closing the existing bridge during construction; this would impact pedestrian and bicyclist access to properties east of the canal and the highway. Access to Homestead Park and the Homestead Canal Trail would also be disrupted during construction. Access to the Redmond Athletic Club (located just east of Walmart) and the Country Side Living memory care facility would be temporarily disrupted. Construction would result in noise, visual, dust, and vibration impacts to adjacent neighborhoods, parks, and trails.

Piping to the East in the Watermaster's Access Road

This option would affect multiple bridge crossings, creating access closures due to construction. Access to the Redmond Athletic Club and the Country Side Living memory care facility would be temporarily disrupted. There would be construction-related noise, visual, dust, and vibration impacts to adjacent neighborhoods, parks, and trails.

Piping to the West within Northwest Canal Boulevard

This piping option would create the greatest temporary traffic disruptions to NW Canal Boulevard, impacting access to adjacent neighborhoods and driveway access points, as well as affecting travel routes for pedestrians and cyclists within the Project Area. See the Transportation Technical Report for a complete discussion of temporary construction impacts for this option. It would require the complete reconstruction of NW Canal Boulevard. There would be construction-related noise, visual, dust, and vibration impacts to adjacent neighborhoods, parks, and trails. This option would have the highest impacts to sensitive neighborhood and community resources for the route options considered for the City of Redmond.

7.2.2 Socioeconomics

7.2.2.1 No Action Alternative

Under the No Action Alternative, there would be no construction impacts.

7.2.2.2 Modernization Alternative (Full Piping)

In addition to the effects on noise, aesthetics, and transportation noted above, the primary socioeconomic effect during the construction period would be to increase employment and income opportunities in construction and related sectors. Construction of each project group is expected to be completed within a 1-year time frame, with the six groups constructed across a total of 3 years (see Table 1). Construction-related impacts on socioeconomics would be limited to short-term effects on economic opportunity, due to the boost in spending in the construction sector, and the ripple effects on employment and income across the Study Area economy due to the influx of federal funds. As construction in each segment is expected to last 1 year, effects on individual neighborhoods would be limited to this time period and there would be no long-term effects on property values or associated property taxes and government revenues.

The annual average effect of each alternative is presented in Table 15. Over the course of the 3-year construction period, the Project is expected to support an average of approximately 680 to 790 jobs and provide $44.4 million to $61.9 million in annual labor income.

Table 11. Change in Total Annual Economic Contribution from Project Construction (Action Alternatives Compared to No Action Alternative)

		Construction (Direct)		Other Sectors (Indirect, Induced)		Total, All Sectors	
Construction Phases	Year	Jobs	Income (millions)	Jobs	Income (millions)	Jobs	Income (millions)
1 – King Way	2025	190	$11.9	60	$3.1	250	$14.9
2 – Redmond							
Pilot Butte Canal Alignment Option	2026	350	$21.6	110	$5.6	460	$27.2
Watermaster Road Alignment Option	2026	380	$23.7	120	$6.1	500	$29.9
NW Canal Boulevard Alignment Option	2026	420	$25.9	130	$6.7	550	$32.6
Open Canal	2026	220	$13.7	70	$3.6	290	$17.3
3 – Veterans Way	2027	350	$21.5	110	$5.6	460	$27.0
4 – Canal	2027	280	$17.5	90	$4.5	370	$22.1
5 – Deschutes Market	2026	460	$28.5	150	$7.4	610	$35.9
6 – Rivers Edge							
Pilot Butte Canal Alignment Option	2025	680	$42.1	220	$10.9	900	$53.0
18th Street Alignment Option	2025	550	$34.0	180	$8.8	720	$42.8
Old Deschutes Road Option	2025	660	$40.7	210	$10.5	870	$51.3
Minimum Annual Average During Construction	2025 to 2027	680	$35.2	180	$9.1	750	$44.4
Maximum Annual Average During Construction	2025 to 2027	790	$49.1	250	$12.7	1050	$61.9

Socioeconomic Values for Recreational, Biological, Cultural, and Historic Resources

