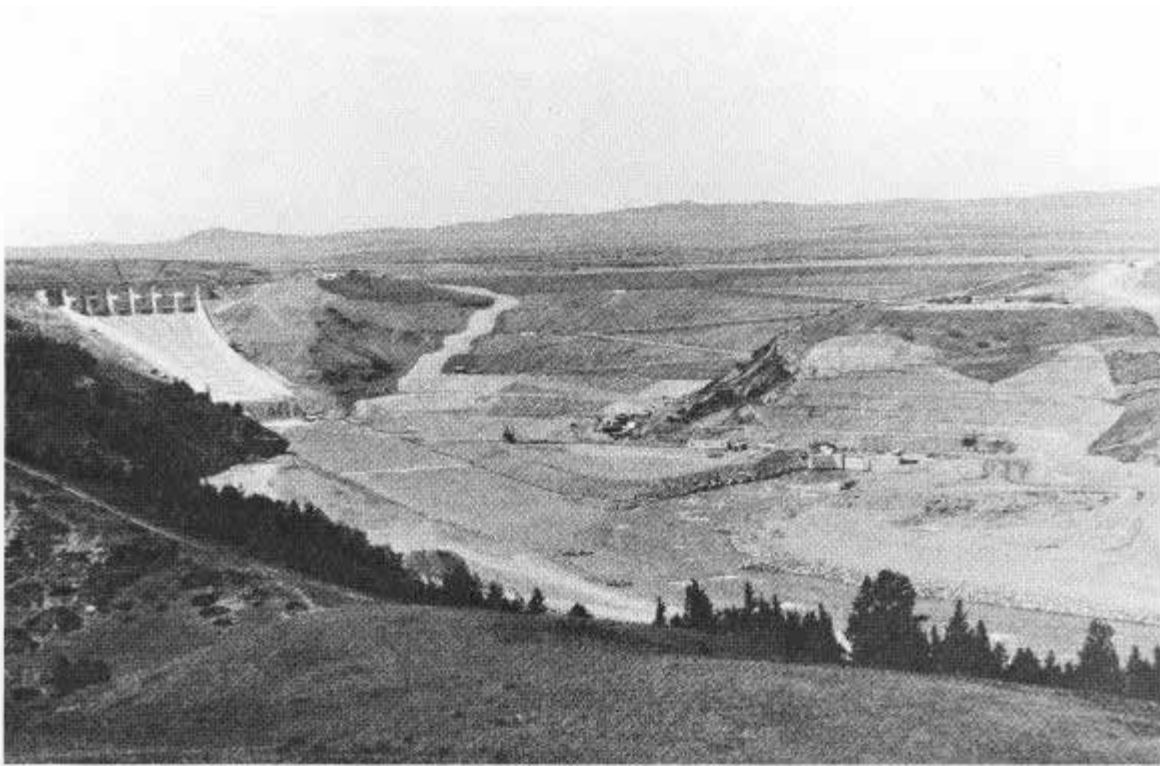


# Oldman River Dam

## REPORT OF THE ENVIRONMENTAL ASSESSMENT PANEL



Downstream view of the Oldman River dam  
(Photo Bob Greycl)




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OLDMAN RIVER DAM  
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Ottawa, Ontario  
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Dear Ministers:

In accordance with the terms of reference issued in November, 1990, the Environmental Assessment Panel has completed its review of the **Oldman** River Dam in Southern Alberta. On behalf of the Panel, I have the honour to submit this report for your consideration.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'W.A. Ross'. The signature is fluid and cursive, with a long horizontal stroke at the end.

W.A. Ross  
Chairperson  
Oldman River Dam  
Environmental Assessment Panel

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# Oldman River Dam

## EXECUTIVE SUMMARY

This environmental assessment review of the Oldman River Dam was undertaken between November 1990 and April 1992 by a six-member panel appointed under the federal Environmental Assessment and Review Process. The Panel was given the mandate to evaluate and make recommendations on the design and safety of the proposed dam, the significance of potential environmental and socio-economic effects of the proposed dam and its operation, and options for mitigating these effects. The Oldman River Dam in Southwestern Alberta was constructed to impound water for "water management, flood control, erosion control, flow regulation, conservation and recreation". The project was completed during the review and at the time of writing is entering its second year of operation. The proponent, the Alberta Government, did not formally participate in the review.

Although many environmental and socio-economic impacts are discussed in this report, the major considerations are those affecting fisheries, wildlife and riparian forest ecosystems, and those affecting the Peigan Indian Band. The consequences of the project in these four areas impose substantial environmental, social and economic costs and underlie the principal conclusions and major recommendations of the Panel. When considered in the context of the small economic benefits to be derived from increased irrigation agriculture and other uses of the dam, they lead the Panel to its preferred, but not unanimous, recommendation that the dam should be decommissioned by opening the low level diversion tunnels and permitting unimpeded flow of the river.

However, recognizing that the proponent has shown some efforts at mitigation and that acceptance of the first recommendation would lead to inter-jurisdictional conflicts, the Panel is prepared to recommend that the Dam continue to operate on certain conditions which must be fulfilled within a reasonable time. These conditions arise from the Panel's finding that there are impacts for which mitigation efforts must be substantially improved if the dam is to be operated. Consequently, the Panel presents an alternative set of recommendations designed to minimize the project's negative consequences.

The Panel's first recommendation follows:

Decommission the dam by opening the low level diversion tunnels to allow unimpeded flow of the river.

This recommendation is the preference of all but Mr. Anderson.

The alternative recommendations are encompassed in recommendations 2, 3, 4 and 5. Recommendation 2 follows:

**If Recommendation 1 is not accepted and the Oldman River Dam is to be operated, attach stringent conditions to the approvals granted by the**

**federal government. These conditions include the proponent reaching an agreement with the Peigan and making a long term commitment to mitigating the many environmental impacts of the project.**

This second recommendation is the strong preference of Mr. Anderson and, although endorsed by the other five members as the second best option, it is not their preference. If this recommendation is accepted, the project would be made environmentally acceptable. This recommendation should be implemented through the following recommendations:

**Create an Environmental Management Committee and give it full authority to mitigate and continue mitigating the major environmental impacts, especially those affecting fish, wildlife and riparian ecosystems. Programs and activities of the Environmental Management Committee should be open to public scrutiny.**

**Establish a negotiating process by which the proponent and the Peigan can reach an agreement on mitigation and compensation for environmental, social and cultural impacts of the project on the Peigan and Peigan Reserve.**

**If the proponent fails to comply with Recommendations 2, 3 and 4 then decommission the dam in accordance with Recommendation 1.**

In the view of the Panel, the federal government has the authority to impose either decommissioning of the Dam or all the recommended conditions. The authority arises primarily from the Navigable Waters Protection Act and the Fisheries Act.

In the report the Panel also makes recommendations about: water allocation to the Peigan, hydrology, water allocation for conservation, riparian cottonwood forests, vegetation, wildlife, rare fish species, fish mitigation, reservoir fisheries, downstream fisheries, archaeology, the Peigan Band, and navigation. These recommendations clarify and provide specific guidance as to necessary mitigation actions and agreements that are required to make the project acceptable.

Additional recommendations related to: efficiency of water use; economic assessment of projects; the role of Fisheries and Oceans Canada; follow-up programs in environmental reviews; and emergency evacuation plans are not critical to the acceptability of the project. These provide additional guidance on issues of concern,

## 1.0 PROJECT REVIEW AND PERSPECTIVE

### 1.1 Introduction

The **Oldman River Dam Environmental Assessment Panel** was appointed in November, 1990, by the Honourable Robert de **Cotret**, then Minister of the Environment. The Ministers of the initiating departments, the Department of Transport and the Department of Fisheries and Oceans, referred the project for public review in response to a March, 1990 Federal Court of Appeal ruling requiring that they comply with the Environmental Assessment and Review Process Guidelines Order.

The Panel was given the mandate to evaluate and make recommendations on the design and safety of the dam, the significance of potential environmental and socio-economic effects of the dam and its operation and options for mitigating these effects. The Terms of Reference can be found in Appendix A.

In June, 1991, the Panel held public hearings into safety and design aspects of the **Oldman River Dam**. The Panel submitted an Interim Report on Dam Safety and Design to the Ministers of Environment, Fisheries and Oceans, and Transport. The Interim Report was released to the public in July, 1991.

### 1.2 Project Description

The **Oldman River Dam** is located downstream from the confluence of the **Oldman**, **Crowsnest** and **Castle Rivers**, near **Pincher Creek** in Southern Alberta (Figure 1). The dam is an earth and rockfill dam, 76 metres high and 3,070 metres long. In June, 1991, the reservoir was filled to the spillway crest and water began passing over the spillway. At its peak 1991 water level, the reservoir was storing approximately 300 million cubic metres of water. The spillway gates were installed in the fall of 1991. With the spillway gates in place, the reservoir will be capable of retaining water to the full supply level. At full supply level the reservoir would store 490 million cubic metres of water, extend 24 kilometres in length and have a surface area of 24.2 square kilometres.

The dam was constructed by Alberta Public Works, Supply and Services. Upon completion, Alberta Environment will become the owner and operator of the dam. The stated purpose of the **Oldman River Dam** is "to impound water for water management, flood control, erosion control, flow regulation, conservation and recreation". It was also stated that flow regulation achieved by the **Oldman River Dam** would permit irrigation expansion, enhance downstream fisheries, improve water quality, provide an assured water supply for municipal and other uses, and provide Alberta with greater flexibility to meet its commitments for water supply to downstream Provinces.

Studies began in 1974 to evaluate sites for on — and off-stream storage when the Planning Division, Alberta Environment formed a Technical Advisory Committee. The Committee undertook Phase I studies designed to consider means of meeting the present and future water use requirements in the

**Oldman River**, including irrigation needs. The report was issued in June, 1976. Phase II of these studies was conducted by the eight-member **Oldman River Basin Study Management Committee** established in 1975. A wide range of **socio-economic** and environmental impact studies were carried out. The Phase II report issued in 1978 recommended on-stream storage at either the **Three Rivers**, the **Brocket** or the **Fort MacLeod** site, increased off-stream storage and extensive delivery system rehabilitation.

In 1978, the Environment Council of Alberta was asked to hold public hearings on the Management of Water Resources in the **Oldman River Basin**. The four-member Panel held public hearings and issued its report in 1979, recommending against the use of on-stream storage at that time. However, the Environment Council of Alberta report accepted on-stream storage at a future time, at **Brocket** or **Fort MacLeod**, should a dam become economically feasible. It also recommended continued activity to increase delivery and water use efficiencies in the irrigation industry.

In 1980, the Alberta government announced its decision to construct a dam on the **Oldman River**, but deferred its final decision on the location to allow the **Peigan Band** the opportunity to submit a proposal for the dam to be constructed near **Brocket**. In 1984, Alberta announced its decision to proceed with the dam at the **Three-Rivers** site.

In 1984, a Panel of the Alberta Water Resources Commission held public hearings to receive views regarding the management of water in the South Saskatchewan River Basin. The Commission Panel supported the need for the management of the South Saskatchewan River Basin to meet the requirements of the inter-provincial Apportionment Agreement and put this forward as one of the justifications for the construction of the **Oldman River Dam**.

