RECLAMATION

Managing Water in the West

PROPOSED WATER SERVICE CONTRACT
GREENBERRY IRRIGATION DISTRICT
WILLAMETTE RIVER BASIN PROJECT, BENTON COUNTY, OREGON

DRAFT ENVIRONMENTAL ASSESSMENT

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
PACIFIC NORTHWEST REGION
LOWER COLUMBIA AREA OFFICE
PORTLAND, OREGON

FEBRUARY 2007

MISSION STATEMENTS

The mission of the Department of the Interior is to protect and provide access to our nations natural and cultural heritage and honor our trust responsibilities to Indian tribes and our commitments of island communities.

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

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PREPARED ON THE BEHALF OF

GREENBERRY IRRIGATION DISTRICT, BENTON COUNTY, OR

BY

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FEBRUARY 2007

List of Acronyms and Abbreviations

ACOE	U.S. Army Corps of Engineers
BA	biological assessment
BIA	Bureau of Indian Affairs, Department of the Interior
cfs	cubic feet per second
District	Greenberry Irrigation District
DSL	Oregon Department of State Lands
EA	environmental assessment
EFH	essential fish habitat
EO	Executive Order
ESA	Endangered Species Act
ESA	Endangered Species Act
ESU	evolutionarily significant units
FWS	US Fish and Wildlife Service, Department of the Interior
ITA	Indian Trust Assets
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service, US Department of Commerce
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
OWRD	Oregon Water Resources Department
POD	point of diversion
Reclamation	US Bureau of Reclamation, Department of the Interior
RM	river mile
SHPO	State Historic Preservation Office
USGS	US Geological Survey, Department of the Interior

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1. PURPOSE AND NEED FOR ACTION

1.1. BACKGROUND

The Willamette Basin Project (Project) consists of 11 storage and 2 reregulating reservoir projects constructed on tributary streams of the Willamette River in western Oregon. These were constructed by the US Army Corps of Engineers (ACOE) pursuant to Congressional authorizations dating from 1938 to 1962. The basic plan for operation of the reservoir system is provided in House Document 531[a/] as incorporated into the Flood Control Act of 1950 [64 Stat. 170].

The primary function of the reservoir system is flood control, but it is also authorized for the purposes of fish and wildlife, hydropower, irrigation, municipal and industrial, navigation, recreation, and water quality. Conservation storage space totals approximately 1.6 million acre-feet. The State of Oregon issued certificates of water right to the Bureau of Reclamation (Reclamation) to store water for irrigation use in this space. Since 1953, Reclamation has administered a program to market stored water available from the Willamette reservoir system under the authority granted to the Secretary of the Interior by the Flood Control Act of 1944. Water-service contracts are written pursuant to Section 9(e) of the Reclamation Project Act (August 4, 1939). Through Reclamation's application process individuals or irrigation districts can apply for water-service contracts.

Beginning in 1999, Reclamation, in agreement with ACOE, suspended long-term contracting for the Willamette Basin Project pending the completion of the on-going ESA consultation. However, short-term contracts have been made available each year since 1999 to applicants that have met NEPA and ESA compliance; the exception was in 2001 when ACOE concluded that water would not be made available for short-term contracts due to drought conditions. Although Reclamation continues to accept long-term contract applications, long-term contract actions in the Project remain suspended. That said, efforts are under way to resume long-term contracting in the Project.

Greenberry I.D. is currently operating in the fourth year of an OWRD five-year hardship permit with a possible extension of two years. The District's temporary exemption from the OWRD Willamette River Basin Project will expire in 2008; continuation of the exemption will be at the discretion of the State and is uncertain at this time. The use of additional groundwater for irrigation purposes is not feasible due to limited local groundwater resources.

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[a] *H.D. 531, Columbia River and Tributaries, Northwestern United States*, 1950; 81st Congress, 2nd session, is an eight-volume set; Volume V is "Appendix J—Willamette River Basin." H.D. 531 is a Congressional reprint of the *Columbia River and Tributaries Review Report*, 1 October 1948, ACOE North Pacific Division, which is 28 volumes.

The Greenberry Irrigation District (Greenberry I.D., the District, or GID) has submitted to Reclamation a specific water-service contract application. Reclamation must make a decision regarding the District's request. This Draft Environmental Assessment (Draft EA) has been prepared as required by the National Environmental Policy Act (NEPA) to evaluate the environmental and social impacts of the application.

The "Proposed Action" — issuing a water-service contract — is authorized under provisions of the Reclamation Act of June 17, 1902 (32 Stat. 388), and Section 8 of the Flood Control Act of December 22, 1944 (58 Stat. 887, 891), and acts amendatory. Although the Proposed Action is authorized by law, Reclamation must first analyze the environmental impacts of the Proposed Action, in compliance with the NEPA, before a water-service contract can be considered. The EA describes the potential impacts and provides an opportunity for the public to comment on the proposed water-service contract prior to Reclamation's decision.

This chapter addresses the purpose and need for the District's request, provides a general description of the affected area, and includes a summary of other related activities.

1.2. Purpose and Need for Action

The underlying purpose and need to which Reclamation is responding is the PCWD request for a water service contract. Greenberry I.D. has applied for a water-service contract that provides for the annual use of up to 7,500 acre-feet of water for irrigation. This water, which will come from the Willamette River Basin Project, would provide a primary water supply for the irrigation of 3,800 acres of existing agricultural land and a supplemental water supply for 2,500 acres of land that are presently irrigated.

In order for Reclamation to consider execution of a water-service contract, several conditions must be satisfied. These conditions include acceptable application from a qualified water user, availability of water from the stored water system, and preparation of an appropriate NEPA document.

1.3. Location and General Description of Affected Area

Greenberry I.D. located south of the city of Corvallis in Benton County, Oregon. The district is west of the Willamette River, in Townships 12 South and 13 South, Range 5 West. Most of the District is in Township 13 South (Figure A-1; all figures are located in Appendix A). The District was formed in 1998 and consists of lands in private ownership that have groundwater and surface-water rights dating back to 1952. The primary crop is grass for the production of grass seed.

The main boundary of Greenberry I.D. is generally rectangular in shape and is approximately 8 miles (north to south) by 3 miles (east to west). Muddy Creek is on the west side of the District and runs from south to north through the GID to Marys River in Corvallis. There are two small parcels of land on the south end of the District and outside the main boundary also are part of the GID. The William L. Finley National Wildlife Refuge (NWR) is located along Muddy Creek southwest of the GID (Figure A-1).

Greenberry I.D. consists of farmlands traditionally non-irrigated; however, some farmlands are irrigated with existing groundwater and surface-water rights from the State of Oregon. GID has requested a contract with Reclamation for 7,500 acre-feet of water stored in Federal reservoirs in the Willamette River Basin Project to irrigate farmlands within GID. Some of these farmed lands are to be newly irrigated with a primary water right while others have existing surface-water and/or groundwater rights. According to State law, in cases where landowners have a primary water right to appropriate river or groundwater, use of the Willamette River Basin Project water can be used to supplement their supply.

There are several water courses that are adjacent to or within the GID boundaries (Figure A-1). The project area is located on the west side of the Willamette River. Several lakes and creeks exist in the area and many are located in the Booneville Channel (or Booneville Slough), a historic Willamette River channel. Due to natural and human causes, the area's hydrology has been significantly altered over the last century. Where rivers once flowed, abandoned channels, drainage ditches, and oxbow lakes are now found.

Long Tom River – The Long Tom River is tributary to the Willamette River. It is south of the GID and flows into the Willamette River upstream of the existing point-of-diversion (POD) for GID's water right on the Willamette River. The lower portion of the historic channel of the Long Tom River is a backwater area for the Willamette River (Figure A-2).

Willamette River – The Willamette River flows in a northerly direction and borders the project area's east side. The existing GID point-of-diversion is on the historic channel of the Long Tom River channel that receives backwater from the Willamette River (Figure A-2).

Albany Channel – The Albany Channel is an oxbow channel of the Willamette River to the west of the main stem Willamette (Figure A-2).

Muddy Creek – Muddy Creek (on the west side of the Willamette River) is a low-gradient creek that flows northerly through the William L. Finley NWR and through GID. The District has existing water rights throughout the length of the creek (Figure A-2); however, Muddy Creek is over-allocated, with insufficient flow to service existing water rights.

Dry Creek – Dry Creek is a short intermittent drainage for the Corvallis Airport. It is located near the northeastern corner of GID near the airport and drains to the Booneville Slough of the Willamette River.

Whitby Ditch – Whitby Ditch flows north for approximately 3 miles through GID. It is surrounded by agriculture land. Averaging 4 feet in width, the ditch is mainly straight as it follows the outline of crop fields. Whitby Ditch exists for agriculture drainage only and connects with Muddy Creek.

Oxbow lakes – The series of water bodies include Winkle Lake, Whitaker Lake, McBee Lake, and Baker Lake (Figure A-2). These lakes were formed from the remnants of the Booneville Channel (also known as Boonville Slough), once the mainstem of the Willamette River in the mid 1800s. The lakes have water year-round; in some late summer, irrigation demands pump the lakes to low levels. All properties around the oxbows lakes are privately owned, and there is no public access. These lakes presently provide irrigation water to GID (Figure A-2).

Although historically connected and used as mainstem fisheries habitat, the oxbow lakes have been isolated and used as a source of irrigation water. Current connectivity of the lakes to the mainstem Willamette is highly unlikely (Mamoyac 2001). However, high flow events may establish a hydrologic connection between the lakes and possibly the mainstem Willamette.

Winkle Lake – Located near GID's southern boundary, Winkle Lake is a remnant of the old Booneville Channel. With intermittent inflow and outflow, the lake exists in the old channel and retains the shape of the historic river channel. GID presently removes water from Winkle Lake to downstream lakes through a control structure via gravity flow and by several pump stations on the lake (Figure A-2).

Unnamed Channel (north of Winkle Lake) – A channelized ditch connects Winkle Lake on the south and Whitaker Lake on the north. Flow goes northward and in the dry season is controlled by a structure on the north end of Winkle Lake. The ditch is about 8 feet wide and 3 feet deep with sloped banks. It has no riparian zone but supports wetland plants within the confines of the ditch itself. It has a graveled road on the west, and currently a grass seed field to the ditch edge on the east.

Whitaker Lake – Whitaker Lake is near the GID's eastern boundary and just north of Winkle Lake. It also is located in the historic Booneville Channel. It ranges from 50 to 100 feet wide and receives flows from Winkle Lake and other upstream sources occurring within the historic Booneville Channel. Two existing pumps stations are located on the lake to remove water for local irrigation of nearby fields (Figure A-2).

McBee Lake – just north of Whitaker Lake, McBee Lake is also near the District's eastern boundary and located in the historic Booneville Channel. Ranging from 75 to 150 feet wide, McBee Lake receives flows from Whitaker Lake and other

upstream sources occurring within the historic Booneville Channel. An existing pump is located on the west side of the lake and is used for current irrigation needs (Figure A-2).

Baker Lake – Baker Lake is the northern-most lake within the GID and also is located in the historic Booneville Channel. Baker Lake receives water from McBee Lake. Two existing pumps are located on the lake for irrigation purposes (Figure A-2).

1.4. DESCRIPTION OF CURRENT FACILITIES

Irrigated acreage is shown on Figure A-3. GID comprises about 13,000 acres; about 11,000 acres are farmed and about 2,000 acres are comprised of lakes, streams, highways, roads, and residential and farm facilities. Presently, about 19 percent (2,500 acres) of GID is irrigated, and about 81 percent (8,500 acres) is farmed without irrigation. The primary crop is grass seed; there are also row crops —such as beets, beans, corn, blueberries —and other specialty crops.

