Methow Valley Irrigation District Project

Preliminary Environmental Assessment

June 1997

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CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

1.1 Underlying Need for Action

Bonneville Power Administration (BPA) is proposing to assist with funding the conversion of the Methow Valley Irrigation District's (MVID) project in order to increase the efficiency of the MVID irrigation system. In doing so, BPA is responding to a need to increase in-stream flows and fish passage[1] in the Methow and Twisp rivers for resident and anadromous fish. The Pacific Northwest Electric Power Planning and Conservation Act of 1980 requires BPA to protect, mitigate, and enhance fish and wildlife that have been affected by the construction and operation of the Federal Columbia River Power System (FCRPS). Funding this project would be partial mitigation for the FCRPS system-wide impacts. Also important is the need to promote more efficient use of water in the Methow River Basin. The Washington Department of Ecology (WDOE) would co-fund a major portion of the project.

1.2 Background

MVID's gravity-fed, open-canal irrigation system has been vital to the Methow Valley's agricultural production since the MVID was organized and the system became operational in the early 1900s. Water diverted from the Methow River supplies the east side of the valley between Twisp and Carlton; water from the Twisp River supplies the west side in the same area. (See Figure 1-1.)

However, maintenance and repair of the MVID system has not occurred on a regular basis, and its efficiency has been compromised. Currently, the overall conveyance efficiency of the MVID system (i.e., current demand for irrigation water divided by the total amount of water diverted) is estimated at 20 percent (Montgomery Water Group (MWG), 1996, page 27). Consequently, a number of properties at the lower end of the MVID east and west canals are not delivered their share of irrigation water on a reliable basis, and landowners have had to drill their own wells to provide irrigation water. The MVID diversion structures are also in need of repair or replacement. The in-stream diversion dam on the Methow River is made up of wooden flashboards that must be adjusted by hand, and the diversion on the Twisp River is a rock levee dam that must be pushed up by a bulldozer each year.

By the 1930s, there appeared to be a decline in the fish population of the Methow and Twisp rivers. Much of the loss was caused by fish being drawn out of the rivers and into the irrigation system, where they often died. Fish screens, which prevent the entry of fish into the irrigation system, were installed at both canal intakes in 1937. The fish screens were periodically remodeled and eventually completely replaced. However, today they are outdated. The irrigation diversions

[1] To help the reader, words that appear in the GLOSSARY (Appendix G), are underlined at their first appearance in the text.

in the Methow and Twisp rivers, the outdated fish screens, and the inefficient canal system all contribute to reduced habitat and passage conditions for anadromous fish in the Twisp and Methow rivers.

In 1991, as a tribe with fish management responsibilities, the Yakama Indian Nation (YIN) filed a lawsuit against the WDOE for the latter's inaction in insisting that the MVID meet a reduced water consumption level that WDOE had required in 1989. The YIN also filed a complaint against the MVID for wasteful water practices. In 1992, the YIN postponed its legal actions, with the assurance that WDOE and the MVID would begin working together on a comprehensive plan. In early 1996, the MVID Board of Directors identified a preferred plan, and filed and approved a State Environmental Policy Act (SEPA) checklist for that plan. Concurrently, the YIN proposed to the Northwest Power Planning Council (Council) that BPA help fund the MVID's efforts as part of BPA's responsibility for fish and wildlife mitigation. Upon approval of the project by the Council, BPA joined the project as a proposed co-funder and began this required analysis of environmental impacts to satisfy requirements of the National Environmental Policy Act (NEPA).

Several possible alternative plans have been identified and are addressed in this environmental assessment (EA). Briefly, they are as follows:

- Replace much of the current open canal with a piped system and groundwater wells; use an acreage-based formula to compensate those who prefer to leave the MVID and supply their own water sources.
- Line portions of the canal to reduce losses and continue the existing gravity-fed system; and compensate those who prefer to leave the MVID either according to an acreage-based formula, or on an as-needed basis to enable modification of existing wells or construction of new wells sufficient to irrigate.
- Dissolve the MVID and compensate all members according to an acreage-based formula.
- Continue present system operation (No Action).

1.3 Purposes

BPA has identified the following purposes for participating in this project. BPA will base its choice among alternatives on these purposes:

- increase habitat for anadromous and resident fish in the Methow and Twisp watersheds;
- protect environmental resources:
    * promote water conservation,
    * assure MVID members access to adequate water supplies, and

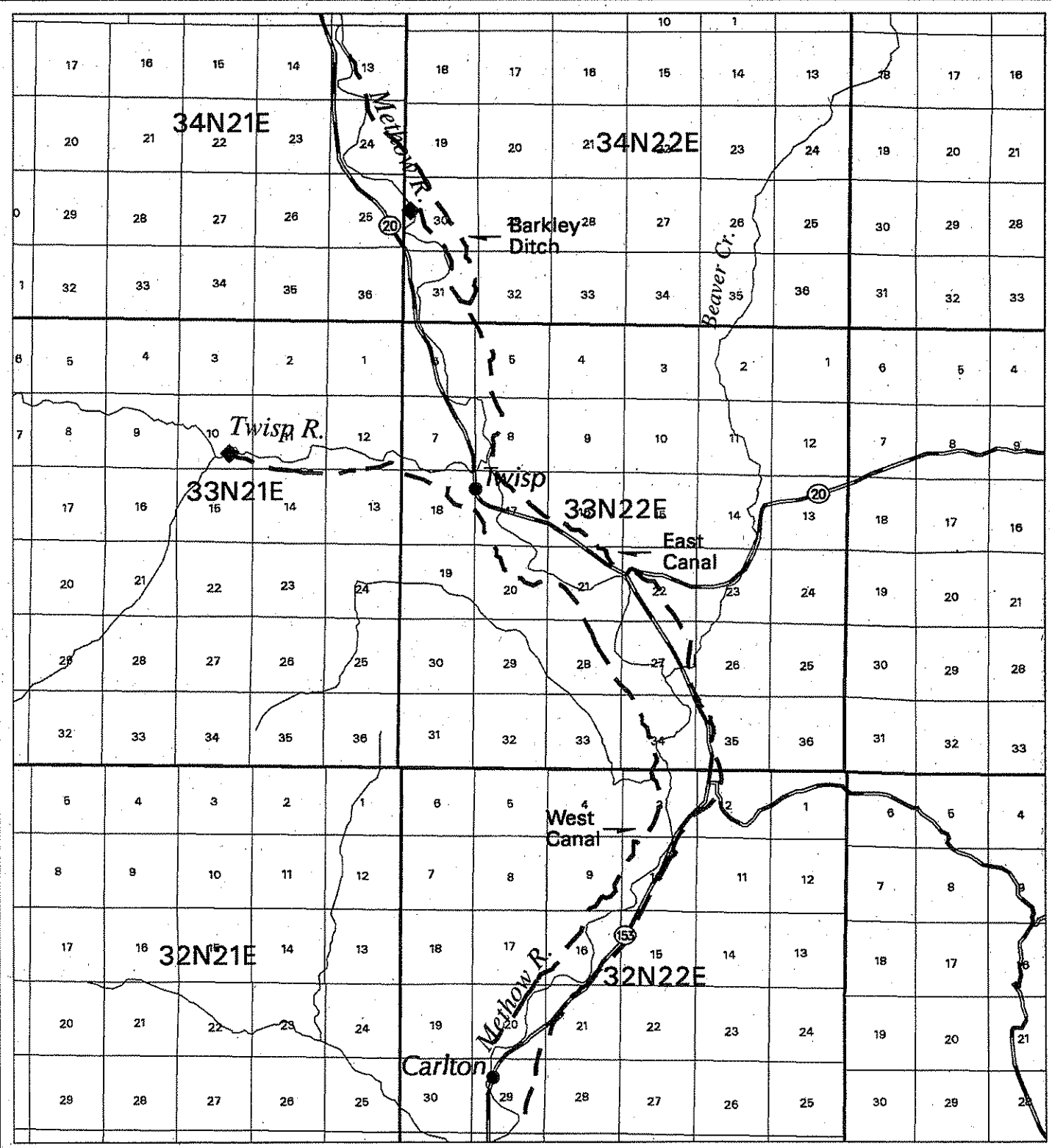


FIGURE 1–1: METHOW VALLEY IRRIGATION DISTRICT PROJECT – BASE MAP

* protect the landscape and aesthetics of the valley;

- achieve cost and administrative efficiency;
- comply with all applicable laws, regulations, and Executive Orders.

1.4 Public Involvement

BPA became involved with the MVID project in July 1996, after the Council recommended the project to us for funding. We began our environmental review with a letter to the public (October 25, 1996) announcing a scoping meeting to be held in Twisp. (Scoping is the gathering of topics and issues for consideration in an environmental study.) The scoping and information gathering period extended from October through December 1997, and included the following public meetings:

- November 6, 1996: meeting in Omak, Washington, with members of the Colville Confederated Tribes to present information, answer questions, and hear concerns about the project;
- November 14, 1996: open house meeting in Twisp, Washington, with all interested attendees to answer questions and gather scoping comments on the project;
- December 16-19, 1996: workshops with members of the MVID and other interested people to answer specific landowner questions about the effects of the project on water rights (requested by people attending the November 14 meeting).

A number of comment letters and phone calls have been received throughout the process. Those written comments received by January 1997, as well as the comments from the public meetings, were summarized in a "For Your Involvement" information bulletin and sent to people on the mailing list in February 1997. The comments were reviewed and used to design the alternatives and issues to be addressed in the EA. We have also continued to consider comments received since then in drafting the EA, when possible.

An open house meeting is planned for late June or early July 1997 to answer questions about and receive comments on the preliminary EA. Written comments will also be accepted. Please see the cover letter accompanying the EA for detailed information about the open house meeting and comment period dates. We anticipate that the final EA will be completed in August 1997.

CHAPTER 2: ALTERNATIVES, INCLUDING THE PROPOSED ACTION

2.1 Introduction

This chapter describes, and then compares, four project alternatives. Section 2.2, below, provides basic descriptions of the four project alternatives and lists the assumptions behind each alternative. The section then discusses some options that we considered, and explains why we did not examine them in detail.

Section 2.3 compares the four alternatives to see how well each meets the project purposes (section 1.3). Eventual selection of one of these alternatives, as well as funding sources and amounts, depends on how well that alternative meets those purposes.

Table 2-1, following, presents and compares the details of Alternatives A - D.

2.1.1 Alternative A: Proposed Action

Alternative A would include the following elements:

- A new irrigation system would be built. It would use 46-centimeter (cm) (18-inch (in.)) groundwater wells from three well fields, one for the east canal and two for the west canal. About 21 kilometers (km) (13 miles (mi.)) of new low-pressure pipe would be placed in existing canal rights-of-way. (See Figure 2-1.)

- Three small concrete tanks would be built above-ground to act as reservoirs for the new system. Each tank would be about 6 meters (m) tall (20 feet (ft.)) by 6 m (20 ft.) in diameter.

- Several existing canal reaches would be abandoned: *east canal*: reaches 1, 2, lower 4, 5, 6; *west canal*: 1, middle of reach 3. (West reach 5 has already been abandoned.) Areas served by these canal reaches would be removed from the MVID and served by existing or new, privately owned groundwater irrigation wells.

- A portion of reach 2 on the east canal has been shared under an agreement with the Barkley Ditch users for many years. In order not to adversely affect the Barkley Ditch users, this potion of the reach would be repaired to provide them with the same amount of water they are currently using, and turned over to them.

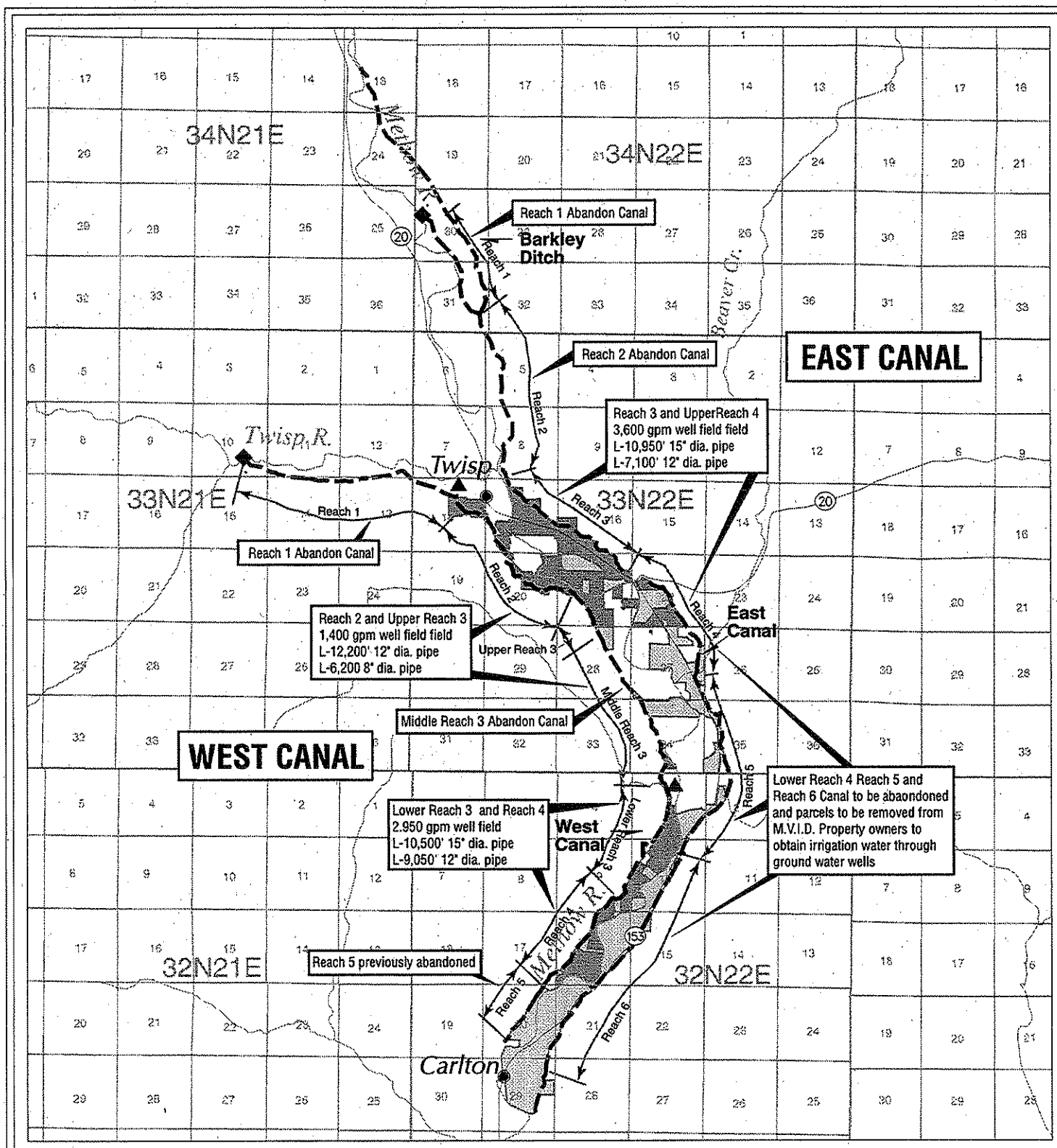
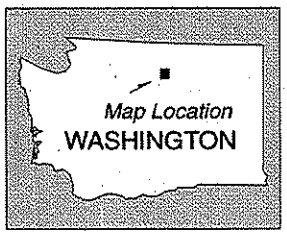


FIGURE 2- 1: METHOW VALLEY IRRIGATION DISTRICT PROJECT - ALTERNATIVE A: PROPOSED ACTION



- New Well Field
- Diversion
- Highway
- Section Line
- Revised M.V.I.D. Service Area
- Area Removed from M.V.I.D.
- Township Boundary
- River / Stream
- East & West Canals

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Table 2-1: Alternatives Description Matrix [Page 1 of 4]

DESCRIPTION	ALT. A: PROPOSED ACTION	ALT. B: PARTIAL UPGRADE	ALT. C: MVID DISSOLUTION	ALT. D: NO ACTION
1. NEW CONSTRUCTION NEEDED	New system built using groundwater wells and low-pressure pipe. Some drilling of new groundwater wells for individuals leaving MVID.	Canal rebuilt and lined with concrete. Upgraded in-stream diversions built. Some drilling of new groundwater wells for individuals leaving MVID.	Some drilling of new groundwater wells for individuals leaving MVID.	None.
2. BARKLEY DITCH	Section of canal serving Barkley users repaired to provide them with same amount of water as they receive now.	Section of canal serving Barkley users relined with concrete as part of overall MVID canal relining. Possible efficiencies in amount of water delivered to Barkley users.	Section of canal serving Barkley users repaired to provide them with same amount of water as they receive now.	No changes to section of canal serving Barkley Ditch users or to amount of water provided them.
3. NEED FOR SHORT-TERM REPAIRS (next 10 years)	No short-term canal system repairs anticipated. Some repairs to or upgrading of existing individual wells for individuals leaving MVID.	No short-term canal system repairs anticipated. Some repairs to or upgrading of existing individual wells for individuals leaving MVID.	No short-term canal system repairs anticipated. Some repairs to or upgrading of existing individual wells for individuals leaving MVID.	Canal repairs needed in areas of high operational risk (7 mi.) to keep system operating even at its present level; additional short-term repairs likely.

Table 2-1: Alternatives Description Matrix [Page 2 of 4]

DESCRIPTION	ALT. A: PROPOSED ACTION	ALT. B: PARTIAL UPGRADE	ALT. C: MVID DISSOLUTION	ALT. D: NO ACTION
4. MVID MEMBERSHIP	MVID membership drops because (1) some reaches would not be served; (2) some members would elect to leave.	Same as Alt. A, though fewer reaches would be dropped.	MVID dissolved.	Assumed no MVID membership changes.
5. DIVERSIONS AND FISH SCREENS; WDFW FUNDING	In-stream diversions/fish screens removed. WDFW might help fund new system construction instead of new fish screens.	In-stream diversions and fish screens upgraded. WDFW might fund fish screen upgrade.	In-stream diversions and fish screens removed; costs covered by WDOE and BPA.	In-stream diversions not upgraded. WDFW might fund fish-screen upgrade.
6. WDOE FUNDING	WDOE is project manager, helps fund new system construction.	Possible WDOE funding (if there are sufficient in-stream flow benefits, if there is concurrence from WDFW & YIN fish managers and if there are significant operational efficiencies consistent with Referendum 38).	WDOE funding for removal of in-stream diversions and fish screens and for new local improvement districts (LIDs) if they apply for money before the MVID dissolves.	No WDOE funding for anything, including any repairs or rehabilitation of future system failures.
7. BPA FUNDING	BPA helps fund new system construction, and compensates those leaving the MVID, based on an acreage-based formula (see Table 2-2).	Same as Alt. A, if significant in-stream flow benefits. Also, option to reimburse those leaving the MVID on an as-needed (rather than acreage-based) formula.	BPA compensates former MVID members, based on an acreage-based formula, up to a total of $2.2 million.	BPA provides no funding.

Table 2-1: Alternatives Description Matrix [Page 3 of 4]

DESCRIPTION	ALT. A: PROPOSED ACTION	ALT. B: PARTIAL UPGRADE	ALT. C: MVID DISSOLUTION	ALT. D: NO ACTION
8. MVID MANAGEMENT CONSIDERA-TIONS	Only alternative currently approved by MVID Directors.	Would require MVID Directors' vote and additional source(s) of funding; funds available from WDOE and BPA would fall far short.	Would require dissolution petition from MVID members and membership vote.	Current MVID structure constant. Funding source for canal repairs/ deferred maintenance needed.
9. WATER RIGHTS AND CLAIMS	**9 (a)** MVID members leaving the district retain benefits under MVID water rights and claims. **(b)** MVID receives authorization to transfer from surface-water point-of-diversion to point-of-withdrawal from groundwater wells.	**9.** MVID member water rights remain unchanged. Members leaving the MVID would apply for new rights or changes to MVID rights from WDOE.	All former MVID members retain benefits under MVID water rights and claims.	MVID retains current water rights and claims pending outcome of potential litigation.
10. IRRIGATED ACREAGE IN/OUT OF MVID	About 930 ac. stay in MVID, irrigated by piped groundwater system. Up to 1,346 acres no longer in MVID, irrigated by existing or new, privately developed groundwater wells.	About 1,277 ac. stay within MVID, irrigated by open canal system. Up to 999 ac. no longer in MVID, irrigated by existing or new privately developed groundwater wells.	No acres stay in MVID. Up to 2,276 ac. no longer in MVID, irrigated by existing or new, privately developed groundwater wells.	About 776 ac. in the MVID currently irrigated. Additional 1,500 ac. within the MVID not irrigated, or irrigated by existing or new, private well systems.

Table 2-1: Alternatives Description Matrix [Page 4 of 4]

DESCRIPTION	ALT. A: PROPOSED ACTION	ALT. B: PARTIAL UPGRADE	ALT. C: MVID DISSOLUTION	ALT. D: NO ACTION
11. WATER USAGE (estimated peak irrigation usage)	About 46 cfs (19 cfs from groundwater for areas within MVID; 27 cfs from groundwater wells for acreage no longer served by MVID).	About 46 cfs (26 cfs from river diversions for areas within MVID; 20 cfs from groundwater wells for acreage no longer served by MVID).	About 46 cfs (all from groundwater wells).	About 67 cfs from river diversions (plus some unknown amount of existing groundwater use from existing private wells).
12. COSTS (as estimated by CH_2M HILL; see Appendix A)	$4.6 million	$11.9 million	$2.7 million	$275,000 for fish screen upgrades, plus $2.4 million for immediate system repairs.
13. MVID O&M (Operations & Maintenance) ESTIMATED TOTAL ANNUAL COSTS	$104,000, or, on average, $112 per ac., based on 930 ac. irrigated.*	$123,000; or, on average, $97 per ac., based on 1,277 ac. irrigated. *	$0 (Any O&M costs for water supply to be absorbed by landowners or LIDs.)	$78,370 (1993; per MVID Water Supply Facility Plan, Vol. 1, p.9); per-ac. O&M current charge $50/ac. (MVID WSFP, Vol. 1,p, 63). **

* Average O&M cost per-acre may not reflect actual charge per-acre, established in MVID rate schedule (currently there is a minimum charge of $200 for a 2-ac. minimum).

** This figure is the amount cited for 1993 in the MVID Water Supply Facility Plan (1994). Those currently not receiving water contribute additional funds. These costs may need to be increased due to the backlog of deferred maintenance.

- MVID members who wished to leave the District would keep benefits under MVID water rights and claims. The remaining 376 hectares (ha) (930 acres (ac.)) would be irrigated by the piped groundwater system. The MVID would receive authorization to transfer surface water points-of-diversion to points-of-withdrawal for existing or new, privately developed groundwater wells. (For more information on water rights in the State of Washington, please see **Appendix A**).

- BPA, WDOE, and Washington Department of Fish and Wildlife (WDFW) would fund new system construction. BPA would provide compensation funds for MVID members leaving the district, based on an acreage formula (Table 2-2, below). The total estimated cost for this alternative is $4.6 million (see **Appendix B** for engineering cost details for each alternative).

- This is currently the only alternative approved by the MVID Directors.

Table 2-2: Compensation Formula

Parcel Size (acres)	Formula (acres = size of parcel)	Payment Range
0-2	$2,000 (minimum payment)	$2,000
2-5	$2,000 + [(acres - 2) x $1,000]	$2,000-$5,000
5-10	$5,000 + [(acres - 5) x $900]	$5,000-$9,500
10-15	$9,500 + [(acres - 10) x $800]	$9,500-$13,500
15-20	$13,500 + [(acres - 15) x $700]	$13,500-$17,000
20-25	$17,000 + [(acres - 20) x $600]	$17,000-$20,000
25-30	$20,000 + [(acres - 25) x $500]	$20,000-$22,500
30-35	$22,500 + [(acres - 30) x $400]	$22,500-$24,500
35-40	$24,500 + [(acres - 35) x $300]	$24,500-$26,000
40-45	$26,000 +[(acres - 40) x $200]	$26,000-$27,000
45+	$27,000 [(+ acres - 45) x $100]	$27,000-$29,514*

* Based on 70.14-acre maximum parcel size in MVID

Assumptions for Alternative A are as follows:

- The annual allowable water use would be 4 acre-feet/acre; the maximum instantaneous diversion rate would be 0.02 cubic feet per second (cfs) per ac. for each acre of land within the MVID (J. Monahan, WDOE, pers. comm., 1997). This rate would be applied to the total area within the MVID as it is now, because it is assumed that any land no longer served by the MVID would be irrigated with new or existing, privately owned groundwater wells. With about 921 ha (2,276 ac.) of land within the MVID (MWG, 1996), the maximum instantaneous diversion rate for this alternative would be about 45.5 cfs.

- The transfer from MVID points-of-diversion to individual points-of-withdrawal would be handled by WDOE on a case-by-case basis. MVID surface water right points-of-diversion could be transferred only to wells withdrawing water from the same water source. This would mean that transfers could be made only from the diversion points to wells that would withdraw water from the alluvial aquifer that is in direct hydraulic continuity with the river. Those unable to access the alluvial aquifer on their own land would need to seek arrangements with neighbors who might have access (which WDOE could then authorize), or would need to join with others to form a Local Improvement District (LID) as described in RCW 87.03.480 - 87.03.527, which would allow WDOE to provide funding for water access.

- Where the canal system is replaced by irrigation pipe, that pipe would be located in the canal alignment; the canal and pipe would be backfilled with gravel and native soil. Where the canal system is abandoned, the canal alignment would be (1) plugged to allow water to drain out the existing spillways, or (2) otherwise modified to control stormwater. The unused portions of the canal alignment would be allowed to return to their preconstruction state over time.

- As part of maintenance, trees would be removed along the piped irrigation system to reduce hazards and potential damage to the pipe, but the need would be less frequent than under Alternative B (partial upgrade; see section 2.1.2). Without vegetation maintenance, the MVID (the irrigation system owner) would be exposed to liability for potential damages to life and property from a failed pipe.

- Weed control and revegetation activities within MVID easements would conform to the multi-agency Coordinated Weed Control Management Area (CWCMA) weed control programs and policies of the Okanogan County Noxious Weed Control Board. Where new construction or facility removal activities disturbed soils, those areas would be treated for weed control and revegetated consistent with CWCMA weed control programs and policies.

- Wherever possible, construction in jurisdictional wetlands or riparian areas would be avoided, and MVID groundwater pumping would be designed to avoid affecting surface jurisdictional wetlands through groundwater withdrawal. New MVID facilities would be

designed to avoid or minimize impacts on jurisdictional (open) waters of the United States, which are protected by Federal, state, and county law. Facilities constructed by local landowners would be regulated by Federal, state, and county agencies with jurisdiction over wetlands and waters protection.

- If landowners wished to retain the existing vegetation along their section of canal, they would be free to use their allocated water right to irrigate riparian vegetation on their property at their own expense. The allocated water right (0.02 cfs instantaneous and 4 acre-feet/acre annually) would generally be adequate to irrigate crops and to maintain existing riparian areas.

- Where existing riparian trees die off and are not a safety hazard, dead snags would be left as bird perching sites for at least 30 years.

- Compensation would be provided to those landowners with parcels that would be excluded from the reorganized MVID. This compensation would be based on an acreage formula developed by the MVID and originally reported in the MVID Water Facility Supply Plan (MWG, 1996). Table 2-2 shows how the formula would work. The rationale for the compensation is based on the MVID members' desire for all members to benefit equally from the water supply improvements. It is anticipated that former members would use the money to drill new or upgrade existing groundwater wells, pumps, and pipelines to replace the MVID water supply to which they are currently entitled. It would also compensate those who have been required to continue to pay assessments to the MVID over the years, while not receiving their entitled water. No restrictions would be placed on the use of the money.

2.1.2 Alternative B: Partial Upgrade

Alternative B would include the following elements:

- The existing system would be upgraded: about 42 km (26 mi.) of the existing canal would be lined with concrete, upgraded in-stream diversions would be built, and fish screens would be upgraded. (See Figure 2-2.) The concrete-lined open channels would generally follow the existing canal rights-of-way.

- The lower reaches (lower reach 5 and all of reach 6) of the east canal would be abandoned. (Reach 5 of the west canal has already been abandoned.) The portion of the MVID canal in reach 2 of the east canal presently shared under an agreement with the Barkley Ditch users, would be upgraded with concrete lining as part of the overall MVID canal relining.

- Water rights for MVID members would remain unchanged. Those leaving the MVID would apply to WDOE for transfers from points-of-diversion to points-of-withdrawal. About 514 ha (1,277 ac.) would be irrigated within the MVID; the rest would be irrigated by existing or new, privately developed groundwater wells.

- Some funding for new system upgrades and compensation might be available from BPA, WDOE, and WDFW, depending upon increases in in-stream flow benefits, operational efficiencies, and agreement with YIN and WDFW fish managers. Two options have been proposed for compensation for those leaving the MVID: basing the compensation on 1) an acreage-based formula, or 2) on an as-needed basis to drill new wells or upgrade existing wells. The total estimated cost for this alternative is $11.9 million (see **Appendix B** for engineering cost details for each alternative).

- This alternative would need approval of the MVID Directors.

Table 2-1, pages 5-8, presents and compares the details of Alternatives A - D.

Alternative B is similar to Alternative 1 in the MVID Water Supply Facility Plan (MWG, 1996). The major difference is that, instead of using pipe materials (Alternative 1), the canal would be lined with concrete (Alternative B). Concrete lining was chosen as the most cost-effective method for use in a gravity-fed, open-channel system to reduce leakage. (Other lining methods were considered for this alternative, but found less effective; see **Appendix C** for details.) Concrete lining is a proven method to conserve and transport irrigation water. Although initial capital costs may seem excessive, the reduced labor costs for maintenance over the life of the lining make this the best option for a lined system.

Assumptions for Alternative B appear below:

- Assumptions regarding the amount of water available for irrigation are the same as those for Alternative A (section 2.1.1). No allowance would be made for conveyance and operational losses. (J. Monahan, WDOE, pers. comm., 1997).

- As under Alternative A, the transfer from MVID points-of-diversion to individual points-of-withdrawal would be handled by WDOE on a case-by-case basis. Such transfer would be carried out only to wells withdrawing water from the same water source: that is, to wells that would withdraw water from the alluvial aquifer that is in direct hydraulic continuity with the river. As under Alternative A, those unable to access the alluvial aquifer directly would need to seek arrangements with neighbors or would need to join with others to form an LID, which would allow WDOE to provide funding for water access. See discussion under Alternative A.

- Concrete lining installation would consist of the following tasks: clearing and grubbing of the canal alignment, bulldozing the existing canal full with native embankment material, compacting that material to form a suitable construction platform, regrading the alignment to a level surface to provide for the new channel and a 3.7-m-wide (12-ft.-wide) access road along one side of the new channel (wherever space exists to site a road), excavating the canal prism in preparation for lining activities, installing crushed aggregate lining base, and placing the concrete lining using slip-forming techniques. The gravel base is required for drainage beneath the lining to keep the lining from floating during high water and to protect against frost-heaving over the winter months.

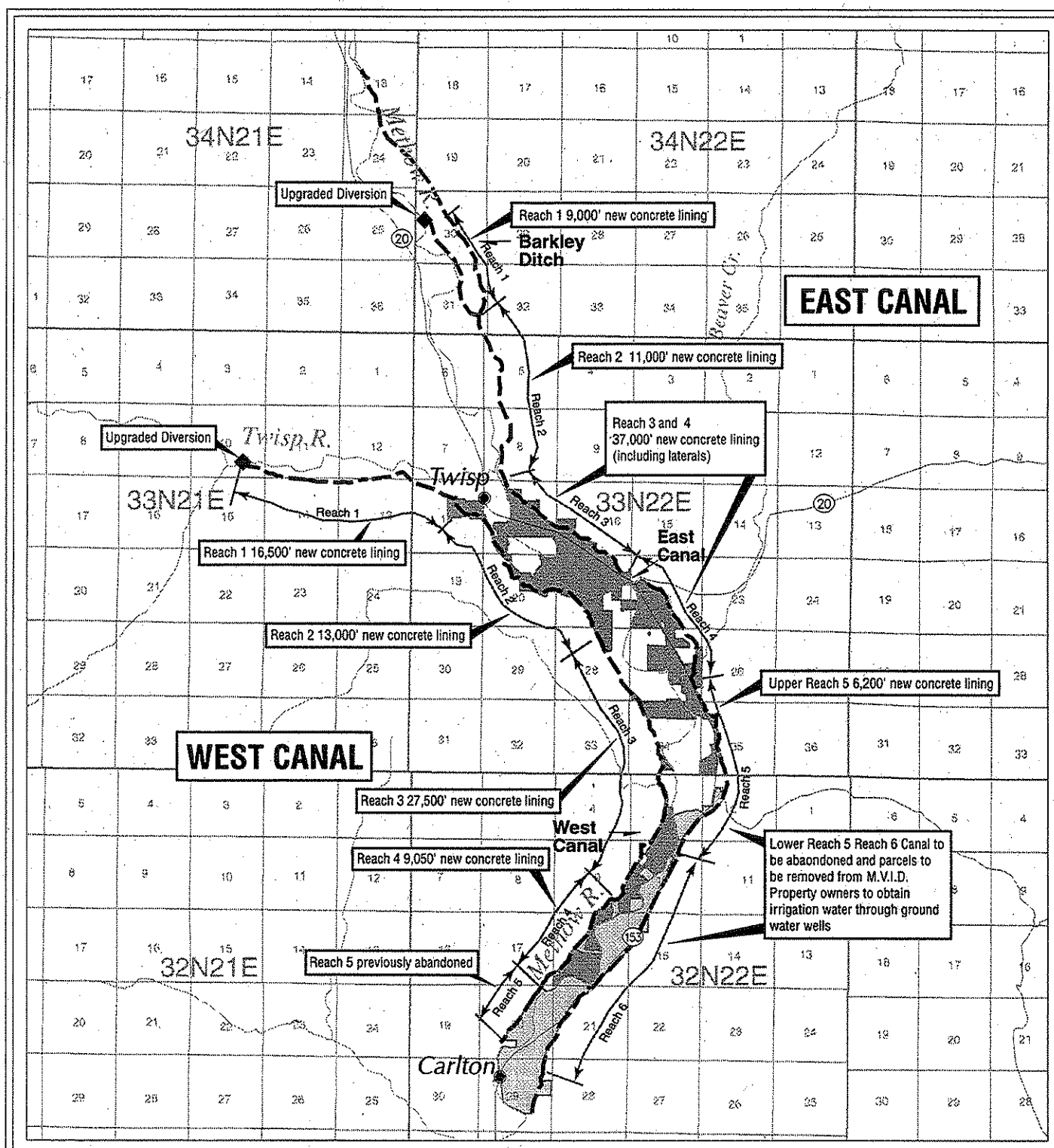
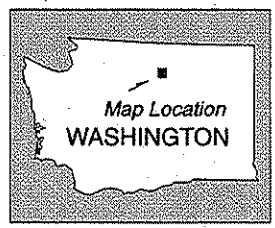


FIGURE 2- 2: METHOW VALLEY IRRIGATION DISTRICT PROJECT - ALTERNATIVE B: PARTIAL UPGRADE



- Diversion
- Township Boundary
- Highway
- River / Stream
- Section Line
- East & West Canals
- Revised M.V.I.D. Service Area
- Area Removed from M.V.I.D.

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- The new, concrete-lined canal system would be located within the existing canal alignment. The channel would be constructed as detailed above. Where the canal system was abandoned, provisions would be made so that the local drainage that now flows into the open canals would drain from the canals at the existing spillways. The unused portions of the canal alignment would be allowed to return to their preconstruction state over time.

- As part of maintenance, trees and other vegetation would be removed from the active canal alignment. Regular removal would be needed to ensure canal safety and maintenance of canal embankment integrity (preventing leakage and breakage caused by tree roots and windthrow). Without vegetation maintenance, the MVID (the irrigation system owner) would be exposed to liability for potential damages to life and property from a failed canal section.

- Weed control and revegetation activities within MVID easements would conform to the multi-agency Coordinated Weed Control Management Area (CWCMA) weed control programs and policies of the Okanogan County Noxious Weed Control Board. Where new construction or maintenance activities disturbed soils, those areas would be treated for weed control and revegetated consistent with CWCMA weed control programs and policies.

- Wherever possible, construction in jurisdictional wetlands or riparian areas would be avoided, and MVID groundwater pumping would be designed to avoid affecting surface jurisdictional wetlands through groundwater withdrawal. See Alternative A for details.

- Landowners would be free to use their allocated water right to irrigate vegetation, as under Alternative A.

- Where existing riparian trees die off and are not a safety hazard, dead snags would be left as bird perching sites for at least 30 years.

- As under Alternative A, it was assumed that compensation would be provided to landowners whose parcels were excluded from the reorganized MVID (see the formula in Table 2-2). This assumption, however, would require further review of the project by the Council to determine whether the in-stream flow benefits were significant enough to warrant inclusion of this project in the Fish and Wildlife Plan. Also, a group of MVID members has proposed the option of BPA paying *only* for the costs of upgrades to existing or installing new groundwater well systems (see section 2.2). This option would be considered; however since its costs were not available, we used the compensation formula costs. In any case, the costs could not exceed $2.2 million, the amount of money approved by the Council and budgeted by BPA for this project. If the costs for compensation were less than this, the remainder would be used to defer construction costs.

- Where the canal system was abandoned, provisions would be made so that the local drainage that now flows into the open canals would drain from the canals at the existing spillways

- Local landowners and/or newly formed LIDs would be responsible for vegetation maintenance along any new irrigation systems.

- Weed control and all related activities would be the responsibility of the landowners and/or the LIDs.

- Federal and county agencies with jurisdiction over wetlands and waters protection would regulate facilities constructed by local landowners or LIDs.

- Landowners would be free to use their allocated water right to irrigate vegetation on their property at their own expense; see Alternative A.

- Where existing riparian trees die off and are not a safety hazard, dead snags would be left as bird perching sites for at least 30 years.

- Compensation would be the same as under Alternative A, although review by the Council of changes to the original proposal might be needed. Because Alternative C's in-stream flow benefits are similar to or slightly better than Alternative A's, the Council would likely approve funding.

2.1.4 Alternative D: No Action

Alternative D would include the following elements:

- The MVID would continue to use the existing system; no changes would be made to the section of canal serving Barkley Ditch users.

- Repairs would be needed to several miles of "high risk" canal sections. Fish screens might be upgraded, based on availability of WDFW funding.

- MVID would retain current water rights and claims, pending outcome of potential litigation. Acres served would continue as at present.

- BPA and WDOE would provide no funding for repairs, for any rehabilitation of possible future failures of the system, or for compensation. However, WDFW might fund upgrade of the fish screens. Costs of needed repairs estimated to be $2.4 million.

The following assumptions are made for Alternative D:

- Although vegetation maintenance was not performed regularly in the past, it is assumed that trees and other vegetation would be removed from the canal alignment. Regular removal is needed to ensure canal safety and maintenance of canal embankment integrity

(preventing leakage and breakage caused by tree roots and windthrow). Without vegetation maintenance, the MVID (the irrigation system owner) is exposed to liability for potential damages to life and property from a failed canal section.

- Weed control and revegetation activities within MVID easements would conform to the multi-agency Coordinated Weed Control Management Area weed control programs and policies of the Okanogan County Noxious Weed Control Board.

2.2 Options Not Examined in Detail

Alternatives to the proposed action (Alternative A) have been proposed by the Canal Associates, an MVID member subgroup, during the environmental process. Several ideas were proposed to WDOE and BPA during the workshops in December 1996, and a preliminary proposal was presented to BPA in a letter from Mr. Jim Gerlach (April 23, 1997). The ideas proposed in **December 1996** included the following:

- Provisions for allowing MVID members who want to leave the district to obtain water rights and to obtain alternative sources of water through direct payment to well drillers (no direct landowner compensation);
- Improvements to the fish screens at the diversions to be paid for by WDFW;
- Lining of the canals, where needed, with mats or half-pipe;
- Upgrading spillways and improving diversion dams;
- Inspecting and, if necessary, upgrading or installing of weirs at district laterals;
- Employment of a ditch walker to monitor wasteful practices;
- Provisions for reorganizing the MVID Board of Directors;
- Use of funding from WDOE, if available, to help non-MVID junior-water-right holders upgrade their efficiencies; and
- Provisions for how to pay for the upgrade, including selling a portion of the water saved by the proposal; a flat $50 per-acre assessment plus administrative fee; establishing a renovation and improvement fund; looking for additional low-interest loans; and/or allowing new and contract water users to join the district.