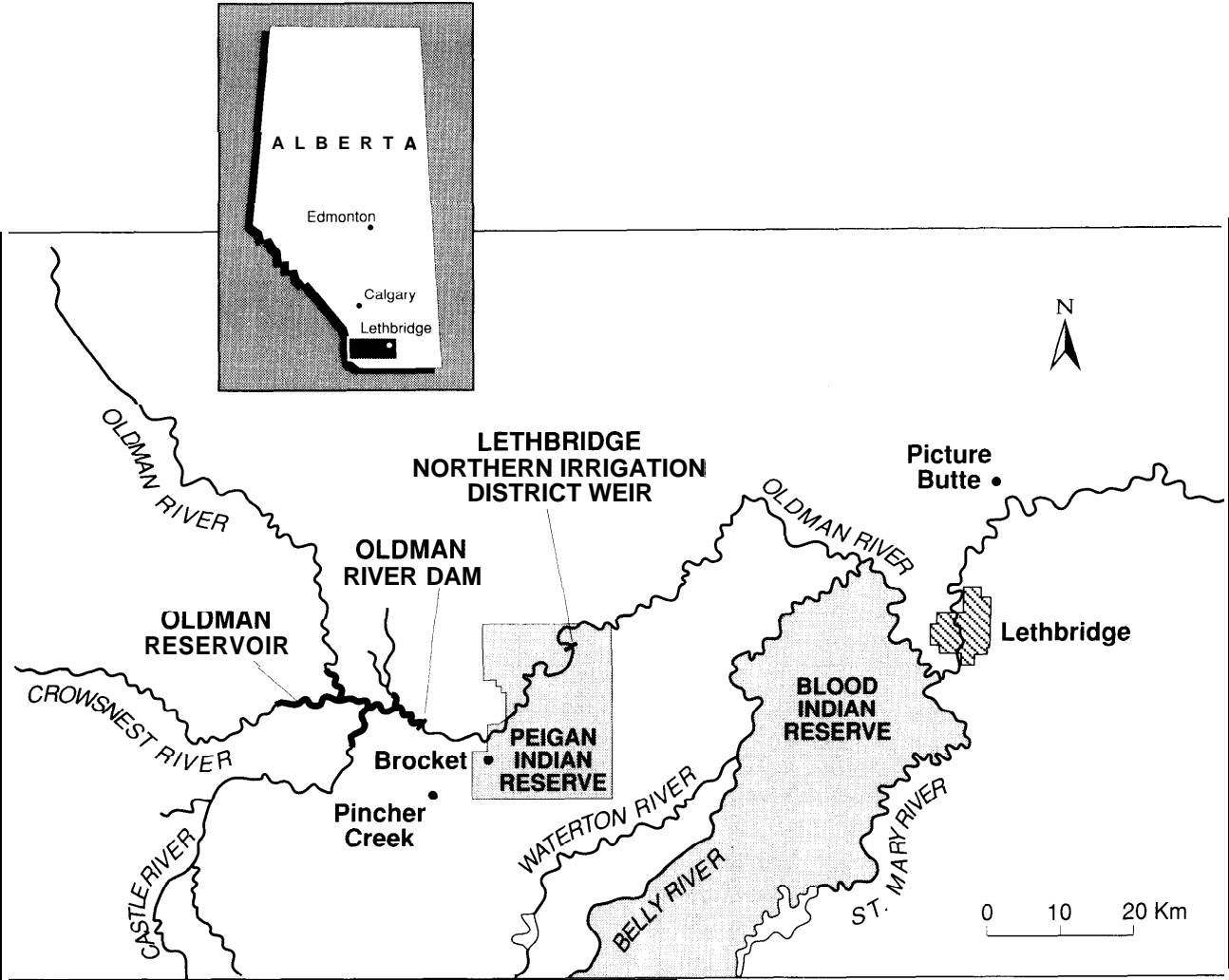
Although studies were undertaken by the Alberta government into a wide range of engineering, economic, environmental and archaeological aspects of the project, an independent public review of the **Oldman River Dam** project did not take place, and a comprehensive environmental impact statement was not prepared for either the provincial or federal Environmental Impact Assessment processes. In March, 1990, while construction of the dam was well under way, the Federal Court of Appeal ruled that the federal Ministers of Transport and Fisheries and Oceans must comply with the federal Environmental Assessment Review Process. Both Ministers subsequently referred the project to the Minister of the Environment for public review.

### 1.3 Environmental Assessment Process

The Panel was appointed in November, 1990, in accordance with the federal Environmental Assessment and Review Process Guidelines Order. Biographies of the Panel members can be found in Appendix B. The federal environmental review

FIGURE 1

# LOCATION OF OLDMAN RIVER DAM PROJECT





process is a planning tool for assessing the environmental consequences of proposals that require a federal government decision. The process allows the Panel to provide the proponent with guidelines for the preparation of an environmental impact statement. Once completed, the proponent's Environmental Impact Statement becomes the focus of discussions at the Panel's public hearings. The review is normally undertaken at the planning stage of a project, before irrevocable decisions are taken.

#### 1.4 Review of the Oldman River Dam

The review of the Oldman River Dam was carried out while construction of the dam reached completion. The Panel did not prepare guidelines nor was an Environmental Impact Statement prepared by the proponent of the project. Instead of guidelines for the preparation of an Environmental Impact Statement, an Additional Information Requirements document was prepared with the assistance of written and verbal advice given to the Panel by technical specialists, government departments and the public during "Issue Identification Meetings" held in January, 1991. Then, a team of technical specialists to the Panel and federal, provincial and local resource people prepared a response to the Panel's "Additional Information Requirements". This collection of responses became the focus of discussion at the public hearings. Appendix C contains a list of the technical specialists on environmental and socio-economic matters retained by the Panel and Appendix D contains a list of Key Review Documents. Many existing studies prepared by or for the proponent also provided valuable information. This unusual approach had to be adopted here because the proponent, the Alberta government, declined to participate so that the conventional approach to a review was not possible.

Public Hearings were divided into two sets. As noted above, public hearings were held in Lethbridge, Alberta in June, 1991 to review dam safety and design. Due to the urgency of public concerns over dam safety, this matter was dealt with as soon as a technical review could be carried out.

Additional time was required to carry out a review of the socio-economic and environmental aspects; therefore, the public

hearings on these matters were not held until November, 1991. This second set of hearings was held in Lethbridge, Calgary, Edmonton, Medicine Hat, Picture Butte, **Brocket**, and Pincher Creek. The Panel heard 127 presentations over eleven days of public hearings. The Panel received 126 written submissions by its December 31, 1991 deadline. Appendix E lists the written submissions and Appendix F lists the presenters in each hearing session.

#### 1.5 Provincial and Federal Government Involvement

The government of Alberta did not participate as the project proponent in the Panel's review. Action was taken in both the Supreme and Federal Courts by the government of Alberta in unsuccessful attempts to prevent the federal government and the Panel from carrying out a public review of the Oldman River Dam project. However, information on the project that had been made publicly available by Alberta Environment and Alberta Public Works, Supply and Services was provided to the Panel and the technical specialists retained by the Panel. In some cases the technical specialists met with Alberta government representatives to assist with their understanding and review of the project. A tour of the project site was also provided by the Alberta government for the Panel and members of the public.

Federal government input to the review process was provided primarily by the two initiating departments, the Department of Transport and the Department of Fisheries and Oceans. Material was also provided by Environment Canada, Indian and Northern Affairs Canada, Agriculture Canada, Forestry Canada and Health and Welfare Canada.

The Departments of Fisheries and Oceans, Environment, and Agriculture assisted with the development of the "Response to the Additional Information Requirements" document. Acknowledgement of their and others' assistance can be found in Appendix G.

## 2.0 OVERALL PROJECT FINDINGS, CONCLUSIONS AND MAJOR RECOMMENDATIONS

Although many environmental and socio-economic impacts are discussed in this report, the major considerations are those affecting fisheries, wildlife and riparian forest ecosystems, and those affecting the Peigan Indian Band. The consequences of the project in these four areas impose substantial environmental, social and economic costs and underlie the principal conclusions and major recommendations of the Panel. When considered in the context of the small economic benefits to be derived from increased irrigation agriculture and other uses of the dam, they lead the Panel to its preferred, but not unanimous, recommendation that the dam should be decommissioned by opening the low level diversion tunnels and permitting unimpeded flow of the river.

However, recognizing that the proponent has shown some efforts at mitigation and that acceptance of the first recommendation would lead to inter-jurisdictional conflicts, the Panel is prepared to recommend that the Dam continue to operate on certain conditions which must be fulfilled within a reasonable time. These conditions arise from the Panel's finding that there are impacts for which mitigation efforts must be substantially improved if the dam is to be operated. Consequently, the Panel presents an alternative set of recommendations designed to minimize the project's negative consequences.

### Fisheries

The fishery resources of the Oldman, Crowsnest and Castle rivers are very highly valued by anglers. The effects of the dam on fish are to flood approximately 1.3 million square metres of critical fish habitat, which includes about 225,000 square metres of high quality rainbow trout habitat, and to alter temperature and flow regimes downstream from the dam. Virtually all participants and the Panel concluded that the reservoir would be unproductive as fish habitat. Fishery mitigation measures are intended to enhance fish habitat upstream from the reservoir and replace the most significant 225,000 square metres. The Panel concludes that even this modest objective will prove very difficult and far more expensive than the proponent believed and budgeted for. Even if that objective were achieved, the "no net loss" requirement of the federal Policy for the Management of Fish Habitat would not be met. Altered flows and temperatures downstream from the dam together with the blockage to migration created by the dam will adversely affect rainbow trout and bull trout populations. On the other hand, conditions downstream from the dam will become suitable for brown trout and creation of a brown trout fishery downstream is a potential compensation measure. This potential could only be realized if brown trout were successfully introduced downstream. The Panel concludes that the losses to the fishery resource caused by the project greatly outweigh any potential gains and that the impacts of the project on fishes are very significant.

### Riparian Forest Ecosystem

The riparian cottonwood forests in the Oldman valley were clearly identified as a highly valued ecosystem (described as

being "provincially and nationally significant"). A substantial loss of these forests has occurred due to flooding of the reservoir. Downstream forests are also put at risk because of altered flows in the Oldman River. Aging and decline of cottonwood forests has been documented below every east slope dam investigated including the St. Mary and Waterton dams. Any loss of riparian forest would also have an effect on fish, birds, wildlife and people, both Native and non-Native. Although damage to this ecosystem, apart from the areas cleared for the reservoir, is not certain, the Panel regards loss of cottonwood forests as being extremely undesirable. In spite of considerable study of the cottonwoods for the purpose of mitigating such impacts, there is no certainty that they can be avoided. Loss of cottonwood forests would constitute an unacceptable environmental and economic cost of the project.

### Wildlife

Several prominent species of wildlife are known to be adversely affected by the project and others probably were. Loss of Prairie falcon nests was adequately compensated by construction of new nest sites elsewhere. Loss of ungulate habitat by flooding the reservoir was reduced but not eliminated by creating alternative habitat in the surrounding areas. The creation of new habitat suitable for whitetail deer would probably result from expanded irrigation farming but at the expense of other wildlife habitat. Other wildlife concerns, such as the effects of the dam on many other species or on genetic diversity, were inadequately addressed or not addressed at all by the proponent so that the Panel is unable to determine the full extent of the project's consequences. The loss of ungulate habitat and the uncertainties in total wildlife impacts represent a substantial cost of the project.

### Effects on the Peigan Band

The Oldman Dam project has many social and cultural consequences for the Peigan. Most significant among these are the following: the Peigan were not sufficiently involved in key decisions about the project; many resources important to their culture, such as cottonwoods, fish, game and willows will be affected by the project; the potential for mercury contamination of fish downstream from the dam could have health consequences for the Peigan; and important culturally and spiritually valued areas within the reservoir were flooded. The Panel concludes that the Oldman River Dam project could be very detrimental to the Peigan Band. On the other hand, the Peigan could reduce the negative impacts and derive some benefits if they were able to reach an agreement with the proponent.

The Peigan were not treated fairly in the decision-making, planning or implementation phases of this project. The failure of the proponent and the Peigan to come to terms over this project is one of the most significant and unacceptable features of the project.

Overall Conclusions:

The Panel weighed economic costs and benefits and determined that, when the costs of construction were included, the Oldman River Dam would be very difficult to justify on economic grounds. Under current conditions, with construction costs spent and not retrievable, the Oldman River Dam project creates a small net positive economic benefit directly to the farmers, some positive secondary economic benefits to agriculture-related industries, and small positive economic benefits from the availability of water for domestic water supplies. These benefits will be reduced if crop prices continue to decline or if fewer than 70,000 hectares are actually irrigated by the project. The Panel also concluded, however, that the positive regional benefits are not mirrored by positive provincial or national benefits.

The Panel concludes that the environmental, social and economic costs of the project are not balanced by corresponding benefits and finds that, as presently configured, the project is unacceptable.

What then should the government of Canada do? The fact that the project is virtually complete greatly constrains the options for cost effective solutions to the problem posed by the Oldman River Dam. The project is not acceptable for the reasons outlined above. An extreme option for resolving the problem would be to dismantle the dam. The Panel thinks that this would be an inappropriate use of government funds. The Panel's preferred recommendation is to decommission the dam by opening the low level diversion tunnels and permitting unimpeded flow of the river. However, the Panel recognizes that this option may pose insurmountable inter-jurisdictional difficulties. Consequently, the Panel also presents a secondary set of recommendations directed toward minimizing the environmental and socio-economic impacts of the dam if it were to be operated.

**Recommendation 1: Decommission the Dam**

Decommission the dam by opening the low level diversion tunnels to allow unimpeded flow of the river.

This recommendation is the preference of all Panel members except Mr. Anderson.

Decommissioning would sharply reduce the effects of the dam on fish (most of the habitat upstream would be re-established within a few years but the migration blockage created by the dam would remain initially) and would result in the downstream flows in the Oldman River being restored to their pre-project regime. Thus, the impacts on downstream riparian ecosystems and on the Peigan would be virtually eliminated. Wildlife impacts caused by the clearing of the reservoir would continue until the reservoir area is revegetated. The majority of environmental impacts would be suitably mitigated by this approach. The price paid, however, is that most benefits of the project would be sacrificed.

This report was completed as the Oldman Dam was impounding early spring runoff for its second season of operation. The Panel recognizes that, at this stage in the project, some individuals have made investments in anticipation of project operation and that these individuals may also suffer losses if Recommendation 1 is implemented.

The Panel believes that the federal government has the authority to require such action under both the Navigable Waters Protection Act and the Fisheries Act. If this recommendation is accepted, an initial environmental assessment would need to be carried out by the federal government before any action is taken.

**Recommendation 2: Conditional Approval**

**If Recommendation 1 is not accepted and the Oldman River Dam is to be operated, attach stringent conditions to the approvals granted by the federal government. These conditions include the proponent reaching an agreement with the Peigan and making a long term commitment to mitigating the many environmental impacts of the project.**

This second recommendation is the strong preference of Mr. Anderson and, although endorsed by the other five members as the second best option, it is not their preference.