Sources of water for the presently irrigated 2,500 acres are from groundwater and surface water. A pump station — the point of diversion — is located in a backwater area off of the Willamette River's western bank (Figure A-2). Water is delivered to the south drainage to Winkle Lake and distributed to other oxbow lakes by gravity flow. Water in the various oxbow lakes is pumped to irrigable lands. Water from Muddy Creek is pumped from various locations along the creek (Figure A-2).

Surface-water sources from Muddy Creek and the Willamette River are used to irrigate approximately 2,400 acres, while groundwater sources are used to irrigate approximately 100 acres. The permits allow for 2.5 acre-feet per acre and a rate of 1 cubic foot per second (cfs) for every 80 acres. GID does not have contracts for appropriation of water from Federal sources.

1.5. OTHER RELATED ACTIONS OR ACTIVITIES

In 1999, the Upper Willamette Chinook Salmon ESU (evolutionarily significant unit) and the Upper Willamette Steelhead ESU were listed as "threatened" by the National Marine Fisheries Service (NMFS) under the Endangered Species Act (ESA). Subsequently, ACOE prepared a Biological Assessment (BA) and initiated consultation under Section 7(a)(2) of the ESA with NMFS and the U.S. Fish and Wildlife Service (FWS). Because of Reclamation's irrigation water marketing program for the Willamette River Basin Project, we are participating in the ongoing consultation as a "secondary action agency."

A determination was made that it was no longer necessary to delay processing new contracts to protect listed species. This was because Reclamation and ACOE were

confident that any potential impact of water-service contracts on listed species could be avoided through appropriate contract terms and conditions as well as the ongoing reservoir management activities of ACOE.

2. ALTERNATIVES

Alternatives which meet the objectives, purposes, and need for GID's proposal are described and analyzed in this chapter.

2.1. NO ACTION ALTERNATIVE

The No Action Alternative is provided for comparison with the Proposed Action described below. It is the most likely future scenario if the Proposed Action is not implemented. Specifically, the No Action Alternative is a decision by Reclamation to deny the GID application for a water-service contract. Without a water-service contract, GID will continue to use the water sources it has already secured including groundwater and surface-water rights.

2.2. PROPOSED ACTION

The Proposed Action is an affirmative decision by Reclamation concerning the Greenberry I.D. application for a water-service contract. Under the Proposed Action, we would contract with GID to provide up to 7,500 acre-feet of irrigation water stored in the Willamette River Basin Project. This water would be used to supplement the District's existing irrigation water supply for 2,500 acres and provide a primary water supply to 3,800 acres.

This water would provide GID with up to 2.5 acre-feet of water per acre of land per year. The individual crop irrigation requirements by month (as published by Oregon State University) were used to estimate the flow rates and volumes required. The average irrigation requirement can exceed 24 inches for crops such as blueberries but is less than 12 inches for most crops. The exception is the water requirements for grass grown for seed. This requirement is expected to be a single, heavy irrigation of 3 to 4 inches within a 2-week period both in spring and fall.

Several irrigation scenarios were developed after consideration of the Willamette Valley climate and possible future cropping patterns. The irrigation requirements for average climatic conditions were calculated as well as those for the hottest and driest year in a 10-year period. Water requirements and supplies can vary. The existing water supplies become scarce in the driest years. The crop patterns that might evolve over time include growing more hay crops or row crops.

The stored water will be applied to a portion of the 8,500 acres that are farmed but not irrigated. Approximately 3,800 acres of the 8,500 acres of land presently farmed without irrigation water will be irrigated with a primary water right. A summary of the proposed irrigation is shown in Table 2-1. .

In addition, approximately 2,500 acres that are presently farmed and irrigated would receive a supplemental water right (Figure A-3). The water would be applied to presently farmed lands to increase grass seed production and/or row crop production. No new lands would be cleared for irrigated agriculture.

Table 2-1. Approximate Acreage in Greenberry Irrigation District

Total Acres in District		13,000
Acres not Farmed	2,000	
Farmed Acres		**11,000**
Acres presently irrigated and proposed for supplemental water	2,500	
Acres not presently irrigated	8,500	
Acreage not presently irrigated proposed for primary water right	3,800	
Farmed Acres		**11,000**
Source: Trimmer 2005b		

The source of the 7,500 acre-feet of water for the primary right on 3,800 acres and a supplemental right on 2,500 acres would be from stored water in the Willamette River Basin Project. With the proposed water-service contract, the District could pump up to 60 cfs from the Willamette River. New facilities would be necessary to divert and distribute the water. These new facilities include a pump station (pumps, intakes, fish screens, and bank stabilization) and a new pipeline (4.2 miles long) from the Willamette River to Winkle Lake and Muddy Creek (Figures 4 and 5). All lands and facilities are owned by the District or its members. Reclamation is not funding, authorizing, or constructing any GID infrastructure. The pump station and pipelines include the following:

- A new Point of Diversion (POD) and intake on the Willamette River for a pump station for 60 cfs (Figures 6, 7, 8, 9, and 10).
- Two 24-inch- diameter pipelines from the POD to Winkle Lake (Figure A-5).
- A 24- inch-diameter pipeline lateral (370 feet) from the new pipeline to Winkle Lake (Figure A-5).
- New outfall on the dam at Winkle Lake (Figure A-11).
- A pipeline 18 to 24 inches in diameter from Winkle Lake to Muddy Creek (Figure A-5).
- New outfall and energy dissipater on Muddy Creek at creek mile 15, approximately 1,500 feet north of Finley Road (Figure A-12).
- A pipeline trench approximately 4.2 miles long and up to 8 feet deep and from 3 feet wide (for one pipeline) to 7 feet wide (for two pipelines) from the intake to the outfalls (Figures A-5 and A-13).

The new pipeline would provide supplemental water rights and primary water rights to serve agricultural lands (Figure A-4). Water delivered to Winkle Lake will flow from there through existing channels to the other oxbow lakes; there will be no storage in nor enlargement of the lake. As water passes through the system, it will be withdrawn by existing pump diversions (Figure A-2). Approximately 5 cfs and up to 10 cfs will be conveyed to Muddy Creek, depending on water needs and availability. Water in Muddy Creek will be delivered to GID lands by existing pump stations located along Muddy Creek (Figure A-2).

The 4.2-mile-long pipeline route from the Willamette River to Muddy Creek would farmed land, pass under Highway 99W and a railroad track, cross local roads, cross the Albany Channel, and cross the Unnamed Channel north of Winkle Lake (Figure A-5). The pipeline will be suspended from the existing privately-owned bridge across Albany Channel. There would be impacts to the Albany Channel bank or the streambed. The crossing of the Unnamed Channel will require a pipeline trench across the channel; however, the channel is normally dry or flow can be controlled from Winkle Lake. Appropriate legal easements to cross private or public lands will be obtained by GID prior to implementation of work.

The installation of the intake on the Willamette River will require minimal structural components. Figure A-9 shows a side view of the "slant retrievable intake and fish screen." The river bank will need to be sloped (material removed and fill provided) for a distance of 300 linear feet and stabilized with Class Size 100 riprap that will be 16 inches deep on top of a 4-inch thick filter layer (Figure A-7). The riprap is needed to provide stability and minimize erosion forces of the river. The 300 linear feet of bank protection is needed to minimize the potential impact of normal river eddies that may form under various flow conditions. A toe-trench will be needed to provide the stability for the riprap on the river bank. For support of the slant retrievable intake, five pairs of vertical support pilings will be needed. The pilings, approximately 6 inches in diameter, will be vibrated to a depth of approximately 10 feet into the river bottom, the river bank, or both.

The outfall structure on Winkle Lake will be a headwall in the dam with two 24-inch-diameter pipes that empty into the lake. Energy dissipation will be accomplished with a riprap apron as the water enters the lake pool (Figure A-11). For the outfall on Muddy Creek, a concrete structure will be built into the east bank to convey water to the creek after energy is dissipated (Figure A-12). Velocity of water from the pipe to the structure will be approximately 5 feet per second (ft/sec). Water will flow up a ramp, over a sill, and to an apron where the velocity will be about 2 ft/sec as it enters the creek as sheet flow from the apron.

Fish screens that meet Oregon Department of Fish and Wildlife (ODFW) and NMFS requirements to protect fish will be installed at the new POD on the Willamette River, the oxbow lakes, and Muddy Creek. For the oxbow lakes and Muddy Creek, fish screens for diversions are available from local suppliers and will be installed on existing intakes.

For the Willamette River intake diversion of up to 60 cfs of water, the fish screens will be installed on each of the slant retrievable intakes (Figures 9 and 10). This design will minimize facility infrastructure, such as the use of concrete for the intake

and therefore minimize impacts on the river. Each screen will be self-cleaning and about 60 inches in diameter by 66 inches long. The mesh will be a Wedge Wire "T" screen with a 0.068-inch slot width. The screens will be retrievable for maintenance and inspection. Design approach velocity is approximately 0.33 ft/sec.

Fill-and-removal requirements for the project are separated into five areas: at the intake on the Willamette River, at Unnamed Channel crossing, the pipeline outfall on Winkle Lake, the pipeline outfall on Muddy Creek, and the pipeline trench (Table 2-2). Total fill for the project will be 44,510 cubic yards (cy^3): the intake, outfalls, and the trench for the pipeline. The great majority of fill (43,200 cy^3) will be for the pipeline trench. The four other locations points comprise about 3 percent of the fill (Table 2-2).

No wetland will be filled for the intake and outfalls. Along the pipeline corridor, farmed wetland (2.14 acres) and forested wetland (0.008 acres) the excavated trench will be filled and the area restored after the pipeline is installed.

The areas of fill below ordinary high water will be at the Willamette intake (0.138 acres), Unnamed Channel crossing (0.008 acres), Winkle Lake outfall (0.002 acres), and Muddy Creek outfall (0.007 acres). (See Table 2-2.)

Total excavation for the project will be 37,500 cy^3 (Table 2-2). The majority is for the pipeline trench (34,600 cubic yards); this will be backfilled. At Willamette River intake, removal will be 2,200 cy^3; at Unnamed Channel crossing, 90 cy^3; at Winkle Lake outfall, 125 cy^3; and at Muddy Creek outfall, 485 cy^3.

The area of removal below ordinary high water at the Willamette River intake will be 0.138 acres; at Unnamed Channel crossing, 0.008 acres; at Winkle Lake outfall, 0.002 acres; and at Muddy Creek outfall, 0.007 acres.

Table 2-2. Amount of Fill and Excavation for GID Pipeline Project						
FILL	**Willamette Intake**	**Unnamed Channel**	**Winkle Lake Outfall**	**Muddy Creek Outfall**	**Pipe-line**	**Total Fill**
Native soil (cy^3)	None	90	100	200	34,600	34,990
Riprap (cy^3)	800	None	10	80	None	890
Size class of riprap:	100	N/A	50	50	N/A	
Trench bedding for pipeline (cy^3)	N/A	30	N/A	N/A	8,600	8,630
Fill impact (acres)	0.207	0.008	0.01	0.06	5.07	5.355
Fill area length in feet is:	300	50	30	25	22,100	
Fill area width (average) in feet is:	30	7	10	10	7	
Fill depth in feet is:	1.5	7	10	14	7	
Forested Wetland areas filled and restored (acres):	None	None	None	None	0.008	0.008
Forested Wetland fill (cy^3)	None	None	None	None	90.35	90.35
Farmed Wetland filled and restored (acres)	None	None	None	None	2.14	2.14
Farmed Wetland fill (cy^3)	None	None	None	None	24,167	24,167
Area filled below high water of stream (acres)	0.138	0.008	0.002	0.007	None	0.155
Vol. below ordinary high water (cy^3)	467	50	25	50	None	592
Total (includes Upland Fill)				44,510		
EXCAVATION (Removal)						
Total removal (cy^3)	2,200	90	125	485	34,600	37,500
Impact area (acres):	0.207	0.008	0.007	0.048	2.296	2.566
Length (feet)	300	50	30	85	22,100	
Avg. removal area width (feet)	30	7	10	11	7	
Removal depth (feet)	15	7	10	14	7	
Forest wetland excavated (acres)	None	None	None	None	0.008	0.008
Forested wetland excavated (cy^3)	None	None	None	None	90.35	90.35
Farmed wetland excavated (acres)	None	None	None	None	2.14	2.14
Farmed wetland removal (cy^3)	None	None	None	None	24,167	24,167
Area excavated below high water of stream (acres)	0.138	0.008	0.002	0.007	None	0.155
Volume below high water (cy^3)	677	50	25	50	None	802
Total (includes Upland Removal)				**37,500**		

2.3. ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER CONSIDERATION

GID considered several alternatives to using stored water from the Willamette River Basin Project to meet its water supply needs. These include development of groundwater supplies (a well), a new reservoir, new surface-flow water rights, and conservation of existing water supply. These alternatives are summarized below.