The **April 1997** letter included a proposal to maintain a gravity-flow irrigation system through low-cost lining of the canal, including:

- Repair of the critical areas of the ditch with a half-pipe galvanized steel, fiberglass, or poly-type culvert; and
- Repair and lining of the existing earthen-lined sections of the ditch with a polyethylene liner (or similar inexpensive liner) to significantly reduce the amount of water seepage from the ditch, but still allow some seepage to occur to irrigate riparian areas and recharge groundwater.

The December 1996 ideas for reorganizing the district, help for non-MVID junior-water-right holders, and provisions for alternative funding of the upgrade are outside of the scope of this EA. WDOE has expressed concerns about the alternative funding ideas to the Canal Associates in a letter to Mr. Jim Gerlach (WDOE, March 14, 1997; see **Appendix D**).

However, BPA did include Alternative B in this EA to address as many of the other ideas as possible. Alternative B preserves a gravity-flow system. The main difference between Alternative B and the April 1997 proposal is in the material to be used to line the canals. Alternative B would essentially rebuild the canals in place, using concrete as a liner. The April 1997 letter proposed a combination of half-pipe sections and lining with a polyethylene or similar lining that allowed a controlled amount of seepage.

Based on information from our consultant, CH_2M HILL, BPA does not believe that the half-pipe or the flexible semi-permeable liners are viable alternatives for the MVID. While the initial costs for the liners themselves might be much lower than those for a new concrete ditch lining, the overall costs, when longevity and maintenance concerns are factored in, raise these costs substantially. The reasons are summarized below:

1. Exposed polyethylene or other flexible liners would need to be replaced quite frequently. Some require replacement each year. For example, the 3-M Ditch in the Teanaway River Basin uses a low-cost liner, but it requires yearly replacement. The life of the liner can be extended by several years through the addition of a protective layer of clayey soil (bentonite). However, in order to get the soil to stay on the sloped sides of the canal, the sides would need to be regraded to a 3:1 slope. Also, provisions would need to be made for drainage, so that groundwater or uphill surface water would not displace the lining. These provisions would entail essentially rebuilding the canal, and would add greatly to the cost of this option. The costs for a long-term lining of this type would therefore be comparable to or more than the concrete lining proposed in Alternative B.

2. A semi-permeable membrane liner that allowed a controlled amount of seepage would not be a very effective solution to watering riparian areas, since it would need either to be replaced on a yearly basis or lined with clayey soil, as discussed above. The clayey soil would end up blocking or severely limiting seepage through the liner. In order to make the maximum amount of water available for in-stream uses, ditch leakage must

be stopped and on-farm water application efficiencies maximized. WDOE and BPA have addressed the issue of providing water for riparian wildlife habitat along the canals by stating that irrigation water may be used for this purpose under Alternatives A, B, and C. See section 2.1.1 for details.

3. Yearly maintenance of a soil-protected liner would be greater than that required for a concrete liner. Vegetation quickly takes hold in a soil liner and must be cleared yearly by either chemical or hand methods to prevent damage to the liner.

4. Alternative liner materials such as semi-circular galvanized steel, plastic, or fiberglass "half-pipes" have not been used successfully on projects of this scale. Factors such as the cost of labor to install them properly and to provide watertight connections to other canal structures, their shorter useful lives due to weathering and exposure to ultraviolet light, and hydraulic characteristics make these products less suitable than pipe or concrete lining materials.

Further details are available in Appendix C.

2.3 Comparison of Alternatives

Table 2-3, pages 19-20, presents a comparison of the alternatives. Each is evaluated as it meets the objectives for the project, which were listed in section 1.3.

Table 2-3: Predicted Performance Summary (2 pages)

	Alternative A	Alternative B	Alternative C	Alternative D
Increase Fish Habitat	Would result in increased habitat area for anadromous and resident fish in the Methow and Twisp rivers above their confluence	Same as Alternative A, except increase would be less	Same as Alternative A	No significant change in fish habitat area
Environmental Protection:				
water conservation	Would result in net average savings of about 21 cfs; would return average of about 67 cfs to both rivers above their confluence	Same net savings as Alternative A, but would return an average of only about 26 cfs to both rivers above their confluence	Same as Alternative A	Would not result in water conservation
access to adequate water supply	Would provide access to adequate water supply for all MVID members	Same as A	Same as A	Does not provide access to adequate water supplies for all MVID members
preserve landscape and aesthetics	Would result in some impacts on riparian vegetation developed along canal, mitigated in part by providing in-stream flows for natural riparian areas along rivers	Same as A	Same as A	Preserves existing riparian vegetation along canal, although some tree removal likely to result from prudent maintenance practices

Table 2-3: Predicted Performance Summary (con't)

	Alternative A	Alternative B	Alternative C	Alternative D
Cost and Administrative Efficiency	Estimated implementation cost of $4.7 million within range of available funds Estimated total annual MVID O&M cost of $104,000 (plus individual well or LID costs shifted to members leaving the district)	Estimated implementation cost of $11.9 million far exceeds available funds Estimated total annual MVID O&M cost of $123,000 (plus individual well or LID costs shifted to members leaving the district)	Estimated implementation cost of $2.7 million well within range of available funds Estimated total annual MVID O&M cost of $0 (all costs shift to individuals or LIDs)	Cost of repairs to 7 miles of high-risk areas estimated to be $2.4 million Current total annual O&M cost of $86,000, but likely to increase due to need to fund repairs and reinstate deferred maintenance
Compliance with Laws, Regulations, and Executive Orders	Would be in compliance	Would be in compliance	Would be in compliance	Diversions and canal operations could be called into question for inefficient water practices by WDOE, as well as under the Endangered Species Act when bull trout are listed in July 1997

CHAPTER 3: ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES

The discussions in Chapter 3 below are divided into sections for each environmental resource potentially affected by the proposed project. Each section describes the existing environment, then identifies specific impacts of each of the four alternatives.

Table 3-1, pages 22-27, presents a summary of the impacts discussed in Chapter 3 for each resource, by alternative.

3.1 Water Quantity and Quality

3.1.1 Existing Environment

The Methow Valley, located in the north-central portion of Washington, drains approximately 4590 square km (1,772 square mi.) of the eastern slopes of the Cascade Range. The valley's primary river system, the Methow River, joins with the Columbia River at Pateros, Washington. The Twisp River is a primary tributary to the Methow River; their confluence is at the town of Twisp. (See Figure 3-1.)

Ice Age glaciation greatly influenced the water resources of the Methow Valley. The glaciers originally carved U-shaped valleys into the mountains' basalt core. As the continental ice sheet that once covered the area receded, however, deposits of glacial till and outwash filled the valleys, providing a broad, shallow alluvial aquifer: a geological formation that receives, holds, and releases water. This aquifer is very permeable, allowing water to flow down the valley both underground as groundwater and in the rivers and streams as surface water. The water flows relatively freely between the underground aquifer and the Methow River and its tributaries because the glacial till and outwash are so porous. Under these conditions, the groundwater in the shallow alluvial aquifer and the surface water in the rivers and streams are described as being *in hydrologic continuity* with each other. This hydrologic connection is central to the discussion below.

3.1.1.1 Water Quantity

For this analysis, we describe water quantity in the study area in terms of three factors: surface water, groundwater, and irrigation demand.

Surface Water

Surface waters from the Methow and Twisp rivers are diverted to supply the MVID (see Figure 3-2). The MVID Water Supply Facility Plan (MWG, 1996) indicates that, at the MVID diversion points, enough water exists in these rivers to supply the MVID with its historic mean diversion rate of approximately 66.8 cfs.

Table 3-1 Summary of Environmental Impacts by Alternative (page 1 of 6)

	ALTERNATIVE A (Proposed action)	ALTERNATIVE B (Partial Upgrade)	ALTERNATIVE C (Dissolution of MVID)	ALTERNATIVE D (No action)
Water quantity	Water use reduced from 67+ to about 46 cfs, providing more water to be left in-stream, especially on the Methow and Twisp rivers above their confluence. Potential impacts on most groundwater and existing wells would be mitigated through WDOE regulation of well locations.	Water use reduced from 67+ to about 46 cfs, providing more water to be left in-stream, although not as much as under Alternative A, due to continuing diversions on the Methow and Twisp rivers above their confluence. Potential impacts on groundwater and existing wells would be less than under Alt. A, and would be mostly mitigated through WDOE regulation of well locations.	Water use, benefits and impacts similar to Alt. A.	67 cfs diverted from Twisp and Methow Rivers upstream of their confluence. Irrigation water not available to some areas of existing MVID. No potential impacts on groundwater or existing wells, as no changes are proposed.
Water quality	Construction - Potential impact in and around rivers, and streams, mitigated through conditions in permits. O&M - improved water temperatures due to more water being left in rivers; decrease in suspended solids in irrigation water.	Construction - Potential impact in/around rivers and streams, mitigated through conditions in permits. O&M - improvements in water temperature, but not as much as under Alt. A. Some potential decrease in suspended solids in irrigation water due to canal concrete lining.	Construction - same as Alt. A. O&M - same as Alt. A.	Construction- none. O&M - impacts on water quality due to sedimentation and turbidity from yearly maintenance of Twisp River diversion. Potential for major sedimentation problems if decayed sections of canal were to fail. Diversions may be contributing to high in-stream water temperatures.

Table 3-1 Summary of Environmental Impacts by Alternative (page 2 of 6)

	ALTERNATIVE A (Proposed action)	ALTERNATIVE B (Partial Upgrade)	ALTERNATIVE C (Dissolution of MVID)	ALTERNATIVE D (No action)
Fish	Construction - Potential impacts from sedimentation mitigated through conditions in permits. Improvement in fish passage through removal of diversions. O&M - increases in habitat area for anadromous fish and Bull trout lifehistory stages in the Twisp and Methow rivers above their confluence.	Construction - Potential impacts from sedimentation mitigated through conditions in permits. Some improvement in fish passage through renovation of diversions, although not as much as under Alt. A. O&M - some increases in habitat area for most anadromous fish and Bull trout lifehistory stages in the Twisp and Methow rivers above their confluence, although less than under Alt. A.	Construction and O&M - Impacts would be very similar to Alt. A.	Construction - none. O&M - fish habitat for anadromous fish and Bull trout lifehistory stages would continue to be affected due to diversions in the Twisp and Methow rivers above their confluence, and to fish passage problems at the diversions. In-stream habitat area would continue to be diminished by amount of water diverted. Annual reconstruction of diversion structure in Twisp River would continue to displace fish and affect fish habitat area and passage conditions.
Soils	Potential erosion impacts from construction mitigated through use of erosion prevention measures. Potential for erosion impacts from canal washouts greatly reduced.	Potential erosion impacts from construction mitigated through use of erosion prevention measures. Potential for erosion impacts from canal washouts greatly reduced from existing situation.	Impacts similar to Alt. A.	Continued risk of major erosion due to potential for canal failure.

Table 3-1 Summary of Environmental Impacts by Alternative (page 3 of 6)

	ALTERNATIVE A (Proposed action)	ALTERNATIVE B (Partial Upgrade)	ALTERNATIVE C (Dissolution of MVID)	ALTERNATIVE D (No action)
Vegetation	Visual impacts resulting from changes in vegetation along canal. Minor potential for impacts on jurisdictional wetlands mitigated through careful facility siting and conditions in permits. Impacts on about 33 ac. of riparian vegetation from elimination of water from canal seepage; potentially mitigated through landowners providing irrigation and through improvements to natural riparian areas along the Twisp and Methow rivers above their confluence. Potential for weed problems resulting from construction controlled through weed control program.	Visual impacts similar to Alt. A. Potential for impacts on jurisdictional wetlands less than Alt. A, because fewer new facilities would be needed. Impacts on about 30 ac. of riparian vegetation from major reduction in water from canal seepage; potentially mitigated through landowners providing irrigation and through some improvements to natural riparian areas along the Twisp and Methow rivers above their confluence. Potential for weed problems similar to those for Alt. A. Open-canal operation could disperse weeds through water.	Visual impacts similar to Alt. A. Potential for impacts on jurisdictional wetlands less than Alt. A, because fewer new facilities would be needed. Impacts on riparian vegetation similar to Alt. A. Potential for weed problems similar to those for Alt. A.	Visual and vegetation impacts would not occur except where prudent maintenance practices would require removal of trees and larger shrubs that could threaten the canal integrity. Little or no impacts on jurisdictional wetlands. Open-canal operation could disperse weeds through water. Little or no potential weed problems resulting from construction, however.

Table 3-1 Summary of Environmental Impacts by Alternative (Page 4 of 6)

	ALTERNATIVE A (Proposed action)	ALTERNATIVE B (Partial Upgrade)	ALTERNATIVE C (Dissolution of MVID)	ALTERNATIVE D (No action)
Wildlife	Impacts from construction, loss of access to open water in canal and reduction in riparian habitat now supported by canal seepage; partially offset by increased in-stream flows benefiting natural riparian habitat along both rivers above their confluence, and maintenance of vegetation by landowners electing to do so. Negligible impact on endangered or threatened species, ex. possible displacement of bald eagle perching.	Impacts from construction and loss of riparian habitat currently supported by canal seepage; would be slightly less than under Alt. A, partially offset by increased in-stream flows benefiting natural riparian vegetation along the two rivers above their confluence. Access to open water preserved. Endangered or threatened species impacts similar to Alt. A.	Impacts similar to those of Alt. A.	Prudent maintenance practices would require removal of trees and larger shrubs that could threaten the canal integrity.
Socio-economics/ Land Use	Construction - Minor land use changes for new wells or well fields and associated facilities. WDOE and BPA cover all costs; no local economic impacts.	Construction - No land use changes due to new facilities. Only a portion of costs covered by WDOE and BPA; no identified source of additional funding.	Construction - No land use changes due to new facilities. Costs covered by WDOE and BPA, so no local impacts.	Construction - No land use changes due to new facilities. Costs of any necessary repairs would not be covered by WDOE or BPA; MVID members would likely need to cover. *[con't]*

Table 3-1 Summary of Environmental Impacts by Alternative (page 5 of 6)

	ALTERNATIVE A (Proposed action)	ALTERNATIVE B (Partial Upgrade)	ALTERNATIVE C (Dissolution of MVID)	ALTERNATIVE D (No action)
Socio-economics/ Land use (con't)	O&M - smaller MVID, resulting in potential loss of some irrigation district benefits. Annual MVID O&M costs estimated to be $104,000 (some costs would be shifted to individuals who leave or new LIDs). Compensation would benefit on a per-acre basis those who elect to leave the district. Benefit to property values for those who would obtain more reliable source of irrigation water. Detriment for those who value aesthetic benefit of canal. Some benefit to future growth and development through deposit of saved water into proposed water bank or State water trust. Could result in future growth-induced impacts.	O&M - smaller MVID (but larger than Alt. A), resulting in potential loss of some irrigation district benefits. Annual MVID O&M costs estimated to be $123,000 (some costs would be shifted to individuals/new LIDs). Compensation option would benefit on a per-acre basis all who elect to leave the district; direct payment option would benefit only those who needed new wells or equipment. Benefit to property values for those who would obtain more reliable source of irrigation water. Benefit for those who value aesthetic benefit of canal. Growth and development benefits and impacts similar to Alt. A.	O&M - MVID dissolved, resulting in potential loss of irrigation district benefits. Annual MVID O&M costs estimated to be $0 (all costs would be shifted to individuals/new LIDs). Compensation would benefit on a per-acre basis all former MVID members. Benefit to property values for those who would obtain more reliable source of irrigation water. Detriment for those who value aesthetic benefit of canal. Growth and development benefits and impacts similar to Alt. A.	O&M - MVID assumed to remain the same size, but not all members currently being served. Economic impacts on those who pay assessments but don't currently receive water. Annual MVID O&M costs currently $86,000, but may need to be increased due to deferred maintenance. No compensation to individuals leaving MVID. Potential system-failure economic impacts. Potential property value impact due to uncertainties regarding water availability and possible liabilities from system failure. Benefit to those who value aesthetic benefit of canal. No benefits to or impacts on future growth and development.

Table 3-1 Summary of Environmental Impacts by Alternative (page 6 of 6)

	ALTERNATIVE A (Proposed action)	ALTERNATIVE B (Partial Upgrade)	ALTERNATIVE C (Dissolution of MVID)	ALTERNATIVE D (No action)
Cultural Resources	Potential construction impacts on historic canal, archaeological sites, and/or traditional use sites, mitigated through pre-construction surveys, careful siting of new facilities, and consultation with SHPO and Tribes. Potential benefit to Tribal and other anglers if fish numbers were to increase as a result of the project.	Similar to Alt. A.	Similar to Alt. A, although potential for impacts on archaeological and/or traditional use sites would be lower due to lack of construction impacts for new facilities except individual wells.	Some potential for impacts due to canal repair and maintenance activities, with less potential for possible mitigation. No potential benefit to Tribal and other anglers.
Safety and Liability	Greatly reduces liability from potential for canal failure and drowning safety issue.	Greatly reduces liability from potential for canal failure. Does not eliminate drowning safety issue.	Same as Alt. A	Continues existing liabilities and safety issues.

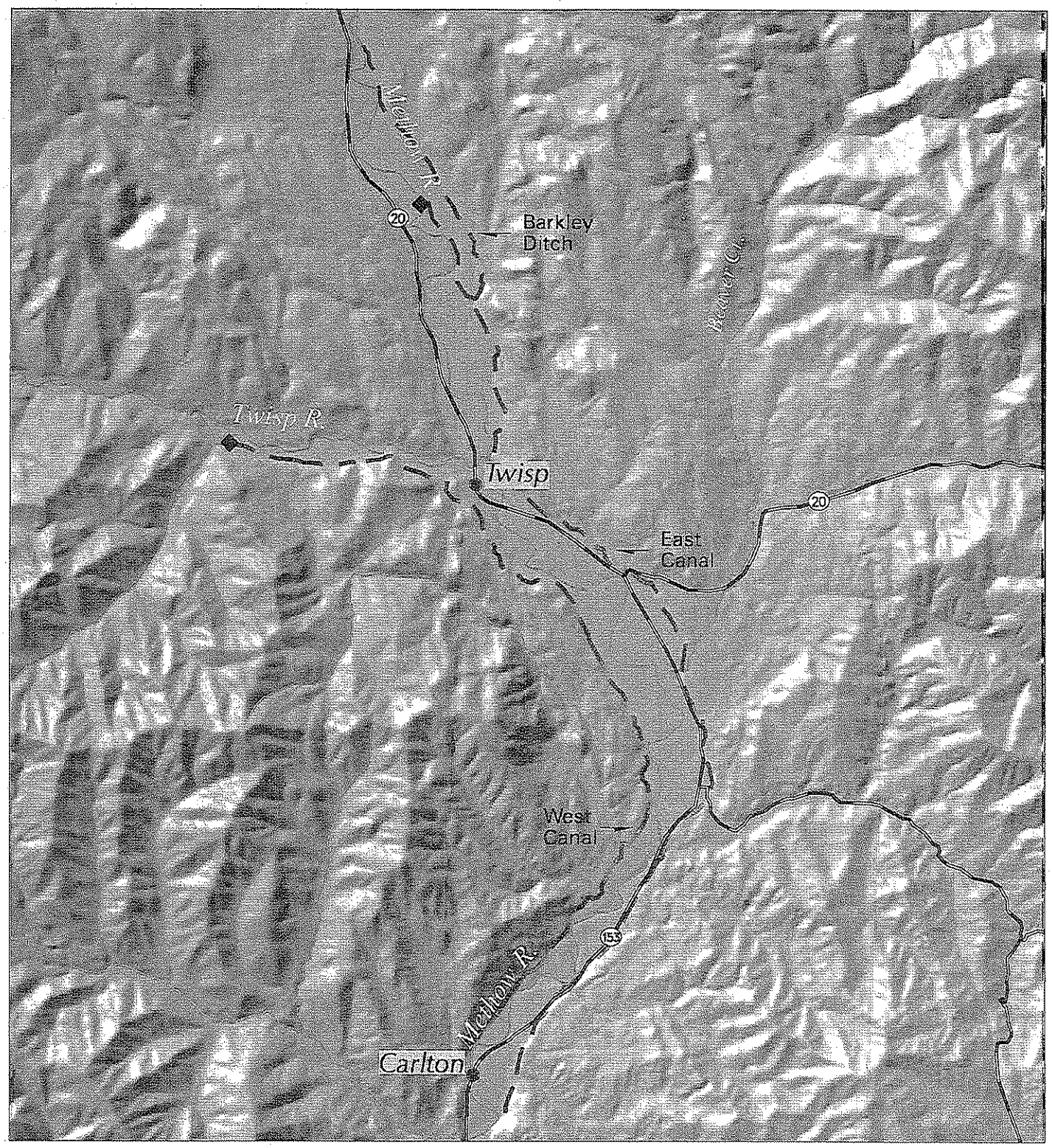


FIGURE 3–1: METHOW VALLEY IRRIGATION DISTRICT PROJECT – TERRAIN

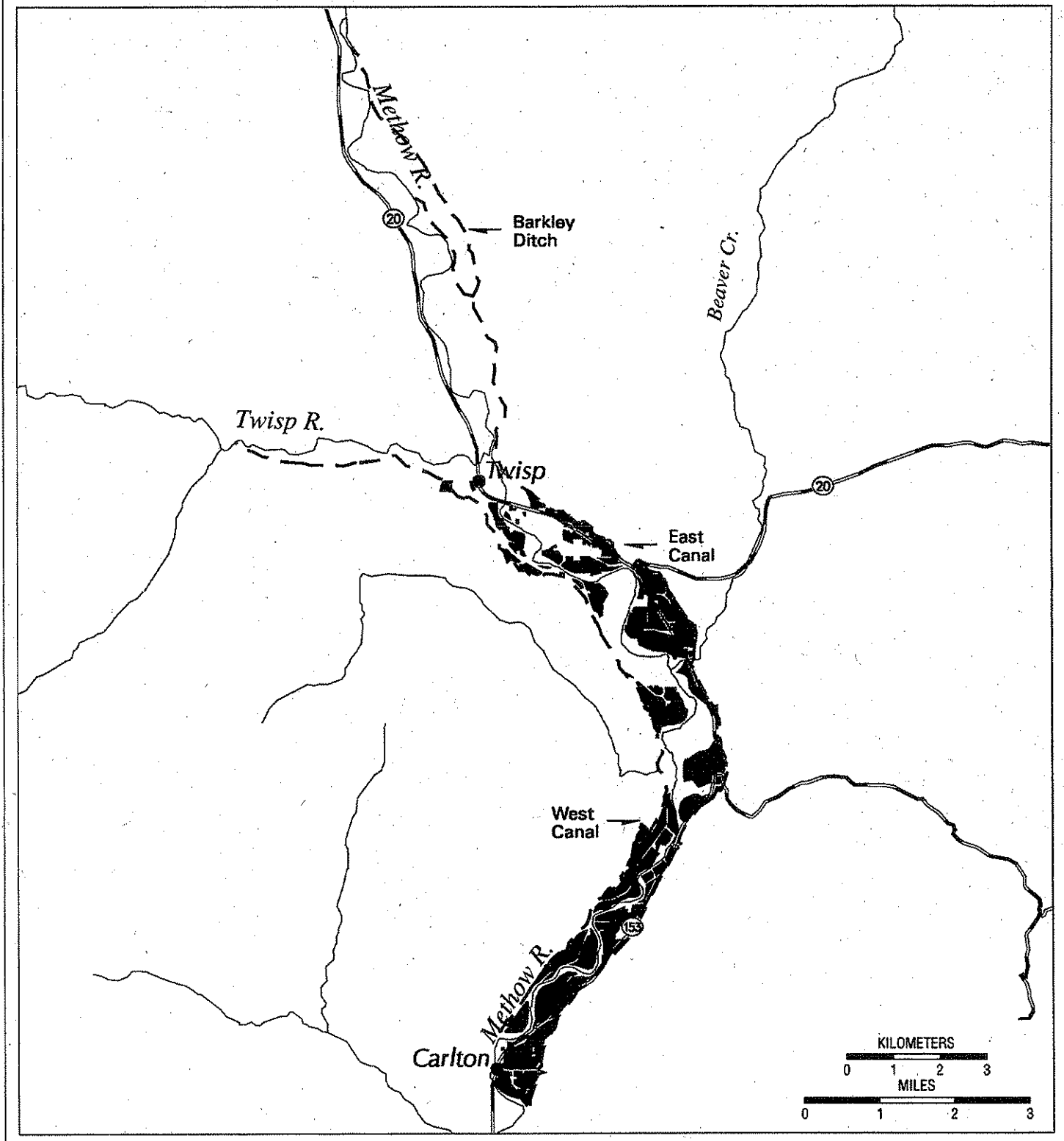
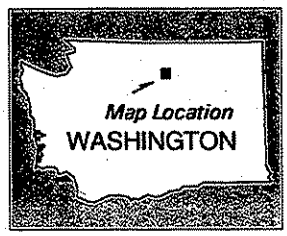


FIGURE 3–2: METHOW VALLEY IRRIGATION DISTRICT PROJECT – IRRIGATED AREAS



Irrigated Areas

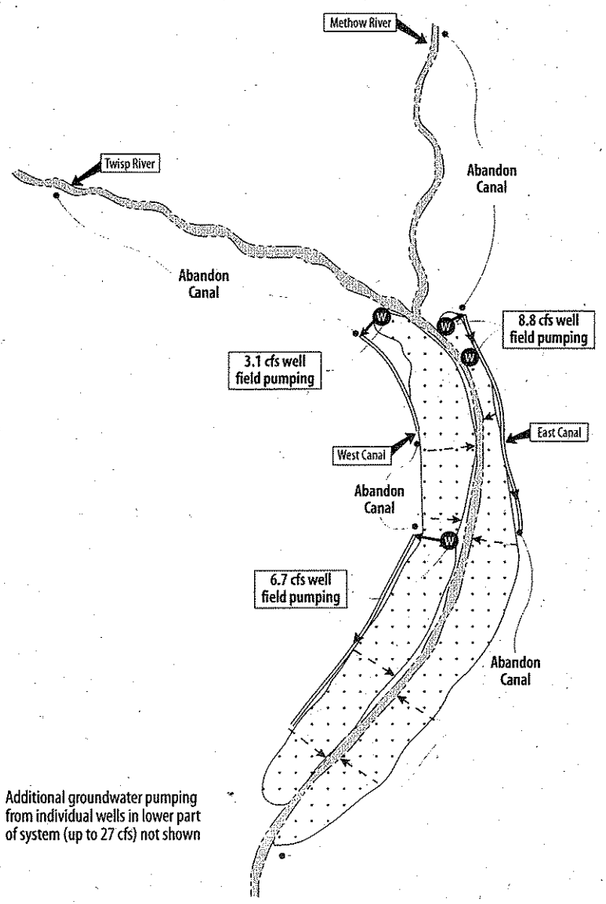
Highway

River / Stream

East & West Canals

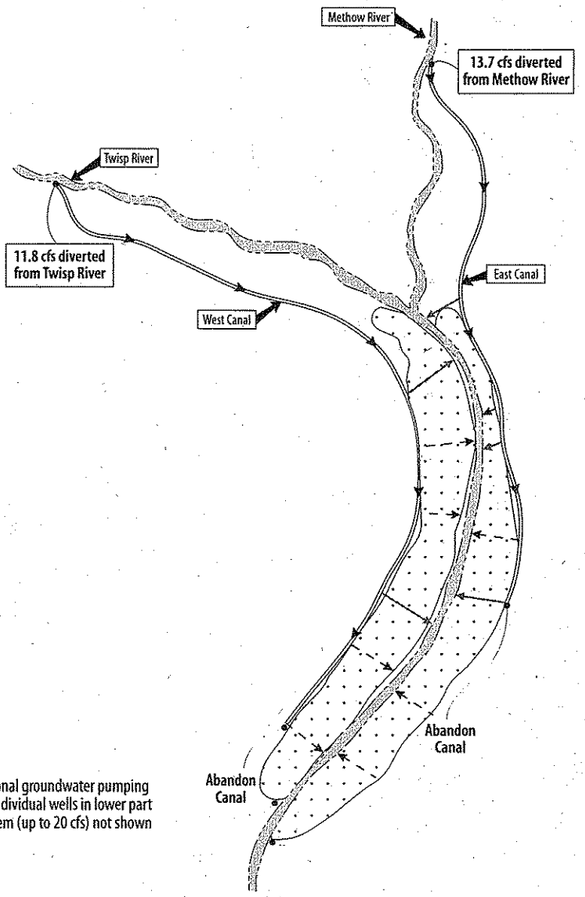
Source: Irrigated Areas, Montgomery Water Group, Inc.

Alternative A



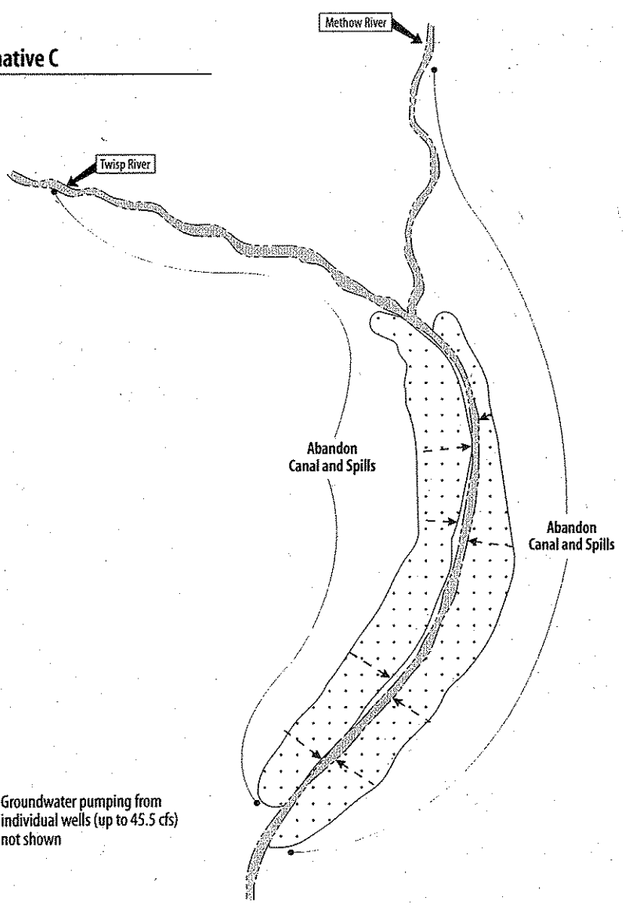
NOTE: Additional groundwater pumping from individual wells in lower part of system (up to 27 cfs) not shown

Alternative B



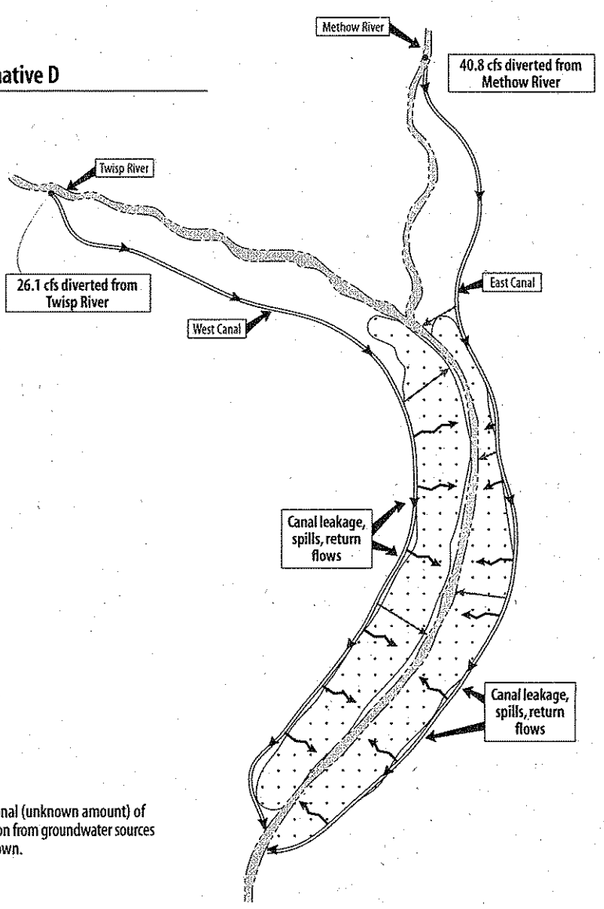
NOTE: Additional groundwater pumping from individual wells in lower part of system (up to 20 cfs) not shown

Alternative C



NOTE: Groundwater pumping from individual wells (up to 45.5 cfs) not shown

Alternative D



NOTE: Additional (unknown amount) of irrigation from groundwater sources not shown.

FIGURE 3-3 SCHEMATIC DIAGRAM OF MVID ALTERNATIVES

Spills

Return flows from irrigated fields

Canal leakage, spills, return flows

MVID parcels

Questions were raised during scoping for this project about the contribution of canal seepage to river flows, especially during the winter. Some people believe that the canal seepage contributes substantially to winter flows in the Methow. To answer this question, we first used a simplified model to approximate the amount of water that seeps from the canals after diversion from the two rivers (see **Appendix E, part 1** for details). Without a complex study beyond the scope of this document, it is not possible to determine exactly where and how much of this water enters the groundwater table. However, the approximate amount of the total diversion of 67 cfs that seeps from the canals is about 51 cfs during the peak irrigation period.

That water returns gradually, during and beyond the end of irrigation season (normally, the beginning of October). Because soils in the area are permeable, and the canals are close to the rivers, it is assumed that almost all return flows reach the river by the end of December. It is also assumed, based on historic diversion rates, that return flows are greatest in August, September, and October; and that they taper off thereafter. Because water generally follows local grades, it can be assumed that all such flows return to the Methow River *below* the confluence of the Methow and Twisp rivers.

Irrigation Demand

Currently approximately 314 ha (776 ac., or about one-third of the MVID acreage) receives irrigation, either through canal irrigation supplied by the MVID or through groundwater wells.

Data are available that document the amount of the river diversions that serve the MVID canal system; however, there are no accurate data about the amount of irrigation water actually delivered to MVID farms and lawns.

The irrigation water demand in the MVID system can be estimated several ways:

- The MVID Water Supply Facility Plan (MWG, 1996) indicates that the current actual MVID system demand is about 0.017 cfs/acre, the average amount delivered at each turnout from the MVID canal system. This means that 0.017 cfs/acre reaches farmers' fields. For the 314 MVID ha (776 ac.) that are currently irrigated, this would amount to approximately 13.5 cfs. Note that this irrigation rate does not include losses from the canal system (i.e., the difference between the 13.5 cfs and the actual 66.8 cfs combined average diversions from the Twisp and Methow rivers).

- The *Washington Irrigation Guide*, the standard reference for irrigation water requirements in Washington State, indicates that, for the MVID crop mix documented in the MVID Water Supply Facility Plan (MWG, 1996), a peak flow of 0.01 cfs/acre is required (Washington Irrigation Guide, 1990). For the 314 ha (776 ac.) currently irrigated, this would amount to 7.62 cfs. This irrigation rate does not include losses from the canal or other delivery systems or from on-farm inefficiencies.

With the information above in mind, WDOE and the MVID have agreed upon an appropriate per-acre water allowance of 0.02 cfs/acre maximum instantaneous (and 4 acre-feet/acre annually) (MWG, 1996, page 26). For the 314 ha (776 ac.) in the MVID that are currently irrigated, this

allowance would amount to 15.5 cfs. This rate would include irrigation system losses and on-farm inefficiencies (i.e., the 0.02 cfs/acre allowance would be measured at the diversion point or groundwater well). This flow rate would provide sufficient amounts of water to meet present demands, but would not allow for the present inefficiencies caused by the excessive canal system losses.

Individual landowners use groundwater from wells they have drilled to irrigate some of the MVID areas *not* currently delivered water by the MVID or not supplied water on a reliable basis, due to canal inefficiency. The total number of such wells, and the amount of irrigation water they supply, is unknown. However, it appears that more than 200 recorded domestic and irrigation wells exist in the MVID service area. The irrigation wells (about 23 of the 200 documented wells) are concentrated near the lower reaches of the east and west canals (Montgomery, 1996).

3.1.1.2 Water Quality

Surface Water

The *Draft Methow River Basin Plan* states that water quality in the Methow basin is affected by the discharge of municipal wastewater treatment systems, logging, grazing, land-clearing, and road-building (Methow Valley Water Pilot Planning Project Planning Committee, 1994). Both rivers are found on the 303(d) list, which identifies streams that are priorities for development of Total Maximum Daily Load [TMDL] standards. That list has been submitted for approval in the Washington 1996 State Water Quality Assessment Section 305(b) Report, prepared as a reporting requirement under the Clean Water Act. Both rivers are listed as in-stream flow- and temperature-limited, which means they do not meet the water quality standards under the Clean Water Act. Nonetheless, within the MVID area, the Methow River is classified by the State as Class A water quality (excellent); the Twisp River above Twisp is classified as AA (extraordinary).

Table 3-2 shows maximum and minimum values for three water quality measures at two monitoring sites (RM 39.4, near Twisp; RM 5, near Pateros) along the Methow River, between 1989 and 1995. Class A in-stream water quality standards, as stated in Chapter 173-201A of the Washington Administrative Code (WAC), were exceeded at the site at Twisp for pH and dissolved oxygen. Standards were exceeded for temperature and pH at the site near Pateros. Data on additional water quality measures is found in **Appendix E, Part 3.**

Table 3-2: Minimum and Maximum Values for Standard Water Quality Measures

	Methow River at Twisp		Methow River near Pateros		WAC[1] Standards
Variable	Max	Min	Max	Min	
Temp(C)	15.5	0	19.8[a]	0	< 18
Oxygen (mg/L)	14.1	7.9[a]	14.7	9	> 8
pH (units)	8.8[a]	7.3[a]	9.5[a]	7.5	7.5 to 8.5

1 = Washington Administrative Code a = Value is above or below WAC standards

Source: *River and Stream Ambient Monitoring Report for Water Year 1995* (Washington Department of Ecology, December, 1996) Data on additional water quality measures is found in **Appendix E, part 3.**

Groundwater

No groundwater quality studies have been completed that address the study area. Groundwater in the Methow Valley is recharged principally from rain, snowmelt, and stream run-off into the shallow alluvial aquifer that underlies the valley. Local inflow from fracture and joint zones in the adjacent bedrock may contribute a minor amount of water. Because the majority of the groundwater is heavily influenced by surface sources and is in continuity with the river, the chemical character of the groundwater in the Methow basin can probably best be characterized by the surface water quality in the Methow River at the site near Pateros (Table 3-2 and **Appendix E, part 3**).

The groundwater in the Methow Valley has been used for drinking and irrigation for many years. We know of no contaminants in these waters that would preclude continued uses. Some of the groundwater used for irrigation in the area returns to the river systems, with no known adverse impacts. Typically, groundwater is less turbid (stirred up, muddy) than river water, a benefit in small quantities for aquatic life. Shallow groundwater is typically cooler than the summer river-water temperature, and warmer than the winter river-water temperature. Groundwater flows to the Methow River during the coldest winter months are probably minimal, because the permeable soils drain water back to the river by December, or perhaps earlier. Although no studies of the effect of groundwater returns on river-water temperature or flow have been completed in the MVID area, it is likely that any such effects are too small to be measurable.

3.1.2 Potential Impacts

3.1.2.1 Potential Impacts of Alternative A

Water Quantity

Construction Impacts. Under Alternative A, the existing diversion, intake, and fish-screen structures would be demolished and new groundwater wells drilled near the Twisp and Methow rivers to serve a new groundwater piped irrigation system. In addition, current MVID members no longer served by the MVID system could leave the MVID and either use existing (upgraded) wells or drill their own new groundwater irrigation wells, or form LIDs to provide piped groundwater to serve their irrigation needs.

Although the demolition of the diversion, intake, and fish-screen structures would occur in and next to the two rivers, and new wells would be drilled into the groundwater, there would be no direct impact on either surface or groundwater quantity. Impacts resulting from the *use* of the groundwater are discussed below.

Operation and Maintenance Impacts. About 376 ha (930 ac.) of agricultural land would remain in the district; these lands would be irrigated from wells and piped distribution systems (for irrigated acreage and water use by alternative, see **Table E-2, in part 3** of **Appendix E**). The remaining 545 ha (1,346 ac.) would be irrigated from private or community wells not controlled by MVID. All new wells would need to be located so as to withdraw water from the shallow alluvial aquifer, and therefore would be in direct hydraulic continuity with the river water.

The maximum allowable instantaneous diversion rate authorized for crops would be 0.02 cfs/ac., with an allowance of 4 acre-feet/acre per year (MWG, 1996). Thus, a total of about 45.5 cfs would be withdrawn from the shallow groundwater aquifer to irrigate the full 921 ha (2,276 ac.) within the current MVID service area. No allowance for conveyance is included (it is assumed that the piped groundwater systems would be leakproof). WDOE's maximum instantaneous water allowance of 0.02 cfs per ac. would be sufficient to meet the crop needs, any on-farm application inefficiencies, and any landowners' irrigation of vegetation previously fed by canal leakage.