Recreational resources support recreational enjoyment and provide direct value to local residents. Further, to the extent that recreational resources attract tourism to the local area, recreational resources can also increase local economic activity through related tourism spending. As described in the Parks and Recreation Technical Report, during construction there would be some reduced access to park and recreation resources adjacent to construction areas, with a likely short-term closure of Homestead Park in Redmond (which features a bike pump track) and closures of portions of a local golf course and several local trails (for details see the Parks and Recreation Technical Report). No physical impacts are expected on other parks, although there could be short-term visual and noise impacts at other parks and at recreation facilities at several schools (for details see the Parks and Recreation Technical Report). For any given park or recreation facility, construction impacts would likely last for a maximum of one winter season. Due to the abundant park and recreation resources in the Study Area and the limited number of parks and recreation facilities that would be affected, the short-term effects on overall recreation participation and enjoyment, tourism spending, and associated socioeconomic

values in the Study Area is expected to be negligible to minor. However, for individuals and students who recreate often at impacted parks and school recreation facilities, the effects on recreation enjoyment and associated socioeconomic value may be moderate to substantial during the construction period.

Management of biological resources can also affect socioeconomic activities and values. In addition to potential subsistence and recreation-related values of fish and wildlife species (related to hunting, angling, and wildlife viewing), people may value habitat and species conservation due to personal beliefs and moral ethics (i.e., believe protecting a species and its habitat is the right thing to do), altruism (i.e., believing a resource should be protected so that others can use it or benefit from it), and/or a desire to bequest the resource (i.e., believing a resource should be protected for future generations). As described in the Biological Resources Technical Report, there may be short-term minor to moderate adverse effects on biological resources (specifically eagles and raptors, vegetation, and nonjurisdictional wetlands) due to noise and ground disturbance from construction. Due to mitigation efforts during construction (described in the Biological Resources Technical Report), effects on socioeconomic values and socioeconomic activities from project-related changes in biological resources would be expected to be minor.

7.2.3 Potential Off-Site Staging Areas

The construction contractor may use one or more off-site staging areas outside the Study Area to store or assemble materials that would then be transported by truck to the construction site. Off-site staging could occur with any of the alternatives. Whether, where, and how to use such sites would be the choice of the contractor; therefore, the actual site or sites cannot be addressed at this time and detailed analysis of impacts is not possible at this time. It is assumed that, because of regulatory and time constraints on the contractor, any site the contractor would choose would have to be already developed with road access. It is also assumed that the contractor would be responsible for relevant permitting or mitigation that could be required for use of a chosen site. The EIS identifies the types of impacts that could occur from off-site staging, based on the above assumptions. This analysis is not intended to "clear" any specific site, but rather to ensure disclosure of the general types of impacts.

The following types of impacts could occur from off-site staging:

- If off-site staging areas are selected in the future within or adjacent to neighborhoods or social services locations, temporary disturbance of use from construction activities would be likely.
- The same federal and local jurisdiction regulations for neighborhoods and social services would apply to staging areas, should they occur within these areas.

7.3 Cumulative Effects

7.3.1 No Action Alternative

The No Action Alternative would maintain existing conditions in the Project Area and would not impact surrounding neighborhoods or their respective community resources.

However, it would result in continued flood risk in Redmond and reduced water supply availability in the larger Study Area, particularly to NUID irrigators. Both of these current issues are expected to be

exacerbated in the future by climate change. Storms and associated flood events in the Deschutes Basin are projected to be more intense in the future with climate change (Geos Institute 2011), increasing the likelihood of flooding from other sources in addition to the potential for canal overtopping or failure in the No Action Alternative.. These multiple sources of flood risk pose numerous potential adverse impacts, which include those related to loss of life, damage to infrastructure and residential homes, reduction in property values, disruption of business and school activities, and effects on overall quality of life.