2.3.1. GROUNDWATER SUPPLIES

Under this alternative, GID would have continued diverting water in compliance with its existing water rights. The supplemental water supply would have been obtained by pumping groundwater on an as-needed basis. Historically, the groundwater resources in the GID area have been very limited; however, the area is not classified by OWRD as a Critical or Limited Groundwater Area. Greenberry I.D. members have attempted to install groundwater wells several times since 1956, and they have found that the aquifers have low, unsustainable yields. GID studies indicate that groundwater sources of the volume needed are not available in the vicinity of the project (Trimmer 2005b). Consultation with OWRD (Miller 2005) indicates that the feasibility of producing the required volume of water from groundwater resources will be low.

Therefore, this alternative has not been examined in detail due to prohibitive costs of well development, the number of wells required to obtain the additional water, the lack of an extensive groundwater supply, and the inability of this option to provide a long-term solution to GID's irrigation needs.

2.3.2. NEW DAMS OR OTHER WATER STORAGE FACILITIES

This alternative was not examined in detail due to the prohibitive costs of a "fatal flaw analysis" for dam or lake sites and the lack of a suitable location for a water storage facility. Overall, the costs and impacts associated with dam construction would far exceed those associated with the proposed additional water supply from the Willamette River storage.

2.3.3. NEW WATER RIGHT FOR NATURAL FLOW FROM WILLAMETTE

This alternative would have allowed additional long-term water diversion from the Willamette River to supplement existing natural flow water rights and storage contracts. According to OWRD (Ward 2005), this alternative is not a viable option because OWRD's Basin Plan does not allow new diversions of water for irrigation in

this section of the Willamette River. GID was advised to seek and rely on a Reclamation water-service contract as its source of additional irrigation water.

GID is currently operating in the fourth year of an OWRD five-year hardship permit with a possible extension of two years. This time horizon does not economically allow infrastructure construction or a long-term solution, but provides an appreciated short-term bridge, which can be partially utilized with existing infrastructure while seeking a Reclamation contract.

2.3.4. Conservation of Existing Irrigation Water Supply

This alternative would involve no new additional water rights or contracts. Existing GID water will be conserved in an attempt to meet demands. GID is concerned by the potential for an irrigation water supply shortage during drought conditions. Technological water conservation measures will do little to increase the water available to irrigators if the water is simply not available for diversion from the Willamette River.

The current delivery system consists of pumps that divert water from the Willamette River, the oxbow lakes, Muddy Creek, and/or groundwater. The water is conveyed for use on GID lands. Individual water users apply the water through sprinkler irrigation. Management practices employed by GID members are within common industry standards for scheduling, operation, and maintenance of the irrigation equipment. The GID system typically operates with a water use efficiency of better than 80 percent, which also is within common industry practices. While there are some conservation actions that could improve the overall irrigation efficiency (such as leak prevention), there are no upgrades in the existing conveyance and sprinkler equipment or improved system operating efficiencies that could result in a significant increase in available water supply. Even if the system were to operate at 100 percent efficiency, the amount of additional water obtained in this manner would be inadequate to meet GID needs.

2.3.5. New Point-of-Diversion for Intake

Relocating the intake of the Proposed Action on the Albany Channel rather than the Willamette River was considered. The proposed pipeline route crosses the Albany Channel, a side channel of the Willamette River. Preliminary surveying and engineering indicated this option would require moving approximately 3,500 cubic yards of material in the channel to open it for adequate flow (approximately 90 cfs) from the Willamette River. A long-term permit would be needed to ensure the ability to perform annual maintenance dredging at the Willamette River inlet to the Albany Channel; this would be necessary to keep the channel open in addition to the inlet-to-intake-pump location in the Albany Channel (approximately 1 mile). Initial discussions with biologists suggest there could be net positive benefits to providing flow to the Albany Channel, however GID decided not to pursue this option.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the existing environment of the project area and impacts associated with the Proposed Action. It is assumed for purposes of this report that the existing condition is the same as the No Action Alternative; therefore, the existing condition will provide a baseline to measure the effects on the environment of Greenberry I.D.'s Proposed Action. Affected Environment are described for twelve resources potentially affected. These resources are economics, hydrology, water quality, floodplains and wetlands, vegetation, fisheries, wildlife, threatened and endangered species, land use, historic and cultural resources, Indian Trust Assets, and environmental justice. The affected environment, impacts, and mitigation measures are described below for each resource.

Due to the nature of the proposed project and the fact that only one new diversion on the Willamette River, two outfall structures, and a pipeline will be needed, the project will have no significant impact on ten environmental parameters: climate, air quality, soils, geology, mineral resources, noise, topography, energy, aesthetics, or hazardous wastes. These items were considered but not analyzed in detail because they are not affected or changed as a result of this project.

3.1. ECONOMICS

3.1.1. AFFECTED ENVIRONMENT

Benton County, where the District is located, has a population of approximately 78,000. The underpinnings of the county's economy are Oregon State University, agriculture, and lumber and wood products manufacturing comprise (Oregon Blue Book 2004).

Within the GID, two large nurseries, fruit orchards, vineyards, and other row crop farms rely heavily upon irrigation water to support agricultural production. The crops produced by GID members either are used locally or exported.

In addition, Oregon is the largest producer of grass seed in the United States. There are about 1,500 grass-seed farmers in Oregon with most located in the Willamette Valley. Grass seed production is a primary crop in the Willamette Valley. Although Benton County is relatively small, its grass seed production accounted for approximately 6.9 percent of Oregon production in 2004 (Extension Economic Information Office data compiled by Extension Agronomist William C. Young III of the Oregon State University Department of Crop and Soil Science). Primary seed crops consists annual rye grass, perennial ryegrass, tall fescue, orchard grass, and

creeping bent grass. Exports of grass seed form a major portion of the market. For example, Oregon supplies about 65 percent of the grass seed imported by China for activities such as playing fields, fish food, and erosion-control projects to golf courses (Oregonian 2002).

3.1.2. ENVIRONMENTAL CONSEQUENCES

3.1.2.1. No Action Alternative

The No Action Alternative will limit members of the GID in their ability to compete in a rapidly changing global market. Irrigation decreases both economic and environmental risk, while increasing crop diversity and opportunity. The environment will not gain the benefits of reduced loading of less-toxic pesticides and other inputs that could be better controlled through irrigation practices. The community and economy in general will be deprived of the multiplier effect that additional economic activity at the production level will allow to ripple up through society.

3.1.2.2. Proposed Action

The Proposed Action would support continued agricultural production and probably support increased agricultural production in the GID area; this would accomplished by providing a supplemental water supply to 2,500 acres of land and a primary water supply to 3,800 acres of land. This in turn would provide net economic benefits to the area.

Additional ability to irrigate lands will allow production of current crops to be more efficient, as well as diversification into irrigated crop rotations. This flexibility to adapt to change in the global marketplace is invaluable. As markets for agricultural goods expand throughout the Pacific Rim, opportunities for growers without irrigation are limited to traditional commodities —mostly small grains and grass seed. Specialty and niche markets, with greater margins as we move up the value chain, are often confined to irrigated crops. With the aid of irrigation, new opportunities will open to GID growers, such as the higher value nursery and berry crops, and allow greater ability to grow certified organic crops as that market continues to expand (O'Brien 2005).

An increase in the gross personal income of GID members may occur as supplemental water supplies are used to produce more water intensive crops in response to market demand during non-drought years. The potential increase in gross personal income will occur without adverse impacts on community infrastructure. The increase in farm production will result in only marginal increases for services such as schools, domestic water or sewage, fire protection, road improvement, or other community support programs. This is because increases in employment opportunities will be marginal relative to the capacity of local social infrastructure.

Weed control continues to command a greater proportion of the agricultural production budget each year; there has been a decrease of open field burning of grass seed fields and increased use of pesticides to control weeds. Irrigation helps control weeds most importantly by breaking weed cycles through crop rotation, by the use of non-selective herbicides after sprouting weed seed with irrigation, and by mechanical control through tillage (O'Brien 2005). Supplemental water would support increased opportunities for weed control.

Production practices allowed by irrigation can be altered by irrigation to be more environmentally friendly, as well as result in lower production costs. For example, in traditional grass seed production, spring fertilizer application tends to be early, when rainfall is usually available to incorporate what is largely nitrogen. With the ability to irrigate, fertilizer application can be delayed when irrigation water is available as necessary to incorporate, lessening the chance of surface runoff from an early heavy spring rain carrying nitrogen into waterways (O'Brien 2005).

The proposed project will to some extent increase jobs in the community, both at the farm level and in value-added processing. This is because dry-land agriculture is largely commodity based. Grass seed and small grains harvested by combines on a large scale and receive minimal or no processing locally, but are shipped from the area for most processing. Irrigated agriculture supports a larger labor pool of many tiers of wage scales, from low skilled laborers to highly skilled management and sales people both on farm and in processing facilities. For example, north Willamette Valley nurseries may average one worker per acre with a range of skill levels. A grass seed farm may have about one full-time employee per 1,000 acres (O'Brien 2005).

The tax base will be expected to slightly increase from implementation of the proposed project. Irrigated land in GID is currently valued at between $3,200 and $4,000 per acre, while non-irrigated land is valued between $2,400 and $3,000 per acre. Further, with the increased productivity of irrigated land, investments in real and personal assets in the form of buildings, machinery, pipelines, and other facilities will be expected to occur (O'Brien 2005).

On a landscape basis, and in separate projects, the Proposed Action could provide the springboard for new life in the South Benton County area. Increased productivity will aid in insuring a vital rural economy, which provides open space as an alternative to the creep of sub-divisions that will overtake a marginal agricultural base, adding to the quality of life for all. Environmentally, existing infrastructure that now must be devoted to GID could also aid local environmental efforts in intergovernmental and agency agreements (O'Brien 2006).

3.2. HYDROLOGY

3.2.1. AFFECTED ENVIRONMENT

The rivers and streams potentially affected by the proposed action are the Willamette River and Muddy Creek. The oxbow lakes also will be affected by the addition of water during irrigation season.

Willamette River – The new water diversion site on the Willamette River is located at RM 144.1. The nearest streamflow gauging station is located at Harrisburg at near RM 161, about 17 miles upstream of the proposed diversion. At the gauging location, the drainage area is approximately 3,400 square miles. Stream flows at Harrisburg (Table 3-1) generally represent flow at the proposed diversion intake, however there are inflows from the Long Tom River, Flat Creek, and Hulbert Lake Slough on the west side of the Willamette River near Monroe, Oregon.

Monthly mean flows are highest in winter and spring months and lowest during summer months (**Table 3-1**). Flow variation primarily reflects precipitation and snowmelt but also releases from upstream reservoirs as well as other water demands, such as from industrial, municipal, and irrigation users.

Table 3-1. Monthly Mean Streamflow at Harrisburg, Willamette River, OR (1944-2004).