The Panel's less preferred second recommendation is offered because the proponent has shown some efforts at mitigation and because acceptance of the first recommendation may lead to insurmountable inter-jurisdictional conflicts.

In the view of the Panel, the federal government has the authority to impose all the recommended conditions. The authority arises primarily from the Navigable Waters Protection Act and the Fisheries Act.

The conditions which must be imposed if the dam is to be operated are such that the adverse environmental and socio-economic impacts of the project would be acceptably mitigated. This will require a much greater commitment of resources by the proponent. It will also require a willingness to be more flexible in dealing with the social and cultural concerns of the Peigan.

Conditions:

If the dam is to be operated, the proponent must first be required to reach an agreement with the Peigan with respect to the mode of operation of the dam. If such an agreement is not achieved, no approvals should be issued and the dam should not be allowed to operate. In view of its fiduciary responsibilities, the Department of Indian Affairs and Northern Development should be involved and should ensure that the Peigan have the resources to participate fully and meaningfully in negotiations. The Peigan indicated their willingness to negotiate; they should be held to their promise. In addition, because of the currently unsatisfactory relations between the Peigan and the proponent, the Panel advises the use of a mediator to help ensure that any discussions proceed effectively and fairly.

The other conditions to be met involve the proponent making the necessary long term commitments of resources needed to mitigate the environmental impacts of the project, especially those affecting fish, wildlife and riparian ecosystems. Details of these impacts and recommendations for reducing them are presented in Section 3 of this report.

Until agreements are reached regarding the mitigation of environmental and socio-economic impacts, the operating regime of the reservoir should be determined by the Department of Transport, in consultation with the Department of Fisheries and Oceans, the Department of the Environment and other federal departments as necessary. This initial operating regime should be chosen primarily to ensure environmental protection and to provide an added incentive to settle outstanding issues.

### **Recommendation 3: Environmental Management Committee**

**Create an Environmental Management Committee and give it full authority to mitigate and continue mitigating the major environmental impacts, especially those affecting fish, wildlife and riparian ecosystems. Programs and activities of the Environmental Management Committee should be open to public scrutiny.**

The Panel believes that measures to mitigate the environmental effects of the dam would best be undertaken by a properly constituted independent body and that this body should be created as soon as possible. Indeed, the proponent has made considerable and successful use of the "Local Advisory Committee" to guide its mitigation work to date. The Local Advisory Committee, however, does not have independent authority and it consists of only a subset of those affected by the project. Membership of the Environmental Management Committee should include balanced representation from:

- 1) the local community, possibly drawn from the current members of the Local Advisory Committee;
- 2) the Peigan Band;
- 3) relevant federal government departments, including the Departments of Fisheries and Oceans, Indian and Northern Affairs, and Environment;
- 4) the proponent;
- 5) downstream water users such as irrigation farmers and municipal users; and
- 6) environmental groups (possibly chosen from nominations by the Alberta Environment Network).

Funds for the operation of the Environmental Management Committee should be provided by the proponent. It should be noted that the purpose of having the federal government representatives on the committee is to ensure adherence to conditions of approval for the project imposed by the federal government. In this way, the federal government agencies can contribute their expertise and assure themselves and the public of compliance with conditions imposed in the federal approval.

Tasks for the Environmental Management Committee will vary depending on whether or not the dam is decommissioned. If the dam is decommissioned, the Environmental Management Committee would be a short-term creation and would function primarily to oversee rehabilitation of the reservoir area. The Committee's main tasks would include, but need not be limited to the following.

- 1) Rehabilitation of the reservoir area, including establishment of woody vegetation along the stream bank to stabilize the bank, seeding of quick growing crop cover on exposed areas of sediment to prevent erosion and drifting, and planting to prevent erosion on steep slopes where trees were removed.
- 2) Modification of the diversion tunnels to permit upstream passage of fish at low to moderate flows.
- 3) Monitoring of the fisheries mitigation structures to ensure that they are not creating navigational or other problems. These upstream fisheries mitigation structures need not be maintained.

The Environmental Management Committee may also wish to become involved in locally desired projects where they arise. These may involve such projects as maintaining fish mitigation structures in degraded sections of the Crowsnest River and maintenance of recreation sites constructed in the reservoir area.

*"If you're going to have meaningful public involvement, you have to get the public involved early at the beginning, you have to give them some assurance that their input is going to be listened to and that it's going to have some effect on what actually takes place."*

*Hilton Pharis, November 5, 1991*

If conditional approval to operate the dam is granted, the Environmental Management Committee should be established for the operational life of the project to oversee the monitoring, evaluation and management of environmental and socio-economic impacts and the mitigation programs. The Environmental Management Committee's tasks would include, but need not be limited to, the following:

- 1) Determine specific objectives for mitigation programs.
- 2) Determine clear and measurable indicators of the success of mitigation programs.
- 3) Plan and implement mitigation or rehabilitation measures. These measures must include programs for conserving and enhancing fish production (not restricted to game species) and for protecting wildlife and riparian ecosystems.
- 4) Evaluate the mitigation or rehabilitation programs and report the findings. If required, these findings should be used to adjust the mitigation or rehabilitation measures in order to make them effective.

Many participants in the review suggested that a trust fund be established totally under the control of the Environmental Management Committee for the purpose of environmental

management. The Panel regards that as a reasonable approach but would be satisfied with any equivalent commitment by the proponent that achieved the management and mitigation objectives. The independence of the Environmental Management Committee, within a reasonable fiscal framework for financial accountability, is important to allay fears that the proponent is itself defining the mitigation measures and determining the success of the programs. The mitigation or rehabilitation measures and their success are of considerable importance to many Albertans. Both users and the wider public have reasonable expectations that they should be informed about and be able to comment on the environmental management program.

If a commitment to reducing these environmental impacts is forthcoming, then the federal approval for operation of the Oldman River Dam should include conditions that require the successful and continuing application of the environmental management program.

#### **Recommendation 4: Agreement Between the Proponent and the Peigan**

**Establish a negotiating process by which the proponent and the Peigan can reach an agreement on mitigation and compensation for environmental, social and cultural impacts of the project on the Peigan and Peigan Reserve.**

The Panel has concluded that the project has significant environmental, social and cultural consequences for the Peigan that need to be compensated or mitigated before the project

can be acceptable. This will require that the proponent and the Peigan enter forthwith into meaningful negotiations in good faith as to the nature of these impacts and as to what would be required to mitigate or compensate for them. The issues to be negotiated should only include the impacts of the dam project and not other issues such as ownership of the river and its bed, or structures in the river on reserve lands.

There should be an independent observer, agreed to by both parties, in attendance at the negotiations. The responsibility of this observer is to determine if either party is obstructing the process and to report the nature of such obstruction to the Minister of Environment. If the Peigan are determined to be obstructing the process unreasonably, the Minister should then proceed as if agreement had been reached. If the proponent is determined to be obstructing the process unreasonably, the Minister should then invoke Recommendation 5.

The Panel assumes that the parties will reach an agreement to agree and will be able to negotiate, in good faith, a reasonable and equitable settlement. Since an impasse is always possible in complex negotiations, the Panel suggests that the parties agree early in the negotiations on a binding dispute resolution mechanism.

#### **Recommendation 5: Failure to Comply**

**If the proponent fails to comply with Recommendations 2, 3 and 4 then decommission the dam in accordance with Recommendation 1.**

The Panel is unanimous in supporting Recommendation 5.

### 3.0 ISSUES

This chapter presents a more complete discussion of the environmental and socio-economic effects of the **Oldman** River Dam. The effects of the project on specific resources are described, opportunities to mitigate adverse effects identified, and the Panel's conclusions and specific recommendations presented. This chapter provides support for the Overall Project Findings detailed in the previous chapter.

#### 3.1 Hydrology

The review of the hydrological aspects of the **Oldman** River Dam project considered three main areas: the flow regime resulting from regulation; sedimentation; and fluvial geomorphology.

##### Flow Regime

The **Oldman** River Dam is designed to store spring runoff for subsequent release during the summer. As a result, regulated post-project flows down-stream of the dam will generally experience the greatest decrease in May or June. During July, August and September post-project flows will be greater than the corresponding pre-project flows, along the river reach from the dam to the first major irrigation diversion. Since the **Oldman** River Dam would result in expansion of irrigation at various locations in the South Saskatchewan Basin, the increased mean summer flows of the post-project regime below the dam would be feeding increased irrigation diversions, thereby eliminating the increase in mean flow for the far downstream reaches of the South Saskatchewan River in Alberta.

All major downstream tributaries of the **Oldman** River, particularly the Waterton, Belly and St. Mary rivers, are themselves regulated by dams and/or diversions and have some of their flows extracted by various irrigation systems. The operating regimes of these rivers are potentially affected by whatever operating strategy is adopted for the **Oldman** River Dam.

At Lethbridge, only the mean regulated July and August flows will be greater than the corresponding pre-project flows after all the proposed irrigation development has occurred, while reduced mean flows are predicted for all other months. At Medicine Hat there is only a very small increase in mean flow for July and reductions in mean flow for all other months. Decreases in the mean monthly flows of the Waterton, Belly and St. Mary rivers are proposed for all months of the year as part of the operation of the **Oldman** River Dam. However, minimum **instream** flow requirements for these tributaries are established in the South Saskatchewan Basin Water Allocation Regulation. Although there will be reductions in mean monthly flows at most sites and most times throughout the South Saskatchewan River system, the **Oldman** River Dam will alleviate extreme summer low flows of dry years along the **Oldman** River (but not along the Belly, Waterton and St. Mary Rivers).

Operation of the **Oldman** River Dam would be part of an integrated system of water management by the Alberta government in the South Saskatchewan River Basin. Under an apportionment agreement, at least 50% of the annual natural

runoff from the Alberta portion of the basin must be passed to Saskatchewan. Since Gardiner Dam on the South Saskatchewan River provides complete multi-year regulation in Saskatchewan, the only effects below it will be a modest reduction in total available flows due to increased use of water for irrigation in Alberta.

The future downstream flow regime depends almost entirely on the details of the operating regime adopted for the **Oldman** River Dam. At present, the operating regime is not well enough defined to answer many important questions on downstream effects. Numerous issues are directly or indirectly linked to the flow regime. The main ones are:

- i) Floods: There was broad agreement that the project does not provide significant, reliable, flood protection. However, it is expected that the project would reduce the magnitude of most small and some large floods.
- ii) Consumptive uses: Most agreed that the project will make it easier to meet all presently licensed downstream consumptive uses and that it does not in any way interfere with meeting the province's commitments to Saskatchewan. It was pointed out, however, that the latest operating plan and the plans for expanded irrigation do not contain any safety allowances for matters such as data uncertainty, upstream land use changes, or global warming.
- iii) In-stream flows: Alleviating a persistent problem of inadequate late summer flows on the **Oldman** River near Lethbridge is one of the stated objectives of this project. There was general agreement that this is desirable and will in fact be achieved, at least in the short to intermediate term. However, some participants suggested that this objective could be achieved by other means, such as improved water management and correcting past water over-allocation. There were concerns that, given the planned expansion of irrigation, the problem could be as bad or worse in the relatively near future on the **Oldman** River and that the increased low flows in the **Oldman** will be used as a justification to reduce even further the already low summer flows of the St. Mary and Belly rivers. Another issue related to increased summer flows is that fording of the river on the Peigan Reserve would be more difficult.
- iv) Groundwater: Groundwater levels in river valleys tend to be quite closely related to the water levels in the channels. The groundwater regime of the flood plain areas along the rivers affected by the **Oldman** River Dam is not well enough understood to draw conclusions that would be useful in predicting detailed downstream effects on floodplain ecosystems.

In summary, while the post-project operating regime is adequately defined for the planned expansion of irrigation, there are too many uncertainties to permit a detailed environmental assessment of downstream effects. The project clearly changes the frequency of both small and large floods in the **Oldman** River and there could be significant effects on the

flow regime of other rivers that have not been assessed for their impact.

### Sedimentation

Together with their flow of water, rivers also move sediments, from fine silt or clay-sized materials right up to boulders. Dams interfere with this process by forcing the river to deposit its sediment load in the reservoir, thus depriving it of sediments immediately below the dam, and by altering the flow regime below the dam.

The capacity of a river to transport sediment depends on the flow of water. The altered flow regime can therefore be expected to result in the erosion or deposition of sediment at different times and places from what would occur naturally. Since sediment transport is closely related to the flow in any river, the uncertainties associated with the future flow regime lead to uncertainty with respect to sediment transport. Some of the specific matters of concern associated with the Oldman River downstream of the dam are:

- i) Scour below the dam: The sediment-free water released at the dam might pick up a new sediment load from the river channel downstream, thereby causing erosion and channel degradation. For the Oldman River, this was not predicted to be a major problem.
- ii) Deposition at tributaries: Due to reduced flood peaks below the dam, the river might no longer be able to transport the sediment loads brought to it by tributaries, thereby causing sediment deposition in the vicinity of the confluences. Overall, such deposition was not anticipated to be a major problem due to the low sediment loads of major tributaries.