Additionally, in the No Action Alternative NUID would face a reduced water supply over time as a result of implementation of the DBHCP. This reduction in water supply due to a change in water management would exacerbate current and expected future decreases in irrigation water supply due to changes in hydrology caused by climate change. Climate change is expected to result in less available snowpack and lower summer stream flows in the Deschutes Basin, with resulting lower availability of water during summer irrigation periods (Geos Institute 2011). These cumulative effects threaten the long-term productivity and viability of farms and the agricultural economy in NUID. Reduced agricultural production and income in NUID, in turn, would have an adverse effect on the social and economic well-being of Jefferson County farmers, farm worker employment and income, farm-related businesses, and local government revenues and stability (due to potential reductions in agricultural property value and associated property taxes). In the long term (after the construction period), the No Action Alternative is not expected to affect non-farm related businesses and so no cumulative effects on economy-wide activity are expected. Further, no significant effects on socioeconomic values on cultural, recreational, or biological resources are expected from the No Action Alternative; no cumulative effects are pertinent to these resources.

7.3.2 Modernization Alternatives

This Project, when combined with other current or future projects, may cause short- or long-term cumulative effects on neighborhoods through impacts to visual resources, access to neighborhoods and community resources, public safety, and job opportunities. Current or future projects considered for this analysis include infrastructure and land use development projects and other irrigation modernization projects in the region.

When considered alongside other past and future irrigation district modernization projects in the region, piping of the PBC would contribute to a long-term impact on visual resources. Piping of the PBC and canals in nearby irrigation districts would lead to the loss of the existing open canals as a visual resource throughout the region; however, there is negligible to minor opportunity for these impacts to cumulatively impact the neighborhoods surrounding the PBC. See the Visual Resource Technical Report for more details.

Short-term access disruptions to local parks and trails could have minor adverse impacts on the community who use and enjoy these resources. By limiting access disruptions and providing alternate routes, the project can minimize disruptions and maintain equitable access to these community resources.

This Project is anticipated to increase neighborhood safety by removing the existing open canal safety hazard. To the extent that the infrastructure and land use development projects and other irrigation modernization projects that are reasonably expected to occur in the region will incorporate public safety features and may remove existing hazards through their design and implementation, this Project will

have a minor contribution to the overall improvement of public safety in the affected neighborhoods. See the Public Safety section of the Draft EIS for more details.

This Project is anticipated to benefit all NUID farm proprietors and farm workers by providing more reliable irrigation water supplies and associated greater income and employment opportunities compared to the No Action Alternative. Increased farm employment opportunities and farm incomes would beneficially impact farm workers. To the extent that other current or planned irrigation modernization projects in the region would also provide more reliable irrigation water to NUID farms, this Project would result in a beneficial cumulative effect to communities relying on farm jobs in NUID for employment.

In the long term (after the construction period), the Modernization Alternative would reduce the risk of flooding in areas adjacent to the canals and thus reduce the risk of economic and community dislocation that could occur due to flooding. To the extent that climate change and more severe weather events pose increased flood risks in the future, this Project would help offset these increased flood risks and result in a beneficial cumulative effect on economy-wide activity, community access, and public safety.

Combined with other current or planned irrigation modernization projects in the region that also include removal of open canals, removal of historic sections of the canal and two railway bridges has the potential for adverse effects on local socioeconomic values for these historical resources that may be important to sense of place, aesthetics, and community identity.

No significant effects on socioeconomic values for recreational or biological resources are expected from the Modernization Alternative, so no cumulative effects are pertinent to these resources.

7.4 Compliance with Laws, Regulations, and Standards

Deschutes County Comprehensive Plan

The Project's goal of improving water delivery reliability is in compliance with the Deschutes County Comprehensive Plan's (Deschutes County 2011) discussion of effectively managing the County's agricultural, forest, natural, and cultural resources to meet today's needs, as well as those of future generations.

City of Bend Comprehensive Plan

Consistent with the City of Bend's Comprehensive Plan Chapter 9, Community Appearance section, the Project would revegetate the piped alignments with native plants and grasses to provide a pleasing open space view. Consistent with preserving great neighborhoods, this Project would not sever or disrupt neighborhood cohesion or affect any neighborhood resources. Although removing a water feature, the space would still be open space with native plants and grasses.