This alternative would be expected to have overall positive effects on surface water quantity and on the groundwater aquifer, because overall river diversions and groundwater extraction would be reduced by at least 32 percent, from more than 66.8 cfs (known river diversions plus some additional unknown amount of groundwater use), to 45.5 cfs.

Surface Water Impacts. In-stream flow increases would occur on the Methow and Twisp rivers, generally above their confluence.

- For the **Methow River**, the reach between the present east canal diversion and a point about 1.6 km (1 mi.) below the confluence (a total of 8 km (5 mi.)), where a

groundwater well field would be constructed, mean peak river diversions would drop from 40.8 cfs (current peak diversion) to 0 cfs.

- On the **Twisp River**, the reach between the present west canal diversion and a point just above the confluence near Alder Creek Road (about 6.5 km (4 mi.)), where a groundwater well field would be constructed, mean peak river diversions would drop from 26.1 cfs to 0 cfs.

These respective reductions would make additional water available for fish along those reaches of the two rivers.

Downstream of the confluence, there would also be an in-stream flow benefit; however, it would not be as great as that above the confluence.

- Pumping from the well fields located near the confluence (a peak amount of 3.1 cfs for the well field serving the upper west side piped groundwater system, and 8.8 cfs for the piped groundwater system on the east side) would reduce river flows in the well fields' immediate vicinity. Figure 2-1 shows the well field locations.

- A second well field serving the lower west side would withdraw a peak amount of 6.7 cfs from the Methow River about 1.6 km (1 mi.) below Alder Creek.

Mean peak diversions below the confluence would be reduced as follows:

- from a total of 66.8 cfs to 11.9 cfs for the reach of the Methow River from the east side well field (just below the confluence) to the lower west side well field below Alder Creek.;

- and from a total of 66.8 cfs to 18.6 cfs for the reach of the Methow River from the lower west side well field to the end of the MVID system.

However, other factors also influence the amount of flow that would be returned to the Methow River below the confluence. These include leakage from the canal, and the extent and destination of groundwater return flows. Currently, under existing (No Action) conditions, canal leakage and surface and groundwater return flows from irrigated lands located below the confluence return water to the Methow River below the confluence. The return flows currently return some amount of the 66.8 cfs diverted from the Twisp and Methow rivers to the Methow River below the confluence. However, the *location* of these return flows, and the *proportion* that returns as surface water leaks and seeps versus groundwater, cannot be determined without extensive analysis of existing canal leakage, aquifer characteristics, and irrigation patterns. Because we cannot quantify the amount and location of return flows to the Methow River below the confluence in the No Action alternative, we have quantified the benefits of Alternative A only for the Twisp and Methow rivers above their confluence.

Impacts from Development of Groundwater Supplies. Hong West (Hong West, 1997) reports that groundwater sources could probably be developed to meet the irrigation needs of the entire MVID service area (921 ha or 2,276 ac.). Hong West's Table 4 shows that the minimum

"Estimated Reasonable Potential Yield" for the entire area would be 49.1 cfs. This is enough to meet the entire service area peak demand of 45.5 cfs, as calculated above (@ 0.02 cfs/ac.).

However, the Hong West's well logs and the hydrogeologic cross-sections clearly indicate certain conclusions regarding well development and impacts:

- The only locations able to produce the sustained high yields necessary to supply the three groundwater well fields for the reorganized MVID are those right next to the rivers, where direct hydraulic continuity is likely to exist.
- Withdrawal of substantial quantities of water (on the order of 10 cfs) would have local impacts on the groundwater levels in existing wells, and/or on river flows.
- In addition, the groundwater levels would be depressed during the peak demand periods (summer irrigation months) and would be recharged over the non-irrigation season.
- Any nearby wells (new or existing) would probably be influenced by high rates of groundwater pumping.
- In general, any new wells of comparable size, located farther from the river, would experience greater drawdowns and would have more significant negative influences on adjacent wells than would wells drilled nearer the river.

Therefore, the three major well fields to support the MVID pumped groundwater system are proposed for location near the rivers. Note that even if the wells were drilled in areas in hydraulic continuity with the river, groundwater levels would be drawn down, and existing wells could, in theory, be affected in some cases.

However, WDOE would *not* authorize water rights for new wells if they would impair authorized uses of existing wells. The agency might require pumping tests and/or additional test and monitoring wells to assure that new wells were not located where they could impair existing wells. WDOE's regulatory role would limit impacts on existing wells both from wells drilled by the MVID to serve the MVID pumped groundwater system or from wells drilled by individuals and LIDs to serve areas no longer in the MVID.

Under this alternative, some new groundwater wells would also be drilled (by individuals or LIDs) to serve parcels no longer served by the MVID. These wells could potentially affect existing nearby wells, especially if they were drilled into the upslope margins of the aquifer instead of closer to the rivers. In general, the farther the wells are from the river, the longer it could take for recharge to occur and the greater the drawdown of groundwater levels that could affect nearby wells. However, as stated above, WDOE would not authorize new wells that would impair existing authorized uses.

Impacts of Canal Dewatering on Wells. The Hong West hydrogeologic cross-sections (Hong West, 1996) show that water levels in wells located in the upslope margins of the alluvial aquifer are significantly higher than the river level. These wells are replenished primarily from

groundwater in upslope watersheds (winter precipitation), *not* from the rivers. Eliminating canal seepage would likely have very little impact on *properly constructed* existing wells in these upslope areas, because such wells are deep enough to tap the alluvial aquifer. However, very shallow wells (less than 15 m or 50 ft. deep) that are improperly surface-sealed and located in the immediate vicinity of the canals would most likely be affected if the source of local recharge water (canal seepage) were eliminated.

Transfer of Water Right Points-of-Diversion. WDOE could authorize the transfer of MVID surface water right points-of-diversion to groundwater points-of-withdrawal under this alternative under the following conditions: *if* it can be demonstrated that

- the groundwater well was tapping the alluvial aquifer in hydraulic continuity with the rivers,
- it would not impair existing rights, and
- it would meet the conservation/in-stream flow goals of the project.

It is anticipated that most wells within the MVID would meet these requirements without any difficulty. These transfers would be handled on a case-by-case basis, and would be authorized only if the use of adjacent permitted wells would not be impaired. The permit process would require hydrogeologic investigations to size and locate the new wells so that there would be no impairment of existing permitted wells. If a landowner were not able to access the alluvial aquifer on with a well on his or her own property, WDOE would authorize the use of water from a qualified well on an adjacent landowner's property, or through a common source developed by a Local Improvement District (LID). WDOE would not authorize water rights for new wells if they would impair authorized uses of existing wells. The agency might require pumping tests and/or additional tests and monitoring wells to assure that new wells were not located where they could impair existing wells. WDOE's regulatory role would limit impacts on existing authorized wells from wells drilled by individuals or LIDs.

Canal Seepage Contribution to Groundwater. The issue of the effects of eliminating canal-seepage contributions on groundwater levels was raised during scoping. If one compares historic MVID diversions from the Methow and Twisp rivers to the amount of water needed for crop irrigation (see **Appendix E, part 2**, for detailed information on the comparison) it becomes evident that the losses are distributed over a relatively large area (45 km or 28 mi. of canal). The loss of any canal contribution to the total groundwater supply would be *very* small in relation to the amount of groundwater pumping needed to meet irrigation requirements under Alternative A.

Water Quality

Construction Impacts. In-stream construction work associated with the diversion and intake structures and fish-screen removal, as well as construction of the water storage tanks and pipeline, could in the short term increase sedimentation and the potential for diesel-fuel and oil spills from construction equipment. River-bottom sediments would be disturbed and become suspended while equipment is operating in the river or streams at the existing points of diversion or at stream crossings.

However, the potential for major adverse impacts is minimal, because all construction would have to comply with the requirements of a Hydraulic Project Approval (HPA), issued by WDFW, and a water quality permit, issued by WDOE. The conditions specified by these permits, which would likely include an erosion control plan and a Spill Prevention Containment and Countermeasures (SPCC) plan, would minimize the potential for impacts on surface and ground water quality.

Operation and Maintenance Impacts. This alternative is expected to enhance the water quality of both the rivers and the irrigation water. Eliminating diversions into the canal system would leave more water in the Twisp and Methow rivers, and would lower river water temperature during summer months (as noted above in Table 3-2, water temperature standards have been exceeded on occasion on the Methow River at Pateros, below the MVID area). With irrigation water flowing through a pipe instead of an earthen channel, no suspended solids would be scoured from the channel bottom to affect irrigation water quality. However, water removed from wells could suffer turbidity problems that might occur during periods of high surface-water runoff.

3.1.2.2 Potential Impacts of Alternative B

Water Quantity

Construction Impacts. Under Alternative B, the existing diversion and intake structures and fish screens would be rehabilitated. Selected sections of the existing canal system would be reconstructed and lined with concrete to reduce conveyance losses. (For a discussion of alternative lining methods, see **Appendix C.**) Landowners not served by the canal would drill new groundwater wells near the Twisp and Methow rivers to provide their own irrigation water, or would form LIDs to drill groundwater wells and pipe irrigation water to parcels more distant from the rivers. Although construction would occur in and next to the two rivers, and the new wells would be drilled into the groundwater, there would be no negative impact on either surface or groundwater quantity.

Operation and Maintenance Impacts. This alternative is expected to have positive effects on the surface waters and groundwater aquifer, though not to the same extent as under Alternative A (for irrigated acreage and water use by alternative, see **part 3 of Appendix E**). Overall river diversions and groundwater extraction would be reduced about 32 percent, from more than 66.8 cfs to 45.5 cfs, the same as Alternative A. However, 26 cfs would still be directly diverted from the original diversion points on the Methow and Twisp rivers.

Surface Water Impacts. Diversions would be reduced as follows:

- on the Methow River above the confluence of the Twisp and Methow rivers: from 40.8 cfs to 13.7 cfs;
- from the Twisp River above the confluence: from 26.1 cfs to 11.8 cfs.

As under Alternative A, there would also be increased flows in the Methow River below the confluence of the Twisp and Methow rivers. These benefits would be less than those under

Alternative A (because more water would be diverted higher up in the Methow River system). However, in-stream flow benefits have not been quantified, for the same reasons described for Alternative A.

Impacts from Development of Groundwater Supplies. Concerns described under Alternative A about the potential impact of new groundwater wells on existing wells would also be true for this alternative. However, a smaller proportion of the total MVID area would be served by groundwater wells under this alternative. WDOE would authorize the transfer of surface water right points-of-diversion to groundwater points-of-withdrawal *only* if new wells would not impair authorized uses.

Impacts of Canal Dewatering on Wells. Canal seepage would be curtailed under Alternative B by the lining of the canal with concrete. However, Alternative B would likely have very little impact on properly constructed existing wells in the vicinity of the canal. It would have the potential to dewater shallow, improperly surface-sealed wells located immediately downslope of the canal, as under Alternative A.

Transfer of Water Right Points-of-Diversion. WDOE could authorize the transfer of MVID surface water right points-of-diversion to groundwater points-of-withdrawal for individuals no longer within the MVID under this alternative *if* several conditions are met. The groundwater wells must tap the alluvial aquifer in hydraulic continuity with the rivers. As under Alternative A, the water right transfers would be handled on a case-by-case basis, and would be authorized only if the use of adjacent permitted wells would not be impaired. In addition, sufficient in-stream flow benefits and operational efficiencies need to be gained, and agreement must be reached between WDFW and YIN fish managers.

Canal Seepage Contribution to Groundwater. As under Alternative A, the loss of any canal contribution to the total groundwater supply would be very small in relation to the amount of groundwater pumping needed to meet irrigation requirements under Alternative B.

Water Quality

Construction Impacts. Impacts from Alternative B would be similar to those under Alternative A.

Operation and Maintenance Impacts. Under this alternative, water quality is expected to be enhanced, although not as much as under Alternative A. The water quality (particularly temperature) of the Methow and Twisp rivers should improve because less water would be diverted from the rivers; however, because some water (26 cfs) would still be diverted, and from higher up on the two rivers than under Alternative A, water quality improvements would not be as great as those under Alternative A.

3.1.2.3 Potential Impacts of Alternative C

Water Quantity

Construction Impacts. Under this alternative, there would be no construction of new MVID facilities. Landowners would drill new groundwater wells to provide themselves irrigation water, would use existing or upgraded wells, or would create LIDs to drill wells and pipe irrigation water to parcels where the alluvial aquifer cannot be accessed directly. The construction of new wells is not expected to affect surface or groundwater negatively.

Operation and Maintenance Impacts. Impacts would be similar in nature to those described for Alternative A. The entire MVID area would be served by groundwater pumping from individual wells or LIDs. As with Alternative A, all wells would need to be located so as to withdraw water from the shallow alluvial aquifer, and would therefore be in direct hydraulic continuity with the river water.

Overall water use would be reduced by at least 32 percent, the same as for Alternatives A and B. (For irrigated acreage and water use by alternative, see **part 3 of Appendix E.**) However, as with Alternative A, there would be no direct diversions of water from the rivers. Diversions would be reduced as follows:

- on the Methow River above the confluence of the Twisp and Methow rivers: from 40.8 cfs to zero;
- from the Twisp River above the confluence: from 26.1 cfs to zero.

As under Alternative A, there would also be increased flows in the Methow River below the confluence of the Twisp and Methow rivers; however, these benefits have not been quantified, for the same reasons described for Alternative A.

Impacts from the development of groundwater supplies would be similar to those of Alternative A. However, the groundwater wells would be more numerous and dispersed, and the three major well fields would not be developed. WDOE would not authorize water rights for new wells if they would impair authorized uses of existing wells, and the agency might require pumping tests and/or additional test and monitoring wells to assure that new wells were not located where they could impair existing wells. WDOE's regulatory role would limit impacts on existing wells from wells drilled by individuals or LIDs.

The potential impacts of canal dewatering on wells, transfer of water right issues, and canal seepage contribution to groundwater issues would be the same as under Alternative A.

Water Quality

Construction Impacts. The potential for construction-related water quality impacts from removal of diversions and fish screens would be essentially the same as those under Alternative A.

Operation and Maintenance Impacts. Operations and maintenance-related impacts to water quality would essentially be the same as those under Alternative A.

3.1.2.4 Potential Impacts of Alternative D

Water Quantity

Construction Impacts. There would be no new construction in the No Action alternative; however, repairs are needed as soon as possible for approximately 11.3 km (7 mi.) of canal identified as "high risk." This repair work would not directly affect surface or groundwater quantity.

Operation and Maintenance Impacts. Diversions currently average 66.8 cfs during each irrigation season. (For irrigated acreage and water use by alternative, see **Table E-2**, in **part 3 of Appendix E.**) Under this alternative, diversions from the rivers would continue to be made to irrigate a relatively small area of land. The inefficiencies associated with the current irrigation facilities would continue, and areas of the MVID that are not currently served by the canal system would continue not to be served.

Water Quality

Construction Impacts. Repairs to the high-risk areas of the canals could cause water quality impacts if not properly conducted; however the potential for major adverse impacts is minimal, because the work would be conducted consistent with conditions of permits required by WDOE and WDFW. If repair of the most seriously decayed or damaged sections of the existing canal system were *not* to occur, the potential for catastrophic damage or failure (with attendant impacts on water quality) would continue to exist.

Operation and Maintenance Impacts. The current practice of using a bulldozer to push up the berm on the Twisp River, with its resulting adverse impacts of sedimentation and turbidity, would continue. Also, it is likely that the diversions of water from the rivers would continue to increase summer river water temperatures in the stretches of the river below the diversion points (although water temperature data are not available to confirm this).

3.2 Fish

3.2.1 Existing Environment

Salmon populations throughout the Northwest have declined over the last century. Populations of several specific species have reached critical levels, and there is much concern over the dwindling numbers of naturally produced fish. The number of Pacific salmonids returning to the Columbia River system from the ocean has declined dramatically in the last 150 years.

Pacific salmon have also disappeared from about 40 percent of their historical breeding ranges in the Pacific Northwest, and many remaining populations are severely depressed (that is, their

reproduction is substantially lower than would be expected based on natural variation and available habitat, but above the level where permanent damage is likely). The decline in range can be attributed to human impacts on the environment, such as dams, forestry, agriculture, hatcheries, and overfishing, while the decline in population can be attributed both to human influences and to shifting climactic and ocean conditions.

The Methow River basin is fairly high upstream in the Columbia River system. Because of its location, the anadromous fish (those that spend adult life in marine or estuarine water and migrate to spawn in fresh water) that use the basin are subjected to many of the above-mentioned impacts throughout the Columbia River. They are particularly affected at the dams, as they make their way up the system to spawn and as the juveniles return to the ocean.

3.2.1.1 River Habitat and Fish Species Presence in the Methow Basin

Methow and Twisp river channel characteristics and fish habitat are described in the In-stream Flow Incremental Methodology (IFIM) study conducted by WDOE (1992). (For more information on the purpose, suitability, and limitations of the IFIM study, see **Appendix E, part 4.**) The Methow River between Carlton and Twisp is about 50 m (160 ft.) wide, and has an average gradient of less than 0.5 percent. Its substrate is dominated by cobble and some large boulders. Habitat types mostly include glides and riffles, interspersed with some deep pools. Within the project area, the Twisp River is about 18 m (60 ft.) wide, and has an average gradient of 1.7 percent. It is mostly cascade and riffle habitat with no pools. Substrate is primarily cobble and boulder.

The Methow Basin provides 294 km (182 mi.) of streams used by several anadromous fish species, including chinook, sockeye, and coho salmon and steelhead trout (see Figure 3-4) (Mullan et al., 1992). Little is known about sockeye and coho salmon use of the MVID project area; however, such use appears to be minimal because of the basin's location and characteristics (such as limited rearing habitat for those species). Resident species (fish that do not migrate to the ocean) include rainbow, cutthroat/rainbow hybrid, brown, brook, and Bull trout; and mountain whitefish (Table 3-3). The species of primary concern in this portion of the basin are chinook salmon (summer and spring), summer steelhead trout, and Bull trout (USFWS, 1997; WDFW, 1996a).

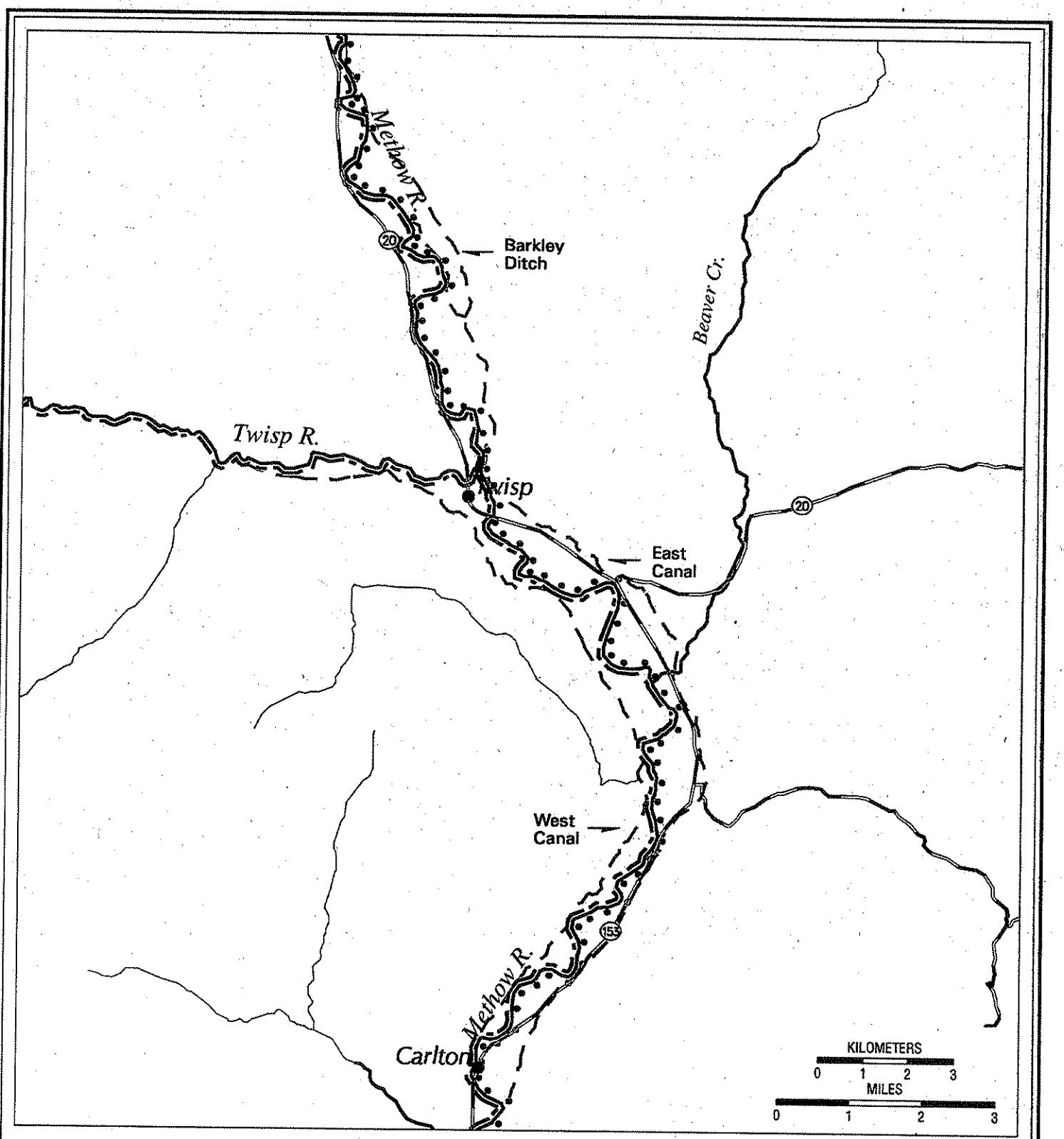
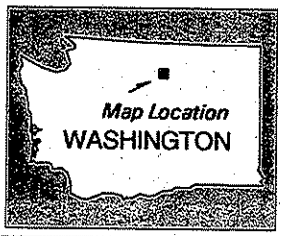


FIGURE 3–4: METHOW VALLEY IRRIGATION DISTRICT PROJECT – ANADROMOUS FISH DISTRIBUTION



Summer Steelhead
Sockeye
Spring Chinook
Highway
River / Stream
East & West Canals

Source: Washington Rivers Information System, 1996

Table 3-3: Anadromous and Resident Fish Species Using the MVID Project Area

Anadromous Species		Resident Species	
Common Name	**Scientific Name**	**Common Name**	**Scientific name**
Summer chinook salmon	*Oncorhynchus tshawytscha*	Rainbow trout	*O. mykiss*
Spring chinook salmon	*O. tshawytscha*	Cutthroat trout	*O. clarki*
Fall chinook salmon	*O. tshawytscha*	Eastern brook trout	*Salvelinus fontinalis*
Coho salmon	*O. kisutch*	Bull trout	*S. malma*
Summer steelhead trout	*O. mykiss*	Brown trout	*Salmo trutta*
		Mountain whitefish	*Prosopium williamsoni*
		Largescale sucker	*Catostomus macrocheilus*
		Longnose dace	*Rhinichthys cataractae*
		Redside shiner	*Richardsonius balteatus*
		Sculpin	*Cottus* sp.

3.2.1.2 Special Status Fish Species

There are currently no Federally listed endangered or threatened fish species within the MVID project area. However, the status of several species within the project area is currently under review by National Marine Fisheries Service (NMFS) and the US Fish and Wildlife Service (USFWS). Summer chinook in the mid-Columbia system were identified in a petition for listing under the Endangered Species Act (ESA) on June 1, 1993. Steelhead in western coastal waters were identified in a petition for listing on February 14, 1994. The NMFS is expected to make a ruling on the status of these species by August 1997. Bull trout were identified on a petition for listing in 1992; the USFWS has recently announced that Bull trout will be listed under the ESA, and is currently finalizing the ruling.

The WDFW considers several of the anadromous and resident species in the Methow basin as Priority Species (Table 3-4). Because of this, the Methow and Twisp rivers within the MVID project area are designated as used by Priority Species. This means that the area requires special protective measures and management guidelines to ensure the continued existence of each species (WDFW, 1996b).

Table 3-4: WDFW-Identified Priority Species in the MVID Project Area

Common Name	Scientific Name	Washington Species Criteria*
Chinook salmon	*Oncorhynchus tshawytscha*	Vulnerable/Species of Importance
Coho salmon	*O. kisutch*	Vulnerable/Species of Importance
Sockeye salmon	*O. nerka*	Vulnerable/Species of Importance
Steelhead trout	*O. mykiss*	Species of Importance
Rainbow trout	*O. mykiss*	Species of Importance
Bull trout	*Salvelinus malma*	Vulnerable/Species of Importance

*WDFW species criteria (WDFW, 1996) include:

Vulnerable - Species or groups of animals susceptible to significant population declines within a specific area by virtue of their inclination to aggregate, e.g., in fish spawning and rearing areas.

Species of Importance - Native and non-native fish species of recreational, commercial, or tribal ceremonial and subsistence importance that are vulnerable to habitat loss or degradation.

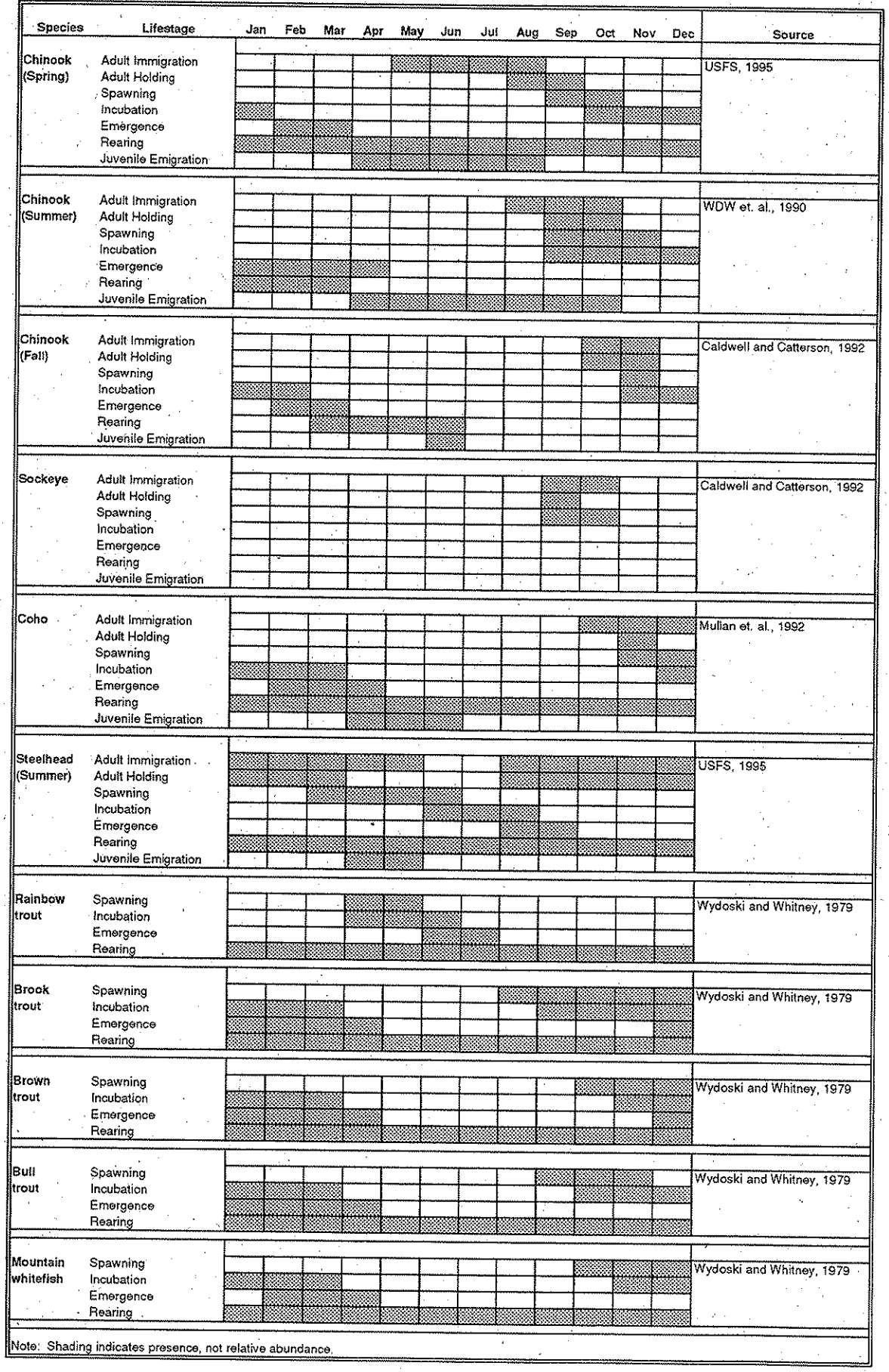
3.2.1.3 Anadromous Fish

Major factors affect Methow Basin anadromous salmonids, including passage and associated mortality at nine mainstem Columbia River dams and overharvest in downstream fisheries (WDW et al., 1990; Caldwell and Catterson, 1992; Mullan et al., 1992). Once anadromous salmonids are in the basin, the factors affecting them are specific to both the species and the lifehistory stages of each species. The discussion below provides a brief overview of anadromous species found within the MVID project area. Figure 3-5 illustrates the life history timing of Methow and Twisp River salmonids in the project area.

Spring Chinook Salmon

Spring chinook spawn in the upper mainstem reaches of the Methow and Twisp rivers. The WDFW considers the Twisp River spring chinook stock to be depressed, based on short-term declines in spawning escapement (USFS, 1995). The fish use both rivers in the MVID project area, mainly for passage. However, spawning surveys conducted in the basin have identified redds near the diversions on both rivers, including both above and below the Twisp diversion. Spring chinook juveniles spend about one year rearing in freshwater before they out-migrate to

Figure 3-5
Life History Timing of Methow and Twisp River Salmonids in the MVID Project Area



the ocean. Natural spawning escapement (returning adults produced from natural reproduction) averaged 2,024 fish between 1977 and 1985 (WDW et al., 1990).

Based on the Council's habitat-carrying-capacity model, the Methow Basin is capable of producing 826,359 smolts (WDW et al., 1990). Currently, the Winthrop National Fish Hatchery produces spring chinook annually and summer chinook as available, with an average releases of 986,187 spring chinook yearling smolts into the Methow River from 1977 to 1987 (WDW et al., 1990).

The goal in the basin is to obtain a sustainable harvest of 2,000 fish, to be shared between sport and tribal fisheries, while maintaining genetic integrity and a balance of spawners in tributaries of the subbasin (WDW et al., 1990; Caldwell and Catterson, 1992). In-basin limiting factors for spring chinook include the following:

- intermittent flow in some reaches,
- low flows because of irrigation diversions,
- substandard diversion screens,
- winter icing, and
- habitat losses from development in riparian areas (WDW et al., 1990; Caldwell and Catterson, 1992).

Summer Chinook Salmon

Summer chinook spawn in the lower- and mid-mainstem Methow River reaches up to the Chewuck River confluence (RM 50.1); this area includes the MVID project area on the Methow River. Summer chinook are not known to spawn or rear in the Twisp River at the present time, but they have in the past, so the river is being managed to encourage the natural production of summer chinook (e.g., hatchery summer chinook are not released into the Twisp River). The average run size for the years of 1977 to 1985 was 1,018 fish per year (WDW et al., 1990).

Summer chinook juveniles spend about 3 to 4 months rearing in the Methow system before out-migrating to rear in the Columbia River impoundments (D. Bambrick, Yakama Indian Nation, pers. comm., 1997). Adult summer chinook migrate into the system beginning in late August, and spawn in late September through early November. Smolts emigrate in the spring, typically before diversions begin.

Winthrop National Fish Hatchery intermittently releases summer chinook into the Methow River, but hatchery fish contribution to annual run sizes is unknown. Based on the Council's habitat-carrying-capacity model, the Methow Basin is capable of producing 1,470,822 summer chinook smolts (WDW et al., 1990). Although the Methow River may be able to support this many juveniles, critical rearing areas in the Columbia River may not. This number may therefore be misleading.

The goal in the basin is to obtain a sustainable harvest of 3,000 fish, to be shared between sport and tribal anglers while maintaining the unique characteristics of the stock (WDW et al., 1990;

Caldwell and Catterson, 1992). In-basin factors limiting summer chinook production include the following:

- low stream flows because of irrigation diversions, and
- in-stream and riparian habitat losses (WDW et al., 1990; Caldwell and Catterson, 1992).

Fall Chinook Salmon

Fall chinook use a small part of the mainstem Methow River. They are not known to use any tributary streams (including the Twisp River) for spawning or rearing. Little is known about the life history of fall chinook in the Methow River, except that they migrate into the system in October, and spawn in November; smolt emigration most likely occurs in June. Documented fall chinook redds have been located only in the lower reaches of the Methow River, downstream of the MVID project area. There is currently no management plan for fall chinook in the Methow Basin because of the lack of information on their basin use (Caldwell and Catterson, 1992).

Sockeye Salmon

Sockeye salmon are known to use the Methow Basin in small numbers. Sockeye that use the Methow and Twisp river systems are somewhat different from typical sockeyes, in that they do not rely on lakes or reservoirs for spawning. Redds have been recorded up to Winthrop in the mainstem Methow River and also in the Twisp River (Caldwell and Catterson, 1992). There is minimal information about escapement or life-history information specific to the Methow River basin. Sockeye enter the system in September; and peak spawning occurs in late September and early October. Emergence, rearing areas, and out-migration timing are uncertain. There is currently no management plan because there is so little information about basin use (WDW et al., 1990).

Summer Steelhead Trout

Summer steelhead are present in the Methow and Twisp rivers and in most accessible tributaries in the basin. Adults begin entering the Methow system in July, and continue their migration into the system through October (Figure 3-5). During the winter, many adults return to the Columbia's warmer waters. Spawning occurs in the upper mainstem Methow River upstream of the MVID project area and in tributaries, including the Twisp River, beginning in March and continuing into early June. Juveniles rear near spawning areas in tributaries. However, many smolts also emigrate from smaller tributaries to rear in the warmer waters of the mainstem Twisp and Methow rivers (USFS, 1995).

Between 1977 and 1986, an annual average Methow Basin return (catch plus escapement) of 8,164 steelhead occurred; 200 of these were considered naturally reproduced (WDW et al., 1990; Caldwell and Catterson, 1992). Annual spawning escapement in the Methow Basin was 4,050 fish, of which an estimated 93 were naturally reproduced. Of the total Methow Basin return, Twisp River escapement between 1972 and 1992 averaged 913 fish per year, of which 79 were naturally reproduced (USFS, 1995). The naturally reproduced component of Methow Basin runs

has increased since anglers were required to catch-and-release unmarked steelhead beginning in 1987 (USFS, 1995). The average sport catch and harvest between 1977 and 1986 was 3,936.

Hatchery releases in the Methow Basin, from Wells Dam brood stock, averaged 370,664 summer steelhead smolts per year from 1981 through 1987 (WDW et at., 1990). Survival of egg-to-smolt and smolt-to-adult for naturally reared summer steelhead is unknown for the Methow Basin, but the average smolt-to-adult survival of hatchery steelhead is 2.1 percent. The Council's habitat-carrying-capacity model estimates that the Methow Basin is capable of producing 169,610 summer steelhead smolts (WDW et al., 1990). The WDFW Salmon and Steelhead Stock Inventory states that the wild Methow River summer steelhead stock is depressed, based on chronically low spawning-escapement counts (USFS, 1995).

The basin's steelhead management goal is to rebuild natural runs and maintain genetic integrity, while allowing a harvest of 10,000 hatchery steelhead for sport and tribal anglers (WDW et al., 1990; Caldwell and Catterson, 1992). The target escapement is 3,200 natural fish with no harvest (Caldwell and Catterson, 1992). In-basin factors limiting summer steelhead production include the following:

- mortalities from winter icing,
- spring runoff flooding,
- lack of in-stream winter cover, and
- inefficient screen systems at diversion points.

3.2.1.4 Resident Fish

The Methow and Twisp rivers support a significant recreational fishery for rainbow, brown, and brook trout. The Twisp River drainage is the most extensively used area for recreation in the MVID project area (USFS, 1995). Rainbow trout are stocked in the Methow Basin to help support the recreational fishery. Brook trout were introduced into the Methow Basin in the early 1900s. Brook trout is a char similar to Bull trout, and can interbreed and hybridize extensively.

Cutthroat, Bull, and brook trout appear to have similar temperature preferences, are found primarily in the cooler upper reaches of the Twisp River, and are probably not found in the MVID portion of the lower Twisp River (USFS, 1995). These trout species are also found primarily in the upper Methow River and tributaries; however, some Bull trout and brook trout have been documented in the MVID portion of the Methow River (D. Bambrick, Yakama Indian Nation, pers. comm., 1997). Rainbow trout are found throughout the MVID project area in the Methow and Twisp rivers. Cutthroat and rainbow trout are spring spawners (April through early May), but cutthroat trout emergence is typically later than that for rainbow trout because cutthroat prefer cooler water temperatures. Bull trout and whitefish typically spawn in the fall months, and develop over the winter months. Ice kills many developing Bull trout and other salmonid species (USFS, 1995).

Two areas of the Methow River have been identified as critical spawning areas for resident fish species: near the confluence with Beaver Creek and near the confluence with the Twisp River

(WDFW, 1996). The MVID portion of the Twisp River has also been identified as a critical spawning area for resident species (WDFW, 1996). Critical spawning areas are designated as Priority Habitat, and are priority areas for management and preservation because of their significant value and contribution to the continued existence of fish species (including Priority Species).

Non-salmonid species are present in the MVID project area and include whitefish, dace, shiners, suckers, and sculpins. However, the distribution and status of these species have not been documented, except incidentally.

3.2.2 Potential Impacts

3.2.2.1 Potential Impacts of Alternative A

Alternative A proposes to provide water to the users in the MVID through a low-pressure pipe system and groundwater wells. The in-stream diversions and fish screens for both canals would be removed, and the canals would no longer be used to convey water. The following sections address the potential resulting impacts on the fish in the Methow and Twisp rivers.

Construction Impacts

Removal of Fish Screen and Diversion Facilities. Alternative A calls for the removal of the diversion and fish-screening facilities at the east canal and west canal diversion points. Removal would require in-stream construction work that could potentially increase sedimentation to the project rivers in the short term, and create the potential for spilling hazardous materials (e.g., gasoline and oil) from construction equipment. A Hydraulic Project Approval (HPA), issued by WDFW, and a water quality permit, issued by WDOE, would be required to carry out the in-stream work. These permits would specify conditions needed to minimize potential impacts on water quality and aquatic resources. Such measures would likely include identifying timing windows for in-stream work, an erosion control plan, and an SPCC plan.

Removing the in-stream diversion would improve upstream fish passage past both canals' intakes. The diversions span most of the river widths, and most likely cause some delay in upstream migration. This delay is particular a problem for spring chinook, because the adults need to have access to deeper holes in the upper watersheds, where they hold before spawning. Temperatures and habitat features *below* the diversions are probably not suitable for spring chinook holding areas, given the number of spring chinook that need to access the upper Twisp and Methow rivers.

Groundwater Wells. Under this alternative, the MVID would construct three groundwater well fields in locations very close to the rivers. In addition, MVID members who do not receive irrigation water through the pipe system could leave the MVID and use groundwater wells for irrigation. Locations of any new wells would be subject to review and approval by the WDOE and Okanogan County (under the Shorelines and Critical Areas Ordinance) to assure compliance

with applicable environmental laws and regulations. Therefore, it is unlikely that construction of these wells would affect fisheries habitat.

Operation Impacts

In-stream Fish Habitat Analysis Methodology. The IFIM study conducted by Caldwell and Catterson (1992) in the Methow River Basin was reviewed by CH_2M HILL and used in this EA to evaluate changes in in-stream fish habitat under the alternatives. (For more information on the purpose, suitability, and limitations of the IFIM study, see **Appendix E, part 4.**) In-stream fish habitat is defined in terms of physical habitat as a function of streamflow. IFIM is typically applied only for the spawning and rearing portions of the life cycles of salmon, because the criteria used to define a fish's preference for certain hydraulic conditions and physical habitat, including cover and substrate, are mostly developed when fish are active and easily observed. A basic IFIM premise is that fish populations respond to changes in the environmental conditions of their habitat. IFIM data can help make decisions about water management. Other factors—water temperatures, harvest, downstream fish passage, and management objectives, for instance—must also be considered when assessing the overall impacts of a project flow change.