The main sedimentation concerns associated with the reservoir are:

- i) Reservoir life: The rate at which the rivers flowing into the reservoir build deltas and the time it will take for the reservoir to lose its usefulness may be of concern if the expected life is short. There was general agreement that the life of the reservoir would be long (several hundred years) in terms of normal environmental and economic considerations.
- ii) Wave erosion: Erosion of the reservoir shoreline by waves can result in significant land loss and silty reservoir water. A considerable amount of wave erosion is expected. This process is likely to contribute volumes of sediment to the reservoir comparable with those from the inflowing rivers. There was uncertainty as to whether reservoir releases would be sediment free or whether wave erosion and extreme drawdowns might occasionally result in silty outflows.
- iii) Wind erosion: Operation of the Oldman River Dam will draw down the reservoir and expose areas of its bed. About 1500 ha of reservoir shoreline will be exposed on average once in 5 years and 2200 ha is expected to be exposed once in 10 years. Reservoir drawdown will begin in summer and will be greatest in February. It is

estimated that about 100 ha of flats located north of the dam will likely be subject to erosion by wind as will smaller areas at the west end of the reservoir. Should wind erosion problems arise, mitigation practices brought up during the hearings, such as the use of snow fencing, soil ripping, seeding farmlands to grass, soil-trapping hedges and the use of tree shelterbelts integrated into wildlife mitigation programs, should be implemented.

The lack of monitoring data on downstream sedimentation and fluvial geomorphology of several comparable, previous projects, and the limited investigations related to the Oldman River Dam make it difficult to predict conditions downstream of this project. Scour or degradation below the dam, sediment deposition at tributary mouths, sediment transfer through the reservoir, and downstream water quality could all be estimated with a fair degree of confidence if monitoring and modelling had been carried out for projects such as the Brazeau, Big Horn, Dickson, St. Mary and Water-ton dams.

The reservoir life is too long to be a significant issue. Wave erosion of the reservoir shorelines might become severe locally but is unlikely to result in major direct problems, other than water quality. The Panel concludes that wind erosion of the reservoir bed may be a problem and suggests that this be monitored by the Environmental Management Committee and if necessary appropriate remedial actions be taken.

### Fluvial Geomorphology

Rivers form their own channels and through the processes of erosion, deposition, sediment transport and channel shifting, they are responsible for the entire landscape of the valley floor. The study of these processes is termed fluvial geomorphology. Over the long term, any altered flow and sediment transport regimes can be expected to result in an altered fluvial landscape. This, in turn, can be expected to have effects on flood plain vegetation, fish and wildlife. Downstream geomorphologic effects of dams are known to depend primarily on the degree to which peak flows and sediment loads are reduced, parameters on which data were limited for the Oldman River Dam project. Predictions about what will happen to the geomorphology of the Oldman River downstream of the dam differed widely. Specific issues brought to the Panel's attention are:

- i) Channel stability: The rate at which a river channel shifts about on a flood plain affects not only fish and wildlife habitat, but also human developments. The Panel was informed that, in general, the channel will be more stable under the proposed operating regime.
- ii) Channel size: Reduced floods encourage vegetation encroachment into river channels with secondary effects on water temperature and fish habitat. The most probable change, the Panel was told, would be a gradual reduction in channel size through vegetation encroachment and sediment deposition.
- iii) Bed materials: The composition of river bed gravels is an important fisheries parameter which depends quite closely on the flow and sediment transport regime. The

data were insufficient to make reliable predictions on this topic.

- iv) **Flushing flows:** The effects of flow regulation on channel stability, channel size and bed materials might, the Panel was told, be mitigated by releasing artificial flood flows from the dam. Such releases are termed flushing flows. The need for flushing flows, their timing, and magnitude are uncertain.

Reasonably reliable predictions of future geomorphologic change would require well defined pre- and post-project flow regimes with particular emphasis on flood frequency, an understanding of the future sediment loads and monitoring data from some comparable projects. Unfortunately, these data are not available. Several of the proponent's predictions of geomorphologic change appear to rest on the assumption that there will be no change in the frequency of the larger floods. The Panel received information which led it to believe that the frequency of large floods would be reduced.

### Conclusion on Hydrology

If the diversion tunnels were re-opened, effects on hydrology, sedimentation, and fluvial geomorphology would be greatly reduced and mainly restricted to the dam and reservoir sites. For the short term, removal of the tunnel plugs and low-level outlet valves and repair of the tunnel lining is all that is needed. This would leave the dam as an effective flood control structure, giving protection against nothing but the very largest floods. The reservoir area, or at least parts of it would remain subject to infrequent inundation. Whether this is a desirable situation for the longer term can only be determined on the basis of further hydrological and environmental work. Increased flow capacity through the dam might be desirable.

### **Recommendation 6: Hydrology**

**If the project is decommissioned, assess the extent and frequency of flooding on lands upstream of the dam to determine the best uses for the lands and to design appropriate reclamation projects.**

**If the project is operated, undertake monitoring and analyze the data to define more clearly hydrological changes and mitigation options. Such a monitoring, evaluation and management program should be a condition of any approval granted by the federal government for this project.**

The Panel notes that predictions of the hydrological changes associated with the Oldman River Dam were limited, in part, by the lack of monitoring data from similar past projects constructed in Southern Alberta. The Panel urges that monitoring programs on the Belly, Waterton and St. Mary rivers be undertaken in addition to the program for the Oldman River recommended above.

## **3.2 Water Management**

*"To maintain quality of life, to remove limits to growth, and to encourage economic development, water resource development has been and will continue to be a vital ingredient in the equation. Some may call water resource development a necessary evil, whereas the facts show it simply as necessary. "*

*Don LeBaron, November 5, 1991*

The Oldman River Dam project will capture and store the spring runoff of the Oldman River for release later in the year when natural flows are low. These releases will be used primarily for irrigation and to increase summer low flows in the Lethbridge area.

The Panel heard that water management to meet society's needs can be accomplished by supply management, demand management or a combination of the two. Under supply management, projects such as dams are built to supply water as required by users. Demand management, which seeks to reduce or control water consumption by more efficient use of water resources, aims to make more effective use of the water resources available. It is a strategy that encourages planning by systematically accounting for water use. It is the Panel's view that construction of the Oldman River Dam is premised on a supply management approach. The project will increase the overall consumption of water.

*"Alternatives to dams do exist, and water conservation and fair pricing are the best ways of stretching what everybody says is a limited water supply in the south. "*

*Cliff Wallis, November 5, 1991*

The Panel believes that plans for expanded consumptive uses are likely to result in future water shortages and that a clamour for further water storage or diversion projects is probable. The proponent's in-stream flows would improve the present, unsatisfactory late summer situation near Lethbridge in the short to intermediate term. This problem is a direct result of flow over-allocation in the past. Increased summer flows in the Oldman River will allow greater amounts of water in the St. Mary and Belly rivers to be allocated for irrigation or other consumptive uses while still meeting minimum in-stream flow requirements in the Oldman River.

The Panel did not receive any information to suggest that the Alberta government or the users have, to any significant degree, implemented demand management. For example, the Lethbridge Northern Irrigation District indicated that it has no requirement for water users to pursue water management. The opinion was expressed that water pumping costs were sufficient to provide an incentive for irrigation farmers to conserve water.

Alberta taxpayers pay the majority of the costs for the present supply management system. The government pays all capital and maintenance costs of storage dams and irrigation headworks. For capital and rehabilitation costs of the canals, Alberta pays 86% and the irrigation farmers 14%. The irrigation farmers pay the full cost of on-farm irrigation equipment. None of the users of the water, irrigation farmers nor municipalities,



pay for the use of the water. Charging users a greater proportion of the cost of providing water would be one mechanism to promote greater conservation of this resource.

Conclusion:

The Panel is of the opinion that decisions on water management projects should be based on a better balance of supply and demand management. Appropriate pricing of water would lead to more rational economic decisions and fewer environmental impacts because of greater conservation. The Panel concludes that the federal government, as part of its policy on water management, needs to support demand management and encourage greater efficiency in water use. Further, the Panel suggests that the federal government should encourage the provinces in general, and Alberta in particular, to focus more on demand management as an approach to water allocation.

#### Allocation of Water in the Oldman River Basin

Operation of the Oldman River Dam would be governed by the South Saskatchewan Water Management Model. At times of low flow it would continue to be difficult to meet all water demands within the basin. The following priorities for water allocation were identified by the proponent:

1. the interprovincial apportionment commitment to the Province of Saskatchewan;
2. domestic, municipal and industrial water supply;
3. minimum in-stream flow targets;
4. irrigation; and
5. desired in-stream flow targets.

Although broad priorities have been established, the Panel is not aware of any comprehensive studies of the in-stream flows needed to meet all demands, including environmental, aesthetic, social and health considerations. Further, the proponent did not make available an assessment of costs and benefits of dividing the water resource between consumptive and non-consumptive uses. It is clear that with limited water resources, trade offs among irrigation, municipal and in-stream non-consumptive uses will be required.

Conclusion:

In order to provide sufficient water for non-consumptive uses, the Panel concludes that specific reserves of water should be set aside for this purpose. Should all the proposed acres allocated for irrigation be developed, the Panel fears that the situation would quickly become the same as it was in the early 1980s and pressures would develop for more dams and diversions to meet the "need" for more water. As long as water is provided to users without charge, and environmental protection is undervalued, as it was in the planning for this project, more environmentally damaging projects will be proposed. The Panel very much wishes to avoid such a future.

The Panel was advised that global warming could have a substantial effect on agriculture in Southern Alberta. Higher temperatures would result in increased water demands due to

increased evaporation and crop evapotranspiration. The Panel concludes that this concern is real and should be considered in water allocation decisions.

#### **Recommendation 7: Water Allocation for Conservation**

**If the project is operated, apply a condition to any approval issued by the Minister of Transport that a reserve of water for conservation purposes (such as minimum fisheries flows and flows sufficient to ensure protection for riparian cottonwood forests) be set aside. It is further recommended that the determination of minimum flows for conservation purposes be assigned to the Environmental Management Committee.**

#### Interbasin Transfers

Several participants in the review suggested that the Oldman River Dam was one small part in a greater scheme of water diversion projects that would lead to interbasin transfers and the export of water. The Panel was told that Alberta has no policy to export water or to pursue interbasin transfers at this time. Allocation of water for irrigation (or other uses for that matter) is effectively permanent. It also leads to arguments that more water should be allocated for such uses or else the water will be "wasted". These arguments, especially when there is no price charged for the water as is the case in Alberta, inevitably lead to over-allocation of water and "shortages". This over-allocation can, in turn, lead to demands for more water storage or diversion projects. The Panel is concerned that this water allocation process could easily result in demands for large water diversion schemes even without the intent of the proponent to do so.

### **3.3 Irrigation Development**

*"Farming is a tradition around Lethbridge. Agriculture production is the backbone of Lethbridge's economy. We have some of Canada's finest grazing land, some of the world's best wheat, and fields that boast an abundance of crops, ranging in diversity from corn and canola to honey and len tils."*

*Mayor David Carpenter, November 5, 1991*

Construction of the Oldman River Dam is predicted to result in expansion of irrigation by about 70,000 hectares (170,000 acres). Issues related to expanded irrigation include water use, water allocation, soil salinization and water quality.

#### Water Use

Irrigation has been practised in Southern Alberta on an organized basis since about 1890. There are presently 13 irrigation districts in Southern Alberta ranging in size from less than 800 ha (2000 acres) to over 120,000 ha (300,000 acres). The assessed acreage in 1989 was about 480,000 ha (1,185,000 acres). Private irrigation schemes play a small role in the irrigation industry. Today there are about 81,000 ha (200,000

acres) under private licenses irrigated directly from the rivers in the South Saskatchewan Basin.

There are 31 different crops grown under irrigation in Southern Alberta. The list includes soft white wheat, hay, silage, vegetables for canning, sweet corn, sugar beets, potatoes, lentils, green peas, dry peas, dry beans, and canola. Additionally, livestock and poultry production is closely associated with field crops under irrigation.

The Panel was told that irrigated farmers apply about 600 mm of water per annum to their irrigated land. Irrigation of the full 70,000 hectares would thus require an additional 420 million cubic metres of water. While not all of this water is drawn from the Oldman River, this amount of water corresponds to a mean annual flow of 13.3 cubic metres per second. This amount is approximately 18 percent of the mean annual flow of the Oldman River at Lethbridge.

A number of presenters proposed alternatives to the Oldman River Dam project. For example, further expansion of off-stream storage and on-farm water conservation measures such as improved irrigation scheduling were mentioned. Groundwater was suggested as a possible alternative source for irrigation; however, there was general consensus that this was not a viable alternative. The Panel accepts that sufficient irrigation water cannot be provided by sub-surface sources. The efficiency of water used for irrigation has long been a subject for debate. In general, efficiency is the ratio of water used to water diverted for irrigation. The water used includes water used by plants, evaporated from soil and used to maintain a salt balance. Improved agricultural practices and rehabilitation of canal and storage systems have resulted in a gradual improvement in delivery efficiency over the last ten to fifteen years. While progress has been made, it is slow and more work is needed in both agricultural practices and water delivery systems to obtain better efficiencies.