YEAR	Monthly Mean Streamflow (cfs)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	25,180	13,030	12,280	10,950	11,140	7,441	4,664	4,818	5,840	6,781	7,296	7,936
2001	4,777	4,692	5,155	8,444	8,646	4,679	3,267	3,795	4,320	5,018	8,794	24,230
2002	19,000	10,640	10,760	14,410	8,410	5,741	4,547	5,227	5,190	5,058	5,125	9,585
2003	18,780	14,390	17,730	16,189	8,763	6,133	4,676	4,730	4,655	4,092	5,181	22,970
2004	22,840	16,210	8,878	9,202	10,150	7,447	4,644	5,145	5,240			
Mean	21,150	16,880	14,220	12,170	11,030	7,860	4,796	4,789	5,607	7,130	13,960	21,040

Source: U.S. Geological Survey. Linn County, Oregon. Hydrologic Unit Code 17090003. Latitude 44°16'14", Longitude 123°10'21" NAD27. Drainage area 3,420.0 square miles. Gage datum 288.39 feet above sea level NGVD29

Muddy Creek –The Muddy Creek watershed is a relatively small, about 129 square miles. It is tributary to Marys River near its mouth at the Willamette River and is a slow, meandering valley creek with several tributaries (). Stream flow records for Muddy Creek are limited to years 1963 to 1968 (). Years 1963 to 1967 were drier than average while year 1968 was wetter than average (Trimmer 2006b). Stream flows are highest in winter and spring months and lowest during summer and fall months with flows below 4 cfs.

Table 3-2. Muddy Creek Watershed Area and Channel Lengths for Tributaries.		
Stream	**Area** (square miles)	**Channel Length** (miles)
North Muddy Creek	18.8	4.7
Evergreen Creek	7.4	4.5
Bull Run Creek	6.5	6.1
Beaver Creek	24.6	4.8
Middle Muddy Creek	15.1	23.0
Reese/Oliver Creeks	27.5	4.8
Grey Creek	5.9	2.6
Hammer Creek	15.3	1.9
South Muddy Creek	7.9	7.5
Total Muddy Creek and Sub-Basins	129.0	
Source: *Marys River Watershed Preliminary Assessment*, April, 1999.		

Table 3-3. Streamflow for Muddy Creek, Benton County, OR (1963-1968)												
YEAR	MONTHLY MEAN STREAMFLOW (ft^3/s)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1963										14.4	196	214
1964	964	252	376	102	56.8	30.5	11.1	4.41	3.6	6.93	84.6	1,205
1965	1,040	353	139	80.3	50.4	22.5	8.05	3.01	2.97	6.75	80.2	417
1966	1,041	260	679	122	43.9	19.4	8.52	1.41	3.99	9.09	61.8	512
1967	680	356	314	157	60.5	25.1	5.25	1.3	1.91	15.7	28.2	365
1968	390	870	289	108	59.2	30.9	9.24	8.49	16.1			
Mean	823	418	359	114	54.2	25.7	8.43	3.72	5.71	10.6	90.2	543
Source: U.S. Geological Survey (USGS) 14171500 "Muddy Creek near Corvallis, OR." Benton County, Oregon. Hydrologic Unit Code 17090003. Latitude 44 29'50", Longitude 123 19'45" NAD27. Drainage area 107.00 square miles. Gage datum 218.43 feet above sea level NGVD29.												

Marys River – Marys River drainage area is approximately 159 square miles above Bellfountain Road; this does not include Oak Creek drainage. Monthly mean streamflow in Marys River (above Bellfountain Road) is shown in . Depending on the month for streamflow statistics available, Muddy Creek contributes 15.5 to 74.9 percent of the flow in the Marys River. The flow from Oak Creek and areas downstream of Bellfountain Road will lower the percentage.

Oxbow Lakes – The oxbow lakes provide irrigation water to GID lands. Water in the lakes originates primarily from precipitation and groundwater inflow (Trimmer 2006a). Water can enter the various swales and side channels to reach the oxbow lakes during periods of flooding in the Willamette River and when water surface elevations exceed 251 mean sea level at the 100-year flood recurrence interval. Landowners have existing water rights for supply of irrigation water from the oxbow lakes. The existing pumps on the lakes draw down the lakes during

irrigation season. The lakes are lowest during fall months after irrigation season. Although the flows from the lakes are monitored to comply with water rights requirements, there are no gages on the lakes to describe water surface changes during seasonal changes.

Table 3-4. Monthly Mean Streamflow, Marys River, near Philomath, OR (2000-2004)

Year	Monthly Mean Streamflow (ft^3/s)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000										32.7	58.8	301
2001	191	219	224	228	125	62.0	28.2	18.2	13.1	28.8	408	1,499
2002	1,443	799	817	304	125	63.0	30.8	12.9	10.5	16.0	56.4	691
2003	836	739	947	593	216	71.3	29.7	14.0	16.3	25.4	132	908
2004	1,305	909	432	264	129	98.2	37.0	24.0	38.5			
Mean	1,193	1,041	782	456	217	93.5	35.7	17.9	19.9	68.5	457	1,054

Source: USGS 14171000 “Marys River near Philomath, OR.” Benton County, Oregon. Hydrologic Unit Code 17090003. Latitude 44°31'35", Longitude 123°20'00" NAD27. Drainage area 159 square miles. Gage datum 224.01 feet above sea level NGVD29.

Albany Channel and Unnamed Channel – The pipeline will cross the Albany Channel, but flows will not be affected. There is no measured hydrology information for the Albany Channel; however, the channel conveys approximately 50 to 100 cfs during summer and fall low flow months. For the Unnamed Channel north of Winkle Lake where the pipeline will cross, there is usually no natural flow during irrigation season.

3.2.2. Environmental Consequences

3.2.2.1. No Action Alternative

The No Action Alternative will not permit Reclamation to administer a contract to GID for irrigation use of stored water. The GID will continue to pursue new water supplies to meet its current and future needs but no hydrological changes to water bodies will occur from use of Willamette River Basin Project water.

3.2.2.2. Proposed Action

Impacts on the hydrology of the Willamette River Basin Project reservoirs, Willamette River, Muddy Creek, and Marys River were considered.

Willamette River – The contracted water will be diverted from the Willamette River using a new irrigation POD and conveyed via a new pipeline to existing conveyance systems. The change to the water surface levels of the reservoirs in the Willamette River Basin Project is not anticipated to be noticeable. The proposed project lies downstream of nine reservoirs in the Willamette River Basin Project and the contracted water could come from any one or several of the upstream reservoirs.

As a result of the proposed contract, up to a total of 7,500 acre-feet will be withdrawn from the reservoirs between May 1 and October 31, perhaps with a maximum rate of about 5,000 acre-feet in any one month. This is less than 1 percent of the 1.04 million acre-feet of usable summer conservation storage space in the nine upstream reservoirs that is available for joint use, which includes irrigation supply (ACOE 2001).

The ACOE controls the flow in the Willamette River to meet a flow target in Salem. The impact of this diversion will be to slightly increase the water flowing in the tributaries upstream of the POD and will slightly decrease water flowing downstream (Trimmer 2006b). In either case, the maximum change in flow rate (60 cfs) in the Willamette River and the upstream tributaries will be small (less than two percent); this is within the measurement error of the USGS gauging stations. The present fluctuation and seasonal drawdown of the reservoirs for flood control far exceed the proposed changes. Current management practices require the release of most of the stored water in the fall to provide reservoir space for flood control.

An increase in flow in the Willamette River will occur from reservoir release to meet the target flow in Salem. The increase in streamflow (up to 60 cfs) in the Willamette River will not significantly increase water surface elevations or velocities. During irrigation season (April through September), mean streamflows in the Willamette River vary from approximately 4,796 cfs to 12,170 cfs. A diversion of 60 cfs will reduce the Willamette River flow by 1.26 percent to 0.48 percent below the diversion, although the flow below the diversion would be reduced, ACOE would release sufficient flows to meet target flows at Salem. (See Table 3-1). Under the current proposal, the amount of additional water released from the storage reservoirs will be less than 1 percent of the mean monthly flow in the Willamette River between April and September.

Muddy Creek – The proposed action will supply up to 10 cfs to Muddy Creek at approximately RM 15 (1,500 feet north of Finley Road) during irrigation season (April through October). The additional flow into Muddy Creek will be removed from the creek at various locations during irrigation season where existing pumps are located (Figure A-2). Although the flows from the pipeline will, at times, potentially contribute a relatively large percentage of the flows to Muddy Creek (Table 3-3 and Table 3-5), the flows remaining in Muddy Creek will decrease as flows are pumped from the creek for irrigation. No flows will be released with the intent to provide flows to Marys River; however irrigation practices occasionally may allow minimal (less than 1 cfs) flows to reach the river.

The potential for return flows to Dry Creek and Muddy Creek was considered; however, based on the type of irrigation and water management (buried pipe infrastructure and low pressure sprinkler or drip irrigation technologies), return flows are not anticipated to be measurable. No measurable return flows are anticipated to occur to the Willamette River.

Table 3-5. Comparison of Monthly Streamflows in Muddy Creek with Estimated Monthly Flows from the Pipeline to Muddy Creek.												
Mean of monthly flows	Monthly Mean Streamflows (cfs)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Muddy Creek	823	418	359	114	54.2	25.7	8.43	3.72	5.71	10.6	90.2	543
from pipeline to Muddy Creek (est.))	0	0	0	5 to 10	5 to 10	5 to 10	5 to 10	5 to 10	5 to 10	5 to 10	0	0

Oxbow Lakes – Flows entering the oxbow lakes from the new diversion on the Willamette River will generally maintain the lakes at maximum levels during the early part of irrigation season. Historically, as irrigation season progressed, water flows tended to decrease. Water levels with the new diversion will be maintained at higher levels than presently exist during the dry season.

Albany Channel and Unnamed Channel – The Albany Channel will not be affected because the pipeline will be suspended from the existing privately-owned bridge. For the pipeline crossing at the Unnamed Channel north of Winkle Lake, no hydrology impacts will occur. The work will occur during the normal low flow months when the channel is dry.

3.3. WATER QUALITY

3.3.1. AFFECTED ENVIRONMENT

Willamette River – The Willamette River typically has fast-moving currents in this reach, and the riverbed is composed of cobble and gravel. Water quality is primarily influenced by agriculture although municipal and industrial point sources and urban non-point sources contribute as well. The Oregon Department of Environmental Quality (ODEQ) administers water quality. Its "Oregon Water Quality Index" (Mrazik 2006) rates as "Excellent" the Willamette River about 20 miles upstream at Harrisburg (RM 161.2) and in the "Good" category about 5 miles downstream at Corvallis (RM 131.4) .

Although water quality is "good to excellent", impaired water quality parameters on the ODEQ "303(d)" database for 2002 for the Harrisburg location are water temperature, fecal coliform, dissolved oxygen (DO), and mercury. The EPA approved the Willamette Basin "TMDL" (total maximum daily load) in September 2006 for temperature, bacteria, and mercury. In addition, this section of the Willamette River is on the 303(d) list for E. coli, iron, and manganese. The dissolved oxygen is seasonal (October 15-May 15).

Muddy Creek – ODEQ does not include Muddy Creek in the Water Quality Index program, and there is only limited water quality data for Muddy Creek. In general, Muddy Creek is influenced by agricultural runoff and erosion during winter

freshets. Previous water quality sampling in the early to mid 1970s reported dissolved oxygen levels below saturation (ODEQ 2005). In the mid-1990s, DO levels were reported below 8 mg/l and saturation of dissolved oxygen at 26 to 66 percent (MRWC 1999).

Albany Channel and Unnamed Channel – The pipeline will cross the Albany Channel and Unnamed Channel. The Albany Channel has flows estimated between 50 to 100 cfs during irrigation season. The Unnamed Channel has intermittent flow from Winkle Lake. There is no water quality information for these channels; however, the water quality of the Albany Channel should be similar to its Willamette River source.