For all project alternatives, changes in in-stream fish habitat were evaluated as they relate to changes in flow for one section of the Methow River and one section of the Twisp River: the upper Methow River from the diversion point at the west canal to the confluence with the Twisp, and the Twisp River diversion point of west canal to the confluence with the Methow River. There would also be benefits to in-stream flow, and consequently to physical habitat, below the confluence of the two rivers. However, relationships between diversion rates, canal seepage, return flows, groundwater recharge, and groundwater-surface water continuity could not be modeled adequately to predict river flows.

The factors evaluated included adult holding (areas in which adults reside before spawning occurs), spawning habitat, and juvenile rearing habitat for spring chinook salmon; spawning habitat for summer chinook; juvenile rearing for summer steelhead; juvenile rearing for Bull trout. These were used, as applicable, for each river section. September flows were selected for evaluation because September irrigation diversions are highest in comparison to in-stream flows, presenting the greatest challenge to the fish. See **Appendix E, part 4**, for more detail, and **Table E-3** presenting September flows for the reaches used in the habitat analysis.

The results of the analysis are presented for two conditions—50-percent "exceedance flows" (which means normal conditions) and 90-percent exceedance flows (dry conditions). Using exceedance flows (rather than average flows) is a more meaningful way to assess impacts on aquatic resources. This is because averages often tend to mask true impacts. For example, fish survival in a particular stream may be more affected by the amount of water present during dry conditions than by the average flows. Exceedance values are computed by compiling the daily flow records for a given stream, or section of stream, over the period of record of interest. These daily flows are then ranked from highest to lowest. The 50-percent exceedance flow, or the normal condition, is the normal flow for the entire period of record. The 90-percent exceedance

flow, or the dry condition, is the flow level at which 90 percent of all the recorded daily flows are greater than (or exceed) that flow.

In-stream Fish Habitat. This section evaluates the expected fish habitat changes associated with changes in flow under Alternative A for the Methow River above the confluence and the Twisp River. As stated above, flows in the Methow River below Twisp are not expected to change substantially from No Action conditions; therefore there would not be substantial changes in fish habitat. However, the upper portion of this section of the Methow River would probably see some flow increase and therefore some benefits to fish habitat under this alternative, because groundwater return flows probably increase downstream of the confluence.

The habitat-versus-flow relationships (Weighted Usable Average or WUA curves) for the species/lifehistory stages were evaluated in the Methow River above Twisp and the Twisp River to provide an evaluation of habitat quality. All show habitat generally increasing with increasing flow, over the range of flows evaluated. Therefore, the percentage of habitat increase is related to the increased flow resulting from the implementation of Alternative A, as well as the pre-existing flow.

Here are the results of the evaluation:

- Maximum habitat for most of these species/lifehistory stages occurs at flows above 650 cfs. The most substantial gains in habitat occur between 90 cfs and 500 cfs.

- Under normal (50-percent exceedance) flows in the Methow River above Twisp, habitat area (WUA) would increase by 10 to 13 percent for almost all of the species/lifehistory stages evaluated (Table 3-5). The exception is for spring chinook juvenile rearing, which would essentially not change. Their habitat-vs-flow relationship is relatively flat at flows between 200 and 300 cfs.

- Because the flow increases in the Twisp River under Alternative A would be greater in percent terms than those in the Methow River above Twisp, habitat increases would also be greater. Habitat in the Twisp River for four of the five species/lifehistory stages evaluated would increase by 45 to 57 percent under normal (50-percent exceedance) conditions (Table 3-5); rearing habitat for juvenile spring chinook would increase by only 10%.

- Under dry conditions (90-percent exceedance flows), habitat increases in both the Methow River above Twisp and in the Twisp River would be greater than those under 50-percent exceedance flows (Table 3-6). This difference is due primarily to the relatively large percentage increase in flows under Alternative A, as well as the relatively low flows in both rivers under No Action. Dry-condition flows for September under No Action conditions are only about 150 cfs in the Methow above Twisp and 24 cfs in the Twisp.

Table 3-5: Comparison of In-stream Habitat (WUA) between No Action Conditions and Alternative A Using the 50-Percent Exceedance (Normal) Flows for September

Exceedance Flow by River Reach and WUA[1] by Species/Lifehistory Stage	No Action	Alternative A	Net Change
Methow River Above Twisp			
50-percent exceedance (normal) flow (cfs)	233	272	+39
Spring Chinook			
Adult Holding	3,890	4,332	+11%
Spawning	28,624	32,446	+13%
Juvenile Rearing	20,907	20,865	0%
Summer Chinook Spawning	28,624	32446	+13%
Summer Steelhead Juvenile Rearing	20,206	22,719	+12%
Bull Trout Juvenile Rearing	48,86	53,588	+10%
Twisp River at Twisp			
50-percent exceedance (normal) flow (cfs)	55	80	+25
Spring Chinook			
Spawning	3,058	4,429	+45%
Rearing	10,369	11,417	+10%
Summer Chinook Spawning	3,058	4,429	+45%
Summer Steelhead Juvenile Rearing	4,522	6,631	+47%
Bull Trout Juvenile Rearing	16,578	26,070	+57%

Note: Habitat was not evaluated in the Methow River below Twisp because flows are estimated to be similar to No Action conditions. Please refer to the text for this discussion.

[1] WUA is defined as the amount (square feet) of habitat per 1,000 feet of stream

Table 3-6: Comparison of In-stream Habitat (WUA) between No Action Conditions and Alternative A Using the 90-Percent Exceedance (dry conditions) Flows for September

Exceedance Flow by River Reach and WUA by Species/Lifehistory Stage	No Action	Alternative A	Net Change
Methow River Above Twisp			
90-percent exceedance (dry condition) flow (cfs)	157	196	+39
Spring Chinook			
Adult Holding	2,972	3,459	+16%
Spawning	19,681	24,548	+25%
Juvenile Rearing	20,466	20,887	+2%
Summer Chinook Spawning	19,681	24,548	+25%
Summer Steelhead Juvenile Rearing	14,078	17,321	+23%
Bull Trout Juvenile Rearing	27,452	43,616	+16%
Twisp River at Twisp			
90-percent exceedance (dry condition) flow (cfs)	24	49	+25
Spring Chinook			
Spawning	820	2,659	+224%
Rearing	6,277	9,828	+57%
Summer Chinook Spawning	820	2,659	+224%
Summer Steelhead Juvenile Rearing	1,610	3,993	+148%
Bull Trout Juvenile Rearing	4,770	14,310	+200%

Note: Habitat was not evacuated in the Methow River below Twisp as the Alternative flows were estimated to be about the same as No Action conditions. Please refer to the text for this discussion.

[1] WUA is defined as the amount (square feet) of habitat per 1,000 feet of stream

- Under dry conditions in the Methow River above Twisp, habitat would increase by 16 to 25 percent for four of the five species/lifehistory stages evaluated; only spring chinook rearing habitat shows a smaller increase of 2% (Table 3-6).

- In the Twisp River, habitat increases for all species/lifehistory stages during dry conditions would be substantial, ranging between 57 and 224 percent (Table 3-6). (Again, spring chinook rearing would have the lowest increase.) These potentially substantial habitat increases can be attributed to the fact that, under dry conditions, flows in the Twisp River are very low. Even a slight absolute increase in flows would result in a substantial percentage increase in habitat.

Special Status Species. All of the species evaluated above are either under review for listing under the Endangered Species Act or listed by WDFW as priority species.

Temperature. One of the concerns about carrying out any of the project alternatives is that changes in streamflows and irrigation diversions might change the groundwater return flows to the Methow and Twisp rivers, particularly during the winter. Groundwater return might affect water temperature, and water temperature is an important factor in fish development and survival. In the Methow Basin, summer and spring chinook salmon; and brook, brown, and Bull trout all have eggs in the gravel through the winter. The rate at which fish eggs develop during that time is greatly influenced by temperature, among other variables. If changes in groundwater return flows (which in winter are usually warmer than stream water) were to occur, such changes could perhaps affect egg-development timing and fry emergence from the gravel. For example, if groundwater return flows were reduced, fry emergence might be delayed because river water is colder. Fry might not have enough time to grow big enough to migrate downstream and smoltify, thus reducing their chance for survival.

Presently, much of the canal system leakage seeps into the ground and recharges the alluvial aquifer that also feeds the river. This groundwater therefore returns to the river over some period of time. About 80 percent of the water currently diverted to the MVID canals is estimated to return to the Methow River as surface or groundwater. How fast it returns to the river is unknown, but return undoubtedly occurs for some time after the irrigation season and probably ends by December. The temperature of the groundwater return flow is about 50°F, while Methow River midwinter temperatures approach 32°F. Alternative A would eliminate much of the groundwater return flow during the summer and late fall. By the time the river has cooled significantly (December), the groundwater return flows have diminished (see section 3.1.1.1). Thus the implementation of Alternative A should have few or no effects on winter river temperatures, and therefore on salmon egg development.

Fish Habitat in the Project Irrigation Canals. Presently, the project canals dry up after irrigation season because water is no longer diverted to them. Therefore, there is no effective year-round fish habitat in the project canals. For this reason, canals are screened to keep fish out of the canals. However, because screening is inefficient, some resident and anadromous fish may occasionally get into the canals during periods of high flow. This occasional use of canal habitat by fish is considered to be detrimental because the canals are essentially isolated from the project

rivers; any fish in them cannot return to the river and would be considered "lost" to the river populations. Therefore, the elimination of the canal system under Alternative A would not reduce fish populations in the project rivers.

Power Usage. Some scoping commenters have noted that Alternative A would require electricity to pump water from the groundwater wells and pressurize the pipe system. Most of the region's power production is from hydroelectric generation on the Columbia River, which has contributed to the decline of the anadromous fish populations of the Columbia Basin. Therefore, it has been argued that any increase in power use within the basin would incrementally contribute to the decline of the fishery.

However, the amount of electricity that would be used to pump groundwater in this alternative would be immeasurably small compared to the region's total electricity consumption, and would lead to a correspondingly small change in generation at the Columbia River system dams. The resulting impact on anadromous fisheries at the mainstem dams would likewise be immeasurably small. In contrast, the improvements in flows in the Methow and Twisp rivers would have direct benefits for fisheries in the project area.

3.2.2.2 Potential Impacts of Alternative B

Under Alternative B, all of the west canal and the upper reaches of the east canal would be lined with concrete to reduce seepage loss. The lower portions of the east canal would be abandoned. The fish screening facilities at the diversion points would be upgraded. The sections below discuss the potential related impacts on fish resources.

Construction Impacts

Improvements to Fish Screen and Diversion Structures. Improvements to the diversion structures and fish-screening facilities would require in-stream work. Such improvements would require in-stream construction work that could potentially increase river sedimentation in the short term, and create the potential for spilling hazardous materials (e.g., gasoline and oil) from construction equipment. These impacts would be minimized by the requirements for an HPA issued by WDFW and a water quality permit, issued by WDOE. These permits would specify conditions needed to minimize potential impacts on water quality and aquatic resources. Such measures would likely include identifying timing windows for in-stream work, an erosion control plan, and an SPCC plan.

Potential designs for these facilities are at present unknown. However, any designs that could receive regulatory approvals would be expected to improve upstream fish passage past both the east canal and west canal diversions, and to reduce fish injury and death at fish screens.

Groundwater Wells. Under Alternative B, MVID members who do not receive irrigation water through the canal system could leave the MVID and use groundwater wells for irrigation. The groundwater wells would be located near but not in the Methow River, at locations to be decided by the individual landowners or LIDs. Locations would be subject to review and approval by the WDOE and Okanogan County to assure compliance with applicable laws and

regulations. Therefore, it is unlikely that the construction of these wells would affect fisheries habitat.

Operation Impacts

In-stream Fish Habitat. As with Alternative A, information from the IFIM study was used to identify the expected changes in in-stream habitat that would result from September streamflow changes in the Methow and Twisp rivers under Alternative B. Please see section 3.2.2.1 (Alternative A) and **Appendix E, part 4,** for a discussion of the basic methodology and applicability of the IFIM study, and **Table E-4** showing the September flows for the reaches used in the habitat analysis.

As with Alternative A, the discussion below evaluates habitat changes *only* in the Methow River above Twisp and the Twisp River between the diversion and the confluence. Changes in fish habitat below the confluence were not evaluated because the assumed effect of increases in in-stream flows in this section of the Methow River would not result in substantial increases in fish habitat.

Alternative B would continue to divert water from the present points-of-diversion. The habitat increases in the Methow River above Twisp and the Twisp River in the project area above the confluence are therefore much less than under Alternative A, because flows would change relatively little in these reaches. Results would be as follows:

- Under normal (50-percent exceedance) flows, habitat in the Methow River above Twisp would increase only slightly (2 to 4 percent) compared to No-Action conditions, for four of the five species/ lifehistory stages evaluated; spring chinook rearing habitat would remain unchanged (Table 3-7).

- The relatively small habitat increase would be a function of the relatively small-percentage flow increase and of the fact that, under normal conditions, habitat for most of the fish increases only gradually as flows increase above the No Action flow of 233 cfs.

- Habitat increases in the Twisp River under normal conditions are more pronounced than in the Methow River above Twisp because flow would increase relatively more compared to No Action conditions. Habitat would increase by 22 to 26 percent for four of the five species/lifehistory stages evaluated; spring chinook rearing habitat would increase by 6% (Table 3-7).

- Under dry flow conditions in the Methow River above Twisp, only modest increases in fish habitat would occur (net flow increase of only 4 cfs; Table 3-8). Habitat would increase by only 3 to 4 percent for all species/lifehistory stages evaluated (Table 3-8).

Table 3-7: Comparison of In-stream Habitat (WUA) between No Action Conditions and Alternative B Using the 50-Percent Exceedance (Normal) Flows for September

Exceedance Flow by River Reach and WUA by Species/Lifehistory Stage	No Action	Alternative B	Net Change
Methow River Above Twisp			
50-percent exceedance (normal) flow (cfs)	233	240	+7
Spring Chinook			
Adult Holding	2,890	3,971	+4%
Spawning	28,624	29,383	+3%
Juvenile Rearing	20,907	20,902	0%
Summer Chinook Spawning	28,624	29,383	+3%
Summer Steelhead Juvenile Rearing	20,206	20,748	+3%
Bull Trout Juvenile Rearing	48,686	49,627	+2%
Twisp River at Twisp			
50-percent exceedance (normal) flow (cfs)	55	66	+11
Spring Chinook			
Spawning	3,058	3,716	+22%
Rearing	10,369	11,005	+6%
Summer Chinook Spawning	3,058	3,716	+22%
Summer Steelhead Juvenile Rearing	4,522	5,470	+21%
Bull Trout Juvenile Rearing	16,578	20,866	+26%

Note: Habitat was not evaluated in the Methow River below Twisp because flows were estimated to be similar to No Action conditions. Please refer to the text for this discussion.

[1] WUA is defined as the amount (square feet) of habitat per 1,000 feet of stream

Table 3-8: Comparison of In-stream Habitat (WUA) between No Action Conditions and Alternative B Using the 90-Percent Exceedance (Dry Condition) Flows for September

Exceedance Flow by River Reach and WUA by Species/Lifehistory Stage	No Action	Alternative B	Net Change
Methow River Above Twisp			
90-percent exceedance (dry condition) flow (cfs)	157	164	+4
Spring Chinook			
Adult Holding	2,972	3,059	+3
Spawning	19,681	20,554	+4
Juvenile Rearing	20,466	20,552	+4
Summer Chinook Spawning	19,681	20,554	+4
Summer Steelhead Juvenile Rearing	14,078	14,660	+4
Bull Trout Juvenile Rearing	37,452	38,559	+3%
Twisp River at Twisp			
90-percent exceedance (dry condition) flow (cfs)	24	35	+11
Spring Chinook			
Spawning	820	1,606	+96%
Rearing	6,277	8,119	+29%
Summer Chinook Spawning	820	1,606	+96%
Summer Steelhead Juvenile Rearing	1,610	2,604	+65%
Bull Trout Juvenile Rearing	4,770	9,282	+95%

Note: Habitat was not evaluated in the Methow River below Twisp because the flows were estimated to be similar to No Action conditions. Please refer to the text for this discussion.

[1] WUA is defined as the amount (square feet) of habitat per 1,000 feet of stream

- In the Twisp River under dry flow conditions, habitat gains would be much more substantial than those in the Methow River (between 29 and 96 percent), because, under dry conditions, the proposed flow increase would be proportionately higher than in the Methow above Twisp.

Special Status Species. As under Alternative A, all of the species evaluated above are either under review for listing under the Endangered Species Act or listed by WDFW as priority species.

Temperature. As under Alternative A, no significant changes in winter river water temperatures are anticipated, and there should be no impact on salmon egg development.

Fish Habitat in the Project Irrigation Canals. Although the canals would be lined to prevent water loss in the canal system, there would be no impact on fish resources in the canals themselves as a result of this action. Please see Alternative A (section 3.2.2.1) for a discussion on the effectiveness of aquatic habitat in the canals.

Power Usage. Under Alternative B, portions of the present gravity-fed canal system would remain in place. Therefore, there would be no expected increase in power usage over what presently exists within the MVID for that aspect of Alternative B. However, some members of MVID would be expected to leave the district and pump groundwater for their irrigation supply, thereby increasing power usage. As described above for Alternative A, the amount of electricity involved would be very small compared to the generation at Columbia River system dams, and any impacts of increased power generation on fish survival likely to be immeasurable.

3.2.2.3 Potential Impacts of Alternative C

Under Alternative C, the existing canal systems would be abandoned, and the individual MVID members would use either new or existing, privately owned groundwater wells for irrigation. The discussion below covers potential impacts on fish for this alternative.

Construction Impacts

Removal of Fish Screen and Diversion Facilities. Because the canal system would be abandoned under Alternative C, the diversions and fish-screening facilities would be removed. Please see Alternative A (section 3.2.2.1) for a discussion of the potential impacts on fish resources.

Groundwater Wells. The groundwater wells that would provide irrigation water in this alternative would be located throughout the former MVID service area, at locations to be identified by the individual landowners or LIDs. Locations would be subject to review and approval by the WDOE and Okanogan County, to assure compliance with applicable laws and regulations. Therefore, it is unlikely that constructing any needed new wells would affect fisheries habitat.

Operation Impacts

In-stream Fish Habitat. As above, the IFIM study was used to evaluate expected changes in in-stream habitat that might result from streamflows changes in the Methow and Twisp rivers through the implementation of Alternative C. Please see Alternative A (section 3.2.2.1) and **Appendix E, part 4**, for a discussion of the methodology and applicability of the IFIM study.

Habitat. Estimated irrigation water use from groundwater wells under Alternative C would be the same as that under Alternative A. The location of these wells would be more dispersed than under Alternative A, but would still be concentrated along the Methow River below the confluence with the Twisp River. Therefore, changes in flow and fish habitat under Alternative C would be very similar to those discussed for Alternative A.

Special Status Species. The changes in flow in the Methow and Twisp rivers under Alternative C are expected to be the same as those described for Alternative A. Therefore, changes in in-stream habitat for the special status species would be the same.

Temperature. As under Alternative A, no significant changes in winter river water temperatures are anticipated, and there should be no impact on salmon egg development.

Fish Habitat in the Project Irrigation Canals. Alternative C would result in a loss of aquatic habitat in the canals. Please see Alternative A for a discussion on the potential impacts on fisheries.

Power Usage. Alternative C might increase power usage for delivering pumped groundwater to the water users in the MVID. As described under Alternative A, the amount of electricity involved would be very small compared to the generation at Columbia River hydroelectric system facilities, and any impacts of increased power generation on fish survival are likely to be immeasurable.

3.2.2.4 Potential Impacts of Alternative D

Alternative D (No Action) would not change existing facilities and operation of the canal system, with the exception of upgraded fish screening facilities and resumption of regular maintenance. Therefore, flows in the Methow and Twisp rivers would remain unchanged from present conditions. The habitat conditions that result from these flows (both in-stream physical habitat and temperature-related conditions) would continue to persist.

Although some improvements to fisheries would result from the improved fish-screen facilities, the project's fisheries objectives would not be met. High diversion rates would persist, to the detriment of in-stream flows downstream of the diversion point. The resulting low flows along the downstream reaches of the Methow and Twisp rivers during the irrigation months would continue to limit the value of the two rivers as fish habitat. The annual re-construction of the Twisp diversion would continue the sedimentation impacts on the Twisp River habitat downstream. Passage conditions would not improve at either diversion. At any time, "high risk"

sections of the conveyance system could wash out, to the detriment of water quality, and therefore fish habitat.

3.3 Soils

3.3.1 Existing Environment

Ice Age glaciation left its mark on most of the Methow Basin. As the continental ice sheet that once covered the area receded, deposits of glacial till and outwash were left behind. These sediments have since been reworked extensively along major streams and tributaries. Resulting soils are coarse-textured and very permeable. Most soils are gravelly sandy loams or stony fine sandy loams.

The effect of glaciation is also reflected in the area's topography. Along the Methow River, the terrain is flat to gently rolling. Slopes become steeper where the glaciated valley is bound by bedrock uplands rising steeply from the valley floor.

3.3.2 Potential Impacts

3.3.2.1 Potential Impacts of Alternative A

Construction and Operation Impacts

The proposed pipeline route follows the existing canal right-of-way. Sections of the existing canals are located on steep slopes subject to erosion (such as along the east canal at and above Twisp, and the west canal between the intake and Twisp). Canal sections would be abandoned in these areas with unstable slopes, and canal washouts due to excessive seepage and unstable soils would be eliminated. Grading and/or filling would be required in converting sections of open canals and laterals to enclosed pipe. Since most areas subject to construction disturbance are flat and would require limited backfilling within the existing canal depression, the erosion risk is low.

Removal of the existing in-stream fish screens and diversions would cause short-term disturbance to soils; minor amounts of sediment could be dispersed downstream. Construction of new wells and three small concrete reservoirs (each approximately 6 m (20 ft.) in diameter) would result in surface disturbance at drilling and reservoir construction sites. Impacts would be slight and limited to the well and reservoir sites. Best management practices would be used to minimize erosion. These would include the use of sediment barriers (silt fences, straw bales, erosion control blankets) and similar measures, as needed, during and after construction (MWG, Inc., 1996, Vol. II).

3.3.2.2 Potential Impacts of Alternative B

Construction and Operation Impacts

Alternative B, the partial upgrade, would cause slight short-term impacts on soils. Relining the canal and rebuilding the access road would cause some ground disturbance, increasing the soils' susceptibility to erosion. Upgrading the existing in-stream diversions and fish screens would disturb soils, with temporary minor increases in erosion and sediment dispersal during construction. Drilling of new wells would result in minor surface disruption, a slight impact. As with Alternative A, best management practices would be used to minimize erosion.

3.3.2.3 Potential Impacts of Alternative C

Construction and Operation Impacts

Alternative C, dissolution of the MVID, would abandon the canal system. There would be minor short-term impacts as fish screens and in-stream diversions were removed. Equipment and spoil deposition associated with new well drilling would disrupt surface soils locally; minor local increases in off-site movement of sediment would occur. Best management practices would be used to minimize erosion.

3.3.2.4 Potential Impacts of Alternative D

Construction and Operation Impacts

The No Action alternative would continue the risk of washouts if repairs were not made to unstable sections of the canal. Areas could erode locally and sediment could move off-site. Repairing the canal would cause minor ground disturbance, increasing the soils' susceptibility to erosion. This change could flush minor amounts of sediment through the canal system. Removing the existing fish screens would cause minor short-term disturbance, and could disperse small amounts of sediment into streams. Best management practices would be used to minimize erosion.

3.4 Vegetation

3.4.1 Existing Environment

3.4.1.1 Project Landscape

Physiography

The project lies in the Okanogan Highlands physiographic province, a region east of the Northern Cascades and north of the Columbia Basin Provinces, in Okanogan County, Washington. Elevations range from about 420 to 515 m (1,380 to 1,690 ft.).

The Okanogan Highlands Province is characterized by moderate slopes, broad rounded summits, and broad river valleys (Franklin and Dyrness, 1988). The predominant natural plant community

consists of high desert steppe, primarily the *Artemesia tripartita/Festuca idahoensis* association. This association is characterized by bunchgrasses and sagebrushes. A dense turf of grasses and grass-like plants and a discontinuous layer of threetip sagebrush (*Artemesia tripartita*) characterize the association (Franklin and Dyrness, 1988). Climatically, the steppe is arid to semiarid, with low precipitation, warm-to-hot summers, and relatively cold winters.

Landscape Analysis

An understanding of the project landscape provides the context for determining potential environmental consequences of project alternatives that may extend beyond the project construction "footprint." The project landscape is confined to the valley bottoms, and roughly parallels parts of the Methow and Twisp rivers. It is predominantly agricultural bottomland and upland steppe. The rivers and associated floodplains are prominent features, and share a common hydrology with the canals. They provide wildlife migration routes and pathways for aquatic resources to move. The canals also function as wildfire breaks, limiting the extent of wildfire spread, and as dispersal routes for weeds. Other prominent features include roads such as Highways 20 and 153, Eastside Winthrop-Twisp Road, Poorman Creek Road, Twisp-Carlton Road, and local roads. The roads cross the canals and, to a lesser extent, the rivers, reducing habitat values by fragmenting these linear corridors.

3.4.1.2 Upland Vegetation

Most of the valley bottom vegetation communities are croplands—including hay, alfalfa, wheat, peas, orchards, lawns—or steppe communities. Steppe communities particularly are present upslope of the existing canals where native vegetation is relatively undisturbed. The steppe community upland vegetation is described in **Appendix F, part 1.** Dominant drought-tolerant vegetation along the canals consists of both species that are drought-tolerant and those that tolerate both moist and dry conditions (facultative species); these are listed in **Table F-2 in part 3** of **Appendix F**.

3.4.1.3 Wetlands

Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water.

Jurisdictional Status

Wetlands in the project area include natural and artificially created wetlands, and jurisdictional and non-jurisdictional wetlands. There are important distinctions between the types:

- *Natural* wetlands are those historically associated with stream margins, floodplains, and natural seeps.
- Natural wetlands are *jurisdictional*; that is, certain types of activities occurring in them are regulated by public agencies.

- *Artificially created* wetlands have formed along the canals and from canal seepage, which is sufficient in places to support moisture-loving (hydrophytic) vegetation.

- Artificially created wetlands are not jurisdictional; that is, they are exempt from wetland regulations because they are induced by irrigation. A wetland is considered artificially created and irrigation-induced if it was created by irrigation or seepage from an irrigation delivery system and was non-wetland historically (Parametrix, 1995; Okanogan County, 1997).

The artificially created wetlands (hydrophytic riparian areas) along the east and west canals are not historical wetlands; therefore they are not jurisdictional. In the lower elevational floodplains of the Methow and Twisp rivers, it is difficult to distinguish between natural and artificially created wetlands along the canal; however, natural wetlands along the MVID irrigation system generally are limited to the areas near the rivers.

County jurisdiction is invoked under the Shoreline Master Program for projects within 61 m (200 ft.) of the ordinary high water mark of Shorelines of Statewide Significance (or within the 100-year floodplain) or for projects requiring a floodplain development permit (Okanogan County, 1997). County jurisdiction is limited to the natural wetlands, and excludes the artificially created wetlands created by irrigation.

The water in the irrigation canals is considered "Waters of the United States," and is subject to Federal jurisdiction under the Clean Water Act.

National Wetlands Inventory Wetlands

The National Wetlands Inventory is maintained by the USFWS; it documents areas believed to be natural or artificially created wetlands through air photo interpretation. **Appendix F, part 2, Table F-1**, lists natural and artificially created wetlands systems within 91 m (300 ft.) of the MVID canals shown on the National Wetlands Inventory (USFWS, undated). Wetlands associated with the main channel of the canals are classified as manmade, artificially flooded, and excavated riverine wetlands (R4SBKCx). Other wetlands in the canal vicinity include riverine wetlands, and palustrine wetlands with forest, shrub/scrub, or emergent vegetation. Dominant vegetation of the wetlands includes hydrophytic and facultative riparian vegetation (described below).

3.4.1.4 Riparian Vegetation

Riparian zones are areas that are located next to aquatic systems with flowing water and that contain elements of both aquatic and terrestrial ecosystems that mutually influence each other. National Wetland Inventory maps provide a good indication of the distribution of riparian areas in the study area (Figure 3-6). A survey of riparian vegetation conducted for the *Methow Valley Irrigation District Water Supply Facility Plan* identified all hydrophytic (water-dependent) vegetation within 1.5 m (5 ft.) of either side of the canal. The survey also identified all canal-dependent hydrophytic vegetation that extended or appeared downslope of the canals (whether or not such vegetation was contiguous with the canal). This survey identified a total of 13.3 ha

(32.9 ac.) of canal-dependent tree, shrub, and herbaceous riparian vegetation (Parametrix, 1995, in MWG, 1996). These riparian areas extend along approximately 43,155 m (141,550 ft.) of the east and west canals.

Jurisdictional Status

As with wetlands, riparian vegetation in the project area includes naturally and artificially occurring communities. Some riparian areas are jurisdictional wetlands, particularly those historically associated with the floodplains of the Methow and Twisp rivers. MVID irrigation system facilities that may be located in or near potentially jurisdictional riparian areas generally are limited to the water intakes, diversions, and groundwater wells in riparian areas associated with state Type I waters (i.e., near the rivers and streams). Most riparian areas along the canals are not jurisdictional because they are associated with an artificially established waterbody (canal), and are not regulated by local, state, or Federal agencies (Parametrix, 1995; Okanogan County, 1997).

Dominant Vegetation Along the Canals

Riparian vegetation along the canals and spillways is dominated by hydrophytic, facultative, and drought-tolerant species. Most of the riparian areas within or next to the canals contain relatively low species richness and a predictable list of species (see **Appendix F, part 3 and Table F-2** for a description and listing of species).

3.4.1.5 Threatened and Endangered Plant Species

A search of the Washington Department of Fish and Wildlife Priority Habitats and Species, and Wildlife Heritage Databases, and informal consultation with the USFWS did not identify the presence of known threatened or endangered plant species in the project area (WDFW, 1997a).

3.4.1.6 Weeds and Weed Control

Several weed species of concern occur in the project area. They include noxious weeds such as whitetop, dalmatian toadflax, musk thistle, knapweeds, tansy ragwort (*Senecio jacobaea*), houndstongue (*Cynoglossum officinale*), St. Johnswort (*Hypericum perforatum*), and purple loosestrife (*Lythrum salicaria*) (Peterson, 1997). All are highly invasive and aggressive. Where they become established, alien weeds dominate the vegetation; change is possible only through human intervention. The policy of the Okanogan County Noxious Weed Control Board (NWCB) sets forth measures for eradication, reduction, and suppression. The policy establishes weed control practices and policies, and identifies a Coordinated Weed Management Area, which is located south of Carlton, downstream of the project area (Noxious Weed Control Board of Okanogan County, 1997).

3.4.1.7 Aesthetic/Scenic Values

Riparian vegetation along the canal possesses positive aesthetic and scenic values (MWG, 1996). Some larger stands of black cottonwood and trembling aspen trees are highly valued (MWG, 1996). These values arise from the contrast in color, structure, and species composition between

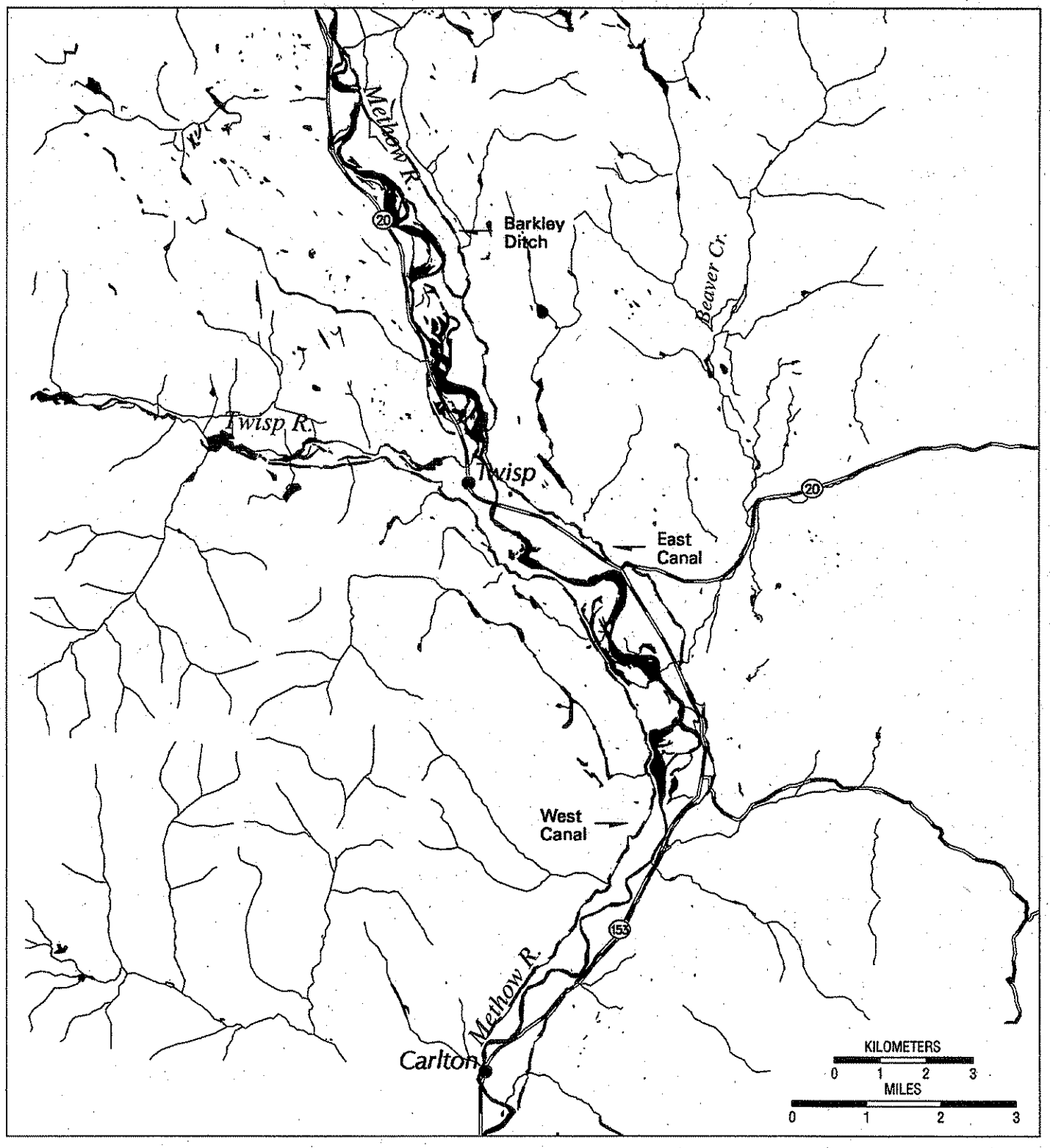
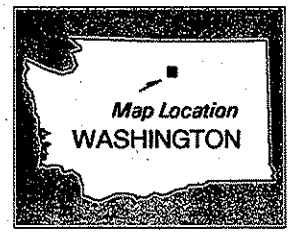


FIGURE 3–6: METHOW VALLEY IRRIGATION DISTRICT PROJECT – RIPARIAN AREAS



Potential Riparian Areas

Highway

River / Stream

East & West Canals

Source: USFWS National Wetlands Inventory (NWI).
Includes Palustrine and Riverine Wetlands.

the riparian vegetation and the surrounding steppe communities. Also, the presence of riparian vegetation along the canals for over 90 years has created a social sense of place.

3.4.2 Potential Impacts

3.4.2.1 Potential Impacts of Alternative A

Construction Impacts

Landscape. Under Alternative A, the primary landscape change would be the removal of the linear aquatic/riparian corridors associated with the east and west canals. The canal corridor functions, which serve primarily for movement of wildlife and aquatic resources, are expected to shift to the Methow and Twisp river floodplains. Although some vegetation may become stressed or die in the short term, the functions the corridors provide would be maintained by the river systems. Reliance on the river systems for these functions has many advantages: (1) the movement corridors would require less maintenance, (2) they would be more fully functional, and (3) they would receive better long-term resource protection under Federal and county jurisdiction.

Uplands. No impacts are expected to occur on upland zones.

Wetlands. Most wetlands in the project area were artificially created. Activities affecting them are not regulated under Federal, state, or county jurisdictions. The precise locations and extent of natural, regulated wetlands in the project area are unknown; however, as noted above (section 3.4.1.3, Wetlands), there are relatively few jurisdictional wetlands along the primary canal alignments. This alternative should not affect jurisdictional wetlands, except for relatively minor and mostly temporary impacts associated with the construction, removal, or maintenance of water intakes, pump stations, diversions, fish screens, reservoirs, and groundwater wells. While exact locations of groundwater pumping stations and reservoirs for the pipeline system are not yet known, jurisdictional waters, wetlands, or riparian areas would be avoided if possible. If these areas cannot be avoided, necessary permits would be applied for and required mitigation undertaken. MVID groundwater pumping would be designed not to affect surface jurisdictional wetlands through groundwater withdrawal. Facilities built by local landowners would be regulated by Federal and county agencies with jurisdiction over waters and wetlands protection. Therefore, impacts on jurisdictional waters and wetlands are expected to be minor, if any, and mitigated.

Riparian Areas. Water withdrawal would change up to about 43,155 m (141,550 ft.) of hydrophytic riparian tree, shrub, and herbaceous vegetation along the east and west canals and crossed by the existing canal alignments (Parametrix, 1995). This represents up to about 13.3 ha (32.9 ac.) of changed hydrophytic riparian tree, shrub, and herbaceous vegetation, including all hydrophytic vegetation within 1.5 m (5 ft.) of the canal and additional riparian vegetation supported by the canal seepage, but extending various distances away from the canals (Parametrix, 1995; **part 3, Table F-3 in Appendix F**). Changes would include plant mortality, species composition shifts, and/or conversion to non-wetland conditions. This anticipated loss of

artificially created riparian areas would not be regulated under Okanogan County's Growth Management Critical Areas regulations.

Many of the highly valued existing riparian communities along the canal could be maintained on-site, if landowners choose to use part of their water right to irrigate riparian areas on their properties. The long-term persistence of such areas would depend on functional, well-maintained irrigation systems, but there would be no assurance that such irrigation systems would be constructed by landowners, or, if constructed, would continue to operate as designed.

The abandoned west canal, reach 5, serves as an example showing how dewatering might affect riparian vegetation. Generally, after the old wooden aqueduct was abandoned, the adjacent black cottonwood and trembling aspen died after several years. Drought-tolerant species persisting along the abandoned canal include sagebrush, bitterbush, wild rose, bluebunch wheatgrass, and arrowleaf balsamroot. Other upland species—bittercherry, serviceberry, and ponderosa pine—survived, but show signs of drought stress.

However, most existing riparian conditions are not by design, and do not represent historical conditions. Artificially created riparian areas do not function as fully natural systems (they are in poor health, fragmented, and/or too narrow for full habitat function).

The negative environmental effects from the loss of artificially created riparian areas would be mitigated, in part, through passive restoration along the Methow and Twisp rivers, as their riparian areas would benefit from increased flows and restoration of a more natural hydrological regime (though the benefits might not be easily measurable). The benefits of flow increases from May through October would include the restoration of soil nutrient cycling rates and water quality improvement functions, increased plant productivity, and the restoration of plant community structure within the wetted perimeter of the floodplains. Also, it is likely that the more natural water regime would help to deter weed infestation and improve habitat quality for a range of moisture-dependent wildlife and aquatic species. In addition, most drought-tolerant riparian communities would persist, and some hydrophytic riparian vegetation would remain where natural seeps occur or where irrigation is continued.

Threatened and Endangered Plant Species. No threatened or endangered plant species are known to occur in the project area; no impacts on such special status species are expected to occur.

Weeds and Weed Control. Grading and pipeline construction would expose new areas to potential weed infestation. Canal abandonment and associated plant community shifts could also predispose some areas to weed infestation. However, weed control and revegetation activities within MVID easements would conform with the weed control programs and policies of the Okanogan County NWCB. Therefore, successional development of new plant communities would be controlled, and negative impacts from the spread of weeds are expected to be minor and controllable.

Aesthetic/Scenic Values. Replacing the canal system with pipelines would change or reduce the scenic/aesthetic values provided by canal-dependent vegetation. However, passive restoration of natural riparian areas through increases in in-stream flows would partially offset the potential losses by improving riparian and vegetation conditions along the natural river corridors, although not necessarily in the same locations or viewsheds. Also, facultative and drought-tolerant riparian vegetation would be expected to persist, and some landowners might choose to use a portion of their water right allocation for riparian-area irrigation.