Irrigation scheduling is an important technique for obtaining efficient on-farm use of water. Another method of managing consumption is charging for water, which requires measurement of water at the farm gates. The present system, where irrigation district staff turn water in and out on demand, is having a positive effect on the efficient use of water but, if accurate records of water use by farmers are required, improvements in the system are needed. The Panel concludes that a study of farm gate delivery control techniques should be undertaken.

### **Recommendation 8: Efficiency of Water Use**

**The federal government should support and encourage research, development and implementation of techniques for improved efficiency of water use.**

#### Water Allocation

The Alberta Government's South Saskatchewan Basin Water Allocation Regulation (dated September 20, 1991) sets out the irrigation acres expansion limits within the basin and distributes the proposed addition of about 70,000 hectares (170,000 acres). As noted earlier, the Panel's main concern

about this allocation is that it may not allow an adequate supply of water for in-stream non-consumptive uses.

The Panel was advised that the Peigan were not fully part of the allocation process. A study conducted for the Peigan suggested there were about 20,000 hectares (50,000 acres) of irrigable land on the reserve. This is considerably greater than the 6000 hectares (15,000 acres) for which irrigation water was allocated. The Panel believes that the present allocation to the Peigan should be protected even if it is not used. Further, an additional amount of water should be held in reserve until an allocation agreement with the Peigan is reached.

### **Recommendation 9: Water Allocation to the Peigan**

**Withhold federal approvals for the project until an agreement between the Peigan and Alberta on water allocation is reached. In the interim, ensure that the maximum amount of water that might be allocated to the Peigan be reserved and not allocated to others.**

Further, the Panel urges the Department of Indian Affairs and Northern Development to fulfil its fiduciary responsibilities by assisting the Peigan in such negotiations.

#### Soil Salinity

Salinization of soil has long been a problem associated with both dryland and especially irrigated farming. Salinization occurs when salts are moved up in the soil profile, usually carried by a net upward movement of water. The soil is said to be saline when the salt levels are such that plant growth is impaired.

Salinization can be countered by maintaining a net downward flow of water through the root zone. This is done by controlling the amount of irrigation water applied to soil and by making allowances for rainfall. Water must be provided for the crop, plus a small amount for downward flow to carry salts out of the soil profile.

Historically, methods of irrigation (surface flooding) and crude techniques for scheduling (irrigation at specified intervals or at specified stages of crop growth) did not provide efficient application of water. Over-irrigation was common. This type of farming caused an increase in salinized land in Southern Alberta. In recent years, considerable efforts have been made to reclaim salinized farm lands. The Panel was advised that good water management can not only avoid increased salinization but that such practices in recent years have resulted in a significant decline in the amount of salinized land in Southern Alberta.

The Panel notes that a key requirement for continued salinity control in irrigated agriculture is the efficient application of water coupled with the effective use of irrigation scheduling. The Panel concludes that considerable progress has been and is being made in controlling the build up of salinity and in reclaiming saline lands. The Panel commends these efforts.

Participants expressed concern over the possibility of poisonous effects on humans and wildlife of selenium accumulation in salinized areas. The concerns were based on reports of an unusual and isolated incident in a wildlife sanctuary in California. The Panel was informed that there were no known instances in Alberta of selenium poisoning. Selenium poisoning does not represent a potential problem associated with irrigated agriculture.

#### Water Quality

The quality of water in the headwaters of the Oldman River (and its tributaries) meets or exceeds Canadian guidelines for potable water. Concern was expressed, however, that logging in the upper watershed may add sediment to the river particularly from logging roads. The Panel was informed that logging started in the headwaters area in 1983 and that serious deforestation has occurred. As a result, changes in water quality are possible.

The issue of reservoir water quality was raised. Sediment will enter the reservoir from inlet streams, shoreline erosion and blowing soil. Consequently the reservoir may be rather turbid.

Another issue raised was that return flows from irrigated lands may adversely affect water quality. The Panel was advised that the water quality of irrigation return flows is essentially equivalent to the quality of water taken out of the river. Return flows are apparently not degrading the quality of the river water.

Sewage and industrial effluent discharged into the river was raised as a concern. Recently the City of Lethbridge has improved its sewage treatment plant and the Taber Sugar Factory has upgraded its facilities. As a result, increased flows past Lethbridge are presently not required for effluent dilution.

Mercury contamination of fish has been observed in a number of newly created reservoirs and is likely to occur in the Oldman reservoir. Concern was expressed that mercury may also be a hazard in drinking water or may accumulate in irrigated crops. In reservoirs where fish have been contaminated by mercury, concentrations in water are generally undetectable. It is postulated that mercury is rapidly taken up by biota and also increases as a result of bioaccumulation. Based on this information, the Panel expects that there will be no mercury hazard in drinking or irrigation water.

### **3.4 Plant Communities**

Many environmental issues discussed at the hearings involved vegetation or plant communities in some way, but four issues were of particular concern to participants. They were vegetation loss in the reservoir area, natural prairie ecosystems, riparian cottonwood forests, and willow communities.

#### Reservoir Area

There is a concern that areas disturbed by dam construction and the area flooded by the reservoir may have contained endangered or rare plants or plant communities. A baseline vegetation survey of the dam site and reservoir area was

completed before the reservoir was flooded but there is general agreement that the present data base is inadequate to define fully the project impacts on rare plants or plant associations.

#### Conclusion:

Notwithstanding a lack of data, clearing and flooding the reservoir area has undoubtedly damaged the ecological diversity of Southern Alberta. Several provincially and nationally rare species are likely to have been affected. If the project were to be decommissioned, the reservoir area would take many decades to recover fully. The gravel salvage operations in the reservoir have resulted in extensive disturbance to parts of the reservoir area.

#### Natural Prairie Ecosystems

There is a concern that expansion of irrigation may include areas of native prairie grassland. The grasslands of the Canadian Prairies are, the Panel was told, one of North America's most endangered ecosystems. Almost all of this natural ecosystem has been lost as a result of cultivation. Although much of the proposed irrigation expansion will affect areas that are presently (or have been in the past) under dryland cultivation, some of the now rare, natural prairie ecosystems may also be lost.

It is not known at present exactly where the proposed expansion of irrigation will take place. The procedure for irrigation allocation, however, is well defined and was explained to the Panel. It makes no allowance for rare plant or ecosystem losses or for any of the commitments of the province under either the Prairie Conservation Action Plan or the Wildlife Policy for Canada.

#### Conclusion:

The Panel considers that loss of natural prairie ecosystems would represent a significant environmental impact of the Oldman River Dam project. These ecosystems are of value since they provide biodiversity and because of their scarcity. In addition to their ecological importance, the few remaining natural prairie areas make an important contribution to the livability of the region, which has direct effects on its economic well being. Since the Oldman River Dam project is only one of many threats to these areas, strong protective measures are urgently needed. An inventory of natural grasslands would be desirable and negotiations with landowners could be undertaken to see if they can be induced to protect the remaining areas.

The major natural grasslands of concern are on the Blood and Peigan Reserves. Should the Indian Bands decide to irrigate any substantial portions of these lands, the loss would be significant and the Panel suggests that inducements be made to convince the Bands to preserve their remaining natural grasslands.

#### Riparian Cottonwood Forests

The cottonwood forests of prairie river valleys are the only forested habitat on the otherwise mostly treeless, semi-arid

plains of Southern Alberta. The forests contain diverse plant communities and provide essential habitat for many species of birds and mammals. The forested river valleys are also aesthetically pleasing and are the favourite location for parks and recreation areas in the region. Any loss of these riparian forests would adversely affect fish, birds, wildlife and people who use these areas. The Prairie Conservation Action Plan, which is endorsed by the governments of Canada and Alberta, identifies the riparian habitat of the southern prairies as an endangered ecosystem.

The details of the hydrological regime required for healthy cottonwood forests are not fully understood. Spring flooding followed by gradual flow reduction and adequate summer flows are some of the requirements. Changes in downstream flow regime as a result of the Oldman River Dam could have a significant effect on riparian cottonwood forests. Extensive die-back of riparian cottonwood forests is well documented for many regulated rivers, including the Water-ton and St. Mary rivers. The Panel was advised that the latest operating regime would not be optimal for Oldman River cottonwoods but that they would probably survive. With respect to the St. Mary and Water-ton rivers, the Panel was told that the Oldman operating regime will increase the stresses that are already causing a decline in riparian cottonwoods along these rivers.

Conclusion:

Both ecologically and in terms of human livability, the riparian cottonwood forests are the most important plant community of the region. Past irrigation developments and agricultural land clearing have already caused a serious decline in the total available area and have virtually eliminated cottonwood forests from some reaches of the St. Mary and Water-ton rivers. The proponent's reports indicate that any decline in riparian cottonwood forests below the Oldman River Dam would be addressed with appropriate changes to the operating regime; however, given the losses on other regulated rivers the effectiveness of this mitigation measure is not assured. Techniques for rehabilitating damaged or destroyed cottonwood forests need to be developed and tested (for example, at affected sites below existing dams in Alberta) before any more of these riparian communities are put at risk.

#### **Recommendation 10: Riparian Cottonwood Forests**

**If the project is operated, then monitoring, evaluation and management of riparian cottonwood**

**forests should be a condition of any approval granted by the federal government to ensure the survival and continued health of these ecosystems.**

#### Willow Communities

The willows, which tend to grow in the coulees and river valleys of the southern prairies, provide browse and shelter for wildlife and have various ceremonial uses in Plains Indian culture. Since the loss of riparian cottonwoods along some regulated rivers is well documented, there is concern that willows might suffer a similar decline along the Oldman River.

The Peigan Elders provided the Panel with detailed information on their use of willows but did not comment on availability. There is a lack of information on the effects of flow regulation in prairie rivers on riparian willow growth and reproduction.

#### Conclusion on Plant Communities

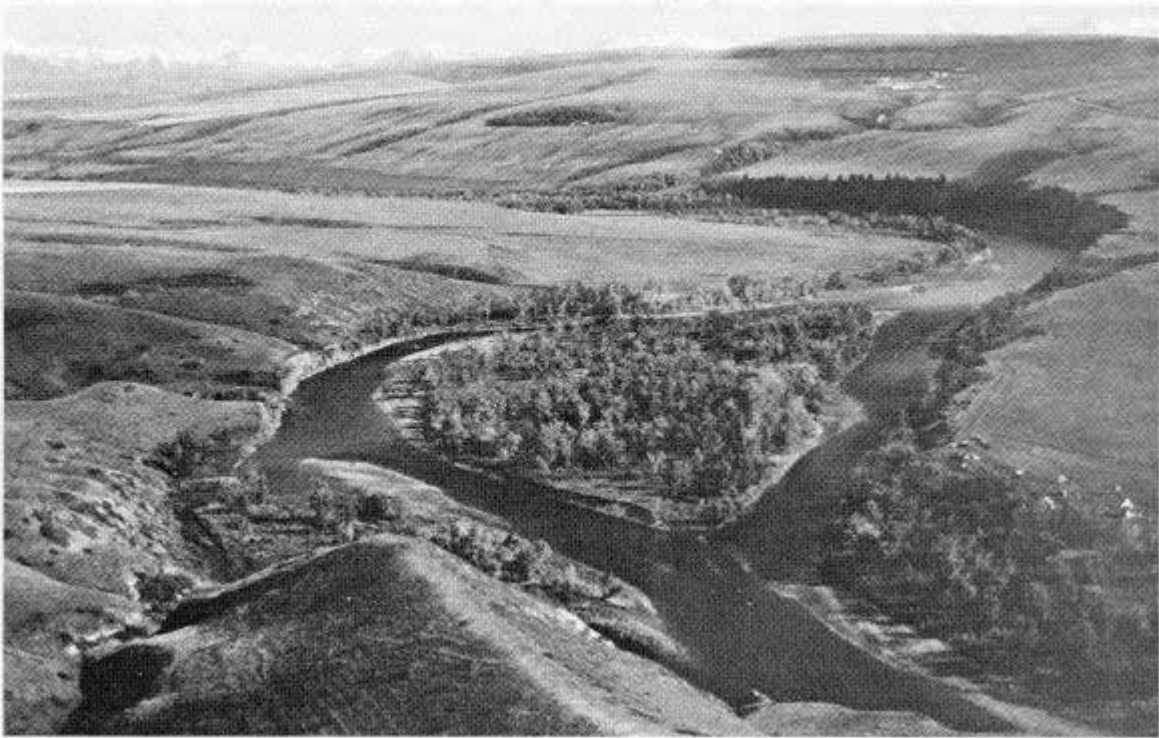
The Panel concludes that the effects of the project on vegetation would, in general, be negative but that the magnitude of these effects cannot be quantified with the existing information. Techniques to mitigate these impacts require investigation.

#### **Recommendation 11: Vegetation**

**If the project is decommissioned, undertake studies to determine to what degree the reservoir area should be revegetated and prepare and implement a reclamation plan.**

**If the project is operated, conduct surveys of plant species composition and abundance downstream of the dam to identify and quantify the effects of flow regulation. Further, reserve a portion of water in the reservoir to provide adequate flows to maintain riparian ecosystems.**

While cottonwoods are the primary species of concern for vegetation monitoring, other species such as willows should also be considered. The Peigan should be consulted on study requirements since this species is important to them. Results of vegetation monitoring should be provided to the Environmental Management Committee to determine and implement any necessary remedial actions.