3.3.2. ENVIRONMENTAL CONSEQUENCES

3.3.2.1. No Action Alternative

The No Action Alternative will not result in changes or improvements in water quality in the Willamette River, Muddy Creek, the oxbow lakes, Albany Channel, or the Unnamed Channel.

3.3.2.2. Proposed Action

Willamette River – Only minimal and short-term adverse impacts are expected to occur for the toe trench, placement of riprap in the water, and removal of shoreline earth for sloping (for placement of riprap and the irrigation intake). Installation of five pairs of vertical support pilings approximately 6 inches in diameter will occur by vibration, and minimal increase in turbidity is expected to occur. Reclamation is concerned that although turbidity is a good indication of disturbance, there should also be consideration given to the disturbance of suspended sediments since mercury is an issue in this stretch of river which can attach to multiple substrates.

Muddy Creek – Water quality of Muddy Creek will be minimally degraded by construction of the outfall structure on the east side of the creek. The construction area will be isolated and minimal short-term sedimentation and turbidity in the local area may occur during placement and removal of isolation structures.

The water quality of Muddy Creek likely will be improved, at least temporarily by the addition of between 5 and 10 cfs via a new pipeline from the Willamette River. Cooler water of generally better quality will be available in the creek for approximately 6 miles; however, the benefits will be minimal and quickly disappear as the water is removed by irrigation pumps along the Muddy Creek mainstem. Reclamation has concerns because, according to available information, there is no indication that the water quality (including temperature) of the Willamette River at the POD is better quality or equal to than that in Muddy Creek. There should be concern with introducing Willamette River waters multiple parameters on the

303(d) list (including mercury and bacteria) to an area with only one issue on the 303(d) list. Muddy Creek levels of mercury and bacteria may increase due to the introduction from water from the Willamette River.

Irrigation return flows to the Willamette River via Dry Creek or to Muddy Creek are not expected to be measurable. GID operates irrigation withdrawals to avoid or minimize return flows because of the cost to pump the water. In addition, sprinkler irrigation is the application method for irrigation water; flood irrigation is not practiced.

Oxbow Lakes – Adverse impacts on water quality of the oxbow lakes are not anticipated; however, improvements to water quality may occur since flows will be provided to the lakes during irrigation season.

Albany Channel and Unnamed Channel – Water quality of the Albany Channel will not be affected by the pipeline crossing. The pipeline will be attached to the existing bridge that crosses the channel. No work will occur below the ordinary high water elevation. The one crossing of the Unnamed Channel north of Winkle Lake will occur during low water when the channel is normally dry or not flowing. No impacts on water quality in the channel are anticipated. The crossing will be restored with native material removed during construction to minimize erosion during irrigation season.

3.3.3. MITIGATION MEASURES

- GID will maintain the current erosion control structures in place near the oxbow lakes to avoid unnecessary erosion which will otherwise result in sediment discharges.
- Construction in the Albany Channel will be avoided by attaching the pipeline to the existing bridge. No work below ordinary high water will be required.
- GID will apply erosion control measures during construction, maintenance, or improvement projects associated with the pipeline right-of-way to avoid or minimize loss of soil. These measures will include erosion control silt curtains and hay or straw bales, as appropriate.
- GID will provide some water quality monitoring especially on Muddy Creek before and after the placement of the pipeline. This will help ensure the introduction of waters from the Willamette River does not affect Muddy Creek adversely.

3.4. FLOODPLAINS AND WETLANDS

3.4.1. AFFECTED ENVIRONMENT

Two types of regulated wetlands exist within the project area; wetlands identified using the *1987 Corps of Engineers Wetland Delineation Manual*, and the agricultural wetlands identified using the *1985 Food Security Act (FSA) Manual*. The FSA manual is utilized in areas that have been in continual agricultural use prior to and since 1985. The ACOE manual is utilized in areas that are not in agricultural use.

A wetland delineation was performed from the Willamette River to Muddy Creek, and included the areas where the intake, outfalls, and pipeline are proposed (Craven 2005). The delineation identified primarily Farmed Wetland, a small area of Forested Wetland, and upland along the pipeline route.

3.4.2. ENVIRONMENTAL CONSEQUENCES

3.4.2.1. No Action Alternative

The No Action Alternative will not affect floodplains and wetlands.

3.4.2.2. Proposed Action

Minimal impacts of the proposed action on floodplains and wetland are anticipated. The removal of water from the Willamette River Basin Project will be minimal and not lessen the acreage of floodplains or wetlands surrounding the reservoirs. The reservoir water surface levels cycle seasonally with average capacity reached in mid-June and drawdown levels reached in mid-January. The dramatic water surface level fluctuations caused by flood control, hydropower, and fisheries enhancement will mask the loss of water delivered to GID. The contracted water constitutes an imperceptible amount compared to average drawdown reservoir levels.

Increased water in the GID will cause no changes to floodplains or wetlands. The typically incised stream banks and riparian area near the oxbow lakes will keep any increased flows in the stream channel or the lakes.

No wetland areas were identified at the intake on the Willamette River or at the outfall locations on Winkle Lake and Muddy Creek. Wetland areas along the proposed pipeline corridor will either be avoided or temporarily affected by construction of the trench for installation of the pipeline. There will not be a net loss of wetlands as a result of the project. A permit application and wetland delineation report will be submitted to the ACOE and Oregon Department of State Lands (DSL).

3.5. VEGETATION

3.5.1. AFFECTED ENVIRONMENT

The plants in the project area consist mostly of grass seed crops except in riparian areas. These deciduous forest and scrub-shrub communities are both upland and wetland depending on specific topographic situations. Areas that are not annually planted with grass seed crops consist primarily of riparian vegetation. The tree species include Oregon White Oak (*Quercus garryana*), Oregon ash (*Fraxinus latifolia*), black cottonwood (*Populus balsamifera*), red alder (*Alnus rubra)*, and a few Douglas-fir (*Pseudotsuga menziesii*). The lower canopy and shrub layer consists of cascara (*Rhamnus purshiana*), hawthorn (*Crataegus monogyna, C. douglasii*), snowberry (*Symphoricarpos albus*), willow (*Salix* sp.), Himalayan blackberry (*Rubus discolor*), and trailing blackberry (*Rubus ursinus*). The herbaceous species include teasel (*Dipsacus sylvestris*), reed canarygrass (*Phalaris arundinacea*), tall fescue (*Festuca arundinacea*), Queen Anne's lace (*Daucus carota*), ryegrass (*Lolium* sp.), and chicory (*Cichorium intybus*).

3.5.2. ENVIRONMENTAL CONSEQUENCES

3.5.2.1. No Action Alternative

The No Action Alternative will not affect vegetation.

3.5.2.2. Proposed Action

Installation of the new diversion on the Willamette River will require minimal vegetation removal. There are no trees in the diversion location; some riparian grasses will be removed during site preparation. These alterations will be permanent.

The pipeline will be buried and only require temporary impacts on fields which comprise 95 percent of the proposed pipeline route. The remaining 5 percent of the proposed irrigation pipeline route consists of forested areas between fields or roadside areas beside private or public rights-of-way. An approximately 25-foot-wide corridor will be cleared to excavate the pipeline trench in agricultural fields. The trench will be back-filled and restored by replanting areas with the appropriate crop or native species.

Two channels will be crossed by the pipeline route. The Albany Channel will be spanned by attaching the pipeline to the existing bridge; minimal impacts on agricultural vegetation and no impact on riparian vegetation are expected. Unnamed Channel is normally dry and will be crossed, but there is no riparian vegetation; minimal impacts are expected.

The outfall structure on Muddy Creek will require minimal removal of vegetation along the east side of the creek to accommodate a work area

approximately 100 feet long. This will result in a loss of riparian vegetation in this area. Vegetation will be restored by planting native species adjacent to the outfall structure.

3.5.3. MITIGATION MEASURES

- Most of the pipeline route will only be affected by temporary impacts to bury an irrigation pipeline. These areas will be restored to their original condition of ryegrass fields or riparian vegetation.

3.6. FISH AND WILDLIFE

3.6.1. AFFECTED ENVIRONMENT

Fish species present in the Willamette River and Muddy Creek include both anadromous and non-anadromous species (Table 3-6). Section 3.7 discusses species listed as "Threatened" or "Endangered" under the ESA.

Species likely to be present are those found in Muddy Creek and the Willamette River. No fish surveys have been reported for the oxbow lakes that are privately owned. No reports of any salmonids have been recorded (Mamoyac 2001). Although anadromous fish may occur in the oxbow lakes when the Willamette River floods these areas, elevated water temperatures, inadequate cover, and lack of connectivity will limit salmonid use of these lakes.

Table 3-6. Fish Species Found at Finley NWR and Potentially at the Project Area (Not Listed under ESA).

Common Name	Scientific Name	Common Name	Scientific Name
Redside Shiner	*Richardsonius balteutus*	Northern Pikeminnow	*Ptychocheilus oregonensis*
Speckled Dace	*Rhinichthys osculus*	Mosquitofish	*Gambusia affinis*
Carp	*Cyprinus carpio*	Brown Bullhead	*Ictalurus nebulosus*
Bluegill	*Lepomis marcrochirus*	Yellow Bullhead	*Ictalurus natalis*
Sculpin	*Cottus spp.*	Three-spined Stickleback	*Gasterosteus aculeatus*
Black Crappie	*Pomoxis nigromaculatus*	Peamouth	*Mylocheilus caurinus*
White Crappie	*Pomoxis annularis*	Largemouth Bass	*Micropterus salmoides*

Source: Mamoyac 2001.

Wildlife species present in the vicinity of the project include furbearers, birds of prey, waterfowl, and big game (Table 3-7). The lands in Greenberry I.D. provide forage for these species as well as living space.

3.6.2. ENVIRONMENTAL CONSEQUENCES

3.6.2.1. No Action Alternative

The No Action Alternative will not affect fish and wildlife species or their habitat in the vicinity.

3.6.2.2. Proposed Action

During construction, fish will be temporarily affected along an approximately 300-foot stretch of the Willamette River shoreline (for the diversion intake) and a 100-foot linear section of Muddy Creek (for the pipeline outfall). Construction sites will be isolated, as feasible, to minimize turbidity and sedimentation of downstream areas. Minimal impact on fish is expected to occur in the Willamette River or Muddy Creek.

The Willamette River in the vicinity of the intake is fast-flowing water with no rearing habitat or refugia. A construction-isolation barrier is not proposed as it likely will cause additional impacts. Fish in the vicinity of the intake area can easily move from the area or avoid it. The Muddy Creek outfall will be isolated during construction with either sand bags or similar structures. In the event that the isolated construction area needs to be pumped to remove water, a pump and fish screen that meets the ODFW and NMFS screen criteria will be used. Permits will be secured from the ODFW for any fish salvage operations.

Adverse Impacts on fish in Winkle Lake are not expected to occur during construction and operation of the outfall. The addition of water from the Willamette River likely will be a beneficial effect on fish in the lake, especially during summer and fall months when the water levels in the lakes will be maintained at higher-than-usual levels with the additional water. No impacts are expected on Unnamed Channel north of Winkle Lake where the pipeline will cross. Construction will occur when the channel is dry, and the channel will be restored after construction.

Operation of the diversion intake will require fish protection screens to prevent fish from entering the irrigation system. The retrievable slant intake with a “T” screen approved by ODFW and NMFS will be installed. The outfall structure on Muddy Creek will be designed to avoid or minimize impacts on fish. The design also minimizes turbidity and erosion of the shoreline. Permit applications will be submitted to the ACOE and the DSL for the intake and outfall structures.