Operation and Maintenance Impacts

Weeds and Weed Control. Alternative A would eliminate the weed dispersal that currently occurs through the active canals. The MVID would be responsible for conforming to the weed control programs and policies of the Okanogan County NWCB (unless an LID were established and assumed that responsibility). Therefore, no negative impacts regarding weeds and weed control issues are expected to occur.

Aesthetic/Scenic Values. Periodic vegetation maintenance would eliminate or control trees and other vegetation regrowth from the active pipeline alignment where it interfered with operations or posed irrigation system performance or safety hazards. However, the vegetation maintenance activities would be considered ongoing operations, and impacts on aesthetic/scenic values probably would occur even if the project were not constructed (i.e., even under the No Action alternative).

3.4.2.2 Potential Impacts of Alternative B

Construction Impacts

Landscape. Under Alternative B, the primary landscape change would be the removal of most of the linear riparian corridors associated with the east and west canals. The change would result from the canal lining and access road construction, and the subsequent reduction in canal seepage. Temporary ecological adjustments would occur; for example, the wildlife and aquatic systems of the canal riparian corridors are expected to shift to riparian areas along the Methow and Twisp river floodplains. The remaining riparian areas along the canals would become increasingly fragmented.

Uplands. The construction of an access road along sections of the lined canal could affect small amounts of upland vegetation, but these impacts are expected to be minor.

Wetlands. As described under Alternative A, impacts on jurisdictional waters and wetlands are expected to be minor, and perhaps slightly less than under Alternative A (because there would be fewer facilities, such as pump stations and reservoirs, potentially located in wetland areas). See discussion under section 3.4.2.1.

Riparian Areas. Water withdrawal and access road construction would change up to about 40,360 m (132,384 ft.) of hydrophytic riparian tree, shrub, and herbaceous vegetation along the east and west canals (Parametrix, 1995). This change represents up to about 12.2 ha (30.1 ac.) of

Aesthetic/Scenic Values. Periodic vegetation maintenance would remove or reduce many trees and other vegetation from the active canal alignment where they interfere with operations or pose canal performance or safety hazards. Maintenance activities would probably be more frequent than under Alternative A. However, the vegetation maintenance activities would be considered ongoing operations, and impacts on aesthetic/scenic values probably would occur even if the project were not constructed. Because the corridor would be wider than the corridor under A, the width of the cleared area would be greater.

3.4.2.3 Potential Impacts of Alternative C

Construction Impacts

Landscape. As under Alternative A, the primary landscape change under Alternative C would be the removal of the linear aquatic/riparian corridors associated with the east and west canals. The wildlife and aquatic corridor functions of the canals are expected to shift to the Methow and Twisp river floodplains. Although some vegetation may become stressed or die in the short term, the functions the corridors provide would be maintained by the river systems. Reliance on the river systems for these functions would have many advantages: (1) the movement corridors would require less maintenance, (2) they would be more fully functional, and (3) they would receive better long-term resource protection under Federal and county jurisdiction.

Uplands. No impacts on upland steppe or drought-tolerant riparian zones are expected to occur (same as Alternative A).

Wetlands. Impacts on jurisdictional waters and wetlands would be less than those for alternative A, since none of the new facilities (pump stations, reservoirs) required for the well fields would be needed. Facilities built by local landowners would be regulated by Federal and county agencies with jurisdiction over waters and wetlands protection. Therefore, impacts on jurisdictional waters and wetlands are expected to be minor, if any, and mitigated.

Riparian Areas. Impacts would be the same as those described for Alternative A (section 3.4.2.1).

Threatened and Endangered Plant Species. No threatened or endangered plant species are known to occur in the project area, and no impacts on such special status species are expected to occur.

Weeds and Weed Control. Although construction activities might differ, impacts for weed and weed control would be the same as those reported for Alternative A (section 3.4.2.1).

Aesthetic/Scenic Values. Impacts would be similar to those reported for Alternative A (section 3.4.2.1).

Operation and Maintenance Impacts

No adverse operation- or maintenance-related environmental impacts are expected.

Weeds and Weed Control. This alternative would eliminate the active canal as a source of weed dispersal. Nevertheless, the newly constructed individual irrigation systems may *not* be required to conform to the weed control programs and policies of the Okanogan County NWCB (unless an LID is established and assumes that responsibility). Although the MVID would relinquish responsibility for long-term weed control, local landowners may elect to adopt these programs and policies. Therefore, minor impacts regarding weeds and weed control issues are expected to occur.

3.4.2.4 Potential Impacts of Alternative D

Construction Impacts

No construction-related environmental impacts are expected, except for those resulting from canal repairs. These canal repair impacts are addressed below, under Operation and Maintenance Impacts.

Operation and Maintenance Impacts

Landscape. The landscape would remain essentially the same under Alternative D, the No Action alternative. Impacts associated with canal repairs and operations and maintenance (O&M), as described below, would not be major enough to affect the wildlife and aquatic corridor functions of the canals.

Uplands. No measurable changes to steppe or riparian areas are expected to occur.

Wetlands. This alternative would not affect jurisdictional wetlands, except for relatively minor and mostly temporary impacts associated with maintaining water intakes, pump stations, diversions, fish screens, and groundwater wells. Any wetlands impacts would be regulated under Federal, state, and county wetlands protection regulations.

Riparian Areas. No measurable changes on riparian length or area are expected to occur (Parametrix, 1995; **Table F-4 in Appendix F**). However, periodic vegetation maintenance would temporarily remove or reduce trees and other riparian vegetation from the active canal alignment where they interfere with operations or pose canal safety hazards.

Threatened and Endangered Plant Species. No threatened or endangered plant species are known to occur in the project area, and no impacts on such special status species are expected to occur.

Weeds and Weed Control. The active canals would continue to disperse weeds. Weed control and revegetation activities within MVID easements would conform to the weed control programs and policies of the Okanogan County NWCB. No impacts regarding weeds and weed control issues are expected to occur.

Aesthetic/Scenic Values. Periodic vegetation maintenance would remove or reduce trees and other vegetation from the active canal alignment where they interfere with operations or pose

canal safety hazards. However, the vegetation maintenance activities would be considered ongoing operations under the No Action alternative.

3.5 Wildlife

3.5.1 Existing Environment

3.5.1.1 Wildlife Overview

Project area wildlife is characteristic of the lower elevation fauna of the Okanogan Highlands. General wildlife habitats in this area fall into three major types: (1) agriculturally modified desert steppe and croplands, (2) black cottonwood-dominated riparian areas along drainages and water bodies, and (3) upland Ponderosa-pine grasslands at higher elevations, commonly above the canals. The vegetation comprising the wildlife habitats, the relationships between the physiography and vegetation, and the landscape patterns associated with habitat distributions are discussed in section 3.4.1.

A list of the terrestrial wildlife that potentially may occur in the project area was prepared for two general physiographic areas from an unpublished U.S. Forest Service (USFS) species list (John Rohrer, USFS, pers. comm., 1997; USFS, 1997). These biophysical environments or general habitats are (1) the hot-dry, lowest elevation Ponderosa forest/grassland associations, and (2) all relatively open non-forested areas including steppe, croplands, and riparian areas. The terrestrial wildlife include about 309 species of amphibians, reptiles, birds, or mammals. Over 77 percent (238 species) of the total are birds; 16 percent (48 species) are mammals; and the remaining 7 percent (23 species) the combined amphibian and reptilian species.

Mammals

The 48 species of mammals that potentially occur in the project vicinity include opossums, shrews, bats rabbits and hares, rodents, furbearers, carnivores, and big game. Furbearers include otters, skunks and the wolverine. The coyote (*Canis latrans*), gray wolf (*Canis lupus*), red fox (*Vulpes vulpes*), mountain lion (*Felis concolor*), and bobcat (*Felis rufus*) are the primary carnivores. The primary big game species in the project area are Rocky Mountain elk (*Cervus elaphus nelsoni*), mule deer (*Odocoileus hemionus*), and white-tailed deer (*Odocoileus viginianus*).

Most mammals are permanent residents, occurring in both the upland coniferous forest/grassland and non-forested physiographic environments. About 75 percent of the total species use riparian areas as a special habitat component.

Birds

The 238 species of birds that may potentially occur in the project area represent all the major groups of birds found in temperate North America. These include waterfowl, shorebirds and other waterbirds, raptors, grouse and quail, swifts, hummingbirds, woodpeckers, and perching

songbirds. The birds are highly seasonal, and favor non-forested habitats and riparian areas. Over 175 species (75 percent) are either migrants or migrating summer breeders. About 60 percent of the total number of species occur exclusively in non-forested habitats; over 90 percent use riparian habitats.

Amphibians and Reptiles

The amphibians (9 species) and the reptiles (14 species) that potentially occur in the project area are all permanent residents. All are found in non-forested environments; over 80 percent of these species use riparian habitats.

3.5.1.1 Wildlife Species of Concern

Threatened and Endangered Species

The USFWS prepared a list of Federally listed threatened and endangered species that may be present in the general project area in Okanogan County (Philip Laumeyer, USFWS, letter; February 28, 1997). The USFWS considered potential species occurrence in the 373 km^2 (144 mi^2) within T34N R22E, T33N R21E, T33N R22E, and T32N R22E. Federally listed species include the endangered gray wolf, the threatened bald eagle (*Haliaeetus leucocephalus*), and the endangered northern spotted owl (*Strix occidentalis caurina*). The USFWS also identified 13 terrestrial species of concern that are to be considered for planning purposes. These species are listed in Table 3-9.

Gray Wolf. One sighting and track observations of a gray wolf were documented in 1991 about 1.2 km (0.75 mi.) south of the Twisp River in the project area (J. Almack et al., 1993a). Recent wolf sightings throughout sparsely populated areas of Washington indicate that wolves have remained relatively rare and widely dispersed, favoring remote areas. It is highly unlikely that any actions of this project would affect wolves or their favored prey species.

Bald Eagle. WDFW Wildlife Heritage database records indicate that the Methow Valley is a bald eagle winter concentration area (WDFW, 1997a). Bald eagles gather primarily in the lowland areas in late fall or early winter. Eagles are regularly observed in riparian areas near the Methow and Twisp rivers, where roost trees are available. A documented communal roost site with over 20 eagles has been recorded in a stand of black cottonwoods and Ponderosa pines about 0.8 km (0.5 mi.) east of the Methow River between Winthrop and Twisp.

Table 3-9 Federal Species of Concern[1]

Species			
Common Name	Scientific Name	Status[2]	Habitat Available[3]
Gray wolf	*Canis lupus*	FE, SE	yes
Bald Eagle	*Haliaeetus leucocephalus*	FT, ST	yes
Northern spotted owl	*Strix occidentalis caurina*	FT, SE	no
Long-eared myotis	*Myotis evotis*	FSC, SM	?
Long-legged myotis	*Myotis volans*	FSC, SM	?
Yuma myotis	*Myotis yumaensis*	FSC	?
Small-footed myotis	*Myotis ciliolabrum*	FSC, SM	?
Pale Townsend's big-eared bat	*Plecotus townsendii pallescens*	FSC, SC	?
Pacific fisher	*Martes pennanti pacifica*	FSC, SC	no
California wolverine	*Gulo gulo leuteus*	FSC, SM	no
North American lynx	*Felis lynx canadensis*	FSC, ST	no
Harlequin duck	*Histrionicus histrionicus*	FSC	yes
Northern goshawk	*Accipiter gentilis*	FSC, SC	no
Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	FSC, SC	no
Olive-sided flycatcher	*Contopus borealis*	FSC	no
Spotted frog	*Rana pretiosa*	FSC, SC	yes

Notes:

[1] Source: Letter from Philip Laumeyer, USFWS, to Lauri J. Croff, BPA, February 28, 1997.

[2] Federal Status: **FE** = Federal endangered; **FT** = Federal threatened;
FSC = Federal species of concern. (Laumeyer 1997)
State Status: SE = State endangered; ST = State threatened;
SC = State candidate for listing; SM = State monitor species.
Source for State Status: 1996. Species of Special Concern List. Washington Department of Fish and Wildlife, Wildlife Management Program, Olympia, WA.

[3] Preferred wildlife habitat for the species is available within the actual project area.

Northern Spotted Owl. In the general vicinity of the project area, northern spotted owls have been documented in the Okanogan National Forest at the higher elevations a few kilometers southwest of the MVID canals and in the non-forested cropland areas (WDFW, 1997b). The large expanses of mature forest stands that comprise spotted owl habitat do not exist in the immediate area of the proposed project. Therefore, it is highly unlikely that spotted owls would occur there or be affected by project activities.

Grizzly Bear. Although not listed by the USFWS as likely to occur in the vicinity of the project, the grizzly bear (*Ursus arctos)*, a Federally listed threatened species, has been mentioned as a species of concern by state wildlife biologists (S. Fitkin, WDFW, pers. comm., 1997). The project is located within the North Cascades Grizzly Bear Ecosystem management area, one of the six ecosystem areas identified within the present distribution of the grizzly bear (J. Almack et al., 1993b). Past sightings of grizzly bears have been recorded from the Twisp Ranger District and the Winthrop Ranger District, but none near the project area.

Federal Species of Concern

Thirteen species of concern are listed by the USFWS as potentially occurring in the general vicinity of the project. Four of these species (the Pacific fisher (*Martes pennanti pacifica*), wolverine (*Gulo gulo*), North American lynx (*Felis lynx canadensis*), and northern goshawk (*Accipiter gentilis*) are typically found in large tracts of mature forests with habitat characteristics similar to those of the northern spotted owl's. All are wide-ranging species, especially the wolverine and fisher. In the project area, it is highly unlikely that these species occur regularly outside the Okanogan National Forest. Therefore, the proposed project would not affect them directly or indirectly.

Another forest-dwelling species of concern, the olive-sided flycatcher (*Nuttallornis borealis*), is a typical summer resident in coniferous forests. Because its preferred habitat is in the coniferous forests at elevations above the influence of the MVID canals and project activities, this species is unlikely to be affected by project habitat modifications.

Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus)* is an uncommon resident of grasslands, hayfields, and open areas broken by canyons and rocky outcrops. In the Methow Valley area, land conversion and residential development have made several historic lek wintering areas no longer suitable habitat. Historic areas are located a few miles from the Methow River east of Winthrop and east of Twisp. In 1992, a small concentration of birds was documented in the Balky Hills area east of the Methow River outside the project area (WDFW, 1997b). It is unlikely that the proposed project would affect Columbian sharp-tailed grouse because their known historic and current habitat is beyond the area that would be influenced by habitat changes.

Five species of bats with a range that includes the Methow Valley area are Federal species of concern. All five are nocturnal and insectivorous, catching and eating insect prey while flying. All are summer residents; the four myotis species typically migrate to warmer areas during winter. Townsend's big-eared bat (*Plecotus townsendii*) may hibernate in local caves or cave-like

features. Although exact roosting habitats and nursery conditions for these species are not well-known, the project's minor habitat modifications are unlikely to influence habitat conditions for roosting or breeding bats. Loss of surface water in canals may eliminate potential locations for drinking and for attracting insect prey; however, bats can easily travel to other nearby areas (such as the Methow and Twisp rivers) where water will be available.

In the project area, harlequin ducks (*Histrionicus histrionicus*) are observed during the summer season along the Methow River from Winthrop to Carlton, and on the Twisp River at its confluence with the Methow River. These bottom-feeding ducks breed in fast-moving streams and nest on fallen logs and on ledges. In the fall they migrate to the coast where they winter, feeding in the breaking surf. The project is unlikely to influence harlequin duck habitat, directly or indirectly.

The spotted frog (*Rana pretiosa*) is most likely to be found in slow-moving backwater pools and ponds associated with watercourses in the project area. This species appears unable to survive where bullfrogs become well established. The Wildlife Heritage database has documented the occurrence of spotted frog adults in a pond next to the south shore of the Twisp River in the project area (WDFW, 1997a). The project canals do not simulate prime habitat conditions for the spotted frog. Because the canals do not flow all year and because they flow fairly rapidly, spotted frogs would probably not occur regularly or consistently in the project canals.

State Species of Concern

WDFW maintains two databases on wildlife resources and occurrences, based on research and field surveys over the last 20 years (WDFW, 1997a). The Priority Habitats and Species (PHS) database and the Wildlife Heritage database were searched to identify documented wildlife occurrences and habitats of concern to the state in the general project area. Data concerning Federal species of concern are discussed above; additional information for state species of concern is summarized below.

The wildlife observations within 1.6 km (1 mi.) on either side of the Methow and Twisp rivers in the project area indicate numerous occurrences of wintering mule deer; and year-round use by white-tailed deer, wintering bald eagles, breeding harlequin ducks, and (based on nest box surveys) cavity-nesting wood ducks (*Aix sponsa*) and goldeneye (either *Bucephala clangula* or *B. islandica*). A few records document spotted frogs in the general vicinity of the rivers. Other wildlife observations from uplands outside the influence of the project include breeding golden eagles (*Aquila chrysaetos*, a State Candidate for listing), sharp-tailed grouse, one record of overwintering Townsend's big-eared bats, and one record of tiger salamanders (*Ambystoma tigrinum*, a State Monitor species).

Wildlife priority habitats identified within 1.6 km (1 mi.) on either side of the Methow and Twisp rivers in the project area include well-developed riparian areas used by resident white-tailed deer; by mule deer for fawning; and by forest grouse, California quail (*Lophortyx californica*), tree swallows (*Iridoprocne bicolor*), kingfishers, and various woodpeckers. The Methow Valley ponds and lakes and associated emergent wetlands are used by nesting mallards, American wigeon (*Anas americana*), teal species, pied-billed grebes (*Podilymbus podiceps*), sora rails (*Porzana*

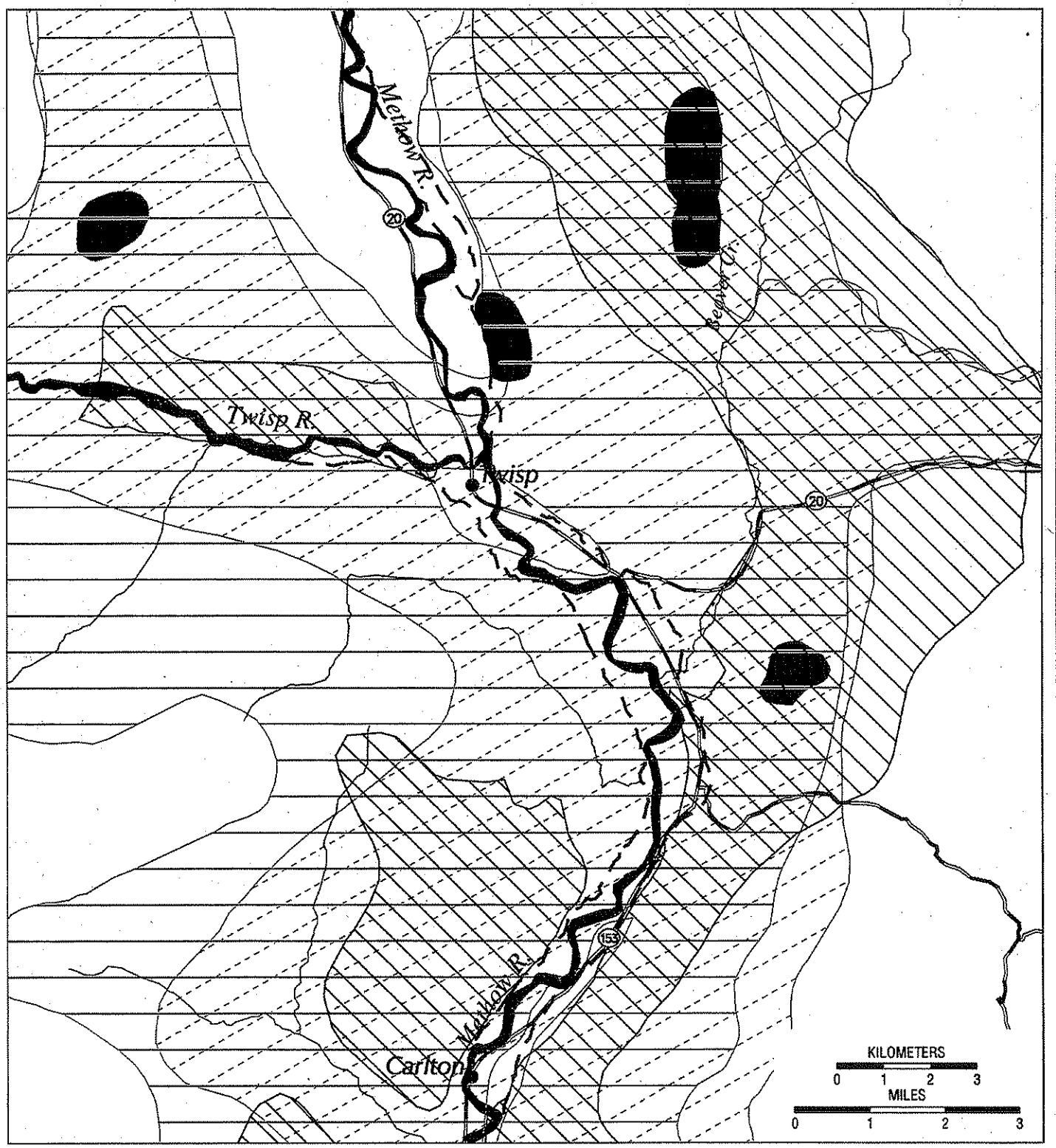
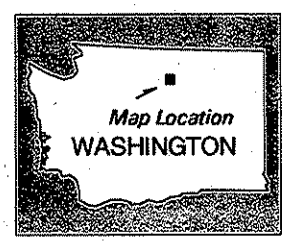


FIGURE 3–7: METHOW VALLEY IRRIGATION DISTRICT PROJECT – WILDLIFE PRIORITY HABITAT LEVEL I & II



- Bald Eagle (P1)/ Harlequin Duck (P2)
- Golden Eagle (P2)
- Mule Deer Critical Winter Range (P2)
- Mule Deer Migration Corridor (P2)
- Mule Deer Spring Range (P2)
- Highway
- River / Stream
- East & West Canals

Source: Washington Department of Fish and Wildlife, Priority Habitats and Species Database, 1996. (P1) = Priority One, (P2) = Priority Two.

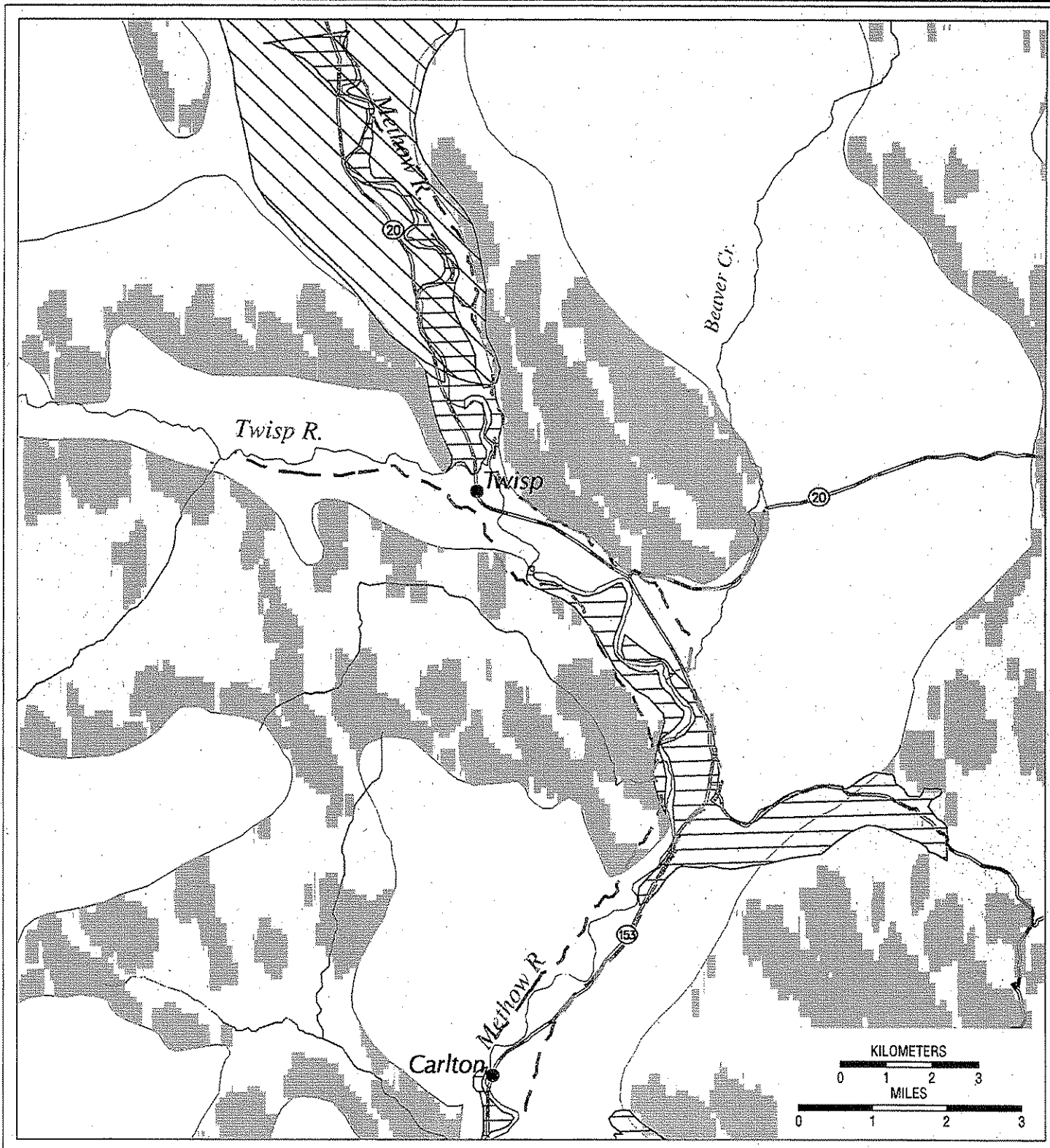
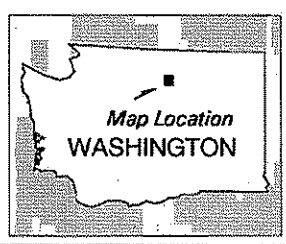


FIGURE 3–8: METHOW VALLEY IRRIGATION DISTRICT PROJECT – WILDLIFE PRIORITY HABITAT LEVEL III



Mule Deer Priority Winter Range (P3)

Mule Deer Migration Corridor (P3)

White Tailed Deer (P3)

Highway

River / Stream

East & West Canals

Source: Washington Department of Fish and Wildlife, Priority Habitats and Species Database, 1996. (P3) = Priority Three.

areas along the Twisp River and tributaries of the Methow River above the project area (Zeigler, 1978). Migration corridors also tend to occur along the higher slopes above irrigated croplands and the riparian river bottoms in the project area. Residential and agricultural development, fencing, and presence of domestic dogs may limit mule-deer access to riparian areas adjacent to the Methow and Twisp rivers (L. Hoffman, WDFW, pers. comm., 1997).

3.5.2 Potential Impacts

3.5.2.1 Potential Impacts of Alternative A

Construction Impacts

Converting existing canals to a piped delivery system would diminish open-water habitat, displace some adjacent riparian habitat to the Methow and Twisp river floodplains, and expand upland habitats for wildlife. The total area of potentially affected riparian habitat for Alternative A is estimated at 13.3 ha (32.9 ac.) (see **part 3, Table F-5 in Appendix F**). Habitat modifications would result in the direct loss or displacement of wildlife that depend on canal habitats for food, water, and shelter. Individuals of more mobile species (e.g., most birds and some mammals) would adjust most readily to construction-related habitat losses, as many would be displaced to the natural river systems. Some individuals of less mobile species (e. g., amphibians, reptiles, etc.) would not survive habitat modifications along the canals.

The noise and other human activities associated with construction are temporary; these activities would not significantly disturb or disperse wildlife. Construction is normally completed during the summer months, and would have little direct impact on wintering species such as the bald eagle or mule deer.

Operation and Maintenance Impacts

Patterns of wildlife use would be altered as open water and some riparian habitat would be permanently replaced with maintained upland areas. Wildlife that rely on open water for cover (e.g., frogs), for foraging (e.g., mink, raccoons), or for drinking (e.g., bats) would be permanently displaced. Wildlife that use riparian vegetation along existing canals for food and cover would also be displaced, although some patches of riparian vegetation are likely to remain outside the canal maintenance area.

Threatened and Endangered Species. Operational impacts on threatened or endangered species are expected to be negligible. Gray wolves and grizzly bears are relatively rare and wide-ranging; in the project area, they occur sporadically. Alternative A would change habitat, but would not appreciably influence normal activities for these species. The northern spotted owl also would not be affected, because suitable habitat for spotted owls does not exist along the canals.

In winter, bald eagles may perch in the tallest trees along the canals. No communal winter roosting areas have been documented along the canals. The dense tree stands preferred for communal winter roosts do not occur there, and probably could not be supported by the normal canal leakage that currently maintains canal riparian areas. Existing perching trees not *directly* in

the canal right-of-way would not be cleared as part of this project. Because bald eagles use both live and dead trees for perching, they could still use existing perch trees that die back as water is withdrawn. Eventually, these perch trees would fall (as would any perch trees). In the meantime, perching trees and communal roosting trees would be available in the areas of the Methow River floodplain along natural riparian corridors.

Other Species of Concern. Alternative A would permanently change patterns of species use in the project canal areas, as habitat is modified. The increase in in-stream flows in the Methow and Twisp rivers above their confluence would offset some potential losses by enhancing degraded habitats along natural riparian corridors. The improved riparian conditions would provide greater habitat potential for most species because it would link to other natural habitat areas and allow for population expansion. Riparian-associated species and species groups that would benefit include white-tailed deer, bats, furbearers, cavity-nesting ducks, songbirds, California quail, frogs, and other amphibians.

Wintering mule deer that occasionally use riparian areas associated with the canals would lose a source of browse and cover. Because the use of canal riparian areas is largely incidental, and because lowland agricultural and floodplain habitats provide food and cover, habitat changes resulting from this alternative should not be important to this species.

3.5.2.2 Potential Impacts of Alternative B

Construction Impacts

Upgrading and relining the existing canals and access roads would eliminate some open-water habitat, associated substrate, and some adjacent riparian habitat, and would expand some wildlife upland habitats. The total area of potentially affected riparian habitat for Alternative B is estimated at 12.2 ha (30.1 ac.) (see **part 3, Table F-5, in Appendix F**). Habitat for species that forage in open-water habitats would be limited, as substrate and associated vegetation would be lost (even though open water would be maintained). Habitat modifications would directly remove or displace wildlife that depend on canal habitats for food, water, and shelter. Individuals of more mobile species (e.g., most birds and some mammals) would adjust most readily to construction-related habitat losses; some of these might survive displacement to other riparian habitats. Some individuals of less mobile species (e. g., amphibians, reptiles, etc.) would not survive habitat modifications along the canals.

As under Alternative A, the noise and other human activities associated with construction would not significantly disturb wildlife or cause them to avoid the area.

Operation Impacts

Although construction activities would differ somewhat, impacts are expected to be similar to those described under Alternative A.

Threatened and Endangered Species. Operational impacts on threatened or endangered species are anticipated to be negligible, as described under Alternative A.

Other Species of Concern. Impacts on other species of concern would essentially be as those described for Alternative A.

3.5.2.3 Potential Impacts of Alternative C

Construction Impacts

Abandoning existing canals would eliminate some open-water habitat, displace some adjacent riparian habitat to the Methow and Twisp river floodplains, and expand upland habitats for wildlife. Impacts associated with construction activities would be as described under Alternative A, and would not result in significant impacts on wildlife.

Operation Impacts

The operational impacts of Alternative C would be essentially similar to those described for Alternative A.

Threatened and Endangered Species. Impacts on threatened and endangered species would essentially be as described for Alternative A, and are expected to be negligible.

Other Species of Concern. Impacts on other species of concern would essentially be as those described for Alternative A.

3.5.2.4 Potential Impacts of Alternative D

Construction Impacts

No construction-related impacts are anticipated.

Operation Impacts

No major changes in habitat are expected if Alternative D were implemented. However, it should be noted that periodic removal of trees and other vegetation would be required for maintenance of the canals.

Threatened and Endangered Species and Other Species of Concern. Under Alternative D, no measurable changes in habitat for threatened or endangered species or other species of concern would occur. Current activities along the existing canal system would continue into the foreseeable future.

3.6 Socioeconomics/Land Use

3.6.1 Existing Environment

3.6.1.1 Land Use

The MVID is located in Okanogan County in north-central Washington, on the east slope of the Cascades. The area is characterized as rural. Land uses in the area include intensive agricultural, urban, recreational residential, tourist, commercial, and unclassified areas including forest, grazing and dryland farming (Comprehensive Plan for Okanogan County, 1964; and field review). Mining and timber-related activities occur mainly in the upper subbasin. The lower valley activities are dominated by agriculture, including hay fields, pastures, cattle ranching, and fruit orchards. The valley is surrounded by expanses of public lands, including the Mount Baker-Snoqualmie National Forest and the Okanogan National Forest (see Figure 3-9).

Three zoning districts exist outside the communities of Twisp, Winthrop, and Carlton. These are:

- Methow Valley Review District "Uplands" (8-ha or 20-ac. minimum lot size),
- Methow Valley Review District 5 (2-ha or 5-ac. minimum lot size), and
- Methow Valley Review District 1 (0.4-ha or 1-ac. minimum lot size).

The MVRD 1 Zoning District is located around the Twisp Airport. The remaining two zoning districts comprise most of the district. The MVID canals are commonly used to separate these two zoning districts, with the Uplands zoning generally upslope of the canals and the District 5 zoning generally downslope (Okanogan Office of Planning and Development, pers. comm., 1997).

The MVID is one of about 50 irrigation districts in Washington State. Irrigation districts operate under State law. Their primary purpose is to distribute available water efficiently, equitably and fairly to all users within those districts (WDOE and Washington State University, 1995).

The district serves parts of the Twisp and Methow river valleys and portions of the low terraces next to them. About 10 percent of Okanogan County is in agricultural use; only about 1.5 percent (20,900 ha or 51,600 ac.) is irrigated, most often by hand/wheel lines and solid set (93 percent). Other irrigation methods less commonly used are drip (3 percent), furrow/open corrugated pipe (2 percent), and center pivots (2 percent) (Natural Resources Conservation Service, 1995). Statewide, about two-thirds of irrigation water is taken from surface water, and about one-third from groundwater (Wandschneider and Barron, 1993).

A total of about 314 ha (776 ac.) in the district is under irrigation. Currently the MVID delivers water to 239 parcels, with an average-sized parcel of 1.3 ha (3.2 ac.). Another 316 MVID parcels, representing 607 ha (1,500 ac.), are also a part of the MVID but currently do not receive any irrigation water from the MVID. Total MVID service area is 920 ha (2,276 ac.), and consists of 555 parcels (tax lots) owned by 344 MVID members.

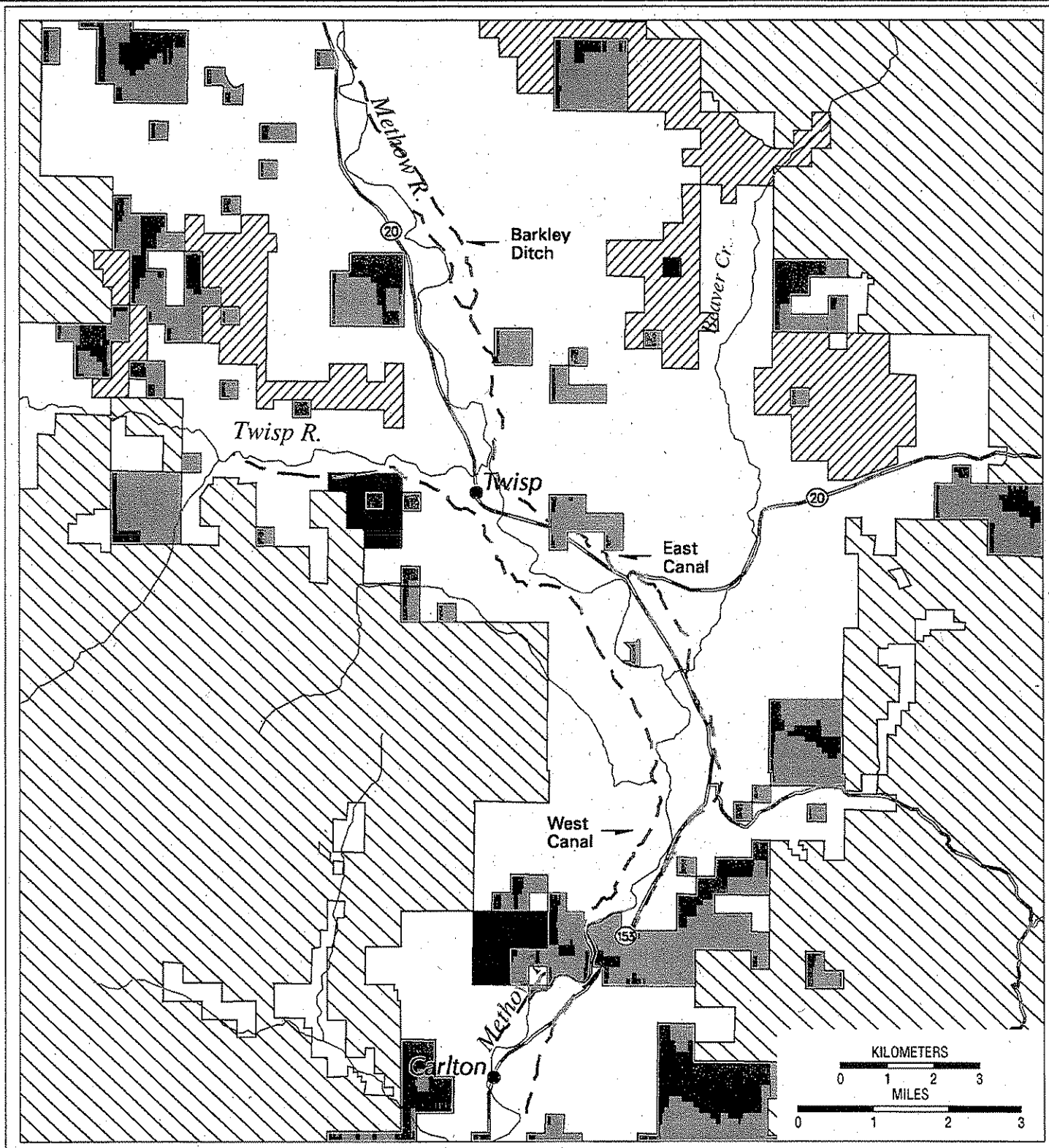


FIGURE 3–9: METHOW VALLEY IRRIGATION DISTRICT PROJECT – LAND OWNERSHIP

- Private or Unknown
- U.S. Forest Service
- Washington Dept. of Fish & Wildlife
- Bureau of Land Management
- Washington Dept. of Natural Resources
- Highway
- River / Stream
- East & West Canals

Source: Washington State Major Public Lands, DNR.

3.6.1.2 Economy

The Methow Valley local economy has historically been based on mining and logging, supplemented by agriculture. However, mining has largely been replaced by lumber and wood products production, and tourism. Agriculture, still part of the local economy, focuses primarily on grass hay and orchards. Cattle production is also part of the local economy.

3.6.1.3 Property Values

Property values in the Methow Valley are on the increase, particularly in the northern portion of the valley (M. Archer, Okanogan County Assessor's Office, pers. comm., 1997). The northern portion of the valley has undergone a transformation from an economy based on natural resources to an economy based on recreation and tourism. Property values throughout the Methow Valley were last assessed by the county in 1993, and will be re-assessed later in 1997. Assessments are based on 100 percent of market value in Okanogan County, and remain stable between assessments. Values are normally based on the highest and best use, as well as on various market factors. Important factors include the size of a parcel; its location; improvements, if any; the supply of land currently on the market; and the availability and cost of essential public services, including water.

3.6.1.4 Growth and Development

Residential development has been relatively strong in the Methow Valley. From 1990 through 1996, 400 residential building permit applications were submitted to the Okanogan County Planning and Development office: about 44 percent above Winthrop and 54 percent below (Okanogan Office of Planning and Development, pers. comm., 1997). Absentee owners predominate in the area, owning perhaps as much as 60 percent of the land (M. Archer, Okanogan County Assessor's Office, pers. comm., 1997). Land ownership is shown in Figure 3-9.