Riparian Ecosystem, Oldman River  
(Photo Brian Rives)

### 3.5 Wildlife

The effects of the Oldman River Dam on wildlife habitat was a significant issue raised during this review. The federal government has a clear responsibility for migratory birds and, since wildlife are important to the Native people in the area, the federal government's fiduciary responsibility to Natives requires that any impacts on wildlife be dealt with.

Inundation of the Oldman River valley has resulted in the loss of wildlife habitat for a wide range of species. In particular, preconstruction surveys indicated that the reservoir area provided fawning and summer range for at least 220 mule deer. Other species of concern include the long tailed weasel, an endangered species, and the yellow marmot. Mammals such as the coyote, beaver, mink, badger, otter and fox were also present in the reservoir area and some of their habitat was lost due to flooding.

The reservoir area was used by both migratory and resident birds. Raptors in the area include the Prairie Falcon, Ferruginous Hawk and Peregrine Falcon. Dam construction and flooding has destroyed 25 raptor nests.

To offset the loss of wildlife habitat, a mitigation program was developed by the Alberta government in consultation with the Local Advisory Committee. The program includes habitat protection, enhancement and creation. The program, the Panel was told, is based on the following principles:

1. wildlife habitat mitigation will be defined as compensation for losses of wildlife habitat;

2. a suitable land base under Crown control will be maintained;
3. a government commitment to long term maintenance and management of the program and land base will be provided;
4. downstream wildlife habitat opportunities will be considered; and
5. a monitoring program will be developed and implemented.

As part of the mitigation program, wildlife population and habitat surveys have been conducted as part of a monitoring program during and after reservoir filling developed. The Panel was informed, however, that funds were not made available for monitoring in 1991 or for analysis of data collected in 1990.

The Panel notes that attempts to set up nesting sites for Prairie Falcons and Ferruginous Hawks around the reservoir have met with success. It encourages continued efforts to complete waterfowl and raptor surveys.

The creation of wetlands by irrigation and their value as wildlife habitat was brought to the Panel's attention. Wetlands in irrigated areas are mostly fed by seepage from irrigation canals. One participant predicted that the eventual development of 70,000 ha (170,000 acres) of irrigated land could result in about 5400 ha (13,400 acres) of wetlands. However,

the extent to which these gains are realized will be influenced by the efficiency of irrigation systems. The Panel was informed that the Lethbridge Northern Irrigation District was allocating a small portion of its water to maintain wetlands as compensation for the loss resulting from canal reconstruction to eliminate seepage. This concept should be encouraged. Further, any wetlands gained by irrigation development need to be considered in relation to natural prairie wetlands that are lost in preparing lands for irrigation.

Wildlife mitigation will require a sustained effort and may necessitate on-going applied research. The ability of the mitigation program to replace certain lost habitats, for example, critical winter habitat for mule deer, is uncertain. It was predicted that habitat creation may require up to 15 years to become effective. The Panel is concerned that there does not appear to be a commitment for the operational life of the project.

#### Conclusion on Wildlife

The Panel concludes that the following are essential elements of a successful wildlife mitigation program:

1. completion of wildlife surveys to identify mitigation requirements;

2. the setting-up of an adequate monitoring scheme to evaluate progress in the habitat mitigation program; and
- 3 a firm commitment to the program, and to a research component of the mitigation efforts, by the government of Alberta for the operational life of the project.

#### **Recommendation 12: Wildlife**

**If the project is decommissioned, the Environmental Management Committee should be responsible for identification and implementation of reclamation programs to restore the wildlife habitat of the reservoir area.**

**If the project is to be operated, the federal government should use its statutory powers to ensure that Alberta undertakes a fully funded, long-term, wildlife mitigation program (inclusive of the concerns of the Peigan people). The implementation of the program should be assigned to the Environmental Management Committee.**



Snow fences as part of the mitigation program  
(Photo Alberta Public Works Supply and Services)

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Snow fences as part of the mitigation program  
(Photo Alberta Public Works Supply and Services)

### 3.6 Fisheries

Inundation of productive riverine habitat for sport fishes and changes in the riverine habitat for fish downstream of the dam are acknowledged consequences of the Oldman River Dam project. In recognition of this, the proponent has implemented and is designing programs to mitigate or compensate for anticipated losses in recreational fishery resources.

This section on fisheries impacts begins with an overview of the effects of the project and proposals to mitigate those effects and then addresses the following issues: effects of the project on rare fish species, mitigation of fisheries losses upstream, reservoir fishery opportunities, effects of the project on downstream fisheries, and fishery opportunities created by irrigation canals.

#### Overview

The Oldman River and its tributaries, the Castle and Crownest Rivers, have been described as "blue ribbon trout streams". Surveys upstream from the dam site suggest that 60% of the high quality habitat for adult brown trout, 62% of the high quality habitat for adult mountain whitefish, and 75% of the high quality habitat for adult rainbow trout in these three rivers was inundated by the reservoir.

The reservoir is not expected to be very productive of game fishes and is likely to be a source of mercury contamination in fishes both within the reservoir and downstream.

The dam blocks all upstream and most downstream fish migration. Species that undertake seasonal migrations past the dam site include rainbow trout, bull trout, and mountain whitefish. The blockage created by the dam will be most critical for rainbow trout and bull trout since the populations of these species downstream from the dam site appear to spawn upstream from the dam site.

Changes in the hydrology, temperature, water quality, and fluvial geomorphology of the Oldman River and its tributaries downstream from the dam will affect the suitability of these rivers for trout and other species. Reduction in average river temperature downstream from the dam and higher minimum flows downstream of the Lethbridge Northern Irrigation District weir are expected to improve conditions for trout, especially brown trout, between the weir and Lethbridge. The section of river from the dam to the weir may become less suitable for trout because of altered seasonal temperature patterns, lack of spawning habitat and possibly gas supersaturation in the plunge pool below the spillway. In addition, higher summer flows may increase entrainment of fish into the Lethbridge Northern Irrigation District canal. Reduced flows in the Waterton, Belly, and St. Mary rivers would make these rivers less suitable for fishes.

To reduce or compensate for the negative effects of the project on fishery resources the Alberta government has initiated an ambitious program of mitigation. The goal of this program is to achieve "no net loss of recreational fishing opportunity" in the Oldman River and its upstream tributaries as a result of the dam. The operational definition of "no net loss of recreational opportunity" has been stated to be: "chiefly the replacement, above full supply level, of the high quality riverine fishery habitat lost to flooding but also including the mitigation of impacts on downstream fish populations." The Panel was informed by the Department of Fisheries and Oceans that this goal is consistent with the no net loss provisions of the federal "Policy for the Management of Fish Habitat".

The program for fisheries mitigation has been developed and implemented in consultation with a Local Advisory Committee of concerned residents. The budget for this mitigation program is approximately \$5.3 million of which about half has been spent to date.

#### Effects of the Project on Rare Fish Species

Only one fish species affected by the Oldman project, the shorthead sculpin, is formally recognized as threatened nationally. Several presenters, however, expressed concern for other species that are rare in Alberta or that represent unique populations. These species include East slope cutthroat trout, bull trout, lake sturgeon and spoonhead sculpin. Limited information exists on the distribution and abundance of these species in those parts of the Oldman River basin affected by the dam and associated works. The lack of information on these species makes it difficult to draw firm conclusions about the effects of the project.

#### Conclusion:

The Panel concludes that a more thorough species survey, designed specifically to provide information on the rare species that may be affected by the dam, should be initiated at once. Populations of rare species should be carefully monitored over a number of generations of each species to determine if the dam is contributing to their further decline. Special measures should be put in place to ensure that the project does not further endanger rare or threatened species or unique populations. Research into the habitat needs of these species and development of measures to conserve them should be begun at once.

#### **Recommendation 13: Rare Fish Species**

**If the project is decommissioned, modify at least one of the diversion tunnels to provide upstream fish passage past the dam. Until this measure is in place, upstream migrating fish should be trucked past the dam.**

**If the project is to be operated, a program to mitigate adverse effects on rare species should be a condition of any approval granted by the federal government. This program would be implemented under the auspices of the Environmental Management Committee.**

If the Alberta government does not act on these recommendations at the request of the federal government, then the Department of Fisheries and Oceans should do so.

#### Mitigation of Fisheries Losses Upstream

*"Let's take a look at the question of no net loss of recreational opportunities. There is little doubt in our minds that the Oldman River mitigation will have great difficulty in meeting the objective of, 'no net loss of recreational angling opportunities.'"*

*Don Pike, November 6, 1991*

*"We are quite satisfied with the Fisheries program; not the fact that it will ever be able to replace that which is lost, but the fact that we're doing as much as possible to replace that which is lost. The government has given us a written commitment to continue monitoring and mitigating until such time that we feel our commitment is met."*

*Dennis Olson, November 20, 1991*



The objective of the fisheries mitigation program upstream from the reservoir is to replace recreational fishing opportunities lost when the reservoir was flooded. This is to be achieved by constructing an equivalent amount of high quality trout habitat in reaches of the Castle, Crowsnest and Oldman Rivers that currently have low quality trout habitat. The goal is to create as much new high quality fish habitat as was lost in the reservoir. Documents provided by Alberta and the Local Advisory Committee expressed confidence that this goal is feasible. Environmental groups, fish and game organizations, and the Panel's technical specialists, however, expressed reservations about the effectiveness of the mitigation program.

The reservoir has flooded 1.3 million square metres of stream habitat critical to fish production, which includes 225,000 square metres of high quality rainbow trout habitat. Consultants to Alberta estimated that it is possible to create 491,000 square metres of high quality trout habitat in the tributaries above full supply level. It is not clear exactly how much high quality habitat must be created in the Castle, Crowsnest and Oldman Rivers to achieve no net loss of recreational opportunity. Without a clear and agreed upon set of criteria for no net loss of recreational opportunity, it will be impossible to evaluate the success or failure of the program.

The Panel's technical specialists were sceptical about the feasibility of creating and maintaining even 225,000 square metres of high quality habitat in the upstream tributaries. Furthermore, even if this amount of habitat modification were accomplished, it is not clear that this would achieve the goal of no net loss. On both logical (43 km of river cannot be "replaced" within existing river), and economic (beyond a certain amount of habitat alteration, costs become prohibitive) they argued that the goal is neither practical or achievable.

Opinions varied as to the acceptability of the structures used to enhance habitat. Anglers and other users of the river commented that the structures were not aesthetically pleasing. However, anglers also used the structures as platforms from which to fish, and reported good angling success in enhanced reaches of stream. Thus, it appears that, despite being physically unattractive, the structures do provide habitat suitable for fish.

The fisheries mitigation team is still discovering which structural modifications do and which do not enhance fish habitat. Structures that have been installed were described as designed to withstand a 100 year flood. However, many failed under modest flood flows. Depending on the type of structure, failure rates ranged from 0% to 70%. Apparently, a better understanding of rivers is needed to allow structures to be made more permanent. As an alternative, regular repair, replacement and maintenance will be required.

The Local Advisory Committee and its Fisheries Management Sub-committee have advised a go-slow approach to the mitigation program so that this kind of adaptive learning can occur. They are to be commended for this practical approach. Yet, the need for repair and replacement of structures that fail or do not work eats away at a fixed budget for fishery mitigation and reduces the amount of enhanced habitat that will ultimately be constructed.

In practical terms, if the fisheries mitigation program is to be even partially successful, it will be never-ending. Yet the commitment by the Alberta government extends only to 1996 and is for a fixed budget. The permanence of the dam and reservoir and the ongoing commitment to their operation and maintenance contrast strongly with the impermanence of upstream fisheries enhancement structures and the absence of a commitment to their maintenance and repair. The enhancement structures not only require repair and maintenance; they also affect fluvial geomorphology so that their value as fish habitat changes from year to year. There is insufficient attention in the mitigation plan to monitoring, evaluation and management of mitigation structures over protracted periods of time. The Local Advisory Committee is working to obtain a longer term commitment by the government, but has as yet been unsuccessful. Several presenters suggested that an endowment fund of some sort needed to be established that would provide income for ongoing fishery enhancement.

Non-structural forms of enhancement were encouraged by some participants. The two most favoured were **fertilization** of river reaches to increase fish food production and fencing cattle away from stream banks. Fencing cattle away from streams, the Panel was told, would have considerable beneficial consequences for fisheries. The Alberta government already has a fund to assist farmers to fence their cattle away from the stream bank.

The Panel remains unclear about the level of responsibility that the federal Department of Fisheries and Oceans believes that it has to protect fish and fish habitat in Alberta. The Department of Fisheries and Oceans raised serious concerns about the absence of detailed mitigation plans, criteria, and procedures for achieving no net loss, and about the absence of a long term commitment to monitoring and evaluation by Alberta. Yet the department did not require that these deficiencies be addressed before permitting the project to proceed in 1986.

In summary, the criteria by which it will be determined if the goal of no net loss of recreational opportunity has been achieved are not explicit. In the absence of better information the Panel assumed that, at a minimum, 225,000 square metres of new high quality trout habitat must be created in upstream tributaries without degrading existing habitat. The Panel was advised that more stringent criteria would require enhancement of the full 491,000 square metres of potentially enhanceable habitat in upstream tributaries or demonstration that increases in production of harvestable trout upstream were sufficient to replace the production lost when the reservoir was filled.