Wildlife resources in the area will not be adversely affected as a result of the proposed action. Minimal disturbance to native vegetation and habitat types at the Willamette River diversion intake, pipelines, and Winkle Lake and Muddy Creek outfall structures are anticipated. As a result of the proposed action, GID members will be able to continue agricultural production of row crops during drought years, which will maintain existing forage opportunities for wildlife.

Significant shifts in cropping practices, resulting in conversion of pasturelands to row crops, are not anticipated at this time. Although there are no plans to change the types of crops produced, it is feasible some row crops may be replaced by more water-intensive crops (i.e., mint) during non-drought years, if market demand dictates.

An increase in flow levels in Muddy Creek during drought years may improve water quality conditions, which in turn will improve forage conditions for waterfowl and non-game species.

Table 3-7. Partial list of wildlife species found at Finley NWR and potentially at the Project Area (not listed under ESA).

	Species Name		Species Name	
	Common	Scientific	Common	Scientific
Fur-bearers	Common Opossum	*Didelphis virginiana*	Western Grey Squirrel	*Sciurus griseus*
	Coyote	*Canis latrans*	Feral Nutria	*Myocastor coypus*
	Beaver	*Castor canadensis*	Weasel	*Mustela frenata*
	Mink	*Mustela vison*	Martin	*Martes americana*
	Muskrat	*Ondatra zibethicus*	Raccoon	*Procyon lotor*
	River Otter	*Lontra canadensis*	Bobcat	*Lynx rufus*
Birds of Prey	Osprey	*Pandion haliaetus carolinensis*	Northern Flicker	*Colaptes auratus*
	American Kestrel	*Falco sparverius*	Morning Dove	*Zenaida macroura*
	Rough-legged Hawk	*Buteo lagopus*	Great Blue Heron	*Ardea herodias*
	Turkey Vulture	*Cathartes aura*	Common Snipe	*Gallinago gallinago*
	Red-Tailed Hawk	*Buteo jamaicensis*	Least Sandpiper	*Calidris minutilla*
	Northern Harrier	*Circus cyaneus*	Great Egret	*Ardea alba*
	Great-Horned Owl	*Bubo virginianus*	Green-backed Heron	*Butorides virescens*
	Short-Eared Owl	*Asio flammeus*	Belted Kingfisher	*Ceryle alcyon*
	N. Saw-Whet Owl	*Aegolius acadicus*	California Quail	*Callipepla californica*
Wate-rfowl	Mallard Duck	*Anas platyrhynchos*	Canada Goose	*Branta canadensis*
	Northern Pintail	*Anas acuta*	Canvasback	*Aythya valisineria*
	Wood Duck	*Aix sponsa*	Northern Shoveler	*Anas clypeata*
	Merganser	*Lophodytes cucullatus*	American Widgeon	*Anas americana*
	Green-winged Teal	*Anas crecca*	Gadwall	*Anas strepera*
Big game	Blacktail Deer	*Odocoileus hemionus*	Roosevelt Elk	*Cervus elaphus*

Source: Beall 2001

3.7. THREATENED AND ENDANGERED SPECIES

On January 25, 2006, GID requested a list of threatened, endangered, and candidate species occurring in Benton County. FWS provided a response on January 26, 2006 (Appendix B). Thirteen threatened or endangered ESA species potentially occur in the area of the Proposed Action. The listed species include five plant species, one invertebrate species, four fish species, and three wildlife species (Table 3-8).

Table 3-8. Threatened and Endangered Species of Vegetation, Wildlife, and Fish Protected under the Endangered Species Act and the Magnuson-Stevens Act.

Common Name	Scientific Name	ESU	Fed. Status*	Critical Habitat Designated	EFH designated
Chinook Salmon	*Oncorhynchus tshawytscha*	U.W.R.	T	Yes	Yes
Steelhead	*Oncorhynchus mykiss*	U.W.R.	T	Yes	No
Coho Salmon	*Oncorhynchus Kisutch*	O.C.	N/W	No	No
Oregon Chub	*Oregonichthys crameri*	N/A	E	No	N/A
Bald Eagle	*Haliaeetus leucocephalus*	N/A	T	No	N/A
Marbled Murrelet	*Brachyramphus marmoratus*	N/A	T	Yes	N/A
Northern Spotted Owl	*Strix occidentalis caurina*	N/A	T	Yes	N/A
Fenders Blue Butterfly	*Icaricia icarioides fenderi*	N/A	E	No	N/A
Bradshaw's Lomatium	*Lomatium bradshawii*	N/A	E	No	N/A
Howellia	*Howellia aquatili*	N/A	T	No	N/A
Nelson's Checker-Mallow	*Sidalcea nelsoniana*	N/A	T	No	N/A
Willamette Daisy	*Erigeron decumbens var decumbens*	N/A	E	No	N/A
Kincaid's Lupine	*Kincaidii sulphureus var kincaidii*	N/A	T	No	N/A
Golden Indian paintbrush	*Castilleja levisecta*	N/A	T	No	N/A

* T= Threatened; E = Endangered; N/A = not applicable; U.W.R. = Upper Willamette River ; O.C. = Oregon Coast; N/W = Not Warranted

3.7.1. VEGETATION

3.7.1.1. Affected Environment

Listed threatened and endangered plant species known to occur in the vicinity of the GID as defined by FWS correspondence letter include Willamette Daisy (*Erigeron decumbens* var. *decumbens*), Howellia (*Howellia aquatilis*), Bradshaw's lomatium (*Lomatium bradshawii*), Kincaid's lupine (*Lupinus sulphureus* var. *kincaidii*), Nelson's checkermallow (*Sidalcea nelsoniana*), and golden Indian paintbrush (*Castilleja levisecta).*

The regularly plowed and seeded ryegrass fields do not provide conditions conducive to the propagation of these species. A plant survey was conducted during 2005 and 2006 to determine the presence of threatened and endangered plants at the

intake on the Willamette River, on the pipeline route, and at the Winkle Lake and Muddy Creek outfalls (Craven 2006a; Craven 2006b). Field surveys were conducted during appropriate blooming periods in 2005 and 2006. No listed species were found during the surveys. One species, Golden Indian paintbrush, apparently does not naturally occur in Oregon, and only planted populations of this species are present on the Finley NWR (Beall 2006).

3.7.1.2. Environmental Consequences

3.7.1.2.1. No Action Alternative

The No Action Alternative will not affect threatened and endangered plant species.

3.7.1.2.2. Proposed Action

No federally listed threatened or endangered plant species were documented along the pipeline right-of-way, at the diversion site on the Willamette River, or at the outfall sites at Winkle Lake and Muddy Creek (CCG 2006a; CCG 2006b). Based on the surveys and the type of habitat present, Reclamation concludes that the Proposed Action will have "no effect" on these plant species.

3.7.2. WILDLIFE

3.7.2.1. Affected Environment

Species of wildlife protected under the ESA were provided in a letter from FWS in January, 2006 (Appendix B). The following species were listed and protected under the ESA:

Marbled Murrelet – The habitat of the murrelet is coastal areas and old growth forests. The area of the Proposed Action consists primarily of open agricultural fields and does not provide habitat generally conducive to murrelets. According to FWS (Beall 2006a), no suitable habitat for marbled murrelets is present in the GID project area.

Northern Spotted Owl – Northern spotted owl concentrate their foraging and roosting activities in old growth coniferous forest; however, they also are known to use mixed age stands as well as young-aged timber stands (FR 1990). The project area consists primarily of open agricultural fields and does not provide habitat generally conducive to northern spotted owl. According to FWS (Beall 2006a), no suitable habitat for northern spotted owl is present in the GID project area.

Bald Eagle –The closest bald eagle nest is found near the Finley NWR (Isaacs and Anthony, 2004). According to FWS (Beall 2006a), the nest was listed as a possible breeding failure in 2002 and 2003. There was no evidence of eggs or young for these years. In 2004, it was listed as occupied, but the outcome for eggs or young

was unknown. The nest also was not occupied in 2001 (Beall 2001). The riparian areas lack large nesting trees and are highly encroached and degraded. Although the area contains sufficient anadromous and resident fish to provide a forage base for wintering eagles, lack of forage perch trees combined with the existing high level of disturbance make it unlikely that eagles will forage in the immediate project area.

Fender's Blue Butterfly – Fender's blue butterfly inhabit native grasslands of the Willamette Valley. The butterflies are typically found in native upland prairies. Dry, fescue prairies make up the majority of habitat for Fender's blue butterfly. In the Willamette Valley, the butterfly is found in association with Kincaid's Lupine. As discussed above, Kincaid's lupine was not found in the plant survey of the corridor and is found only in Yamhill, Polk, Benton, and Lane Counties (FR 1998).

3.7.2.2. Environmental Consequences

3.7.2.2.1. No Action Alternative

The No Action Alternative will not affect threatened and endangered wildlife species.

3.7.2.2.2. Proposed Action

Marbled Murrelet and Northern Spotted Owl – Reclamation concluded that because habitat for murrelet and spotted owl is minimal in the agricultural fields of the Willamette Valley, the Proposed Action will have "no effect" on these species or their Critical Habitat.

Bald Eagle – The nest, which is located near Muddy Creek, is currently not occupied (Beall 2001). Because construction will occur more than 2 miles from any nest location and outside line-of-sight, activities should not disturb eagles at the nearest nest sight if the nest should become occupied. Construction timing (summer months) will further minimize impacts on wintering or breeding eagles. Similarly, eagle prey species should not be affected by the proposed project.

Reclamation concluded that the Proposed Action will have "no effect" on the bald eagle because this species is not known to inhabit or frequent lands designated for irrigation by the project.

Fender's Blue Butterfly – The butterfly's host plant, Kincaid's Lupine, was not found in or near the project area (CCG 2006a; CCG 2006b). Because no Fender's blue butterfly habitat exists and no populations of Kincaid's Lupine are known to exist along the corridor, Reclamation concluded that the Proposed Action will have "no effect" on the Fender's blue butterfly.

3.7.3. FISH

3.7.3.1. Affected Environment

Fish protected under the ESA in the Willamette River and Muddy Creek drainage are enumerated in Table 3-8. In addition, coho and Chinook are protected under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The MSA mandates an analysis of the Proposed Action "essential fish habitat" (EFH) for Chinook, coho, and pink salmon. Freshwater EFH includes all streams, lakes, ponds, wetlands, and other water bodies currently, or historically used by salmon, and necessary to provide habitat for spawning, breeding, feeding, or growth to maturity. Pink salmon are not found in the project area; however coho and Chinook are present.

Steelhead –Migrating to spawning grounds and hatcheries, adult summer and winter steelhead are found year-round in the Willamette River. During spring and early summer, juveniles (smolts) migrate downstream on their way to the ocean. Summer steelhead are not included in the Evolutionarily Significant Units (ESU) for this species, however winter steelhead are included. Summer steelhead are not native to the Upper Willamette River Basin. Upstream winter steelhead migration in the Willamette River is known to stop where the Calapooia River enters the Willamette River (near RM 120). Subsequently, the Upper Willamette River steelhead ESU stops at the Calapooia River confluence with the Willamette River (FR 1999). The diversion intake is approximately 20 miles south (upstream) from the Calapooia River, and adult or juvenile winter steelhead are not likely to be present at this location.

Chinook Salmon – Fall Chinook salmon are not native to the Willamette River Basin and are not included in the Upper Willamette River Chinook salmon ESU. They are not protected under ESA (FR 1999b). Adult spring Chinook salmon are within the ESU and are protected under the MSA. They migrate from late winter to early spring upstream past the project area to spawning grounds. During spring, juveniles migrate downstream on their way to the ocean or rear in the river and tributary streams. The project area does not provide spawning or rearing habitat in the vicinity of the diversion intake on the Willamette River, and habitat is not present in the vicinity of the pipeline outfall on Muddy Creek. In addition, according to ODFW (Mamoyac 2005), although no adult Chinook use Muddy Creek, there is a seasonal movement of smolts from the Willamette River to Muddy Creek.