Okanogan County recently adopted critical area regulations under the state's Growth Management Act of 1990 (as amended) in order to protect wetlands, areas with critical recharging effects on potable water, frequently flooded areas, geologically hazardous areas, and fish and wildlife habitat conservation areas. All development proposals must comply with regulation requirements. Any new development in the Methow Valley must also meet a number of other state and local development regulations before receiving government approval to develop property in the valley.

3.6.2 Potential Impacts

3.6.2.1 Potential Impacts of Alternative A

Construction Impacts

Land Use. Less than 400m^2 (4,500 ft^2) of land would be converted from open space to pump houses and above-ground reservoir tanks. About 3 km (2 mi.) of new pipeline easement would be needed to connect the well fields to the existing canal locations. The new easement would be

located in the existing rights-of-way governed by the Town of Twisp or the county. No new rights-of-way would be required, while about 30 km (19 mi.) of existing canal rights-of-way would be abandoned.

Economics. Construction would likely be undertaken by a non-local construction company. A number of in-state construction companies (e.g., from Yakima, Wenatchee, Seattle, or Spokane) would qualify. Project construction would typically involve a crew of from 5-10 workers, and would take place over one or two construction seasons, depending on what time of year the work would begin, and the size of the construction crew that would work on the project. Construction would likely be curtailed during late fall and winter due to adverse weather conditions (Montgomery, Montgomery Water Group, pers. comm., 1997).

Construction personnel would typically seek temporary lodging in either local area motels or RV (recreation vehicle) parks in the valley. There are enough area accommodations to handle this demand. This impact would be considered slightly beneficial for the local economy. After construction, all construction personnel would be expected to leave the local area. Construction impacts are, therefore, expected to be temporary.

Costs for Alternative A would amount to about $4.6 million, including contingencies (CH_2M HILL, 1997). Funding sources would be public monies provided by both the region's ratepayers through BPA and the state's taxpayers through Referendum 38 funds from the WDOE. About $210,000 in sales taxes would be generated by the proposed action, with effects distributed throughout the state of Washington (CH_2M HILL, 1997).

Operation Impacts

Land Use. Alternative A would result in a smaller irrigation district: about 376 ha (930 ac.) versus the present 921 ha (2,276 ac). Decreasing the size of the MVID would not likely result in major changes in land use, only in the way that land would be irrigated; however, the alternative could lead to an increase in the rate of growth in the area, depending on the availability of land and other market factors (see Growth and Development, below). Most landowners who would elect to leave the district have not received water from the MVID for many years and have already made any necessary adjustments in land use. Any changes in land use would be subject to existing land development regulations, including the Critical Areas regulations that are intended to protect environmentally sensitive areas within the county. Any decision either to develop or sell one's property would be a personal choice, unrelated to the proposed action. Limits on the number, sizes, and locations of groundwater wells allowed to be put in by those leaving the district could limit future development of the valley.

Economics. MVID members electing to remain in the district would face higher O&M costs than at present; however, the water supply would be more dependable, liabilities resulting from lack of maintenance would be less, and future assessments would likely be more predictable and stable as a result (MVID Water Supply Facility Plan, Volume II, Appendix C, page 6 (Berk & Associates)). If the entire 376 ha (930 ac.) identified in the MVID Water Supply Facility Plan as remaining in the reformed district were irrigated, the annual O&M costs, including power cost, would amount to about $104,300 (1997 dollars), or about $277 per ha ($112 per ac.) (CH_2M

HILL, 1997). (The reader should note that the MVID currently charges a minimum rate of $200 for irrigation water for two acres or less. Under Alternative A, the revised district could continue to charge a minimum rate for smaller-sized parcels.) The current O&M rates are assessed at approximately $124 per ha ($50 per ac.) for those members that currently receive irrigation water; however, additional funds are received from members not currently receiving irrigation water (MWG, June 1996).

Per-acre O&M costs will depend on the number of members who elect to remain in the district. If fewer members remain, the per-acre costs will go up. To avoid unacceptably high per-acre O&M costs to the remaining members, the MVID board could exercise its authority to establish district boundaries (RCW 87.03.665: Exclusion of Lands from District—Order Denying or Granting Petition). There is a potential for new members to be allowed to join the reformed MVID; however, any future growth of the district would depend on adequate supplies of water, and interest on the part of those adjacent to the reformed district boundaries. The assessment could be reduced if the MVID were to assess a minimum charge.

Current MVID members whose parcels would be excluded from the reorganized MVID would be compensated. The amount of compensation would be calculated based on the acreage formula in Table 2-2, and would range between $2,000 and $29,500 per landowner, for a total of approximately $1.345 million. It is anticipated that former members would use the money to drill new or upgrade existing groundwater wells, pumps, and pipelines to replace the MVID water supply to which they are currently entitled. It would also compensate those who have been required to continue to pay assessments to the MVID over the years while not receiving their entitled water. No restrictions would be placed on the use of the money.

For those who would be leaving the district, and who would not be drilling new wells or improving existing wells, this would be considered a windfall, a beneficial impact. For those who would be using the funds to drill new well(s) or improve existing wells on their property, the impact would also be considered beneficial, although the degree would be variable and site-specific, benefiting some more than others, depending on the costs associated with obtaining a sufficient amount of water to irrigate one's fields. Overall, however, the impact would be considered to be beneficial in that the new wells would add value to the properties that would be provided with their own wells.

Property-value Impacts. This alternative would be a benefit to the salability of land. The project would establish the availability of water to parcels throughout the MVID service area. Those leaving the MVID could receive an authorization to convert a portion of the MVID right to a separate water right that would remain with the land. For those staying in the MVID, the water supply would be seen as a dependable resource and, with the formation of a new MVID, the O&M costs would be fixed for the near term. Although future power costs could rise over the long term, O&M costs would likely be foreseen as being relatively stable. Either way, long-standing water issues would be solved and this could be seen by potential buyers as an improvement over the existing situation.

However, the abandonment of the open canal could be perceived by some as detriment to property values. Some members of the district enjoy the canal from an aesthetic standpoint, and believe that potential purchasers would also.

Growth and Development. Alternative A would likely contribute to growth, in that the WDOE is currently considering a proposed rule change that would require a portion of the water saved through increasing efficiencies (such as that proposed by the MVID) to be placed in a water bank. If the rule were adopted, a portion of the water saved (10 percent) would be available for future growth, half of which would be reserved for domestic use and half for agricultural/ irrigation purposes. The remainder of the water saved (90 percent) would be made available for in-stream flows. However, if the proposed rule change were *not* adopted, 100 percent of the saved water would go into the State Trust to be used for either new development, or for water management goals in the basin (in-stream flow enhancement).

3.6.2.2 Potential Impacts of Alternative B

Construction Impacts

Land Use. Under Alternative B, about 42 km (26 mi.) of canals would be relined, and 3.2 km (2 mi.) of new access roads would be built next to the renovated canals. No new rights-of-way would be required, but approximately 6.4 km (4 mi.) of existing canal rights-of-way would be abandoned.

Economics. Construction would occur along the entire length of the canal, so actions would be similar to those required for Alternative A. Economic impacts from construction crews would be similar to those under Alternative A. However, this alternative would cost more than 2.5 times as much to implement as Alternative A. Including contingencies, total cost is estimated at about $11.9 million. The cost of this alternative is well beyond the amount of money currently available through BPA and Referendum 38 funds from WDOE, so additional funding would need to be secured. The amount of sales tax received by the State of Washington would be the largest of any of the alternatives: about $700,000 in revenue.

Operation Impacts

Land Use. Alternative B would also result in a smaller irrigation district: about 517 ha (1,277 ac.) versus the present 921 ha (2,276 ac.). Impacts would be similar to those discussed for Alternative A.

Economics. O&M costs of Alternative B would amount to about $123,400 (vs. $104,300 for Alternative A), or about $238 per ha ($97 per ac.), assuming that all 517 ha (1,277 ac.) would be irrigated (more total hectares (acreage) irrigated means lower costs-per-hectare (per-acre) than under Alternative A). O&M costs would increase if fewer hectares (acres) were irrigated; as with Alternative A, the MVID board could exercise its authority to establish district boundaries (include or exclude members). As with Alternative A, more users could be encouraged to receive water from the MVID; however, this would depend on adequate supplies of water and interest. Also, a minimum charge could be levied.

Under Alternative B, there are two options for reimbursing current members who would leave the MVID—the acreage-based compensation option discussed under Alternative A, or an as-needed compensation option proposed by the Canal Associates (see section 2.2).

Acreage-based Compensation Option. This option is the same as the compensation option discussed under Alternative A. It would involve compensating those landowners who leave the MVID, based on the acreage formula in Table 2-2. The compensation would range between $2,000 and $29,500 per landowner, for a total of approximately $1 million. The results and impacts of this option would be the same as those discussed under Alternative A.

As-needed Compensation Option. This option would involve compensating those who leave the MVID for the cost only of new replacement well(s) or improvements made to existing well(s). The amount of payment would be based on the actual costs for these improvements, not on acreage. A maximum of $2.2 million would be available for this purpose, as only the BPA money could be used (Referendum 38 funds from WDOE cannot be used for compensation). However, the number of people actually needing these improvements is expected to be low, so this option could result in savings over the acreage-based compensation option.

Under this option, only those who would want either to develop their own water supply or to improve an existing water supply would benefit. Those who have already developed their wells and/or who have been paying into the district and not receiving water would not be compensated. Those that chose to have replacement wells drilled on their property would experience a beneficial impact, in that they would receive a dependable source of water, and it would be essentially weed-free.

Property-value Impacts. Alternative B would have similar benefits to property values as Alternative A. The system would be essentially new, and water deliveries would be reliable. O&M costs would be more stable than under Alternative A, since the potential for rising electricity costs would not be present with the gravity-fed system. Unlike Alternative A, the open canal would remain; however, some of its aesthetic value might be lost initially due to the reconstruction and removal of trees.

Growth and Development. Impacts would be similar to those discussed for Alternative A; however, not as much water would be saved, and therefore less would be available to the water bank or State Trust.

3.6.2.3 Potential Impacts of Alternative C

Construction Impacts

Land Use. No additional land or rights of way would be needed for irrigation facilities under Alternative C. All 48 km (30 mi.) of existing canal rights of way and easements would be abandoned, and the diversion dams, intake structures, and fish screens removed from the rivers and their banks.

Economics. The construction impacts would include some construction personnel in the area for a much shorter period than under either Alternatives A or B. It is also more likely that local workers would be hired. The estimated cost is about $2.7 million, up to $2.4 million of which would be used for dissolution compensation. Approximately $18,000 in state sales tax would be generated by the proposed alternative.

Operation Impacts

Land Use. Dissolving the MVID would not likely result in major changes in land use, only in the way that land would be irrigated; however, the alternative could lead to an increase in the rate of growth in the area, depending on the availability of land and other market factors (see Growth and Development, below). Many landowners have not received water from the MVID for many years and have already made any necessary adjustments in land use. As under Alternatives A and B, any subsequent changes in land use would be subject to existing land development regulations. Any decision either to develop or sell one's property would be a personal choice, unrelated to the proposed action. Any limitations on the number, size, and location of groundwater wells allowed to be put in by those leaving the district could also limit future development in the valley.

Economics. With the dissolution of the MVID, O&M costs related to the present system would be zero, because the system would be abandoned. The aggregated costs to individuals for operation and maintenance of their systems might be higher than those for an intact district, however, because of the efficiencies of a centralized pumping system over individual wells.

Former MVID members would be compensated according to a formula based on size of area to be irrigated, as under Alternative A. This money could be used by the landowners to upgrade existing or drill new groundwater wells, where needed. It would also help compensate those of the district who have paid into the district over the years without receiving water.

It is likely that not all former MVID members would be able to drill individual wells, either because their land does not lie over the alluvial aquifer, or because WDOE would determine that their proposed well would impair an existing well. If MVID members who were precluded from drilling individual wells formed their own LIDs before dissolution of the MVID, the WDOE would fund replacement wells and associated facilities for the LID members.

Property-value Impacts. This alternative would most likely be a benefit to the salability of land: future assessment, O&M, and liability costs associated with the MVID would no longer be an issue. However, as with Alternative A, the abandonment of the canal could be perceived to be a detriment.

Growth and Development. Impacts would be similar to those under Alternatives A and B.

3.6.2.4 Potential Impacts of Alternative D

Construction Impacts

Land uses would not change under Alternative D. The MVID would continue to use the existing system as it is. Fish screens might be upgraded, if funding for these improvements were available

from WDFW. Needed repairs would cause minor construction impacts. Local crews would most likely be hired, and the construction would likely not exceed one construction season. Repair costs would amount to approximately $2.4 million. MVID members would have to fund these repairs themselves, or alternative funding sources would need to be found, as BPA and WDOE would not fund these repairs.

Operation Impacts

Land Use. Under the No Action alternative, it is assumed that the district membership would remain the same. No changes in land use are anticipated.

Economics. It is expected that O&M costs for the MVID would need to increase, because deferred maintenance is backlogged. The 1993 O&M costs were $78,370. In order to maintain the present system in its current state, annual O&M costs of $86,000 (including administrative costs), or about $272 per ha ($110 per ac.) would be required (based on the currently irrigated acreage plus a minimum charge for those not receiving water). It should be noted that the historic levels of O&M have not included vegetation maintenance; however, it is assumed that some vegetation maintenance would be necessary under this alternative. The potential economic impacts of the No Action Alternative would include the inequity of continuing an economic burden on those MVID members who pay for water but receive none, and who would like to leave the district, but are prevented from doing so at the present time. This would include both those groups who have no need for water (i.e., grow no agricultural crops), and those who have a need but are located at the end of the system, in the Carlton area, and cannot depend on a source of water during those critical times of the year when irrigation water is needed.

If the MVID were to elect to allow people to leave the district, there would be no compensation available.

Other economic impacts of the No Action Alternative include the potential catastrophic failure of the system, due to a number of potential circumstances that could cause the antiquated system to shut down, or at least require a major overhaul. Such system failures, although less likely with the repair of the most critical sections of the canal, could cause heavy property loss or loss of life.

Property-value Impacts. Some prospective property buyers would see the potential assessment and liability issues related to membership in the MVID as detriments to property values, but others might see the canal as an aesthetic asset.

Growth and Development. No growth or development impacts would result from Alternative D.

3.7 Cultural Resources

3.7.1 Existing Environment

3.7.1.1 Tribal Rights

Before European-Americans arrived, north-central Washington State was occupied by a number of different tribal groups, including the Wenatchi (Fulkerson, 1988). Subgroups of the Wenatchi tribal group include the Methow group (Spier, 1936; Teit 1928). A subgroup, the Methow Band, occupied the Methow River Valley, practicing traditional hunting, fishing, and gathering activities. In 1879, the Moses Reservation, which included the Methow Valley, was created by Executive Order; the Methow Band was one of the tribes that moved to the reservation. When the Moses Reservation was canceled in 1886, most members of the Methow Band and other tribes occupying the Moses Reservation moved to the Colville Reservation in central Washington, and were enrolled as members of the Confederated Tribes of the Colville Reservation (A. Fredin, Colville Confederated Tribes, pers. comm., 1996). Others moved to the Yakima Reservation and were enrolled as members of the Confederated Tribes and Bands of the Yakama Indian Nation (J. Menninick, Yakima Indian Nation, pers. comm., 1997). Some Native Americans obtained allotments in the Methow Valley at the time of the move to the other reservations, and retain those allotments today.

3.7.1.2 Traditional Uses

The way of life for the Methow Band centered around ceremonies, religion, traditions, and customs that depended on the continued flow of salmon. This independent lifestyle was in existence and undisturbed by any outside influence for thousands of years. Materials were gathered to make mats, bags, baskets, and medicines (Fredin, 1994). Diet consisted of fish, with supplements from roots, berries, assorted greens, river mussels, deer, elk, bear, fowl, rabbits, and other small mammals.

The local Native Americans extensively used the Chillowist Trail, which began at Chillowist Creek on the Okanogan River and ended where Benson Creek flows into the Methow River. The North Fork of the Chillowist Trail traveled along Beaver Creek (Cain, 1985; Fulkerson, 1988). The east canal crosses the location of the trail in the vicinity of the Benson and Beaver Creek flumes. Many groups of Native Americans came over from the Okanogan valley in the summer to fish and pick berries (Moore, 1965). It is most likely those groups traveled on the Chillowist Trail.

3.7.1.3 Cultural Resource Sites

In October 1996, staff from BPA's cultural resources contractor, Archaeological and Historical Services, conducted a field investigation of the east and west canals. The possible pipeline, reservoir, and well locations were also inspected. Two artifacts were recorded. Although five cultural resource sites have previously been identified in the vicinity of the canal, only the Chillowist Trail is within the project area. It is also known that unmarked Native American

cemeteries are located in the area, and one known cemetery has been marked with a rock (Confederated Colville Tribal member, public meeting, 1996).

MVID Irrigation System

The MVID canal system has been determined to be eligible for inclusion on the National Register of Historic Places (National Register), under Criterion A (property associated with events that have made a significant contribution to the broad patterns of our history). The system has been the most significant irrigation feature in the Methow Valley. Although neglect and numerous changes in the structural materials have caused substantial deterioration, both the east and west canals are still mostly located in the original rights-of-way.

The Methow Valley Irrigation District canal system has been vital to the Methow Valley's agricultural production (especially fruit-growing) during its years of operation, from the 1900s up through the present. European-Americans first began to occupy the Methow Valley following the Moses Agreement of 1886, when most Native Americans west of the Okanogan River were moved onto the Colville Reservation. The first small-scale efforts at irrigation came in the 1880s, when many ditches were taken out from the various creeks flowing down to the Okanogan River and out of the Methow.

After 1900, irrigation attempts in the Methow Valley became larger-scale and more organized. By 1908, the High Line ditch was operational, intended to supply water to several thousand acres on either side of the Methow River. However, the sole source of the water was the Twisp River, which did not prove to be adequate for the job.

In 1919, farmers and orchardists created the MVID. They acquired the High Line ditch and built a completely new system. Instead of drawing all of its water from the Twisp River, it drew from behind a newly built low dam across the Methow River, about 6.5 km (4 mi.) north of Twisp. Water was thus diverted into a new canal that supplied the east side of the Methow Valley. Water from the Twisp River was used only to supply the west side of the valley. By 1923, the new system was completed and the east-side irrigation water had reached Carlton. Much of the old High Line ditch west of the Methow River had been rebuilt, with much of the flume replaced with lined ditches.

Maintenance work on the canals included inspections for leaks and structural damage. The lining of the flumes and ditches required continual patching and replacement. By the 1930s, wildlife officials were becoming concerned with the apparent decline in the fish population in the Twisp and Methow rivers. Much of the loss was attributed to fish being drawn out of the rivers and into the irrigation network, where they often died. Fish screens, which prevent the entry of fish into the irrigation system, were installed at both canal intakes in 1937. These facilities were periodically remodeled and eventually completely replaced.

3.7.2 Potential Impacts

3.7.2.1 Potential Impacts of Alternative A

Construction Impacts

Potential construction impacts under Alternative A would include changes to the canal system (which appears to be eligible for the National Register), impacts on archaeological sites, and/or impacts on traditional use sites. BPA is consulting with the Washington State Historic Preservation Office (SHPO) regarding the eligibility of the canal system and any mitigation that would be required for impacts on the canal system under the proposed actions. Usually, the preferred mitigation is to compile drawings, pictures, and other information in an Historic American Engineering Record (HAER) document. BPA is currently in the process of initiating this work. See section 4.4 for further information on the process.

When definite locations of proposed wells, connecting pipelines, reservoirs, and other new facilities are determined, additional surveys would be conducted to confirm that cultural resources would not be affected by construction or operation of the rebuilt irrigation system. If sites potentially eligible for the National Register were found in the vicinity of any planned construction activity, efforts would be made to avoid affecting the sites, to the extent possible. If this were not possible, consultation with the SHPO and affected tribes would be initiated. A Memorandum of Agreement would be drafted that would detail any additional testing that would be undertaken, and the treatment of any cultural materials that might be found, either during testing or construction.

The groundwater wells and associated facilities might require small plots of land in or near traditional use areas, such as fishing sites and gathering areas for basket-weaving materials. The tribes would be consulted to minimize any impacts on these traditional uses.

Operation Impacts

Under Alternative A, improving flows on the Methow and Twisp rivers would not change existing tribal fishing rights; however Native Americans would benefit from the project if it were to increase fish numbers, as would all people who fish on these rivers.

3.7.2.2 Potential Impacts of Alternative B

Construction Impacts

Impacts for the partial upgrade alternative would essentially be the same as those for Alternative A, except that, because no system wells or pumps would be constructed, those areas would not be affected.

Operation Impacts

As with Alternative A, improving flows on the Methow and Twisp rivers would not change existing tribal fishing rights. Native Americans and other anglers would benefit from the project if it were to increase fish numbers.

3.7.2.3 Potential Impacts of Alternative C

Construction Impacts

The only potential construction impacts of Alternative C would be from the abandoning of the historic canal system, and the drilling of new wells by individuals. Impacts on the canal system would be mitigated, as discussed under Alternative A. The likelihood of affecting cultural resources through well drilling would be small, since the area of ground disturbance would be only slightly larger than the wells.

Operation Impacts

Impacts would be the same as those under Alternatives A and B.

3.7.2.4 Potential Impacts of Alternative D

Construction Impacts

Impacts on cultural resources could occur during ongoing repairs to the canal system. However, since BPA funding would not be involved, there would be no protection to these resources other than any existing state laws.

Operation Impacts

Under the No Action Alternative, flows on the Methow and Twisp rivers would not increase because in-stream diversions would not be upgraded. However, there might be some slight improvement in fish numbers as fish screens were upgraded. Existing tribal fishing rights would not change.

3.8 Safety and Liability

3.8.1 Existing Environment

Much of the current canal system is in poor condition because past maintenance has been incomplete. Sections of the existing concrete-lined canals are on steep slopes, some undercut by erosion. Homes are built in areas below the canals, and narrow bridges and culverts cross the canals. Washouts and breaks have been an ongoing problem. In 1948, hundreds of feet of ditch were washed out when severe flooding occurred. More recent breaks have threatened property and roads, and have dumped material into the Methow River. Sometimes animals tunnel under the ditch and cause breaks. The wooden flashboards in the Methow River diversion dam must be adjusted by hand, requiring workers to walk along the structure in the river.

The valley is also a popular recreational area, drawing those who enjoy boating and floating on the Methow River. Finally, the irrigation canals have been used as a source of water to refill tanks for fighting fires. The Carlton/Twisp/Winthrop/Mazama Fire District #6 provides fire protection services to the MVID area. The Fire District carries water to fight fires primarily in 11,356-liter (3,000-gallon) tankers. If more water is needed, it is taken from rivers and the irrigation ditches (when water is present). No public water supply exists in the area. (Reiber, pers. comm., 1997).

3.8.2 Potential Impacts

3.8.2.1 Potential Impacts of Alternative A

Construction and Operation Impacts

Converting the open canals to enclosed pipe would greatly reduce the threat of canal failures/ breaks and washouts. People and property below the canals would be safe from damage or loss of life that could be caused by breaks. Drowning risk would be eliminated. The dams (removed) would no longer present a hazard to boaters or to maintenance workers. Therefore, the MVID members' costs for liability insurance would be reduced, as would threat from the potentially high cost of lawsuits by persons injured or killed, or property damaged, by current canal failures or operations.

Enclosing the irrigation ditch in an underground pipe could eliminate one source of water for fire district use during the period from May through October. River water would still be available for fire suppression purposes in the area. Also, access to the irrigation pipe could be made available where roads or bridges cross the pipe. Pump ports (accessible only to the fire district and other fire protection providers in the area) could be added to the system that would allow fire fighters a ready source of water when it would most likely be needed, i.e., during the brush fire season (March through September (Reiber, Fire District #6, pers. comm., 1997).

Abandoned portions of the canal would not be backfilled or the land reclaimed to what it was before initial construction (early 1900s). The canals, plugged to allow drainage through existing spillways, would become the responsibility of the landowner. Abandoned sections could hold stagnant water, attracting mosquitoes or other pests. Those portions could be considered an attractive nuisance; however, they would likely be less of an attractive nuisance than they are now, since they would contain much less water.

3.8.2.2 Potential Impacts of Alternative B

Construction and Operation Impacts

Some safety and liability issues would be a continuing concern, since the canal would remain an open, concrete-lined system. However, with completion of proposed repairs in areas of high operational risk, improved in-stream diversions, and regular maintenance, the risks would be greatly reduced. Nearby people and properties would have a reduced threat from breaks and washouts. The improved diversion dam might eliminate the need for workers to walk along the structure in the river to adjust flashboards. However, risk of drowning in the canal would

continue. Boaters and floaters could potentially drop over the diversion dam. Therefore, the MVID members and private citizens might become liable for persons injured or killed, or property damaged, by canal operations, incurring potentially high liability costs. The canal would remain available as a source of water to fight fires.

3.8.2.3 Potential Impacts of Alternative C

Construction and Operation Impacts

Impacts would essentially be the same as those for Alternative A, as the ditch would be abandoned and plugged at the spillways, and the in-stream diversions removed. As under Alternative A, Fire District #6 and other firefighting entities would no longer have access to the water in the canal. The mitigation suggested under Alternative A would not be possible.

3.8.2.4 Potential Impacts of Alternative D

Construction and Operation Impacts

Under the No Action alternative, many safety and liability issues would continue to be of concern, even if some repairs were made. Nearby people and properties would still be threatened by breaks and washouts. Drownings could still occur. Boaters and floaters could drop over the diversion dam. The dam workers would continue to work under risky conditions. Therefore, the MVID members and private citizens would continue to be liable for persons injured or killed, or property damaged, by canal failures or operations, incurring potentially high liability costs. The canal would remain available as a source of water to refill tanks to fight fires.

CHAPTER 4: ENVIRONMENTAL CONSULTATION, REVIEW AND PERMITS

4.1 National Environmental Policy

This environmental assessment is prepared pursuant to the National Environmental Policy Act (NEPA, 42 USC 4321 *et seq.*) and implementing regulations which require Federal agencies to assess the impacts of their proposed actions on the environment. Under NEPA, BPA has the option to prepare an environmental assessment to provide evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact (FONSI). BPA prepared a determination on August 28, 1996, that the funding of the Methow Valley Irrigation District Conversion is within the class of actions normally requiring an Environmental Assessment as listed in Subpart D of 10 CFR Part 1021.

4.2 State, Areawide, and Local Plan and Program Consistency

4.2.1 State Environmental Policy Act

On February 23, 1996, the MVID Board of Directors signed a Determination of Nonsignificance (DNS) under the Washington State Environmental Policy Act, Washington Administrative Code 197-11-340(2), for the proposed adoption and implementation of the Methow Valley Irrigation District Water Supply Facility Plan. This determination was made based on an environmental checklist dated January 18, 1996. A Notice of Environmental Determination was published in the *Methow Valley News* on February 29, 1996. A number of comment letters were received. After the MVID reviewed the comments and prepared responses, the Board of Directors decided to retain the DNS for adoption and implementation of the Water Facility Supply Plan. Subsequently, the DNS was challenged by a group of MVID members who oppose the action. As of June 1, 1997, this issue has not yet been resolved.

4.2.2 State and Areawide Clearinghouses

BPA will distribute the preliminary EA to the Washington State clearinghouse for state and local agency review and consultation, as required by Executive Order 12372. Any comments received through the clearinghouse review will be addressed in the final EA. The clearinghouse will also be informed of the availability of the final EA and decision on whether to prepare a FONSI or an environmental impact statement.

4.2.3 Local Plans

The proposed MVID actions would be located in areas covered by the Okanogan County Comprehensive Plan and the Methow Valley Plan, an addendum to the comprehensive plan. The comprehensive plan is a declaration of policies, and as such, contains no regulations or minimum standards.

Most of the canal facilities are located in either the Methow Valley Review District's Uplands zoning district (8-ha or 20-ac. minimum lot size) or the MVRD 5 zone (2-ha or 5-ac. minimum lot size). Irrigation facilities are consistent with these zonings.

Okanogan County recently adopted critical area regulations under the State's Growth Management Act of 1990, as amended, in order to protect wetlands, areas with critical recharging effects on potable water, frequently flooded areas, geologically hazardous areas, and fish and wildlife habitat conservation areas. The existing and proposed MVID facilities are located in some of these areas:

- **Wetlands.** Diversion dams, intakes, and fish screen facilities might be located in jurisdictional wetlands. Riparian areas created solely by seepage from the canal are not considered to be jurisdictional wetlands by the county. See section 4.6 for a discussion of potential wetland impacts.

- **Aquifer Recharge Areas.** Areas with critical recharging effects on potable water have not been mapped; however floodplains and associated areas are considered to be likely areas. Some of the diversion and intake facilities, short sections of the canal or proposed pipeline, and the new groundwater wells might be located in these areas. Artificially diverted or stored waters such as the irrigation canal are exempted from these areas; therefore, most of the existing canal seepage areas are exempted from this designation.

- **Frequently Flooded Areas.** Diversion dams, intakes, and fish screen facilities are located in frequently flooded areas, defined as the 100-year floodplain as designated on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate maps. See section 4.6 for a discussion of these floodplain impacts.

- **Geologically Hazardous Areas.** It is likely that sections of the existing canal cross erosion hazard and landslide hazard areas; however, maps of these areas are not available. The county will be contacted to determine applicability of the regulations pertaining to these areas.

- **Fish and Wildlife Habitat Conservation Areas.** Much of the existing canal system is located in priority Level II and III mule-deer migration, spring range, and critical winter range corridor (these overlap; maximum about 37 km or 23 miles),and white-tailed deer priority Level III (21 km or 13 mi.) habitat, with a smaller amount bordering bald eagle priority Level I and Harlequin duck priority Level II (3.5 km or 2.2 mi.) and golden-eagle priority Level II habitat (1.1 km or 0.7 mi.). The existing

diversion dams, intakes, and fish screen facilities and proposed well fields and associated facilities are or would be located in bald-eagle priority Level I and Harlequin-duck priority Level II habitat areas. Standards are delineated for Level I and II habitats, but not for Level III habitats. BPA will consult with the USFWS regarding impacts on bald eagles under the Endangered Species Act (see sections 3.5 and 4.3). Standards for Level II habitats applicable to the proposed actions include native revegetation and riparian vegetation protection (for facilities in natural wetlands, but not for riparian vegetation artificially maintained by the seepage from the canal).

WDOE and MVID have and would continue to coordinate the proposed actions with the county planning department to specifically address any concerns regarding zoning or conflict with critical areas.

4.3 Wildlife and Habitat

4.3.1 Endangered and Threatened Species and Habitats

The USFWS prepared a list of Federally listed, threatened, and endangered species that may be present in the general project area in Okanogan County (Philip Laumeyer, USFWS, letter; February 28, 1997). Federally listed species include the endangered gray wolf, the threatened bald eagle, and the endangered northern spotted owl. The USFWS also identified 13 terrestrial species of concern that are to be considered for planning purposes. These species are listed in Table 3-9.

There are no Federally listed, endangered or threatened fish or plant species within the MVID project area. However, the status of several fish species within the project area is currently under review by NMFS and the USFWS. Summer chinook and steelhead have been identified on a petition for listing, and NMFS is expected to make a ruling on the status of these species by May 1997. The USFWS has recently decided to list Bull trout as well; official listing should occur by mid-1997.

See section 3.5 for information regarding impacts on these species. Impacts are expected to be negligible for the wildlife species, and may be beneficial to the fish species currently under review. BPA will complete any necessary ESA consultation with the USFWS and NMFS prior to initiating work on the proposed project.

4.3.2 Fish and Wildlife Conservation

Alternative A is consistent with the Council's Columbia River Basin Fish and Wildlife Plan. It was recommended to the Council for inclusion in the priority projects by the YIN in 1996, and subsequently accepted by and recommended to BPA for funding by the Council. Alternatives B and C would need to be reviewed for consistency with the Council's recommendations, if they

were to be accepted. Alternative D (No Action) would not be consistent with the Council's recommendation.

Alternative B would include revisions to the existing diversions and therefore would require USFWS review under the Fish and Wildlife Coordination Act (16 USC 661 et seq.). BPA will provide USFWS a copy of this EA for their review.

4.4 Heritage Preservation/Native Americans

4.4.1 Historic and Archaeological Resources

The MVID canal system has been determined to be eligible for inclusion on the National Register of Historic Places (National Register), under Criterion A (property associated with events that have made a significant contribution to the broad patterns of our history). The system has been the most significant irrigation feature in the Methow Valley. Although neglect and numerous changes in the structural materials have caused substantial deterioration, both the east and west canals are still mostly located in the original rights-of-way.

BPA is working on a Memorandum of Agreement (MOA) with the Washington SHPO regarding the mitigation that would be required for impacts on the historic canal system under Alternatives A, B, and C. Usually, Historic American Engineering Record (HAER) documentation is the preferred mitigation measure for historic properties of engineering significance. BPA is currently in the process of initiating the HAER work.

Archaeologists from Archaeological and Historic Consultants, BPA's consultant, have also completed a field investigation of the east and west canals, on foot, along the length of the canals. The possible pipeline, reservoir, and well locations were also inspected. Two artifacts were recorded within 30.5 m (100 ft.) of the east canal. Several properties currently listed on the National Register were identified in the general area, but none would be affected by the proposed actions. When definite locations of proposed wells, pipelines, and other proposed facilities are determined, those areas would be carefully inspected and shovel-tested to insure that no intact subsurface cultural remains are affected.

The MOA mentioned above would address these resources as well. It would be signed and the pertinent provisions adhered to before or during any BPA-funded work on the canal or other facilities.

4.4.2 Native Americans

Methow Band members from the Colville Confederated Tribes have indicated that unmarked Native American cemeteries are located in the Methow valley, and one known cemetery has been marked with a rock. Traditional use areas for fishing and gathering basket-making materials are also located along the river (Colville Confederated Tribe members, public meeting, 1996). When definite locations of proposed wells, pipelines, and other proposed facilities are determined, BPA

will comply with the regulations implementing the National Historic Preservation Act, and consult with the Colville Confederated Tribe and Yakama Indian Nation members to determine whether the historic or cultural resources would be affected, and, if so, possible courses of action. However, no additional compliance would be necessary if these facilities were placed in areas such that there is no likelihood of the activity changing the character or use of an historic property.

4.5 Coastal Management, Shorelines and Wetlands

The Coastal Zone Management Act of 1972 requires that Federal actions directly affecting the coastal zone be undertaken in a manner consistent, to the maximum extent possible, with the State's coastal zone management program. Washington's coastal zone management program is implemented through the provisions of the State Shorelines Management Act, including shoreline management programs developed/administered by the counties. The Coastal Zone Act Reauthorization Amendments of 1990 also require that proposed Federal facilities fully comply with Federal consistency requirements, as determined by and through consultation with a designated coastal zone management agency.

County jurisdiction is invoked under the Shoreline Master Program for projects within 61 m (200 ft.) of the ordinary high-water mark of Shorelines of Statewide Significance (or within the 100-year floodplain), or for projects requiring a floodplain development permit (Okanogan County, 1997). The Twisp and Methow rivers and their associated wetlands are considered shorelines of Statewide Significance. However, most riparian areas along the canals are not jurisdictional wetlands because they are artificially established, or they are upland riparian areas (Parametrix, 1995; Okanogan County, 1997). Potentially jurisdictional areas affected by the MVID irrigation system generally are limited to areas around water intakes, diversions, and groundwater wells which are or would be located next to the rivers.

Wherever possible, construction in jurisdictional wetlands or shoreline areas would be avoided, and MVID groundwater pumping would be designed to avoid affecting surface jurisdictional wetlands through groundwater withdrawal. Facilities built by local landowners would be regulated by Federal and county agencies with jurisdiction over wetlands and waters protection.

In addition, BPA would take the following measures, when practicable, to assure consistency with the county's Shoreline Master Plan.

1) Location of structures within the identified shoreline would be avoided if possible. If locations within the shoreline area could not be avoided, BPA would consult with the appropriate state and local agencies to determine the best placement of the structure.
2) In shoreline areas, disturbed land would be restored as closely as possible to pre-project contours and replanted with native and local species. However, there might be locations where site topography would require bank disruption. A restoration and monitoring plan would be prepared before shoreline areas were disturbed.
3) Erosion control measures would be implemented within the 60-m (200 ft.) shoreline area.

4.6 Floodplains/Wetland Assessment

In accordance with the Department of Energy regulations on Compliance with Floodplain/ Wetlands Environmental Review Requirements (10 Code of Federal Regulations (CFR) 1022.12), BPA has prepared the following assessment of the impacts of the Methow Valley Irrigation District Conversion Project on floodplains and wetlands. A notice of floodplain/ wetlands involvement for this project was published in the Federal Register on October 30, 1996. No comments were received.

Four alternatives for the project, including the No Action alternative, are described in Chapter 2 of this EA. The floodplain and wetlands locations are described below. Alternatives A, B, and C would all involve actions in the floodplains of the Twisp and Methow rivers, at the diversion points. All of the action alternatives could involve the drilling of wells for individual landowners in the floodplain and/or associated wetlands along the Methow and Twisp rivers. Of the action alternatives, Alternative C would have the least impact on floodplains and wetlands. The existing diversions and water intake facilities would be removed, but no new construction would take place in floodplains and wetlands. Alternative B would involve improvements to the existing diversions, associated intake structures, and possibly canal structure in the floodplain and/or wetlands. Alternative A would involve the removal of the diversions and associated intake structures, but would also result in the construction of well fields, reservoirs, and laying of pipeline in the floodplain. Wetlands would be avoided if at all possible. The No Action alternative would not affect floodplains or wetlands, unless repairs were needed to existing facilities located in these areas.

4.6.1 Floodplain Effects

Under Executive Order 11988, Federal agencies must avoid or minimize adverse impacts associated with short-term or long-term modification and occupancy of floodplains. Modification and destabilization of the floodplain could have potentially adverse effects, not only near the disturbance, but also in the stream channel and floodplain great distances downstream. Adverse impacts include the potential for flood damage to the facilities, increased flooding due to displacement of water from the normal floodplain by the construction of the facilities, and increased potential for erosion of floodplain soil and sediment near the construction sites.

The existing sites located in the 100-year floodplains of the Twisp and Methow rivers include the diversions, headgates, fish screens, and portions of the canals. Detailed studies have not yet been conducted at the new facility sites; development and operation of these facilities could occur within the defined 100-year floodplain. County authorities and FEMA would be contacted to ensure that any new construction would meet County and FEMA regulations. Certain design restrictions or limitations may apply. If facilities were located within the floodplain, they would be designed to withstand flooding. Overall, the proposed project activities would not adversely affect human life, property, or natural floodplain values.

4.6.2 Wetland Effects

Seepage from the canals has supported riparian vegetation along much of the length of the existing canals. However, since these riparian areas have been artificially created by the irrigation facilities, they are not protected under Federal, state, or local laws or regulations. There are, however, jurisdictional wetlands associated with the floodplains of the Methow and Twisp rivers and various natural streams and seeps that are crossed by the existing canal and facilities.

Detailed delineations of the facility sites have not yet been completed, but preliminary characterizations would be considered during selection of the sites for new construction. Delineations would be completed before facility final design, siting, construction and operation. Wherever possible, construction in jurisdictional wetlands or riparian areas would be avoided, and MVID groundwater pumping would be designed to avoid affecting surface jurisdictional wetlands through groundwater withdrawal. New MVID facilities would be designed to avoid or minimize impacts on jurisdictional wetlands, which are protected by Federal, state, and county law. Facilities constructed by local landowners would be regulated by Federal and county agencies with jurisdiction over wetlands and waters protection.

Disturbance of wetlands during construction and well-drilling activities would be avoided whenever possible. If disturbance could not be avoided, the area of disturbance would be minimized to the extent practicable. Most disturbance would be temporary and would not constitute any net loss to wetlands. Upon completion of construction, excavated areas would be backfilled, and disturbed land restored to its previous condition wherever possible.

Natural and beneficial values of the wetlands associated with the Methow and Twisp rivers would be enhanced under Alternatives A and C, and B (although to a lesser extent), through the return of water to these rivers in the sections upstream of their confluence. At present, the irrigation diversions remove large amounts of water from these rivers and have, over the years, affected riparian wetlands associated with them.

4.7 Farmlands

The Farmland Protection Policy Act (7 U.S.C. 4201 et. seq.) requires BPA to identify and quantify adverse impacts of the proposed action on farmlands. The location and extent of prime and other important farmlands designated by the Natural Resource Conservation Service (NRCS; formerly Soil Conservation Service) were obtained from NRCS soil survey information. The NRCS has designated most of the soils on the valley bottoms next to the Methow River as farmland of statewide importance. Small acreages of irrigated land and orchards have also been classified as prime and unique farmlands. Evaluation of the proposal according to criteria set forth in the Act indicates the project would have minimum impact on area farmlands, for the following reasons:

- The intended project is fully compatible with existing agricultural use of surrounding farmland.