#### Conclusion:

The Panel concludes that the goal of no net loss of recreational opportunity cannot be achieved in the upstream tributaries by physical habitat modification alone. Given the present state of fisheries research and knowledge, it is unlikely that it can be achieved by any combination of physical, chemical and biological manipulations. The less ambitious goal of improved trout production in upstream tributaries is achievable but only with an ongoing program to maintain the enhancement structures. The strategy to achieve this less ambitious

goal would logically include non-structural forms of enhancement such as fertilization and fencing of cattle away from the stream bank.

There is no plan or commitment for long term monitoring, evaluation, and management of upstream enhancement. The Alberta government appears to be committed only to expending the balance of the \$5.3 million allocated for fishery mitigation upstream, regardless of whether that will achieve no net loss. The Local Advisory Committee working with the proponent has done a good job of helping to design and oversee the implementation of a program to compensate for lost angling opportunity. Without **a long term commitment by the Alberta government and funding** support, however, even the modest benefits of the current enhancement program will not be maintained. For any long term improvement in trout production to occur, the Alberta government must commit to monitoring, evaluating, and managing upstream enhancement for the life of the **Oldman River Dam** project.

A fish enhancement program based on the magnitude of structural modification proposed for this project has never been attempted anywhere else. This program is an experiment. Structures will be altered by flooding and their performance will vary as the river changes. Provided a longer term commitment from the proponent can be achieved, the Environmental Management Committee should have responsibility for implementation, monitoring, evaluation, and management of this program.

#### **Recommendation 14: Role of Fisheries and Oceans Canada**

**A clearer definition of the role that the Department of Fisheries and Oceans will play in fishery conservation and habitat protection in the provinces is needed. This should include the requirement for an operational definition of no net loss, criteria and procedures for achieving no net loss, and plans for monitoring, evaluation and management of any programs to achieve no net loss.**

#### **Recommendation 15: Fish Mitigation**

**If the project is operated, encourage the Environmental Management Committee to adopt a realistic goal of upstream enhancement.**

This is not to condone the destruction of 43 km of wild river. Rather it is to prevent the further destruction of wild river habitat through an overly ambitious program of habitat alteration. Alberta should also be encouraged to incorporate non-structural techniques into its enhancement program, such as fertilization and fencing cattle away from the stream bank.

#### Reservoir Fishery Opportunities

Elsewhere in North America and in Southern Alberta, reservoirs provide considerable fishery opportunities. Some participants suggested that the **Oldman** reservoir would also provide significant fishery opportunities and that these would, in part, compensate for the loss of river fisheries. Others argued that

the reservoir would be unproductive of game fishes. The consensus among experts was that the reservoir would not offer significant fishery potential. The reasons for this are primarily its large drawdown, preventing development of a productive littoral zone and regularly reducing the volume of water, its relatively cold temperature, high winds, and unsafe winter ice conditions. The reservoir may also be rather turbid, further reducing productivity.

Consultants to the Alberta government **recognized** the potential for mercury contamination of fishes in the **Oldman** reservoir. Information from other reservoirs suggests that increases in mercury concentration in fishes on the order of 3 to 6 times the background level could be expected. Vegetation clearing in the **Oldman** reservoir area prior to inundation may reduce the magnitude of this problem. Resident fishes appear already to have a relatively high mercury content. Additional mercury contamination could render any fish that do live in the reservoir unfit for human consumption. The length of time that mercury would continue to contribute to fish contamination in the reservoir is uncertain, but could be a decade or more.

#### Conclusion:

The Panel concludes that the reservoir will not **support** a fishery of any consequence. The major species in the reservoir will probably not be game fish. Any fish in the reservoir are likely to become contaminated with mercury.

#### **Recommendation 16: Reservoir Fisheries**

**If the project is decommissioned, establish woody vegetation on the stream banks in the reservoir area as soon as the reservoir is drained, to prevent excessive bank erosion and channel migration during the first few years of ecosystem recovery.**

**If the project is operated, routinely monitor fishes in the reservoir for mercury levels during the first few years of reservoir operation. Provide results of the monitoring programs to the Environmental Management Committee for action as required.**

#### Effects of the Project on Downstream Fisheries

Fish species that occur naturally downstream from the dam, and contribute to an active sport fishery include rainbow trout, bull trout, mountain whitefish, northern pike, walleye and sauger. These and other species will all be affected by the operation of the **Oldman River Dam**. No mitigation plan for the downstream reaches of the river has been approved by Alberta. However, various options have been identified.

Although there is uncertainty as to the full extent of changes that will occur downstream, there seems general agreement that the fishery between the dam and Lethbridge will change from a cool-water and warm-water combination of species to a cold-water and cool-water combination of species. Priority species for management downstream from the dam site are brown trout and rainbow trout in the cold-water zone and walleye and sauger in the cool-water zone. The Panel heard

conflicting information on whether mountain whitefish populations downstream from the dam would increase or decrease in abundance.

Modelling of thermal conditions in the river suggests that winter temperatures will be warmer and summer temperatures cooler below the dam. As a result of the warmer winter temperatures there will be an ice free reach downstream from the dam, increasing the possibility of frazil and anchor ice forming in the river. Anchor ice, in particular, can be harmful to spawn and juvenile fish hiding in the substrate in winter.

The Panel was told that no sudden changes in temperature due to project operation are expected. However, others suggested that the possibility of sudden temperature changes with reservoir drawdown cannot be ruled out if the reservoir stratifies and the reservoir is drawn down past the thermocline. Rapid temperature changes may also occur during summer spillway releases. Even though such sudden changes in temperature may be rare, they may have an important effect on cold-water fish downstream. With fixed low level outlets, there is no possibility of regulating the temperature of water released from the dam. Presenters at the hearings argued that potential problems with thermal regimes downstream from the dam would have been eliminated if a multilevel outlet system had been installed.

Although studies on minimum instream flow requirements for fish in the Oldman River downstream of the dam were conducted by the proponent, concern was expressed to the Panel regarding the adequacy of these studies. In addition, there is concern that minimum fisheries flows may be sacrificed to meet other demands such as irrigation. In general, the flow regime downstream from the Lethbridge Northern Irrigation District weir will be better for gamefish than the flow regime before the dam. However, flows in the Water-ton, Belly and St. Mary rivers will be further reduced under the Oldman River Dam operating plan and these rivers may become less suitable for fish.

Analysis of future conditions downstream from the dam suggested that, between the dam and Rocky Coulee, downstream from Fort Macleod, temperature and substrate conditions would not be suitable for rainbow trout reproduction, and that a self-sustaining population of trout might not exist downstream from the dam. Considerable habitat suitable for brown trout reproduction is present both upstream and downstream from the Lethbridge Northern Irrigation District weir and recent analyses suggest that habitat for this species could extend downstream to Lethbridge. Brown trout do not presently occur downstream from the dam and would have to be introduced. The development of a downstream trout fishery is dependent on the creation of suitable cover for salmonids, as the channel is relatively devoid of cover.

The Lethbridge Northern Irrigation District weir is both a barrier and a hazard to fish. During operation, the weir blocks upstream fish movement and fishes are also swept into the irrigation canal. The fishway installed to permit upstream passage of fish does not work very well and may increase fish

losses into the canal. These characteristics of the weir will contribute to the difficulty of maintaining trout populations upstream from the weir. The Panel is concerned that the cumulative effects of the weir and the dam may have an overall negative impact on downstream fish production.

Information received by the Panel suggests that downstream fish will also be subject to potential contamination from methyl mercury released from the reservoir. In fact, contamination levels could be higher than in the reservoir. As yet, no methods exist to control mercury contamination although research is being conducted on this topic. Several participants, especially Native people, expressed concern over the possibility of mercury contamination.

The Panel received conflicting information on whether gas supersaturation would occur downstream from the dam. It was stated that, once a plunge pool develops below the spillway, gas supersaturation will occur. Depending on the turbulence in the river, gas supersaturation may persist for up to one kilometre downstream from the dam and could kill or impair fish.

#### Conclusion:

The Panel concludes that, with some assistance, a brown trout population sufficient to sustain an active sport fishery may be developed downstream from the dam. Rainbow trout and bull trout may be eliminated from this region, however, and some concern was expressed about mountain whitefish. Belief in the successful establishment of brown trout was not universal. Nor should replacement of native species (whitefish, bull trout) with exotics (brown trout) be considered sustainable resource management.

No approved plans for protecting or enhancing downstream fish populations exist. The probable losses of rainbow trout and bull trout and possible losses of mountain whitefish downstream from the dam indicate that such plans are essential.

The river section between the dam and Lethbridge Northern Irrigation District weir, most of which is on the Peigan Reserve, is at greatest risk of substantial fishery losses. This is of great concern to the Peigan who use the river fishes as a food source. The departments of Fisheries and Oceans and of Indian Affairs and Northern Development are the federal agencies most directly responsible for protecting any aboriginal rights of the Peigan to fish; yet, neither department appears to have taken steps to discharge its responsibility in this area.

It is the Panel's view that the departments of Fisheries and Oceans and of Indian Affairs and Northern Development must take an active role in assisting the Peigan to preserve any aboriginal rights to fish in the Oldman River. The absence of any assessment of native use and entitlement by these departments is inexcusable and their passive approach to meeting their fiduciary responsibility is seen as unacceptable by the Panel.

### Recommendation 17: Downstream Fisheries

**As a condition of any approvals granted, the federal government should require that Alberta develop a plan of monitoring, evaluating, and managing downstream fisheries that would protect and enhance these populations. In addition, the Minister of Fisheries and Oceans should investigate the issue of fish passage and entrainment at the Lethbridge Northern Irrigation District weir and ensure that any necessary remedial measures are implemented.**

**The federal government should exercise its fiduciary responsibility to Native people and ensure that the rights of the Peigan to fish on their reserve are protected. One requirement is that a routine monitoring program for mercury in fishes downstream from the Oldman Dam be instituted.**

**The federal Minister of Fisheries and Oceans should seek a reserve of water in the reservoir for fishery management purposes. This reserve should be sufficient to ensure minimum flows downstream from the Lethbridge Northern Irrigation District weir and to provide flexibility in flow regimes to manage for conservation and enhancement.**

**The Environmental Management Committee should determine whether a multilevel water release structure is required to permit control over downstream water temperatures. If deemed necessary the Minister of Fisheries and Oceans should require its construction.**

#### Fishery Opportunities Created by Irrigation Canals

Several participants at the public hearings stated that increased fishing opportunity in irrigation canals was a secondary benefit of expanded irrigation works. Although some participants were sceptical of the value of irrigation canal fisheries, others indicated that canals provide a recreational opportunity used by anglers. Many people fish in the canals, and fishing for pike, suckers, and whitefish may be particularly successful when flows are reduced and fish are concentrated in areas retaining water.

Canal fish populations, however, are not self-sustaining. They result when fish from the river or from offstream reservoirs are entrained into the canals. Most fish remaining in the canals probably die when canal water flows are turned off. Canals do not, therefore, enhance fish production. In fact, to the extent that large fish from the Oldman River become entrained into the Lethbridge Northern Irrigation District canal, the canal robs the river of part of its recreational fish production.

Offstream reservoirs may enhance fish production if they retain a large enough permanent body of water. Fish produced in offstream reservoirs are more likely to be cool — and warm-water species, such as pike and walleye, rather than trout.

#### Conclusion:

The Panel concludes that offstream storage reservoirs and irrigation canals do provide fishing opportunities. To some extent, however, these opportunities will be at the expense of riverine fisheries if the canals entrain large fish from the river. Offstream storage reservoirs may enhance production of certain species, probably mainly cool — and warm-water species like pike and walleye. Offstream reservoirs can contribute positively to recreational fish production if they have a sufficiently large permanent water body.

### 3.7 Archaeological and Historical Resources

*"In the Oldman River valley where the dam has inundated the whole valley . . . we have lost we don't know how many volumes of information in terms of what we or western civilization call 'religion'. They have ripped the greater portion of our so-called Bible from us, and that information is no longer available. "*

*Devalon Small Legs, November 7, 1991*

The area studied by the proponent for archaeological information was the Oldman River reservoir, including the shoreline of the reservoir and the dam site.

Consultants for the proponent conducted both an historical and an archaeological resource impact assessment of the Oldman River Dam area. The archaeological study concluded that the area is part of a complex and unique ecosystem encompassing the Northwestern Plains and Rocky Mountains. Particularly well preserved is the cultural record over the past 5000 years. The terrace campsites and kill sites are among the most important archaeological sites in Alberta's foothills, documenting the wintering patterns and life of different Native cultures, the most recent being the Peigan. The unique evolution and development of the Northern Plains Bison Hunting Culture occurred in this general area. The Panel was told that these sites, *in situ*, are significant to the understanding of the "whole, which is greater than any one of, or the sum of the individual sites", and is considered by the Peigan as the heartland of their traditional territory, Real Oldman Country. The Panel technical expert on archaeology considers the proponent's primary consultant to be intimately familiar with the archaeology of southwestern Alberta and suggested that he "must be given credit for considering the importance of these southwestern Alberta resources not just regionally but on a continental and global basis" and that his views should be taken seriously.