Oregon Chub – Oregon chub are typically found in warm, shallow backwater slough areas. Extirpation of Oregon chub in the mainstem Willamette River likely was caused by habitat loss and introduced warmwater fish. Known established populations of the Oregon chub in the Willamette River are restricted to an 18.6-mile stretch of the Middle Fork Willamette River in the vicinity of Dexter and Lookout Point Reservoirs in Lane County, Oregon (FR 1993). Muddy Creek drainage, however, contains Oregon chub (Mamoyac 2005), but they are not found in the mainstem of Muddy Creek (Scheerer 2005).

Coho Salmon – Coho salmon are located in the vicinity of the project, but the ESU for this species does not extend to the project area. The ESU for Oregon Coastal Coho salmon does not include the Willamette River (FR 2004) and listing of this species under the ESA was "Not Warranted" (FR 2006). Also, the Lower Columbia River ESU includes the Willamette River only to Willamette Falls (FR 2004), approximately 100 miles downstream of the proposed project. Although Coho are not protected under ESA, they are protected under MSA.

3.7.3.2. Environmental Consequences

3.7.3.2.1. No Action Alternative

The No Action Alternative will not affect threatened or endangered fish species.

3.7.3.2.2. Proposed Action

A biological assessment (BA) evaluates the impacts of the project on Chinook and coho salmon, steelhead, and Oregon chub (CCG 2006c). The project "may affect, but not likely to adversely affect" Oregon chub because this species is not considered to be present in the mainstem Willamette River within the area of the proposed pump station, and are not known to be present in Muddy Creek. FWS concurred with this conclusion on August 29, 2006 (Appendix B).

The project facilities at the Willamette River diversion "may affect, and are likely to adversely affect" spring Chinook. Although this area is not a spawning or rearing area for Chinook, some potential, though minimal impact may occur during construction. The adverse effects may occur during removal of river bottom and shoreline, excavation for a toe trench on the west bank, and placement of riprap in the toe trench and on the bank. These effects will be minor and temporary and occur only during the construction period. The construction period will occur during the ODFW designated in-water work period (June 1-September 30 for the Willamette River; July 1-September 30 for Muddy Creek). For MSA, because of the measures taken to minimize impacts at the intake during construction and avoid or minimize impacts during operation with installation of a fish screen, the project will have no adverse impact on EFH or Critical Habitat. The NMFS is presently reviewing the BA.

The project will have "no effect" on steelhead. The project area is approximately 20 miles upstream of the boundary the Upper Willamette River steelhead ESU.

The Oregon Coast Coho ESU does not include the Upper Willamette River (FR 2004), and the threatened status for this species was "Not Warranted" (FR 2006). Under the MSA, because of the measures taken to minimize impacts at the intake during construction (in-water work during the ODFW designated in-water work period) to avoid or minimize impacts

during operation with installation of a fish screen, the project will have no adverse impact on EFH. NMFS is presently reviewing the BA for effects on coho EFH.

3.7.3.3. Mitigation Measures

Greenberry I.D. will implement several mitigation measures to prevent or minimize impacts on listed species of fish as required by the NOAA Biological Opinion. Specifically, the District has designed an intake structure that minimizes construction in the Willamette River. The retrievable slant intake system with a "T" screen will be supported by five pairs of pilings that will be vibrated into the river substrate or riverbank. In addition, the "T" screen will meet ODFW and NMFS criteria for fish protection. Other intakes for smaller diversions on the oxbow lakes and Muddy Creek also will be screened to ODFW criteria. The outfall structure on Muddy Creek will be parallel to the bank line and will not extend into the creek to any significant distance. In addition, the outfall will have an energy dissipater to prevent erosion in the creek. Construction will occur during the ODFW-designated in-water work period.

3.8. VISUAL RESOURCES

3.8.1. AFFECTED ENVIRONMENT

Visual Resources along the Willamette River in the vicinity of the proposed diversion intake are generally excellent because the surrounding area is agricultural lands with no noticeable development from the river level; however, there is virtually no stabilizing overstory vegetation along the riparian corridor of the west bank. The Willamette River has meandered throughout this area over the years, and the west bank of the river is actively eroding downstream of the intake area. Measures have been implemented to stabilize this area of the river (Trimmer 2005a).

The visual resources along the riparian area of Muddy Creek are excellent with thick riparian growth along the creek. In the vicinity of the outfall for the irrigation pipe on Muddy Creek, the upland area has been cleared previously.

3.8.2. ENVIRONMENTAL CONSEQUENCES

3.8.2.1. No Action Alternative

The No Action Alternative will not affect Visual Resources of the area.

3.8.2.2. Proposed Action

There will be minimal impacts on the Visual Resources at the proposed diversion intake and the outfall on Muddy Creek. The presence of a pump intake and

riprap on the Willamette River initially will detract slightly from the visual resources at the river level. This is because the structure will not blend into the background given the absence of riparian vegetation due to extensive erosion of the sloughing bank. The presence of the riprap will allow riparian plantings that may stabilize this area of the river and promote establishment of a vegetated riparian corridor along the bankline. The outfall structure on Muddy Creek is along a corridor that will be infrequently visited by the public. The structure will generally blend into the background of the riparian vegetation that presently exists at the outfall site.

3.8.3. MITIGATION MEASURES

- Mitigation measures are proposed to attempt to allow the diversion intake to appear to be a more natural setting on the river. A planting plan consisting of native vegetation of the area will be implemented 200 feet upstream and 300 feet downstream to provide understory and overstory vegetation an opportunity to get established along the river bank. In addition, a planting plan will be developed for the riprap bank to promote growth of native species of riparian vegetation. the Muddy Creek bankline will be restored with native species on either side of the outfall structure.

3.9. RECREATION

3.9.1. AFFECTED ENVIRONMENT

The Willamette River provides opportunities for fishing and hunting activities along the waterway. Public access to private farm lands is limited. Public recreational values are mainly restricted to observations from rights-of-way within the project area. Virtually all land is privately owned. Some private recreational opportunities exist from fishing, hunting, or both on the private lands and waterways.

3.9.2. ENVIRONMENTAL CONSEQUENCES

3.9.2.1. No Action Alternative

The No Action Alternative will not result in changes to recreational opportunities.

3.9.2.2. Proposed Action

No impacts have been identified. The diversion of 60 cfs of water from the Willamette River will not be a measurable impact on flows or recreation. The inflow of up to 10 cfs to Muddy Creek will not provide a benefit to fishing or waterway use.

3.10. LAND USE

3.10.1. AFFECTED ENVIRONMENT

The Benton County Comprehensive Plan map designates the project area under several zoning designations, including Exclusive Farm Use, Agricultural Industrial, Commercial, and Rural Residential. The majority of the project area is used exclusively for farming. The land use code limits or prohibits development in the exclusive farm district in an effort to maximize the potential agricultural productivity.

3.10.2. ENVIRONMENTAL CONSEQUENCES

3.10.2.1. No Action Alternative

The No Action Alternative will not result in changes to local land use patterns.

3.10.2.2. Proposed Action

Land-use designations will not change as a result of the proposed project. Water availability will allow the production of agricultural commodities to continue, as well as provide an opportunity to produce higher value crops in the future that typically require irrigation. No impact on undeveloped land within the GID will occur as the result of the proposed action.

3.11. HISTORIC PROPERTIES

3.11.1. AFFECTED ENVIRONMENT

In 2005 and 2006, GID contracted for investigations to comply with the requirements of Section 106 of the National Historic Preservation Act (NHPA). In July 2005, a file search of Oregon State Historical Preservation Office (SHPO) records indicated no prior surveys had occurred and no historic properties had been previously identified in or near the proposed pipeline corridor.

A pedestrian survey was completed of the 4.2-mile-long pipeline corridor between July 20 and August 23, 2005 (CCG 2006d). During the survey, shovel test probes were excavated in locations with poor surface visibility and with a high probability for archeological sites. Three archeological sites were identified; they were then designated as 35BE106, 35BE107, and 35BE108. All three sites are lithic scatters located near old meander channels of the Long Tom River or Albany Channel. Site 35BE108 was visible on the surface in plowed fields, while the other two were buried sites detected only in the shovel probes. The survey report recommended that test excavations were needed to determine if the sites were eligible to the National Register of Historic Places (National Register).

In preparation for the next phase of work, the Confederated Tribes of Siletz Indians of Oregon (Siletz) and The Confederated Tribes of the Grand Ronde Community of Oregon (Grand Ronde) were notified by letter (on August 18, 2005) of the proposed pipeline project and the need to implement test excavations at the three sites. Soon thereafter, the tribes also were provided with information and an opportunity to comment as part of the State of Oregon permit application process for archeological test excavations. No response was received from either tribe following these two notifications in 2005.

In March 2006, both tribes were notified of the proposed action as part of the NEPA process. The Grand Ronde responded by letter (dated March 14, 2006), indicating that areas along waterways had a higher density of cultural sites and recommending that cultural resource surveys be completed. In response, Reclamation provided the Grand Ronde (in a May 12, 2006 letter) with a copy of the report of the investigations completed in 2005 summarizing past and planned future investigations.

In 2006, the District resumed historic property investigation efforts with a focus on seeking the means to avoid impacts on identified archeological sites (HRA 2006). Work was conducted under State of Oregon permit number 876 (issued June 1, 2006). Additional shovel test probes were excavated at all three archeological sites to determine site boundaries; six 50x50cm shovel probes also were excavated at 35BE108. As a result, alternative routes to avoid the archeological sites were identified. In a letter dated August 28, 2006 (Appendix B), State Archaeologist Dr. Dennis Griffin concurred that, if GID uses the alternative alignments, the project will have no adverse effect on the sites. He also recommended that a site monitor was appropriate during construction at 35BE108. Reclamation forwarded a copy of the testing report and the SHPO letter to both the Grand Ronde and the Siletz.

3.11.2. ENVIRONMENTAL CONSEQUENCES

3.11.2.1. No Action Alternative

No effects would occur to historic properties, as there would be no new construction.

3.11.2.2. Proposed Action

The Proposed Action will have no effect on historic properties, due to avoidance of the three recorded archeological sites.

3.11.3. MITIGATION MEASURES

The mitigation measures proposed by Greenberry I.D. have been determined in consultation with SHPO and Reclamation.

- Alternative alignments will be used in the vicinity of archeological sites 35BE106, 35BE107, and 35BE108 so that impacts on the sites are avoided.
- A professional archeologist will be present to monitor excavation of the pipeline trench at 35BE108. The monitor will continue to be present during subsequent construction actions at the site if recommended as necessary by the archeologist performing the monitoring.
- If archeological materials are found during construction or any segment of the pipeline, GID will immediately halt construction activities in the vicinity of the discovery and notify Reclamation and the Oregon SHPO of the discovery. The find will be examined by a professional archeologist to confirm that it is archeological in nature and make an assessment of actions needed to evaluate or protect the discovery. If the discovery is archeological in nature, then GID will notify the SHPO and proceed pursuant to Oregon Revised Statutes (ORS) 390.235. GID will take all prudent actions necessary to protect the site from harm until completion of the consultative and investigative process. No construction will proceed in the vicinity of the discovery until all consultations required to comply with Section 106 of NHPA have been completed; the conditions of any State permit issued under ORS 390.235 have been met; and Reclamation has provided a written notice-to-proceed to GID.
- If human remains are discovered during construction of the pipeline system, GID will immediately notify SHPO and Reclamation. Verbal notification will occur the day of the discovery, followed by written notice within two days of discovery. They will immediately halt construction in the vicinity of the find, and a qualified person will examine the discovery and its location to assess if they are human and if they are Indian remains. If they are Indian remains, then GID will notify the SHPO and comply with all requirements pursuant to ORS 97.740-760 and ORS 358.940. GID will take all prudent actions necessary to protect the remains from harm until completion of the consultative process. When GID provides Reclamation with certification that it has complied with the State requirements, then Reclamation will provide a written notice-to-proceed; no disturbance can occur in the vicinity of the human remains until that notice is received.