- No additional non-farmable farmland would be created by physically interfering with existing land use patterns.
- The project would follow an existing canal right-of-way and would not affect previously unaffected existing agricultural operations.
- No existing substantial and well-maintained on-farm investments would be adversely affected.
- The project would not cause the agricultural use of adjacent farmlands to change, nor would it jeopardize the continued existence of area farm support services.

4.8 Water Resources Protection

4.8.1 Permits for Structures in Navigable Waters

No Section 10 permits would be required from the U.S. Army Corps of Engineers (Corps) for work in the Methow or Twisp rivers. Neither of these rivers is considered by the Corps to be navigable at the existing diversion areas (Jim Green, Regulatory Branch, Corps, pers. comm., 1997).

4.8.2 Permits for Discharges into Waters of the United States

No point discharges requiring National Pollutant Discharge Elimination System (NPDES) permits are proposed. However, facility design plans will be reviewed to determine the applicability of storm water discharge permits for construction activities disturbing land of 2 or more ha (5 or more ac.).

It is anticipated that most new proposed MVID facilities could be sited to avoid wetlands or discharges. However, diversion and intake structure work might require that fill be placed in wetlands or the rivers themselves. Information from wetland delineation surveys at the facility sites would be used during final design to develop mitigation measures, if necessary, to ensure that the project would result in no net loss to wetlands. Well-field locations for the MVID facilities would be reviewed to determine whether their operation would affect jurisdictional wetlands through groundwater withdrawal. Review and concurrence through the Corps Section 404 permit process and County shorelines review process would be completed as necessary before site development.

4.8.3 State Laws

Before initiating work on any of the action alternatives for the proposed project, the MVID would apply for all permits required under State law. These would include water rights permits from the WDOE and Hydraulic Project Approval from the WDFW.

4.9 Public Lands

The existing MVID canal crosses about 3.2 km (2 mi.) of land owned by WDFW and 0.8 km (0.5 mi.) of Federal land managed by the Bureau of Land Management. Under Alternative A, these agencies would be contacted to determine whether any changes to existing easement agreements would be needed to convert the open canal to a pipeline. Under Alternative C, the easements would be abandoned and revert to these agencies. Under Alternatives B and D, there would be no changes to the existing easements.

4.9.1 Wild and Scenic Rivers

The Methow River system, including the Twisp River, has been recommended for inclusion in the Washington State Scenic Rivers Program. The Twisp River is considered a River of Statewide Significance (USFS, 1995). The entire Twisp River and over half of its tributaries are recommended for inclusion in the National Wild and Scenic Rivers System (USFS, 1995). Alternatives A, B, and C would require short-term construction work in the Twisp and Methow rivers at the diversions. Any in-stream work would be coordinated with the appropriate public entities to preserve the values under which these rivers were determined to be eligible for inclusion. In the long term, removal of the diversion dams and in-stream structures under Alternatives A and C would enhance and contribute to the wild and scenic values of these rivers.

4.10. Pollution Control

4.10.1 Air Quality

The proposed actions would be located in a Class II air quality attainment area (meets or exceeds primary and secondary air quality standards set by the Environmental Protection Agency.) Neither construction-related increases in dust, smoke, or construction vehicle emissions nor operations of the MVID facilities would result in significant air emissions that would require air quality permits under the Clean Air Act (42 USC 7401 et seq.). Construction equipment exhausts would meet applicable regulatory requirements. Any fugitive dust caused by construction would be mitigated by water sprinkling.

4.10.2 Water Quality

See section 4.8.

4.10.3 Noise

Noise generated during construction is regulated by the Washington Noise Control Act of 1974. It states that noise from temporary construction sites is exempt from regulation, except between the hours of 10 p.m.. and 7 a.m., when noise should not exceed 45 dBA in residential areas (WAC

173-60-040). Since all construction work would occur outside of these hours, no exceedences of the standard are anticipated.

Noises generated by the operations of the facilities would mainly result from the operations of the groundwater pumps and reservoirs under Alternative A. These noise levels are not anticipated to exceed Washington state standards.

4.11 Other

The following resources protected by Federal laws and statutes would not be affected by the proposed project:

- Global warming
- National Trails
- Wilderness Areas
- Parks, Campgrounds, Trails, National Scenic Areas
- Energy Conservation at Federal Facilities
- Hazardous Waste, Toxic Substances, and Pesticides
- Drinking Water
- Environmental Justice.

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APPENDIX A

WATER RIGHTS INFORMATION

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
P.O. Box 47600 • Olympia, Washington 98504-7600
(360) 407-6000 • TDD Only (Hearing Impaired) (360) 407-6006

March 21, 1997

Dear MVID Member and/or Interested Party:

This letter is to provide you with information regarding water rights and water right claims in the state of Washington. The information results from inquiries during hearings and workshops held by the Bonneville Power Administration (BPA) and the Department of Ecology (Ecology) regarding the proposed rehabilitation of the Methow Valley Irrigation District (MVID).

Common questions asked during workshops and public hearings have included the following:

1. What are the water rights of the MVID?

MVID members share use of the surface waters of the Twisp and Methow rivers. These uses are documented in Surface Water Certificate 945, and Water Right Claims 3935, 118275, 118276 and 118277.

- Surface Water Certificate 945 authorizes the diversion of up to 150 cubic feet per second (cfs) from the Methow River. (Conversion factor is 1.0 cfs = 448.8 gallons per minute (gpm). Therefore this right, if expressed in gpm, would be for 67,320 gpm.)
- Claim number 3935 asserts the right to the use of up to 500 cfs from the Twisp River.
- Claim number 118275 asserts the right to the use of up to 30 cfs from the Twisp River.
- Claim number 118276 asserts the right to the use of up to 10 cfs from the Methow River.
- Claim number 188277 asserts the right to the use of up to 2 cfs from Alder Creek.

2. Is there a difference between rights and claims?

Yes. The enclosed Question and Answer sheets will provide you with descriptions of each and an explanation of the similarities and differences. Basically, Surface Water Certificate 945 is a water right issued to the MVID through the appropriation procedure defined in Chapter 90.03 RCW. Water Right Claims 3935, 118275, 118276, and 118277 are assertions or claims to water rights filed consistent with Chapter 90.14 RCW.

3. How will my rights be affected by the rehabilitation?

Changes to the existing MVID water rights and water right claims will be processed by the Department of Ecology. Ecology has the authority to authorize:

- Changes to the locations of diversions or withdrawals;
- Development of additional points of diversion or withdrawal;
- Changes in locations where water is to be applied; and/or
- Changes in purpose or type of use of water.

These changes are authorized when there is a valid right or claim to change, when the proposed change will not impair existing rights, and when there is no expansion of the right. The change(s) would result in Ecology issuing a Superseding Certificate (for a water right) or Certificate of Change (for a claim) that reflects the change approved. The Superseding Certificate or Certificate of Change would hold the same priority date as the water right or claim that was changed.

We appreciate the interest that you and your neighbors have expressed regarding the proposed rehabilitation of the MVID. We understand that you may have additional questions, and encourage you to ask them. Please call the Department of Ecology, Central Regional Office, John Monahan at (509) 457-7112 or write to:

DEPARTMENT OF ECOLOGY
Shorelands and Water Resources Program
ATTN: John T. Monahan
15 West Yakima Avenue, Suite 200
Yakima, WA 98902-3401

Sincerely,

J. Michael Harris
Shorelands and Water Resources Program

JMH:JTM:mh
Enclosures

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Questions & Answers

Water Rights in Washington

Ecology is charged, by law, with managing the state's water resources to meet the varied needs of Washington's public waters. By protecting our natural resources, we preserve our quality of life and ensure a healthy environment, while maintaining a strong economy.

In 1985 Washington State's rivers served as a source of community water supply and supported production of an estimated 76,900 million kilowatt hours of electricity with wholesale value exceeding one billion dollars. Sport anglers spend more than half a billion dollars each year enjoying the fish that thrive in our waters. The state's commercial fisheries are valued at more than $139 million. More than 1.6 million acres of croplands in Washington are irrigated and provide in excess of one and one-half billion dollars of crop value. Of equal importance is the need to provide water for drinking and household use, while meeting the needs of navigation, industrial development, recreation, and aesthetic enjoyment. With such great demands being placed on Washington's water supply, water rights play a crucial role in managing and allocating this finite resource.

Q. ***What is a water right?***

A. A water right is a legal authorization to use a certain amount of public water for specific beneficial purposes. Washington State law requires certain users of public water to receive approval from the state prior to actual use of the water. Approval is granted in the form of a water right permit or certificate. In addition to state-authorized water rights, Washington recognizes valid water right claims and federal reserved water rights.

There is one exemption from the requirement of obtaining a water right. You do not need to apply for a water right if you use a total of 5,000 gallons or less of ground water from a well each day for any of the following combinations:

- Stockwatering purposes,
- Single or group domestic purposes,
- Industrial purposes, or
- Watering a lawn or noncommercial garden that is a half acre or less in size.

Although you are exempt from the water right permit process in these cases, all other water laws and regulations apply.

Q. ***Who needs a water right?***

A. A water right is necessary if you plan to divert any amount of water for any use from:

- Surface waters (water located above ground)

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- Lakes
- Rivers
- Streams
- Springs

❖ Ground Waters
- If you plan to withdraw more than 5,000 gallons per day; or
- If you plan to irrigate more than a half acre of lawn or noncommercial garden.

Q. ***Why are water rights required?***

A. Water rights ensure proper allocation and management of Washington's water resources. Our state's waters are a public resource and their use should return the maximum benefit to the public.

Q. ***What criteria does Ecology use when making water right decisions?***

A. Water right permits are issued by Ecology only if the proposed use meets the following requirements:

❖ Water will be put to beneficial use;
❖ No impairment to existing, or senior rights;
❖ Water is available for appropriation; and
❖ Issuance of the requested water right will not be detrimental to the public's interest.

In making water right decisions, consideration is given to existing basin management plans, stream closures, instream flows, hydraulic continuity (surface water interconnected to ground water), seawater intrusion, and availability of alternative water supplies.

Q. ***How do I apply for a water right?***

A. Water rights are issued by Ecology's regional offices in Lacey, Bellevue, Yakima, and Spokane. Contact the regional office nearest you for a Water Right Application and the accompanying instructions (see addresses on back). The following will help you understand the steps in the process:

1. Fill out your application, using the accompanying instructions. The minimum fee required to file an application is $10. Additional fee may be required depending on the amount of water requested.
2. Return the completed application to Ecology's regional office, Shorelands and Water Resources Program. Don't forget to include your application fee
3. Once an application is received by Ecology it will be assessed for completeness. Ecology will send you a *legal notice* for you to publish in a newspaper with general circulation in the county (or counties) where the water is to be withdrawn,

stored and used. The notice is published once a week for two consecutive weeks. It includes:

- The basic facts of your request; and
- Offers the public 30 days to protest if they feel your proposed water use would impair other uses of the resource. This 30-day protest period begins on the last day that your legal notice is published.

4. After final publication of the notice, send Ecology the original, notarized *Affidavit of Publication* which is obtained from the publishing newspaper. Ecology cannot take action on your water right request until the Affidavit has been submitted.

5. Ecology will conduct an investigation of the application which may include a field examination of your proposal to validate the information on the application and will apply the four criteria mentioned above. The results of the investigation are summarized in a *Report of Examination*. The report contains Ecology's decision on your water right request, which will recommend either a denial or an approval. If approved, your permit may contain specific conditions .

6. Ecology sends you, and all those who have filed a protest, a copy of the report. You (and others) have 30 days to accept or appeal the Examiner's recommendation to Washington's Environmental Hearings Office, Pollution Control Hearings Board.

7. Provided there are no appeals to your proposed water use and your permit fee (based on types of use) has been paid, you are issued your *Permit to Appropriate Public Waters*. The permit allows you to begin construction of your water system and to put the water to use. It will contain a reasonable construction schedule, and a date by which you should put the water to use.

8. When your construction has been completed and the water has been put to use, you must submit a *Proof of Appropriation* affidavit form. The Proof of Appropriation form includes:
   - Exactly what facilities or equipment you are operating;
   - How much water you are using;
   - For what purpose;
   - Where the water is being used; and
   - A statement that all conditions of the permit have been met.

9. Ecology may choose to inspect your completed project based on the information you have provided in Step 8. After the inspection has been completed, or if Ecology determines an inspection is not necessary, certificate recording fees for the state and county will be requested by Ecology.

10. Ecology will issue a *Certificate of Water Right*, based on the information you have submitted and the field inspection. The certificate can not exceed what has actually been put to use up to the conditions of the permit. Any development authorized requires that a new application be submitted. This certificate is recorded at the County Auditor's Office in the county where the project is located and at Ecology. The County Auditor will forward your certificate to you. It becomes the legal record of your water right.

Q. ***How long will it take for me to receive my water right?***

A. Depending upon the complexities of water availability and use within your watershed, obtaining a water right permit may take anywhere from months to years.

Q. ***Once I get my water right certificate, what are my rights to use the water?***

A. Your rights are outlined in your water right certificate. A water right is subject to relinquishment if it is unused, without sufficient cause, for five consecutive years. One exception is water claimed for municipal water supply purposes. It is important to note and follow any conditions of your permit or certificate.

Q. ***Does my water right protect me during drought?***

A. Not directly. A water right does not guarantee the availability of water during drought. The degree of reliability depends on your seniority as a water right holder. Instream flows, set by regulation, are also water rights.

Q. ***How do I get more information?***

A. For more information about water rights and the application process, please contact the Department of Ecology regional office nearest you.

Department of Ecology
Northwest Regional Office
390 160th Avenue SE
Bellevue, WA 98008-5452
Telephone: (206) 649-7000
TDD: (206) 649-4259

Department of Ecology
Southwest Regional Office
PO Box 47775
Olympia, WA 98504-7775
Telephone: (360) 407-6300
TDD: (360) 407-6306

Department of Ecology
Central Regional Office
15 West Yakima Avenue, Suite 200
Yakima, WA 98902-3401
Telephone: (509) 575-2597
TDD: (509) 454-7673

Department of Ecology
Eastern Regional Office
North 4601 Monroe, Suite 100
Spokane, WA 99205-1295
Telephone: (509) 456-2926
TDD: (509) 458-2055

This document can be accessed through Ecology's home page on the World Wide Web. The address is: http://www.wa.gov/ecology/

If you have special accommodation needs or require this document in alternative format, please contact Paula Smith at (360) 407-6607 (Voice) or (360) 407-6006 (TDD).

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Questions & Answers

Water Right Claims

History of Washington Water Law

In our early history, Washington settlers obtained water rights under two doctrines: the Riparian Doctrine and the Prior Appropriation Doctrine. The Riparian Doctrine allowed a person with property next to a surface water body to draw water from that source. The Prior Appropriation Doctrine allowed water to be used on land which was not directly adjacent to the water source.

In 1917, the Washington State Legislature enacted the Water Code. The Legislature said "all waters within the state belong to the public, subject to existing rights." Subsequently, water law was based on the Prior Appropriation Doctrine: "first in time, first in right." This Water Code established a permitting process to obtain surface water rights. However, this code did not address water rights established before 1917.

By 1945, many people were using wells. The Legislature then enacted the Ground Water Code which did not address ground water rights established before 1945. The same permitting process used for surface water was now extended to ground water. However, the Ground Water Code did allow an exemption to the permit requirement if you use a total of 5,000 gallons or less of ground water from a well each day for any of the following combinations:

- Stockwatering purposes,
- Singles or group domestic purposes,
- Industrial purposes, **or**
- Watering a lawn or noncommercial garden that is a half acre or less in size.

Today, the Department of Ecology manages the permitting process for surface and ground waters.

By the 1960's, the Legislature realized that water rights established prior to 1917 for surface water and 1945 for ground water should be recorded. These water rights are vested rights. A vested right is a water right established by the beneficial use of water. Beneficial use is the reasonable quantity of water that has been applied to a specific type of use; i.e. domestic, irrigation, etc. A water right claim is a statement of the beneficial use of water that occurred either prior to the adoption of the water codes or from exempt ground water uses and are not authorized by a state-issued permit or certificate.

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Q. *"Will my claim to a vested right ever be confirmed by the state?"*

A. A small portion of Washington's vested rights have already been confirmed through a process known as a general water right adjudication. An adjudication is a legal process, conducted through the Superior Court, to determine the validity and extent of existing water rights in a given area. An adjudication does not create new rights, it only confirms existing rights. If your right is confirmed, you will receive a certificate issued by the state. Each confirmed right includes a priority date, quantity, point of diversion, and place of use. Ecology will protect and enforce the elements of your right as stated on the certificate once a vested right is confirmed and a certificate is issued.

Q. *"How can I protect my claimed right?"*

A. First determine that the vested water right was perfected, and was not relinquished for failure to file a claim. If a claim was filed, verify the elements of your registered claim. A claim protects a vested water right if you:

- Used surface water before 1917, or ground water before 1945;
- Filed a water right claim with the state; and
- Have continuously used the same amount of water.

This can be shown through items like photographs or maps depicting the water system, historical documents or old letters that describe the system, tax documents, or "old timer" testimony that the system existed, and has continuously existed up to the present date. If you have a registered claim, it is extremely important that you maintain documents that support your claim. If you have not already done so, please collect and maintain historical records of your water use.

Q. *"What if Ecology advises me that my water use is not protected by a claim?"*

A. You should not continue to use water if it appears that you do not have a vested water right. Ecology will work with you to try and find alternate ways for you to use water legally. Unauthorized use of water is illegal and detrimental to your neighbors, as well as our state's waters.

Q. *"How will I know if an adjudication will occur in my area?"*

A. When an area is scheduled for an adjudication, all affected water users within the area are notified by summons issued from the Superior Court. It is important, however, that you not wait until that time to collect information you need to support your claim.

Q. *"Does my claim limit my water usage in any way?"*

A. Yes. Your claim protects your water right only for the quantity, purpose, and place of use established prior to the surface and ground water codes. Your current water use should be consistent with this information. You may request to change the purpose and place of use of your water right, but increasing the quantity of water

historically used is not allowed. If you contemplate expansion of your water use, you must obtain prior authorization in the form of a new state-issued water right. If you expand your water use without first obtaining a state-issued permit, you are subject to enforcement.

For More Information

Q. *"How can I find out more about my claim?"*

A. First you should research and document your historical water use. This will prepare you to answer our questions and speed up the Ecology review. Then if you need more information about your claim and available alternatives, you can write or call the Shorelands and Water Resources Program at the Department of Ecology regional office nearest you.

Northwest Regional Office	3190 - 160th Avenue SE Bellevue, WA 98008-5452	(206) 649-7000 TDD (206) 649-4259
Southwest Regional Office	P.O. Box 47775 Olympia, WA 98504-7775	(360) 407-6300 TDD (360) 407-6306
Eastern Regional Office	N. 4601 Monroe, Suite 100 Spokane, WA 99205-1295	(509) 456-2926 TDD (509) 458-2055
Central Regional Office	15 W. Yakima Ave., Suite 200 Yakima, WA 98902-3401	(509) 575-2597 TDD (509) 454-7673

Other Facts You Should Know

- The state water codes are based on a "first in time, first in right" premise. This means that any new water right is subject to existing rights. Therefore, your application may be denied, or your water use may be regulated or modified if it adversely affects existing rights. This will also protect your water right against impairment by future applicants.
- If you propose to use ground water and it is interconnected to surface water, your ground water use may be subject to the same conditions as a proposed or existing surface water use.
- Water rights carry no right-of-way privileges. If the water source you wish to use is not on your property, you must make right-of-way arrangements with the appropriate property owner(s).
- Water right certificates remain attached to the land described on the water right, unless specifically withheld from the deed at the time of sale. When you are buying property, make sure the water right is included with the property. You might want to make sure that the water rights mentioned are valid and recognized by Ecology. In contrast to water right certificates, water right applications and permits are **not** attached to the land and must be assigned to the new water user. Check with Ecology if you have questions about water rights for property you have acquired or are thinking about purchasing.
- Changes to an existing water right can be requested under a separate water right change application.
- If you are required to have a water right, no construction or water use should begin before a water right permit is obtained.

Definition of Key Terms

Water Right Claim

A *water right claim* is a statement of claim to a water use that began before the State Water Codes were adopted and is not covered by a permit or certificate. A claim may represent a valid water right if it describes a surface water use that began before 1917 or a ground water use that began before 1945, a water right claim that was filed with the state during an open filing period designated under RCW 90.14 (the Water Rights Claim Registration Act), or is covered by the ground water exemption.

Water Right Permit

A *water right permit* is permission given to water right applicants by the state to develop a water right. Water rights are developed when water right applicants follow the provisions outlined in their permit, using water for the purposes and up to the limits stated in the permit. Water right permits remain in effect until the water right certificate is issued, if all terms of the permit are met, or the permit has been canceled.

Water Right Certificate

A *water right certificate* is issued by the Department of Ecology to certify that water users have the authority to use a specific amount of water under certain conditions. These conditions are based on beneficial use of water under your water right permit. The water right certificate is a legal document recorded at your county auditor's office. The certificate completes the process of obtaining your water right. Once a certificate is issued, no expansion is allowed under the water right.

APPENDIX B

ENGINEERING COST DETAIL

APPENDIX B
ENGINEERING COST DETAIL

The following tables present cost estimates prepared by the environmental engineering firm CH2M HILL, consultant to BPA. The conceptual cost estimates shown were prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor and material costs, competitive market conditions, final project scope, implementation schedule, and other variable factors. As a result, final project costs may vary from the estimates presented on each of the tables. Because of this, project feasibility and funding needs must be carefully reviewed before making specific financial decisions, to help ensure proper project evaluation and adequate funding.

CH2M HILL

BPA / METHOW VALLEY IRRIGATION DISTRICT

ENGINEER'S OPINION OF PROBABLE COST

PROJECT: BPA / METHOW VALLEY IRRIGATION DISTRICT ENVIRONMENTAL ASSESSMENT
CLIENT: BPA / MVID
TASK: ALTERNATIVE A - PIPED SYSTEM WITH PRIVATE GROUNDWATER WELLS
NOTE: PRICES ARE ESTIMATES, IN 1997 DOLLARS, BASED ON INFORMATION AVAILABLE AT THE TIME THIS ESTIMATE WAS PREPARED AND ARE SUBJECT TO CHANGE.

ITEM	DESCRIPTION	QUAN.	UNIT	UNIT COST	COST
1	MOBILIZATION	1	LS	$200,000.00	$200,000
2	DIVERSION DAM DEMOLITION	1	LS	$3,000.00	$3,000
3	INTAKE STRUCTURE DEMOLITION	1	LS	$10,000.00	$10,000
4	FISH SCREEN DEMOLITION	1	LS	$7,000.00	$7,000
5	TRENCH SAFETY SYSTEM	61,000	LS	$1.00	$61,000
6	EXCAVATION	29,609	CY	$2.10	$62,179
7	IMPORTED PIPE BEDDING	1,807	CY	$21.15	$38,218
8	SELECT BACKFILL	6,830	CY	$8.50	$58,055
9	NATIVE BACKFILL	19,082	CY	$3.20	$61,062
10	GRADE SPOIL MATERIAL	10,527	CY	$1.05	$11,053
11	15" PIP PVC PIPE	21,450	LF	$13.00	$278,850
12	12" IPS PVC PIPE	26,250	LF	$11.00	$288,750
13	8" IPS PVC PIPE	9,700	LF	$7.00	$67,900
14	6" IPS PVC PIPE	3,600	LF	$6.25	$22,500
15	FITTINGS, VALVES, TBs, ETC.	1	LS	$65,800.00	$65,800
16	TURNOUT & SLIDE GATE	68	EA	$550.00	$37,400
17	FLOWMETER @ WELL HEAD	10	EA	$3,000.00	$30,000
18	ROAD X-INGS, ACP PAVED	1	LS	$30,000.00	$30,000
19	ROAD X-INGS, CSTC GRAVELED	1	LS	$20,000.00	$20,000
20	ROAD X-INGS, UNIMPROVED	1	LS	$10,000.00	$10,000
21	18" WELLS, 100 FT DEEP	10	EA	$18,000.00	$180,000
22	WELL PUMP CONTROLS	10	EA	$26,500.00	$265,000
23	WELL HOUSE STRUCT. & ELECTR.	10	EA	$10,300.00	$103,000
24	EQUALIZING RESERVOIR	3	EA	$51,500.00	$154,500
25	REESTABLISH DRAINAGE PATTERN	1	LS	$100,000.00	$100,000
26	BARKLEY DITCH REHABILITATION*	1	LS	$50,000.00	$50,000
27	EXCLUSION COMPENSATION	1	LS	$1,345,000.00	$1,345,000

The cost for Item 27 is excerpted from Table 5-5, page 39, of the MWG Water Supply Facility Plan, June 1996, for the removal of 1,346 acres from the MVID.

* This item provides for lining only the bottom of the ditch with a 6-inch-thick layer of a 5 pounds/cubic foot bentonite clay soil admixture. Ditch is 9,300 feet long and has a bottom width of 3 feet. The unit price assumes that the in-situ material is of a proper gradation that will mix and bind well with the bentonite clay so that clay leaching will not occur prematurely.

** Contingency; state sales tax; and engineering, legal, and administrative fees are not computed on the exclusion compensation.

SUBTOTAL CONSTRUCTION COSTS		$3,560,268
CONSTRUCTION CONTINGENCY**	20%	$443,054
ESTIMATED CONSTRUCTION COSTS		$4,003,321
ESTIMATED WASHINGTON STATE SALES TAX**	8%	$212,666
DESIGN ENGINEERING, LEGAL, & ADMIN. FEES**	15%	$398,748
(No costs for services during construction are included in this estimate.)		
TOTAL ESTIMATED PROJECT COST		$4,614,735

CH2M HILL

BPA / METHOW VALLEY IRRIGATION DISTRICT

ENGINEER'S OPINION OF PROBABLE COST

PROJECT: BPA / METHOW VALLEY IRRIGATION DISTRICT ENVIRONMENTAL ASSESSMENT
CLIENT: BPA / MVID
TASK: ALTERNATIVE B - OPEN CANAL SYSTEM
NOTE: PRICES ARE ESTIMATES, IN 1997 DOLLARS, BASED ON INFORMATION AVAILABLE AT THE TIME THIS ESTIMATE WAS PREPARED AND ARE SUBJECT TO CHANGE.

ITEM	DESCRIPTION	QUAN.	UNIT	UNIT COST	COST
1	MOBILIZATION	1	LS	$665,000.00	$665,000
2	CLEAR & GRUB CANAL BANKS	15	AC	$2,400.00	$36,000
3	PREPARE COMPACTED BASE	129,470	LF	$5.00	$647,350
4	CONCRETE LINING	129,470	LF	$42.00	$5,437,740
5	GRAVEL CANAL ACCESS ROAD	12,787	TON	$12.00	$153,444
6	TURNOUT & SLIDE GATE	122	EA	$550.00	$67,100
7	DIVERSION DAM REHABILITATION*	1	LS	$15,000.00	$15,000
8	INTAKE STRUCTURE REHAB.	1	LS	$25,000.00	$25,000
9	FISH SCREENING FACILITIES	1	LS	$275,000.00	$275,000
10	EXCLUSION COMPENSATION	1	LS	$1,056,868.00	$1,056,868

Item 10 is based on the compensation formula in Table 6-1, page 60, of the MWG Water Supply Facility Plan, June 1996, applied to the total acreage within the MVID, then prorated to the unserved (999) acres left out of the MVID after implementation of this alternative.

* Rehabilitation consists of placement of simple pre-fab diversion structures; actual cost for diversion with acceptable fish passage could cost up to $500,000 for inflatable rubber dam and fish passage on both Methow and Twisp Rivers.

** Contingency; state sales tax; and engineering, legal, and administrative fees are not computed on the exclusion compensation.

	SUBTOTAL CONSTRUCTION COSTS		$8,378,502
	CONSTRUCTION CONTINGENCY**	20%	$1,464,327
	ESTIMATED CONSTRUCTION COSTS		$9,842,829
	ESTIMATED WASHINGTON STATE SALES TAX**	8%	$702,877
	DESIGN ENGINEERING, LEGAL, & ADMINI. FEES**	15%	$1,317,894
	(No costs for services during construction are included in this estimate.)		
	TOTAL ESTIMATED PROJECT COST		$11,863,600

CH2M HILL

BPA / METHOW VALLEY IRRIGATION DISTRICT

ENGINEER'S OPINION OF PROBABLE COST

PROJECT: BPA / METHOW VALLEY IRRIGATION DISTRICT ENVIRONMENTAL ASSESSMENT
CLIENT: BPA / MVID
TASK: ALTERNATIVE C - MVID DISSOLUTION & REHABILITATION OF BARKLEY DITCH
NOTE: PRICES ARE ESTIMATES, IN 1997 DOLLARS, BASED ON INFORMATION AVAILABLE AT THE TIME THIS ESTIMATE WAS PREPARED AND ARE SUBJECT TO CHANGE.

ITEM	DESCRIPTION	QUAN.	UNIT	UNIT COST	COST
1	MOBILIZATION	1	LS	$17,000.00	$17,000
2	DIVERSION DAM DEMOLITION	1	LS	$3,000.00	$3,000
3	INTAKE STRUCTURE DEMOLITION	1	LS	$10,000.00	$10,000
4	FISH SCREEN DEMOLITION	1	LS	$7,000.00	$7,000
5	REESTABLISH DRAINAGE PATTERN	1	LS	$100,000.00	$100,000
6	BARKLEY DITCH REHABILITATION*	1	LS	$50,000.00	$50,000
7	DISSOLUTION COMPENSATION	1	LS	$2,407,796.00	$2,407,796

* This item provides for lining only the bottom of the ditch with a 6-inch-thick layer of a 5 pounds/cubic foot bentonite clay soil admixture. Ditch is 9,300 feet long and has a bottom width of 3 feet. The unit price assumes that the in-situ material is of a proper gradation that will mix and bind well with the bentonite clay so that clay leaching will not occur prematurely.

** Contingency; state sales tax; and engineering, legal, and administrative fees are not computed on the MVID dissolution compensation.

SUBTOTAL CONSTRUCTION COSTS		$2,594,796
CONSTRUCTION CONTINGENCY**	20%	$37,400
ESTIMATED CONSTRUCTION COSTS		$2,632,196
ESTIMATED WASHINGTON STATE SALES TAX**	8%	$17,952
DESIGN ENGINEERING, LEGAL, & ADMIN. FEES**	15%	$33,660
(No costs for services during construction are included in this estimate.)		
TOTAL ESTIMATED PROJECT COST		$2,683,808

APPENDIX C

ALTERNATIVE METHODS TO LINE CANALS

APPENDIX C
ALTERNATIVE LININGS FOR CANAL UNDER ALTERNATIVE B

In developing Alternative B, we researched a number of alternative lining approaches. Concrete was the method selected for this option. Below are discussions of the other options, including their benefits and drawbacks.

- Spray-on synthetic liners (such as CIM 1000® and Boot®) are inappropriate for this application because of their very high maintenance requirements and relatively short useful life. They would suffer degradation by ultraviolet (UV) light; would require a continuous anchorage mechanism to prevent shifting or peeling of the liner; are not fire-proof; would require careful, labor-intensive, manual removal of sediment and debris to avoid puncturing the liner; would require a protective blanket above the liner to protect against vandalism and sharp objects; and are subject to penetration by vegetation. For these reasons, spray-on synthetic linings would not be appropriate for this project.

- Polyvinylchloride (PVC) and high-density polyethylene (HDPE) pipe "half rounds" were also determined inappropriate for this application. The pipes would have to be oversized to fit the existing canal's cross-section to avoid large amounts of fill and earthwork. In addition, they would suffer degradation by UV radiation; are not fire-proof; would be difficult to connect to turnouts; would be subject to floating and frost-heaving without a drainage blanket; and would require a labor-intensive installation procedure because of the special connections required at each joint to seal the pipe along its length. Such connections are not required for installation of a full pipe. Besides UV degradation, the thermal expansion coefficient of HDPE pipe would preclude the use of this material in this application. The changes in temperature from day to night and from summer to winter would pull the system apart by expansion and contraction. For these reasons, PVC and HDPE "half rounds" would not be appropriate for this project.

- Similarly, corrugated metal pipe (CMP) "half rounds" are inappropriate for this application. Although CMP is fire-proof, is not affected by UV radiation, is slightly more resistant to vandalism than synthetic liners, and resists vegetation penetration, it has inherent problems similar to those associated with the PVC and HDPE materials (labor-intensive jointing, oversized sections, floating and frost-heaving, and complexity in making turnout connections). In addition, CMPs leak badly by the very nature of their jointing mechanism, and would ultimately break down through galvanic corrosion. Galvanization of steel CMP only delays its ultimate failure, and aluminum CMPs are expensive. Lastly, cutting a spiral-wound CMP lengthwise to produce two "half rounds" would cause the ribs to unwind. (It is the cap on each end of a spiral-wound CMP that maintains its integrity.) For these reasons, CMP "half rounds" would not be appropriate for this project.

Information sources: (1) Bureau of Reclamation, May 1994. Deschutes Canal Lining Demonstration Project.; (2) Professional experience of Paul Soboleski, consultant to CH_2M HILL.

APPENDIX D

WDOE LETTER TO CANAL ASSOCIATES

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
P.O. Box 47600 • Olympia, Washington 98504-7600
(360) 407-6000 • TDD Only (Hearing Impaired) (360) 407-6006

March 14, 1997

Mr. Jim Gerlach
Box 601
Twisp, WA 98856

Dear Jim:

I am enclosing with this letter Ecology's response to the "Ideas for M.V.I.D. Alternative Delivery System" presented by several members of the MVID during the workshop held in Twisp from December 16 through 19, 1996. I apologize for the delay in completing this effort but it was important that key Ecology staff have an opportunity to review and edit my work as appropriate.

I am also going to mail copies of this letter with the response to individuals noted below. As I do not have an address for some of the individuals who expressed interest in the proposed alternative delivery system, I hope that you will be able to provide them the information.

Sincerely,

J. Mike Harris
Shorelands and Water Resources Program

JMH:mh
Enclosure

cc: Senator Bob Morton
James Archambeault
Mike Gage
Vaughn Jolley
MVID Board of Directors
Bob Montgomery, Montgomery Water Group, Inc.
Richard Price, Attorney
David Byrnes, BPA
R.A. (Bud) Richards
Ken Bruce
Dale Bambrick, Yakama Indian Nation
Joe Peone, Confederated Tribes of the Colville Reservation
Andre L'Heureux, NW Power Planning Council

March 13, 1997

Staff from the Department of Ecology (John Monahan, Central Regional Office and myself, Mike Harris), Bonneville Power Administration (Nancy Weintraub, David Byrnes, and Laurie Croff), and Bob Montgomery, Montgomery Water Group, Inc. held a workshop in the Town of Twisp from December 16 through 19, 1996 to discuss how the proposed reorganization of the Methow Valley Irrigation District might affect area residents. During the workshop several members of the Methow Valley Irrigation District (MVID) presented their ideas for an MVID alternative delivery system. This is written in response to the document they provided us at the workshop summarizing their ideas Ecology's responses are in italics.

Because the alternative delivery system proposal is very broad in scope, this response will deal with items issue by issue, as presented in the undated document.

IDEAS FOR M.V.I.D. ALTERNATIVE DELIVERY SYSTEM
(More refinement and specifics to come)

Suggestions for Proposal to be submitted to the Joint Select Committee on Water Resources, Department of Ecology, BPA, Washington State Fish and Wildlife, and the present Board of Directors.

<u>This proposal is predicated on the acceptance of a water delivery system that meets the objectives of the new reorganized District and any funding agencies.</u>

It is possible for the reorganized District to accept and implement a renovation of the present canal system with minimal or no outside funding from governmental entities. The District is capable of managing its water resources if it is allowed a reasonable amount of time to accomplish this. It would allow the District to remain independent and responsible for its own resources without needless expense to the taxpayer.

This is a laudable goal though we are concerned, based on past experience, that the MVID will continue to look to outside funding and other public assistance to address emergency system failure, let alone development of an irrigation system that has reasonable efficiency and is able to serve its entire membership with a reliable water supply.

No. 1 A new MVID Board of Directors should be appointed by the Okanogan County Commissioners comprised of a voting majority (2) who will remain members after reorganization. In the interim, a panel or advisory committee could be elected or appointed by those members who will remain in the new reorganized District to represent, inform, and receive feedback from the new reorganized District.

Ecology does not have a position on this issue. Our understanding is that this is not provided for in state statutes. Perhaps the members interested in pursuing this idea should seek advice from Mr. Richard Price, attorney for the MVID.

No. 2 The Department of Ecology will issue points of diversion and exclusions for all lands petitioning for exclusion (perhaps Benson Creek spill south and others) to be completed as soon as possible.

Ecology is prepared to work through the exclusion process with the MVID Board of Directors when appropriate. The MVID, not Ecology, must initiate this process. The exclusion process must occur in order to proceed with the rehabilitation of the District. Once all issues are resolved concerning the proposed rehabilitation of the MVID, then Ecology is prepared to issue the appropriate water rights with points of withdrawal for existing or proposed wells.

No. 3 External funding (BPA, DOE, etc.) could provide for an alternative source of water (wells) for those to be excluded that do not currently have an alternative source of water. The external funding agency will contract directly with a well driller and all payments of funds will be exchanged between agency and contractor, with no moneys going directly to the land owner.

This seems to conflict with the introductory paragraph statement that a renovation can occur with "minimal or no outside funding".

Ecology has and will continue to support the proposed project with Referendum 38 Agricultural Water Supply Facilities funds. These funds can be distributed only to public entities. If the MVID Board of Directors and members vote for dissolution of the District, before dissolution would occur, local improvement districts would need to be created in order for Ref 38 funds to be distributed to assist with agreed upon improvements.

If the alternative delivery system proposal were approved, BPA may be able to provide funding support directly to well drillers or upgrade wells for those members opting to leave the District who need it, if there are significant instream flow benefits.

No. 4 DOE should reimburse the MVID for the attorney fees incurred on the present rehabilitation project as stipulated on the MVID Water Supply Improvement Plan Ballot.

Ecology has worked closely with the MVID Board of Directors and their attorney concerning the rehabilitation of the District for a number of years. The position of Ecology has been to provide technical assistance and financial support for the planning, acquisition, construction and improvement of the MVID water supply facilities. A final determination as to the resolution of this issue has not been made by Ecology at this time. All costs directly associated with the implementation of the project, including attorney fees associated with the water supply facility plan, may be eligible for reimbursement.

No. 5 The reorganized District retains all District assets (Adams fund, properties, collected assessments).

The MVID's attorney will review Chapter 87.03 RCW to ensure the appropriate actions are taken to protect the District's assets. Upon completion of the reorganization, District assets should remain with the District.

March 13, 1997

Staff from the Department of Ecology (John Monahan, Central Regional Office and myself, Mike Harris), Bonneville Power Administration (Nancy Weintraub, David Byrnes, and Laurie Croff), and Bob Montgomery, Montgomery Water Group, Inc. held a workshop in the Town of Twisp from December 16 through 19, 1996 to discuss how the proposed reorganization of the Methow Valley Irrigation District might affect area residents. During the workshop several members of the Methow Valley Irrigation District (MVID) presented their ideas for an MVID alternative delivery system. This is written in response to the document they provided us at the workshop summarizing their ideas Ecology's responses are in italics.

Because the alternative delivery system proposal is very broad in scope, this response will deal with items issue by issue, as presented in the undated document.

IDEAS FOR M.V.I.D. ALTERNATIVE DELIVERY SYSTEM
(More refinement and specifics to come)

Suggestions for Proposal to be submitted to the Joint Select Committee on Water Resources, Department of Ecology, BPA, Washington State Fish and Wildlife, and the present Board of Directors.

<u>This proposal is predicated on the acceptance of a water delivery system that meets the objectives of the new reorganized District and any funding agencies.</u>

It is possible for the reorganized District to accept and implement a renovation of the present canal system with minimal or no outside funding from governmental entities. The District is capable of managing its water resources if it is allowed a reasonable amount of time to accomplish this. It would allow the District to remain independent and responsible for its own resources without needless expense to the taxpayer.

This is a laudable goal though we are concerned, based on past experience, that the MVID will continue to look to outside funding and other public assistance to address emergency system failure, let alone development of an irrigation system that has reasonable efficiency and is able to serve its entire membership with a reliable water supply.

No. 1 A new MVID Board of Directors should be appointed by the Okanogan County Commissioners comprised of a voting majority (2) who will remain members after reorganization. In the interim, a panel or advisory committee could be elected or appointed by those members who will remain in the new reorganized District to represent, inform, and receive feedback from the new reorganized District.