Redmond Comprehensive Plan

Piping the canals would alter the views and the feel of the Homestead Canal Trail. Revegetating the alignment with native plants and grasses would help to minimize impacts. Revegetation would also help make the Project consistent with Redmond's Comprehensive Plan. However, improving water delivery reliability would be consistent with the plan's commitment to the natural environment, including water conservation and balancing water resources for future generations.

The Project would be consistent with Goal 15, Livability, because it would not disrupt any neighborhood connections or opportunities to develop new neighborhood resources. The closed canals would still provide an open space.

7.5 Conclusion

Piping the canal and removing the seasonal water associated with the open canal would not alter the overall characteristics of adjacent neighborhoods or impact neighborhood cohesion. Piping would also not create long-term impacts on community resources. Piping could improve neighborhood safety by removing the open canals and water. Other than temporary construction impacts affecting neighborhood and community resource access, this Project would not create long-term access impacts.

Under the No Action alternative, agricultural water would not be conserved and irrigation water supplies to NUID would decline from historical levels due to implementation of the DBHCP. With reduced irrigation water supply reliability, adverse effects on farm employment and income, regional employment and income, government fiscal stability, and agricultural property values in Jefferson County would result. Further, under the No Action Alternative, Redmond would continue to face flood risk that would be abated under the Build Alternatives.

The Modernization Alternative would conserve water and pass this conserved water savings to NUID irrigators in Jefferson County. This conserved water is expected to offset the decrease in water availability that NUID irrigators would otherwise experience due to changes in water management under the DBHCP. NUID farm proprietors and farm workers would benefit from more reliable irrigation water supplies and associated greater income and employment opportunities compared to the No Action Alternative.

By providing conserved irrigation water to support agricultural production in NUID, the Modernization Alternative is expected to support higher long-term agricultural property values in NUID than under the No Action Alternative.

Residential property values could be positively or adversely affected by piping the PBC. While some homeowners and homebuyers likely view the canal as a scenic amenity (in which case the Project could reduce home value), the Project also provides several benefits to nearby residential areas that may offset any declines in value and/or actually increase property values. These benefits include revegetated green space, removal of the potential safety hazard that the open canal currently poses, and removal of flood risk from failure of the canal.

Construction-related impacts on socioeconomics are expected to be limited to short-term effects on economic opportunity, due to the boost in spending in the construction sector, and the ripple effects on employment and income across the Study Area economy due to the influx of federal funds.

8. MITIGATION MEASURES

There are no mitigation measures specific to neighborhoods, social services, or socioeconomics because no significant adverse impacts were identified. However, the following mitigation measures described in the Parks and Recreation, Visual Resources, and Noise and Vibration Technical Reports are applicable as these resources contribute to neighborhoods.

- Mitigation of the removal of the PBC as a visual and aesthetic feature at park and recreation facilities could incorporate measures to enhance the ground above the buried pipe where the canal formerly ran, such as seeding with native plants or creating a trail along the alignment. For additional details, see the Visual Resources Technical Report.
- Mitigation of potential construction impacts may include measures to reduce construction noise, limiting construction activities to certain times, and creating blasting plans. For more information on noise impacts and potential mitigation measures, see the Noise and Vibration Technical Report.
- Nearby landowners and residents should be notified of all planned construction activities affecting parks and recreation areas. When there are impacts to access to park and recreation resources, an alternative route shall be determined and communicated with the public. Alternative trails, parks, and/or recreational resources will also be communicated with the public to mitigate construction disruptions.
- Any landscaping or vegetation removed from a park or recreation facility shall be replaced in kind at the conclusion of construction. Trails or other recreation amenities disturbed during construction shall be restored to their previous state upon completion of construction. For additional details, see the Park and Recreation Technical Report.

9. CONTACTS AND COORDINATION

COID District Manager Craig Horrell was interviewed twice as part of the preparation of this technical report. Vidi Tejeda, crew leader for Central Oregon Seeds, was also interviewed as part of the preparation of this technical report.

10. PREPARERS

Name	Professional Affiliation	Education	Years of Experience
Sabrina Robinson	Parametrix	B.A. Political Science	5
Barbara Wyse	Highland Economics	M.S. Applied Economics	20
Winston Oakley	Highland Economics	M.S. Applied Economics	10

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