3.12. Indian Sacred Sites

3.12.1. Affected Environment

Executive Order (EO) 13007 defines an Indian sacred site as “any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion.” None of the lands affected by the proposed action are Federal fee lands or lands where Federal easements or other realty interests

pertain. There is no corollary statute in State codes pertaining to Indian sacred sites on non-Federal lands.

3.12.2. ENVIRONMENTAL CONSEQUENCES

3.12.2.1. No Action Alternative

The No Action Alternative will not result in changes to Indian Sacred Sites.

3.12.2.2. Proposed Action

No impacts would occur under EO 13007 because that authority does not extend to non-Federal lands.

3.13. INDIAN TRUST ASSETS

3.13.1. AFFECTED ENVIRONMENT

Indian Trust Assets (ITAs) are legal interests in property held in trust by the United States for Indian tribes or individuals, or property that the United States is otherwise charged by law to protect. Examples of resources that could be ITAs are lands, minerals, hunting and fishing rights, water rights, and instream flows. The Bureau of Indian Affairs (BIA) was contacted regarding Trust Lands in the area for either the Siletz or Grand Ronde tribes; Norton (2006) indicated that there are no Trust Lands. In addition, the Confederated Tribes of the Siletz Reservation and the Confederated Tribes of the Grand Ronde Community of Oregon were contacted concerning ITAs in the project area. According to the Siletz (Kentta 2006), there are no ITAs in the project area. According to the Grand Ronde (Reibach 2006), he did not think there are any ITAs in the project area.

3.13.2. ENVIRONMENTAL CONSEQUENCES

3.13.2.1. No Action Alternative

The No Action Alternative will not affect Indian Trust Assets.

3.13.2.2. Proposed Action

No impacts have been identified because no tribal treaty rights to ITAs have been identified in the project area.

3.14. ENVIRONMENTAL JUSTICE

3.14.1. AFFECTED ENVIRONMENT

The Presidential Executive Order (EO) 12898, "Federal Actions to Address Environment Justice in Minority Populations and Low-Income Populations" (February 11, 1994) requires agencies to identify disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations, as well as the equity of the distribution of the benefits and risks of their decisions. The EO is intended to protect minority and low-income communities from discriminatory projects or practices that can result in a more hazardous or degraded human environment caused by a Federal action. Federal agencies are directed to analyze the effects of Federal actions on minority and low-income communities and to avoid those impacts to the extent that is practicable.

Population estimates, distribution of minority population, and income levels for year 2000 for Benton County as compared to Oregon are shown below (Table 3-9). Based on these statistics, Benton County has a relatively low percentage of its population that consists of Hispanic or Latino origin, or a race other than white, African American, American Indian, or Alaska Native persons; however it has a relatively high percentage of persons with Asian origin.

Table 3-9. Population Statistics for Benton County, Oregon.

	Benton County	Oregon
Persons under 18 years old	21.3%	24.7%
Persons over 65 years old	10.3%	12.8%
White Persons	89.2%	86.6%
Black or African American Persons	0.8%	1.6%
American Indian and Alaska Native Persons	0.8%	1.3%
Asian Persons	4.5%	3.0%
Persons of Hispanic or Latino Origin	4.7%	8.0%
Persons Reporting Some Other Race	1.9%	4.2%
Persons Reporting Two or More Races	2.6%	3.1%
Median Household Income	$41,897	$40,916
Source: quickfacts.census.gov for Benton County, Oregon.		

3.14.2. ENVIRONMENTAL CONSEQUENCES

3.14.2.1. No Action Alternative

The No Action alternative will not result in negative or beneficial effects on low income or minority populations.

3.14.2.2. Proposed Action

The Proposed Action will not add, delete, or otherwise modify any housing units or land uses that may affect minority populations. Minimal employment opportunities will occur as a result of project construction; no employment

opportunities will be lost by implementation of the Proposed Action. Reclamation did not identify any minority and low-income populations as being adversely affected by this proposal.

3.15. CUMULATIVE IMPACTS

Cumulative impacts of the Proposed Action were evaluated by determining if there are ongoing or planned activities that may result in incremental impacts on resources. The potential for impacts has been considered by evaluating changes in reservoir operating schedules by ACOE, the water marketing program of Reclamation, and water rights applications that OWRD has received.

Flow Releases from the Willamette River Reservoir System by ACOE

- The project releases are normally operated from a rule curve. ACOE does not anticipate changes in flow releases other than the month-to-month or year-to-year fluctuations that occur because of a difference of inflows to the reservoirs.

Water Marketing Program of Reclamation

- Currently, there are approximately 1.6 million acre-feet of conservation storage space available for multiple use, which includes irrigation contracting in the Willamette River Basin Project system. Of this use, up to 50,230.80 acre-feet of water have already been contracted, and there are 61 other pending applications for the use of up to an additional 30,197 acre-feet of water.

OWRD Applications

- OWRD was contacted to ascertain the status of new applications for diversion and storage of water from the Willamette River and tributaries. Additional water is not available during irrigation season due to previous over appropriation of water.

No significant cumulative impacts have been identified because of the following:

- The volume of water that may be contracted if all the pending applications to Reclamation are permitted represents less than 2 percent of the storage space available for joint use, which includes irrigation.
- The applications at OWRD are for natural flow from the Willamette River or tributaries rather than for reservoir system storage. These applications will be considered on a case-by-case basis and each approved if the water is available and there are no adverse impacts on beneficial uses of water.
- No other private projects have been identified that may, in combination with the proposed action, result in incremental impacts on any resources to cause a significant cumulative impact.

4. CONSULTATION AND COORDINATION

4.1. AGENCIES CONSULTED

The following agencies were consulted in preparation of this EA:

- Oregon Department of Fish and Wildlife
- Oregon Department of Transportation
- State Historic Preservation Office, Oregon State Parks and Recreation Branch
- Oregon Department of Environmental Quality
- Oregon Department of State Lands
- Oregon Water Resources Department
- Oregon Department of Agriculture
- Oregon Department of Forestry
- National Marine Fisheries Service
- Natural Resources Conservation Service
- US Army Corps of Engineers
- US Fish and Wildlife Service
- US Environmental Protection Agency
- National Park Service
- Confederated Tribes of the Siletz
- Confederated Tribes of the Grand Ronde
- Legislative Commission on Indian Services
- Bureau of Indian Affairs
- Benton County Public Works Department
- Benton County Soil & Water Conservation District

4.2. PUBLIC INVOLVEMENT

A project scoping letter and graphics showing the location of the proposed project dated March 2, 2006, was sent to local, State, and Federal agencies, Native American tribes, land owners, and interested parties (Appendix C). The letter requested comments concerning the proposed project. Reclamation also issued a news release on March 1, 2006 of the proposed project. In addition, the GID notified their water

users through newsletters and the GID website of the Proposed Action. Four comments were received by mail (Appendix C). The comments are summarized as follows:

The Confederated Tribes of the Grand Ronde

The Grand Ronde responded that areas along waterways, such as the project area, frequently have a higher density of cultural sites. They requested that a review with the SHPO and the ACOE be conducted to provide information regarding any previous cultural surveys that may have been completed in the proposed project area.

Greenberry I.D. has conducted field studies and prepared two archeological reports that were submitted to the Confederated Tribes of the Grand Ronde. A portion of the pipeline route has been realigned in the pipeline corridor to avoid known archaeological sites as a result of the studies. The proposed project would be monitored by independent archeologists while excavating in these areas.

The District also will consult with the ACOE. The ACOE would review the EA as well as the Section 404 permit application that will be submitted before ground-disturbing activities occur.

The SHPO responded with a request for a map of the project location.

Greenberry I.D. has provided SHPO a map of the project location.

The Marys River Watershed Council responded with the following list of concerns:

- *Assurance that no introduction of exotic plants and animals into the Muddy Creek system will occur by the addition of Willamette River water.*

  GID is unaware of any exotic species of plants or animals that would be introduced from the Willamette River. According to ODFW (Mamoyac 2006), it is presently unaware of any exotic fish species that would be introduced.

- *Assurance that Muddy Creek will not be adversely affected by the chemical composition of the Willamette River that will cause Marys River to be listed on the ODEQ 303(d) list;*

  The quality of Willamette River water seems to be of at least equal if not better than Muddy Creek water, and the chemical composition of Muddy Creek likely would not be adversely affected by Willamette River water; the more likely outcome is to improve water quality in Muddy Creek, at least locally.

- *Assurance that erosion and turbidity will not be increased as a result of increased flow at unusual times of the year;*

The avoidance or minimization of erosion or turbidity during construction will be accomplished by the use of sand bags near the bank during low water. The potential for turbidity during placement or removal of sand bags is possible, but it would be minimal and short-term. The increase in flows during the irrigation season will not cause additional erosion or turbidity to Muddy Creek, as a dissipation structure will be constructed at the outfall. The flows would occur during summer and fall when stream flows are normally low and well below the maximum flows that occur in winter and spring. (See Table 5 for average streamflows in Muddy Creek by month.)

- *Assurance that the GID plan also will look forward to acquisition of senior water rights dedicated to instream flow from those who will benefit from the additional water from the Willamette River.*

  Comments pertaining to water rights dedicated to instream flow likely indicate concern about dry season flows in Muddy Creek. Muddy Creek is currently over-allocated. In the reaches affected by GID, many members cannot satisfy their water rights, and some do not attempt to exercise them. GID is proposing to put water into Muddy Creek at a rate that will balance withdrawals of members, essentially adding water for beneficial use for irrigation (the only use allowed by Reclamation), leaving the creek in better condition (as less live flow is removed) or at minimum unaffected from current conditions. In the last analysis, water rights on Muddy Creek are the property of individual landowners.

However, as GID also is concerned about the water quality of Muddy Creek, the GID has proposed to ODFW and Oregon Water Trust that a wildlife water right (which can be left instream) be obtained to flows augmented during the dry season. This would compensate for upstream withdrawals and may significantly improve water quality and fish habitat. This is an ancillary project that cannot be accomplished without the proposed infrastructure for the Proposed Action, and is under review with ODFW.

Oregon Department of Agriculture responded with concerns including:

- *Concern about the fate of irrigation drainage and the possible need for a drainage system.*

  GID does not anticipate the need for a drainage system (these are more closely associated with canal and ditch systems) for the application of additional water to the agricultural lands. The type of irrigation and water management practiced (buried pipe infrastructure and low pressure sprinkler or drip irrigation technologies) largely avoids runoff and return flows.

- *Concern about any activities that may disturb and/or restrict growth of riparian vegetation;*

The increased flows in Muddy Creek will not cause adverse impacts on riparian vegetation. Due to the possibility of additional water in the creek, the riparian vegetation may be improved.

- *Concern that increased flow in Muddy Creek may cause more erosion of stream banks, loss of farm land, and increased sediment in Muddy Creek*;

  The increased flow would not be expected to exacerbate existing erosion problems because the increased flow would occur when flows are relatively low and the potential to cause erosion are low. (See for average streamflows in Muddy Creek by month.) Loss of farm land would be more likely to occur during high winter and spring flows and would not be expected to occur under low water conditions when the flows would occur to supplement Muddy Creek.

- *Concern about the impact of increased stream flow on riparian vegetation.*

  Additionally, Muddy Creek in general has very good riparian vegetation throughout GID, and is quite stable.

4.3. EA DISTRIBUTION

This EA was sent to local, State, and Federal agencies; Native American tribes; landowners; and interested parties (See Appendix C for the mailing list).

5. LITERATURE CITED

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In text	Complete Citation
	(Note: Personal communications were undertaken by the Craven Consulting Group)
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