Ecology does not have a position on this issue. Our understanding is that this is not provided for in state statutes. Perhaps the members interested in pursuing this idea should seek advice from Mr. Richard Price, attorney for the MVID.

No. 2 The Department of Ecology will issue points of diversion and exclusions for all lands petitioning for exclusion (perhaps Benson Creek spill south and others) to be completed as soon as possible.

No. 6 Improve fish screens and intakes as recommended and funded by Fish and Wildlife for renovation.

Should the alternative delivery system be approved, diversions and fish screens would need to be upgraded. Discussions with the Washington State Department of Fish and Wildlife would be needed to determine whether the $275,000 that they have designated for implementation of the MVID Water Supply Facility Plan, Alternative 4, would be available for this alternative.

No. 7 The District be allowed to sell saved water to individuals or interests for additional revenue for renovation, such as the Town of Twisp. This saved water sales will not increase surface diversions without the DOE's approval, it may be ground water. Exact amount to be calculated and approved by DOE and District.

Ecology has been negotiating with the MVID Board of Directors concerning the exchange of the MVIDs water right claims and certificate of water right (totaling 692 cfs) in favor of a certificated right, issued by Ecology. The certificated water right would be sufficient to provide adequate water to the reorganized district. Lands within the new district boundaries would be eligible to receive water at the instantaneous rate of 0.02 cubic feet per second (cfs) and an annual quantity of 4.0 acre feet per acre. The District may use their certificated water right in any manner they chose within the District boundaries. If the District wants to supply water outside District boundaries, by statute the District must apply to Ecology for a change in place of use.

No. 8 Request non-MVID water users upstream on the Twisp River (junior water rights) to reduce their diverted water to increase instream flow. Ask non-MVID water users down stream to limit or reduce their withdrawal from Twisp River. If funding is available in this project, it may be used to help increase efficiency to these water users.

Regardless of whether Ecology were to take enforcement action against non-MVID water right holders or water users in the Methow River Basin, it would still be necessary to address MVID's efficiency problems, the inability to deliver water to all MVID members, and the several miles of the MVID irrigation system that is at "high risk" of failure.

If the MVID or members of the MVID have evidence that "water users upstream on the Twisp River" or "non-MVID water users downstream" are acting outside of their water rights, then we encourage the MVID to provide the Department of Ecology's Central Regional Office in Yakima, Washington with documentation.

IDEAS FOR RENOVATION

No. 1 Upgrade spillways.

Ecology staff are not sure what this means. We assume that it refers to improvements to the existing system, and we request details regarding materials, labor, construction schedule, and funding sources before we can provide further comment.

No. 2 Line ditch where needed with mats or half pipe.

MVID members dissenting with the water supply facility plan's preferred alternative have opposed the plan in part because the riparian habitat would no longer be supported by leakage from the ditches. If ditches were lined with non-permeable mats or half pipe, riparian habitat created and supported by seepage from the existing ditch system would not continue to be watered by the seepage. We therefore assume the objective is to allow some seepage through a semi-permeable lining. We fail to see the value added in using a mat/half pipe design and pipe design in lieu of the pressurized pipe system of the preferred alternative 4.

Second, we are concerned by the vagueness of the statement "...where needed...". *We believe, based on surveys of the conditions of the canal system, that almost all, if not all, of the canal system would need to be lined in order to achieve the needed efficiency improvements. If the group has reason to believe otherwise, it would be useful to know your criteria for determining where lining would or would not be needed.*

The most similar alternative evaluated is Alternative 1 of the water supply facility plan which considered lining of the entire ditch with polyethylene pipe while retaining gravity-fed instream diversions, at a significantly higher cost than the preferred alternative. Because the lining materials proposed would be different, the costs may vary some. Since the alternative delivery system proposal document does not provide details regarding the type of lining or lengths of the canal to be lined, we are unable to respond to the author(s) assertions that "it is possible for the reorganized District to accept and implement a renovation of the present canal system with minimal or no outside funding ...". *We would need details regarding materials, labor, construction schedule, and funding sources before we can provide further comment. However, Alternative 1 was not selected in part due to it's cost, which was estimated to be twice the cost of the preferred alternative.*

No. 3 Inspect and, if necessary, upgrade or install weirs at District laterals, ditch walker to monitor wasteful practices (leakage, boxes needing repair, etc.).

Ecology staff are not sure what this accomplishes. Inspections of the system have already been made. Based on the inspections, we know that almost all turnouts would need to be replaced in order to adequately measure or shutoff water. We also know that many members along the lower reaches of the East Canal would still want to be removed from the MVID, as this is the area which historically has been unable to receive water from the MVID. Consequently, the remaining members would need to be assessed appropriately to cover the additional operation and maintenance costs associated with this element.

No. 4 Improve diversion dams. Perhaps use natural materials, such as logs, that would provide additional fish habitat and would be beneficial for fish in the winter as well as the irrigation season by providing a pool.

Ecology's preference is for the MVID members to receive water without diverting directly from the Methow and Twisp rivers. The existing diversions, an antiquated system of wooden flash boards installed in a timber and rockfill dam on the Methow River and a boulder weir and excavated side channel on the Twisp River (created by a bull dozer working in the Twisp River), are known to be inefficient and prohibit fish passage. However, Alternative 1 in the Water Supply Facility Plan did include improvements to the diversion dams. If the alternative delivery system proposal for improving the diversion dams is significantly different from the improvements proposed in Alternative 1, we request details before we can provide further comment.

*To summarize, the **IDEAS FOR RENOVATION** described above appear to be similar to the MVID Water Supply Facility Plan Alternative 1 with the exception that Alternative 1 calls for a pipeline rather than an open lined ditch or half pipe. The Alternative 1 gravity pipe system's cost is approximately $7,800,000 (not including design and engineering costs and compensation to people leaving the MVID). The cost for Alternative 4, the preferred alternative, is approximately $4,400,000 (including design and engineering costs and compensation to people leaving the District).*

MONEY

No. 1 Approximately $61,000.00 in L. Adams fund. Attorney fees around $20,000.00. Possibly sell the parcels the District owns.

This is a District issue. Just for informational purposes, Laura Adams, an MVID secretary during the 1980's, was found guilty of wrongfully misappropriating MVID funds. Apparently the Superior Court, as part of the settlement of the case, directed funds be repaid to the District and this is the $61,000 noted and apparently the balance remaining.

No. 2 Eliminate category two. As soon as possible eliminate all categories. You are in the District or you are not. All members will be assessed $50.00 per acre. The administrative fee will stay in place as is. These rates will provide the District with the same revenue (probably more after you start eliminating the category ones).

This is a District issue. Background--Because the MVID has been unable to provide water for years to all of the members in the service area of 2,276 acres, years ago the MVID Board of Directors established three categories of assessments. Category 1 and 2 members do not receive irrigation water but pay reduced assessments to stay in the MVID. They have an option of receiving water in the future. Category 3 members pay for a full allotment of water.

The District needs to be able to deliver water to all its members, then the various categories could be eliminated. Assessments would need to be calculated based on system improvements and associated operation and maintenance costs.

No. 3 Establish a renovation and improvement fund for annual improvements in addition to normal maintenance. This would prevent the poor condition that the District now experiences with its canals.

This is a District issue. However, Ecology agrees with having adequate revenues to properly operate the system including funds for routine maintenance and capital improvements. In working with the MVID, has heard numerous concerns expressed by members about any increase in assessments. The inability of the District members to agree on the level of assessment needed to properly operate and maintain the system as well as set aside funds for improvements has led to the present deterioration of the MVID facilities.

No. 4 There are low interest loans available to District for this project and its improvements.

This is a District issue. However, Ecology is unaware of any agency, firm, or individual willing to commit funds for the alternative delivery system proposal. Ecology remains supportive of any cost effective alternative that will result in water use efficiency and conservation, and increase instream flows in the Methow and Twisp rivers to help mitigate for the loss of fish and fish habitat.

No. 5 Extra water users will generate additional revenue for the District.

The District has been unable to provide water to all of the MVID members so historically there never has been "extra water". However, it may be possible, through the reorganization process, to change the boundaries of the MVID, and incorporate lands presently outside the MVID. This would require clear identification of lands historically served water within the MVID, and lands to be "included" in the reorganized MVID. Whether or not it will be possible to "include" lands presently outside District boundaries in the reorganized MVID is dependent on the desires and actions of the current MVID members. This might be achieved through the "exclusion" and "inclusion" process that is outlined in Chapter 87.03 RCW. Until implementation begins on a "preferred alternative", and the exclusion process is defined it is uncertain to what extent MVID can utilize the "inclusion" process and how much additional revenue may be generated.

No. 6 Include in the District those lands that have historically purchased extra water from the District.

Please note response to No. 5 above.

EFFICIENCY

With this canal upgrade using poly lining it is projected to reduce surface diversion to one third of the current diversion. This renovation is expected to cost a total of about two million dollars (a savings to the public of 2.4 million dollars), the bulk of which will be spent on diversion dam improvements for fish passage. The efficiency of this proposal will vary depending on various changes made to it.

It would be very helpful to see the details of your cost estimate to help us evaluate the improvements proposed. We agree that efficiency will vary depending on the changes proposed. This is key in determining the viability of this proposal. If significant improvements in efficiency over the existing system cannot be achieved, we cannot support it.

BENEFITS

Some of the benefits stated below may be possible under the alternative delivery system proposal, but without further details, we cannot make a determination as to the probability or extent of achieving them.

No. 1 Increases instream flow by significantly reducing diversions.

Ecology does agree that any significant reduction of diversions should result in increasing instream flows. However, inadequate information is provided to determine the amount of reduction of the diversions.

No. 2 Provides additional fish habitat.

To be determined. The amount of additional fish habitat that would be provided is dependent on the amount of reduction of the diversions and the design of the improved diversions. See the Parametrix discussion of instream flow, project alternative, and projected fish habitat relationships in the MVID Water Supply Facility Plan (Volume II, Appendix F) for an example of a more thorough discussion of this subject.

No. 3 Maintains riparian areas for wild life habitat and insect production for fish and other wildlife.

Depending on the amount of seepage allowed to continue, a reduced amount of riparian area would probably be maintained by the alternative delivery system proposal. However, maintaining riparian areas on the hillside rather than along the river corridor does fragment habitat. For example, invertebrates (insects) that may develop in the canal system are not readily accessible to fish in the river system. Perhaps adult insects may reach the river, but only a fraction of what would be available for fish, were they generated in the river. Furthermore, no juvenile aquatic insects would be available to fish in the river. Juvenile aquatic insects are a primary food source of trout and juvenile salmon. Therefore, the fragmentation of habitat could actually be regarded as a detriment rather than a benefit.

No. 4 Helps maintain valuable and protected wetlands.

Again, a reduced amount of wetlands would probably be maintained, depending on the amount of seepage allowed to continue. The wetlands created by seepage along the canal system are not protected by law. The wetland assessment by Parametrix, Inc. in the MVID Water Supply Facility Plan (Volume II, Appendix E) suggests that any wetlands

that may be lost by complete elimination of system leakage would be replaced by wetlands associated with the river system. These wetlands are part of a properly functioning river system, and therefore may provide more overall ecological value than fragmented wetlands associated with the canal.

No. 5 Minimal aquifer recharge.

Ecology does not understand how "minimal aquifer recharge" is either a benefit or a detriment without further context. This will need to be clarified before we can comment further.

No. 6 Maintains the esthetic value of Methow Valley.

The MVID does not hold a water right for aesthetics as a beneficial use, although it is recognized as a beneficial use of water. The MVID would need to file an application to change purpose and obtain authorization from Ecology to make this legal, if it is important to the members, and recognized as a goal of the reorganization.

No. 7 Flexibility - allows for inexpensive changes to the delivery system in response to the sensitive ecosystem along the canals.

More detail is needed in order to evaluate the costs. Based on the similarity of this alternative delivery system proposal to Alternative 1 of the Water Supply Facility plan, the project cost could be double that of Alternative 4 of the Water Supply Facility Plan.

No. 8 Cost-effective and efficient - reduces taxpayer burden by millions of dollars.

Again, to be determined. See discussion for No. 7.

No. 9 Complies with all laws and regulations.

To be determined.

No. 10 Preserves the historic irrigation practices (with much more efficiency of course) and eliminates wasteful practices.

To be determined. The amount of efficiency gained is not yet clear - more detail is needed in order to determine this.

No. 11 Provides water for future growth and development of the Methow Valley.

We find no demonstration that this will be possible under existing water law, rules, and procedures. We ask for a more clear demonstration of how the alternative delivery system proposal would accomplish this without violating existing water law, rules, and procedures.

No. 12 Provides a low maintenance and operational cost for agricultural/land use.

Please refer to page 39 of the Water Supply Facility Plan for an illustration of the operation and maintenance of Alternative 1 (most similar alternative) and other alternatives. Alternative 4 has the lowest projected operation and maintenance expenses. Furthermore, it is uncertain whether the alternative delivery system proposal would be more or less expensive than Alternative 1 until the requested details have been addressed.

No. 13 Meets the stated objectives of the DOE, Fish and Wildlife, BPA, Yakama Indian Nation, and MVID, while addressing the concerns of valley residents.

To be determined. This is a necessary goal to avoid further legal challenges to the MVID. (i.e. to avoid reactivating of challenges from the YIN, or new challenges from others).

APPENDIX E

WATER QUALITY AND QUANTITY DETAILED DATA

APPENDIX E

WATER QUALITY AND QUANTITY DETAILED DATA

Part 1: Method for Determining Contribution of Canal Seepage to Winter River Flows

The following simplified model was used to determine the *amount* of canal seepage:

- Average the net irrigation requirements for the Methow and Winthrop areas, taken from the *State of Washington Irrigation Guide* (Washington Irrigation Guide, 1990),
- Apply these rates to the existing cropping patterns in the MVID (MWG, 1996), and
- Assume, based on professional judgment and experience, that evaporation losses from the open canals are 2 percent of the total river diversions and spills at 10 percent of the total river diversions.

The following equation is then used to make the calculation:

CS = D - NIR - S - E

Where: CS = canal seepage
D = total river diversion (Montgomery Water Group, 1996)
NIR = net irrigation requirement (application rate from Washington Irrigation Guide, multiplied by 776 acres currently irrigated, according to MWG, 1996, page 6)
S = operational spill (10 percent of D)
E = evapo-transpiration loss from the surface of the canals and transpiration from vegetation in and immediately adjacent to the canal (2 percent of D).

From this equation and the values discussed above, the amount of water seeping from the canal and contributing to groundwater or surface leakage is:

CS = 66.8 cfs - 7.62 cfs - (0.1 * 66.8 cfs) - (0.02 * 66.8 cfs) = 51.16 cfs.

Under this method, one may conclude that about 51.2 cfs of the total peak season irrigation diversion of 66.8 cfs either seeps to the groundwater table or leaks to surface or near-surface waters (including riparian areas along and downslope of the canal system).

However, this water does not immediately return to the Methow River. The return extends beyond the irrigation season, which normally ends at the beginning of October. Although there is some delay of the canal seepage returning to the river, we believe that virtually all of the return flows reach the river by the end of December. This assumption is based on the permeability of the soils and the proximity of the canals to the Methow and Twisp rivers. Greater return flows would occur during the latter part of the irrigation season (August, September, and October), while much smaller flows would occur after the end of the irrigation season after the canal contribution to groundwater ceases. No flows originating from the canals and irrigated fields would be

expected after December. Given that groundwater generally follows the gradient of the local topography, it can be assumed that all return flows, for No Action (existing) conditions and the action alternatives, return to the Methow River below the confluence of the Methow and Twisp rivers.

Part 2: Canal Seepage Contribution to Groundwater

The importance of seeps and leaks from canal system to groundwater can be evaluated by comparing historic MVID diversions from the Methow and Twisp rivers to the amount of water needed for crop irrigation. Historically, the MVID has diverted 66.8 cfs from the Twisp and Methow rivers (Montgomery, 1996). If *all* of the water that MVID diverted were lost to return flows, and none reached the irrigated fields, about 2.4 cfs would be contributed per mile of canal, along the 45 km (28 mi.) of canal.

If we then assumed that the whole 921 ha (2,276 ac.) of the MVID were irrigated, and deducted maximum crop needs of 45.5 cfs, then about 21.3 cfs would be going to return flows over the entire system. (Please note that this is a simplistic approach: it does not consider the fact that the whole 921 ha would not be irrigated, nor does it account for evaporation losses from the canals and lateral spills that flow directly to the rivers.) The return flow value of 21.3 cfs demonstrates the scope of the losses that are distributed over a relatively large area (45 km or 28 mi. of canal). Divided out by the length of the canal, the contribution would be about 0.8 cfs per mile of canal. Therefore, the rate of contribution of canal seepage to groundwater likely falls somewhere in the range of 2.4 cfs to 0.8 cfs per mile of canal, or less. Even at the higher rate, the amount of groundwater recharge lost due to the termination of the canal seepage is *very* small in relation to subsurface flows through the aquifer. Thus, the recharge from the leaking canals has a very limited and local influence on the groundwater quantity and level.

Part 3 Detailed Water Quality Data

Table E-1: Water Quality Measures at two monitoring sites (RM 39.4, near Twisp; RM 5, near Pateros) along the Methow River, between 1989 and 1995

	Methow River at Twisp		Methow River near Pateros		WAC[1] Standards
Variable	Max	Min	Max	Min	
Temp(C)	15.5	0	19.8[a]	0	< 18
Flow (CFS)	7610	192	8300	263	
Conductivity (umhos)	194	59	300	59	
Oxygen (mg/L)	14.1	7.9[a]	14.7	9	> 8
Oxygen Sat. (%)	119.8	71.4	111.9	94.4	
pH (units)	8.8[a]	7.3[a]	9.5[a]	7.5	7.5 to 8.5
Suspended Solids (mg/L)	103	1U	8300	263	
TPN *[define]*	0.349	0.082	0.393	0.056	
NH3-N *[define]*	0.04	0.01U	0.03	0.01U	
Total Phosphate (mg/L)	0.101	0.01U	0.115	0.01U	
Dissolved Ortho Phos (mg/L)	0.01	0.005U	0.013	0.005U	
Turbidity (NTU)	40	0.2	45	0.3	
Fecal Coliform (#/100ml)	68	1	84	1	
NO2+NO3-N (mg/L)	0.287	0.016	0.355	0.018	

1 = Washington Administrative Code
a = Value is above or below WAC standards

Source: *River and Stream Ambient Monitoring Report for Water Year 1995* (Washington Department of Ecology, December, 1996)

Table E-2: Irrigated Acreage and Maximum Instantaneous Water Use by Alternative

Alternative A			
Acreage/Water Use	**West Canal**	**East Canal**	**Total**
Irrigated acreage in MVID to be served by piped groundwater system	491	439	930
Former MVID acreage to be served by individual wells and LIDs	206	1140	1346
Total Irrigated Acreage	697	1579	2276
Maximum instantaneous groundwater provided by MVID (acreage*0.02 cfs)	9.8	8.8	18.6
Maximum instantaneous groundwater provided by individual wells and LIDs (cfs) (acreage*0.02 cfs)	4.1	22.8	26.9
Total maximum instantaneous irrigation groundwater use (cfs)	**13.9**	**31.6**	**45.5**

Alternative B			
Acreage/Water Use	**West Canal**	**East Canal**	**Total**
Irrigated acreage in MVID served by open canal system	592	685	1277
Former MVID acreage to be served by individual wells and LIDs	105	894	999
Total Irrigated Acreage	*697*	*1579*	2276
Maximum instantaneous diversion rate (MVID) (acreage*0.02 cfs)	11.8	13.7	25.5
Maximum instantaneous groundwater provided by individual wells and LIDs (acreage *0.02 cfs)	2.1	17.9	20.0
Total maximum instantaneous irrigation water use (cfs)	**13.9**	**31.6**	**45.5**

Alternative C			
Acreage/Water Use	**West Canal**	**East Canal**	**Total**
Total Irrigated Acreage (all former MVID acreage to be served by individual wells and LIDs)	697	1579	2276
Total maximum instantaneous irrigation groundwater use (cfs) (acreage * 0.02 cfs)	**13.9**	**31.6**	**45.5**

Alternative D (No Action)			
Acreage/Water Use	**West Canal**	**East Canal**	**Total**
Current MVID irrigated acreage	330.6	445.4	776
Current MVID non-irrigated acreage	366.4	1133.6	1500
Total MVID Acreage	**697**	**1579**	**2276**
Maximum instantaneous irrigation water use (cfs)*	**26.1**	**40.8**	**66.8**

*Plus some unknown amount of existing groundwater use from existing wells.

Note: No Action diversion amounts are from Montgomery Water Group, 1996, page 15; diversion amounts for other alternatives based on crop irrigation requirement and acreage irrigated.

Part 4: Application of Instream Flow Incremental Methodology

The Instream Flow Incremental Methodology (IFIM) is a standard tool used to develop habitat-versus-streamflow relationships to assist in making water management decisions. A basic IFIM premise is that fish populations respond to changes in the environmental conditions of their habitat. Therefore, if one quantifies their habitat and understands how habitat changes in response to environmental variables (such as streamflow), the information can be used to help make decisions in water management.

The fisheries and water management community has largely accepted the assumption that the potential for fish population is related directly to available habitat. Note that the IFIM is designed to help make decisions by providing information that can be interpreted and used in cases involving out-of-stream water uses (such as irrigation) and more than one fish species at a time. However, it does not provide *all* the information needed to assess impacts related to changes in flow. Other factors, including water temperatures, harvest, downstream fish passage, and management objectives, must also be considered when assessing the overall impacts of a project flow change. Nonetheless, IFIM has remained the tool most widely accepted and used by fisheries scientists and managers to evaluate the impacts of flow changes on fish.

For all alternatives, changes in in-stream fish habitat were evaluated as they relate to changes in flow for one section of the Methow River and one section of the Twisp River:

- **Methow.** The uppermost section of the Methow River in the study area, which extends from the diversion point of the West Canal down to the confluence with the Twisp River, a distance of about 6.5 km (4 mi.).
- **Twisp.** The affected section of the Twisp River extends from the diversion point of the West Canal to the confluence with the Methow River, a distance of about 6.5 km (4 mi.).

The factors evaluated were also divided by river section:

- **Methow:** adult holding, spawning habitat, and juvenile rearing habitat for spring chinook salmon; spawning habitat for summer chinook; juvenile rearing habitat for summer steelhead; and juvenile rearing habitat for Bull trout.
- **Twisp:** spawning and juvenile rearing habitat for spring chinook; spawning habitat for summer chinook; juvenile rearing habitat for summer steelhead; and juvenile rearing habitat for Bull trout.

These species and lifehistory stages are those most likely to occur in each of the specified locations and are of greatest concern from a commercial, recreational, and species status standpoint. Other lifestages of these fish do occur in the project area during the irrigation season; however, their occurrence does not correspond to times when flows are an issue. For instance, summer chinook juveniles and summer steelhead spawners are present in the project area from about March until June. However, flows in the lower Methow River range between about 2,000 and 10,000 cfs during this time, and any small changes in flow during these high flow periods would be inconsequential to fish.

September flows were evaluated because they reflect the time when flows are lowest during the irrigation season, and irrigation demand is still high. This approach allowed the evaluation of habitat conditions that are probably most limiting to the affected fish species. Habitat values were computed (weighted usable area, or WUA) for each species/lifestage using the 50-percent and 90-percent exceedance flows (normal and dry conditions, respectively) in September; these were compared to No Action conditions and to project alternatives. Analysis of habitat changes focuses on the Methow and Twisp rivers above their confluence because, as indicated in section 3.1.2.1, there would be little net change in flows below this confluence. Table E-2 presents the September flows for the reaches used in the habitat analysis for Alternative A; Table E-3 presents the September flows used for the Alternative B analysis.

Table E-3: Comparison of September Irrigation Water Use and Net Streamflows Between No Action Conditions and Alternative A

Irrigation Water Use/Streamflows	No Action	Alternative A
Methow River Above Twisp		
Irrigation Water Use (cfs)[1]	39	0
Natural Streamflow (cfs)—50% Exceedance	272	272
Natural Streamflow (cfs)—90% Exceedance	196	196
Net Streamflow (cfs)—50% Exceedance	233	272
Net Streamflow (cfs)—90% Exceedance	157	196
Twisp River at Twisp		
Irrigation Water Use(cfs)	25	0
Natural Streamflow (cfs)—50% Exceedance	80	80
Natural Streamflow (cfs)—90% Exceedance	49	49
Net Streamflow (cfs)—50% Exceedance	55	80
Net Streamflow (cfs)—90% Exceedance	24	49

[1] Irrigation water use is the amount of water removed through direct streamflow diversion or the amount that is proposed to be pumped from groundwater wells, or a combination of both, depending on the alternative.

Table E-4: Comparison of September Irrigation Water Use and Net Streamflows between No Action Conditions and Alternative B

Diversions/Streamflows	No Action	Alternative B
Methow River Above Twisp		
Irrigation Water Use(cfs)[1]	39	32
Natural Streamflow (cfs)—50% Exceedance	272	272
Natural Streamflow (cfs)—90% Exceedance	196	196
Net Streamflow (cfs)—50% Exceedance	233	240
Net Streamflow (cfs)—90% Exceedance	157	164
Twisp River at Twisp		
Irrigation Water Use (cfs)	25	14
Natural Streamflow (cfs)—50% Exceedance	80	80
Natural Streamflow (cfs)—90% Exceedance	49	49
Net Streamflow (cfs)—50% Exceedance	55	66
Net Streamflow (cfs)—90% Exceedance	24	35

[1] Irrigation water use is the amount of water removed through direct streamflow diversion or the amount that is proposed to be pumped from groundwater wells, or a combination of both, depending on the alternative.

APPENDIX F

VEGETATION DETAIL

APPENDIX F
VEGETATION

Part 1: Upland Vegetation

South-facing slopes, mainly above the east canal and the southern portion of the west canal, consists of scattered ponderosa pine (*Pinus ponderosa*). Shrub species on these aspects include sagebrush (*Artemesia* spp.), bitterbrush (*Pushia tridentata*), squaw current (*Ribes cereum*), and serviceberry (*Amelanchier alnifolia*). Native grasses include Idaho fescue, bluebunch wheatgrass (*Agropyron spicatum*), basin wildrye (*Elymus cinereus*), and cheatgrass. Forbs include arrowleaf balsamroot (*Balsamorhiza saggittata*), and Wright buckwheat (*Erigeronum wrightii*). Weed species include whitetop (*Cardaria draba*), dalmatian toadflax (*Linaria genistifolia* ssp. *dalmatica*), musk thistle (*Carduus nutans*), knapweeds (*Centaurea* spp.), and others.
The north-facing slopes, mainly above the northern portion of the West Canal, are dominated by Douglas-fir (*Pseudotsuga menziesii*), intermixed with scattered ponderosa pine.
The understory consists of wild rose (*Rosa woodsii*), creeping Oregon grape (*Berberis repens*), snowberry (*Symphoricarpos albus*), poison oak (*Rhus radicans*), and serviceberry. The herbaceous groundcover consists of pinegrass (*Calamagrostis rubescens*), heartleaf arnica (*Arnica cordifolia*), and star-flowered false Solomon's seal (*Smilacina stellata*).

Part 2: Wetlands Along Canals

The natural and artificial wetlands systems within 91 m (300 ft.) of the MVID canals are shown by canal and reach in Table F-1. The data are from the US Fish and Wildlife Service's National Wetlands Inventory (USFWS, undated).

Table F-1: Natural and Artificial Wetland Systems within 91 m (300 ft.) of MVID Canals

Canal	Reach	Wetland System*
East	1	R4SBKCx, R3OWH, PEMC, PFOC
	2	R4SBKCx, PSSC, PEMC
	3	R4SBKCx, R3OWH
	4	R4SBKCx, PFOC, PSSC
	5	R4SBKCx, PEMCx, PSSC, PFOC
	6	R4SBKCx, R3OWH, R4SBC, PEMA, PSSA, PFOA
West	1	R4SBKCx, R3OWH, PEMC, PSSC
	2	R4SBKCx
	3	R4SBKCx, PEMC, PSSC, PFOC
	4	R4SBKCx, R3OWH, PSSC, PFOC
	5	R4SBKCx

*System	*Subsystem	*Water Regime	*Modifier
R3 Riverine Upper Perennial	OW Open water	A Temporarily flooded	x Excavated
R4 Riverine Intermittent	SB Streambed	H Permanently flooded	
P Palustrine	EM Emergent	C Seasonally flooded	
	SS Scrub/Shrub	K Artificial	
	FO Forested		

Part 3: Vegetation Along the Canals

Common hydrophytic riparian species include red-osier dogwood (*Cornus stolonifera*), peachleaf willow (*Salix amygdaloides*), and Pacific willow (*Salix lasiandra*). Herbaceous species include cattail (*Typha latifolia*), hardstem bulrush (*Scirpus acutus*), and reed canarygrass (*Phalaris arundinacea*).

Drought-tolerant riparian vegetation along the canals includes ponderosa pine, Douglas-fir, black locust (*Robinia pseudoacacia*), choke cherry (*Prunus virginiana*), bittercherry (*Prunus emarginata*), wild rose, snowberry, poison oak, Oregon grape (*Berberis repens*), sagebrush, bitterbrush, bearberry honeysuckle (*Lonicera involucrata*), Canada goldenrod (*Solidago canadensis*), and bluebunch wheatgrass (*Agropyron spicatum*).

Facultative riparian vegetation includes black cottonwood, red alder (*Alnus rubra*), and trembling aspen (*Populus tremuloides*), serviceberry, poison oak, and stinging nettles (*Urtica dioica*).

Table F-2 lists the dominant existing hydrophytic, facultative, and drought-tolerant riparian species by canal and reach.

Table F- 3 lists the areas of hydrophytic riparian vegetation potentially affected by the proposed alternatives. Again, the existing conditions are shown as Alternative D (no action).

Table F-2: Vegetation Along MVID Canals[1]

Canal	Reach	Dominant Vegetation		
		Hydrophytic[2]	*Facultative*[3]	*Drought-tolerant*[4]
East	1	red-osier dogwood, peachleaf willow, Pacific willow	black cottonwood, red alder, trembling aspen, bearberry honeysuckle	wild rose, black locust, serviceberry, poison oak
	2	red-osier dogwood	stinging nettles	choke cherry, wild rose, black locust, poison oak
	3	red-osier dogwood	black cottonwood	wild rose, big sagebrush, bitterbrush
	4	red-osier dogwood	black cottonwood, trembling aspen	choke cherry, wild rose, bitterbrush, poison oak
	5	red-osier dogwood, reed canarygrass, waterhemlock	black cottonwood, trembling aspen, stinging nettles	choke cherry, wild rose, black locust, bitterbrush, poison oak
	6	red-osier dogwood, peachleaf willow, Pacific willow	black cottonwood, trembling aspen, stinging nettles	--
West	1	red-osier dogwood, scouring rush horse-tail, reed canarygrass	black cottonwood, red alder	Canada goldenrod, ponderosa pine, Douglas-fir, wild rose, service-berry, Oregon grape, snowberry
	2	peachleaf willow, Pacific willow, cattail, hardstem bulrush	black cottonwood, red alder	ponderosa pine, Douglas-fir, wild rose, serviceberry, Oregon grape, snowberry
	3	red-osier dogwood	black cottonwood, red alder, trembling aspen	Canada goldenrod, ponderosa pine, Douglas-fir, serviceberry, Oregon grape, snowberry
	4	red-osier dogwood	black cottonwood, trembling aspen	choke cherry, big sagebrush, bitterbrush, serviceberry, poison oak, bluebunch wheatgrass
	5	--	--	ponderosa pine, wild rose, big sagebrush, serviceberry, poison oak, bluebunch wheatgrass, bittercherry, arrowleaf balsamroot

1 After Parametrix, 1995; Reed, 1988; Reed, 1993.
2 Hydrophytic = Refers to plants that tend to grow in water or soils with excessive water content.
3 Facultative = Plants equally likely to occur in wetlands or non-wetlands.
4 Drought-tolerant = Plants able to withstand prolonged dry periods.

Table F-3: Areas in Acres[1] of Hydrophytic Riparian Vegetation Potentially Affected by the Proposed Alternatives[a]

Canal	Type	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Total
Alternative A								
East[b]	Trees	1.4	0.7	0.5	1.0	1.6	1.8	7.0
	Shrubs	0.7	2.3	2.2	0.9	1.4	0.7	8.2
	Herbs	0	0	0.4	0.4	0.8	2.0	3.6
West[b]	Trees	3.6	3.1	4.2	0.4	0	--	11.3
	Shrubs	0.2	0.2	1.5	0.9	0	--	2.8
	Herbs	0	0	0	0	0	--	0
Total		5.9	6.3	8.8	3.6	3.8	4.5	32.9
Alternative B								
East[c]	Trees	1.3	0.6	0.5	0.9	1.5	1.7	6.5
	Shrubs	0.6	2.1	2.0	0.8	1.3	0.6	7.4
	Herbs	0	0	0.4	0.4	0.7	1.8	3.3
West[d]	Trees	3.3	2.8	3.8	0.4	0	--	10.3
	Shrubs	0.2	0.2	1.4	0.8	0	--	2.6
	Herbs	0	0	0	0	0	--	0
Total		5.4	5.7	8.1	3.3	3.5	4.)	30.1

(con't)

1 For simplicity's sake, metric equivalents have been omitted from this table. However, 1 acre is generally equal to 0.4 hectares.

Table F-3 Areas in Hectares (and Acres) of Hydrophytic Riparian Vegetation Potentially Affected by the Proposed Alternatives[a] (con't)

Canal	Type	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Total
Alternative C								
East[b]	Trees	1.4	0.7	0.5	1.0	1.6	1.8	7.0
	Shrubs	0.7	2.3	2.2	0.9	1.4	0.7	8.2
	Herbs	0	0	0.4	0.4	0.8	2.0	3.6
West[b]	Trees	3.6	3.1	4.2	0.4	0	--	11.3
	Shrubs	0.2	0.2	1.5	0.9	0	--	2.8
	Herbs	0	0	0	0	0	--	0
Total		5.9	6.3	8.8	3.6	3.8	4.5	32.9
Alternative D								
East[e]	Trees	0	0	0	0	0	0	0
	Shrubs	0	0	0	0	0	0	0
	Herbs	0	0	0	0	0	0	0
West[f]	Trees	0	0	0	0	0	0	0
	Shrubs	0	0	0	0	0	0	0
	Herbs	0	0	0	0	0	0	0
Total		0	0	0	0	0	0	0

[a]After Montgomery Water Group, 1996; numbers may not add due to rounding

[b]Assume no seepage (100% loss of hydrophytic vegetation)

[c]Assume 2.1 cfs seepage (91% loss of hydrophytic vegetation)

[d]Assume 1.8 cfs seepage (91% loss of hydrophytic vegetation)

[e]Assume 23.73 cfs seepage (no loss of hydrophytic vegetation)

[f]Assume 18.37 cfs seepage (no loss of hydrophytic vegetation)

APPENDIX G

GLOSSARY

APPENDIX G
Glossary

acre-feet	quantity of water (43,560 cubic feet) that would cover 1 acre to a depth of 1 foot
alluvial aquifer	a geological formation that receives, holds, and releases water; created by deposits of glacial till and outwash in a valley
anadromous (fish)	fish species that migrate from fresh to salt water when young, spend most of their adult life in the ocean, and then return to their ancestral drainage to spawn
aspect	directional bearing, particularly as related to the direction a slope faces (e.g., the southern aspect of a hill)
backfill	the material used to fill in excavated areas
basin	geographically defined area in which all of the land is drained by a specific river and its tributaries
cascade	a series of small steps of alternating small waterfalls and small pools
cfs	cubic feet per second, a measure of the rate of flow of water
char	any of several fishes of the genus *Salvelinus*, related to the trout
cobble	streambed rocks, 14 to 29 cm (5-119 in.) in diameter
confluence	the location where two or more streams or rivers flow together
conveyance efficiency	the efficiency with which water is transported from its source (a river, for instance) to a destination (such as fields needing irrigation); it is figured by the current demand for irrigation water divided by the total amount of water diverted
depressed	with reference to a population of a certain species, abundance or production that is substantially lower than would be expected based on natural variation and available habitat but above the level where permanent damage is likely
diversion	the withdrawal of water from its natural flowpath into another flowpath; i.e., into an irrigation canal system

easement	a right or privilege that a person or agency may have on another's land, a right-of-way
emergence	coming out of the spaces between streambed gravel by fry following the development period after hatching
escapement	the number of adults of an anadromous species or stock returning to spawn in an area or stream
exceedance flow	with reference to the percent chance of observing flows greater than a specified amount; e.g., 90-percent exceedance flows are flows that are exceeded 90 percent of the time, and represent dry conditions
facultative	with reference to plant species, those that occur in wetlands and nonwetlands
fish passage	the ability of fish to pass by a potential obstacle, such as a diversion dam, or through a section of a stream that has been substantially dewatered.
fish screen	wire mesh over or in front of a diversion intake to prevent juvenile fish from entering
flume	an artificial channel, usually an inclined chute or trough, for carrying water
fry	early life stage of fish, juvenile
glacial till	unstratified clay, sand, gravel, and boulders intermingled in any proportions deposited by glaciers as they receded
glides	a moderately shallow stream or river reach with an even flow and no pronounced turbulence
groundwater	water that fills all the unblocked pores of underlying material below the water table, which is the upper limit of saturation
herbaceous	non-woody vegetation
hydraulic	referring to water in motion
hydraulic continuity	used to describe two water bodies that are easily demonstrated to be directly linked; for example, a river and a lake, two linked subsurface groundwater aquifers, or an aquifer and an adjacent river
hydrophytic	plants associated with wet or moist places

instantaneous	the flow in a stream or river at a specific point in time
in-stream habitat	areas within a stream or river that can be used by fish for rearing or spawning
jurisdictional wetlands	areas meeting regulatory criteria for wetlands and over which the county, state and/or US Army Corps of Engineers have regulatory control
lateral	a pipeline or smaller canal that takes water from the main pipeline or canal and delivers it to an irrigated field
lek	areas where certain types of birds (such as grouse) congregate and display during the breeding season
lifestage	each period during a plant's or animal's life history
mean	the average of a range of numbers
mitigation	actions proposed or taken to avoid, minimize, rectify, reduce, eliminate, or compensate for impacts on a resource
nocturnal	adapted to being active during the night
out-migrate	the oceanward movement of anadromous salmonids from stream spawning and rearing areas
palustrine	descriptive of nontidal wetlands dominated by plants, and with salinity less than 0.5 °.
passive restoration	restoration of a damaged or degraded habitat or vegetation type using primarily natural processes (e.g., the return of historic water flows or vegetative regeneration) rather than active human intervention (such as irrigation or replanting)
percolate	to pass through a porous substance
physiographic area	a landform that is distinct in its appearance and development; used to characterize and categorize landforms
point-of-diversion	the legally recognized location from which the holder of a valid water right or claim can take *surface water*
points-of-withdrawal	the legally recognized location from which the holder of a valid water right or claim can take *groundwater*
reach	a section of a stream or river

redd	a salmon nest
resident (fish)	fish that are permanent inhabitants of a body of fresh water and do not migrate long distances from the area (compare with anadromous fish)
restoration	putting or bringing back into a former, normal, or unimpaired state or condition
riffles	type of stream habitat characterized by fast-flowing turbulent water
riparian	growing or living on or adjacent to the banks of streams and rivers
riverine	freshwater wetlands and waters contained within a channel
semi-permeable	a material that allows some, but not a full amount of, water to pass through it
smolt	juveniles of anadromous species migrating to the ocean and in a physiological state to transition from fresh to salt water
smoltify	the process by which juvenile anadromous salmonids metamorphose into saltwater fish, usually during the downstream migration period
spillway	an opening in a canal that allows excess water to leave the canal and return to the main stream or river; prevents the canal from being overfilled with rainwater or other water draining into the canal in addition to the water being diverted
steppe	area that is arid to semi-arid, with low precipitation, warm-to-hot summers, and relatively cold winters
subbasin	geographically defined area in which all of the land is drained by a specific river and its tributaries, and is a subset of a basin
successional development	the sequence of changing plant communities over time
surface water	water which is present or flows on top of the ground in channels, streams and rivers
terrestrial	consisting of land or living on land
understory	vegetation found on the ground and below the overhead canopy of a forested area

water claim	those water rights in use prior to legislation to establish water law in the state
water right	given the authority from the state to use or transport a specified amount of water from surface or groundwater of the state, as provided by state laws and regulations
weir	a small dam that raises the water level in a river or stream to force water into an irrigation diversion