On the other hand, the Panel also received documentation indicating that the sites do not have outstanding importance but do have sufficient significance "to merit a large mitigation programme" consistent with "the principles applied in managing all of Alberta's historical resources". This programme, which appears to have involved the collection of over 100,000 artifacts, was planned to compensate for the effects of the project by providing suitable benefits "in the form of increased knowledge and appreciation of prehistory". The information recovery from these lost or inundated sites through the mitigation programme "is a viable option". It is, the Panel was told, through the scientific study of these archaeological materials that they are endowed with meaning.

The Panel was informed that the study which was conducted on the historic sites "must be considered state of the art" and has resulted in a large, detailed data base for the historic period resources. The historic sites and themes (ranching, settlement, the Doukhobors and the railway) are considered significant and are an integral part of the Three Rivers ecosystem. A significant mitigation programme to salvage and interpret historical resources in the area was also developed and continues to be implemented.

Concern was expressed that the Peigan have lost valuable cultural resources and that they were not involved or consulted in the studies. Information collected and interpreted from the Elders regarding the traditions and uses of these sites, it was suggested, is crucial to the understanding of the cultural and spiritual heritage of the Peigan.

#### Conclusions on Archaeological and Historical Resources

Alberta Public Works and Alberta Culture and Multiculturalism have implemented an ambitious program of mitigation which has included the assessment and examination of sites in the project area and the removal of objects and buildings from sites in the affected area. However, the scientific and cultural value of these resources is diminished when the artifacts are taken out of context. This is particularly true when considering the spiritual and cultural value of these sites for the Peigan people.

There is lack of agreement on the importance of the heritage resources but the Panel was informed that collectively, the historic and prehistoric sites are significant to an understanding of the Three Rivers ecosystem. The study of the historic sites was comprehensive and detailed. The existence of a record of the unique cultural achievement of the bison hunters, in situ, is important provincially, nationally and internationally. The irreversible loss of an area which contains so much historic and prehistoric information is a significant cost of the project.

Although the archaeological resources still in the reservoir area may survive a few years of flooding, they will gradually deteriorate.

Numerous individuals were interviewed in the proponent's historic sites study; native people were not. This is an inexcusable omission, in the Panel's opinion, because it overlooks a very important source of local information.

#### **Recommendation 18: Archaeology and the Peigan**

**Withhold federal approvals for the dam until such time as the Peigan have reached an agreement with the proponent on the extent to which the Peigan should be compensated for cultural and spiritual losses in the reservoir area.**

### **3.8 Recreation and Amenity Values**

*"These river valleys with their vegetation, wildlife and recreation opportunities are the single most important natural amenity the region has to offer. Seriously damage it, and the economic future of the region is seriously damaged."*

*Dr. Tom Powers, November 5, 1991*

Conservation and environmental groups pointed out that considerable recreational values associated with hunting, fishing, camping, hiking, and canoeing were lost in the reservoir area when it was cleared and subsequently flooded. Proponents of the project argued that considerable new recreational potential was provided by the reservoir itself and the associated recreational facilities constructed as part of the project. The reservoir is expected to be cold, windy and unproductive of game fishes, however, limiting its direct recreational value. Notwithstanding this fact, these facilities are likely to contribute significantly to the recreational opportunities in Southern Alberta.

The fisheries mitigation works on tributaries upstream reduce recreational potential by destroying some of the aesthetic natural appeal of the river. While "wild river" paddling upstream of the dam has been reduced and altered, a whitewater kayak run and recreational vehicle park have been developed immediately downstream from the dam. As well, under the proposed operating regime, opportunities for paddling in the Fort Macleod and Lethbridge areas during the summer months would increase.

Several participants noted that enhancement of sport fish habitat upstream from the reservoir and creation of wildlife habitat in the upper reaches of the coulees and around the reservoir margins were designed to compensate for lost fishery and wildlife opportunities. Information presented to the Panel, however, suggested that these compensatory measures would not replace the lost fishery and wildlife productivity represented by the valley bottom. The current budget for these compensatory measures is approximately \$11.5 million and is inadequate, according to some participants, even to meet preliminary objectives for habitat creation. No budget has been identified for monitoring, evaluation and maintenance of enhancement projects throughout the life of the Oldman River Dam project.

Analysis by fishery specialists suggests that environmental conditions in the Oldman River between the dam and the Lethbridge Northern Irrigation District weir will be detrimental to rainbow and bull trout populations below the dam. Downstream from the weir, however, environmental conditions in the river are expected to become suitable for brown trout and the possibility exists that a high quality brown trout fishery might be developed between the weir and Lethbridge. Considerable information was presented that the substantial cottonwood forests downstream from the Oldman River Dam are put at risk by the dam. The river valley cottonwood forests not only provide critical habitat for wildlife and fish, they also provide sheltered oases and ecological variety important to human activities in an area that is windy and exposed. The forested river valleys, thus provide an important amenity resource to the region. It was suggested that these amenity values were crucial to the economic future of Southern Alberta because they were the values that would attract people and industry to the area.

Numerous participants pointed out that fish and wildlife habitat and recreational areas are provided by irrigation agriculture and its associated works. Offstream storage reservoirs are the most important in this regard. Associated with the project has been the expansion of Keho Lake, Park Lake, Forty Mile

Coulee and their recreational facilities. The irrigation canals provide recreational fishing opportunities but canal fish populations are not self-sustaining. Wildlife habitat along canals is mainly grassy habitat in the canal rights-of-way and wetlands associated with return flows and leaky canals. Some wildlife obtain food from irrigated crop lands and farm shelterbelts provide habitat for wildlife. The Panel was unable to determine the magnitude of wildlife (especially deer) habitat likely to be created as a result of the 70,000 ha of new irrigated lands. It was pointed out to the Panel, however, that habitat and opportunities for wildlife provided by irrigation agriculture are materially different from the natural prairie habitat and especially that of the river valleys.

Several participants argued that irrigation agriculture in such an arid region generates amenity values. To some participants, the presence of green fields and well tended farmsteads is aesthetically pleasing in the midst of otherwise brown and arid prairie. One participant suggested that irrigation agriculture even alters the local microclimate making it

moister and more tolerable. A resident of Lethbridge commented that increased flows in the Oldman River past his home in 1991 as a result of the first year of reservoir operation greatly increased the aesthetic value of the river to him.

#### Conclusion on Recreation and Amenities

The Oldman River Dam project represents a net loss of fishery and amenity values as well as significant change in the recreational opportunities available in the area. There is a loss of "natural" recreation but a gain in "artificial" recreational facilities. Because of uncertainties in the amount of wildlife habitat likely to be created on new irrigation lands, the Panel is unable to determine whether there is a net gain or a net loss in economically valuable wildlife. Again, however, the changes on new irrigation lands will tend to be from prairie habitats to more managed wildlife habitats. If dam operations result in loss of the downstream riparian forests, then the losses will become enormous.



Horseshoe Canyon, Castle River  
(Photo Brian Reeves)

### 3.9 Social and Cultural Impacts

Social and cultural effects of the project include not only the effects of the Oldman River Dam and its construction on the social services and education resources of a community but also the consequences of that construction and operation on the people affected. The Panel heard a range of views on the social consequences of the dam on the people most directly

affected: residents in the reservoir area; displaced landowners in the vicinity of the dam; irrigation farmers; and the Peigan Indian Band. The Panel also heard from Albertans in general on the social consequences of the dam for them. The Panel's specialist on these matters advised that although there have been studies and inventories on environmental and historic effects, there has not been an adequate assessment of the ramifications of building the dam on the human beings directly or indirectly affected.

### The Local Community

*"Pincher Creek is a community torn in two, and that's probably one of the greatest costs that's ever happened here. We have neighbour arguing with neighbour. We have some very unhappy situations where positions have been taken over time, and they have hardened over time, and it's torn our community apart."*

Doug Thornton, November 20, 1991

The debate over the costs and benefits of the Oldman River Dam to the local communities, particularly to Pincher Creek, has resulted in the polarization of the community into those in favour of the dam as an economic development project and those who believe its environmental costs would be too great. The Panel was told that healing the local community could take a long time. Local residents who opposed the dam felt they had won their point when the Environment Council of Alberta report recommended against any onstream storage. Many were frustrated, angry and confused when the government rejected this recommendation. Others were enthusiastic about perceived opportunities for economic growth.

*"For 16 years, my energy reserve is greatly taxed. I had to cope with many unknown and frustrating events, plus always strive to keep the values in place as our environment changed."*

Audrey Westrop, November 19, 1991

The process used to acquire land in the reservoir area was neither fully understood, nor clearly documented. The Panel heard that some families, who did not wish to lose their land, had no option but to give up their properties. Although adequately compensated for their economic losses, for some, the social values associated with living in the river valley and in the community were irreplaceable. The effects of the displacement were a source of distress to some of the landowners. There appears to have been a lack of effective and direct communication with the landowners to ensure they understood the land acquisition process and to assist them in making important relocation decisions. No counselling services were provided.

*"For all of my life associated with this region, I have heard the phrase 'next time' . . . from those in decision making and advisory positions. Well, when does it become this time?"*

Diane Pachal, November 20, 1991

The proponent carried out no studies on those who were affected by the building of the dam in the community of Pincher Creek and surroundings, what changes have taken place within the community, or what effects there have been on the local economy or region. There has, thus, been no follow-up information on the positive or negative effects on residents.

#### Conclusion:

The debate over the Oldman River Dam created a polarization in the local community of Pincher Creek. Some displaced

landowners believe that they were mistreated by the proponent and that the land acquisition process lacked transparency. The disruption in the lives of these landowners and farmers will be felt for years to come. By documenting what happened and the effects on the local community, the government of Alberta might be in a position to make the process more responsive to the needs of those displaced in future development projects.

### Irrigation Farmers

*"I am very confident that all of the forecast benefits will be realized. These are not only economic benefits, but social benefits and environmental benefits as well."*

Don LeBaron, November 20, 1991

*"Simply put, the values of the Oldman River as a natural system are far greater than anything that will come out of expanding the irrigation system."*

Cliff Wallis, November 5, 1991

The irrigation farmers in southeastern Alberta voiced their concerns over threats to their way of life arising from insufficient water supplies, world markets, commodity pricing and the world economic situation. The Panel was informed that water shortages resulted in rationing in the Lethbridge Northern Irrigation District in the 1980s with the loss of productivity and income. The irrigation farmers believe that the dam is economically, socially and culturally of benefit to all Southern Albertans and that by constructing the dam, the provincial government has made a good investment in Southern Alberta.

The City of Lethbridge and other Southern Alberta communities strongly maintained that the dam and the additional water which will be available for irrigation and industry is necessary for the economic growth and stability of the area.

#### Conclusion:

There is no doubt that existing irrigation in Southern Alberta is important and valued on a national, provincial and regional scale, and needs to be maintained. Although the farming community takes pride in being self-sufficient and in making a major contribution to the local economy, this is true for parts of the industry only. Given today's world economic situation, continuing government help will be essential for many farmers. The values of existing irrigation farmers should be preserved and supported. However, the need for increased irrigation acreage was not convincingly demonstrated.

### Peigan Indian Band

*"Our people and our culture have been tied to the land and the rivers and the mountains from time immemorial. We live and have lived in harmony with the land. To the Peigan, land and water do not generate diversification or multiplier effects. Rather, it is the foundation of a culture which has existed here in this area in harmony with nature for thousands of years. We must find a way to resolve the issues of the Oldman River Dam in the way that respects the rights of the Peigan Nation."*

Chief Leonard Bastien, November 76, 1997

Many participants in the public hearings commented that the Peigan had not been treated fairly in the decision to build the Oldman River Dam. The effects of the project on fish and wildlife populations will have an adverse impact on the social economy of the Peigan. Like the Alberta government, however, the Peigan declined to participate fully in the environmental and socioeconomic assessment undertaken by the Panel. Limited participation by the Peigan resulted because a challenge by the Peigan regarding the ownership of the river and river bed as it passes through the reserve is currently before the courts. Consequently, the Panel's ability to assess fully the consequences of the dam for the Peigan was somewhat diminished.

*"On my trip along the Oldman River, I was thinking about the government, I was thinking about my people, I was thinking about my young generation looking down the Oldman River, seeing the beavers, seeing the fish, seeing deer, coyotes, eagles. And I thought to myself what God has provided for the people. There's no man in this world is going to create the same situation and the spiritual situation and understanding. They're spoiling our Mother Earth. It is very important to every one of us."*

Joe Crow Shoe Sr., November 16, 1991

The Peigan identified the Oldman River as their sacred river and stated that it represents a way of life. Consequently, alteration of the river, they said, would mean altering the Peigan way of life. The upper Oldman and surrounding regions play an important role in their spiritual and material lives. Based on archaeological and ethnographic research carried out for the proponent, one participant told the Panel that the Oldman River valley in the reservoir area and downstream from the dam was a significant source of sacred plants and animals for the Peigan and a key location for their principal religious ceremonies, including the Sundance.

A study of the potential health impacts of the Oldman River Dam on the Peigan nation estimated that over 75% of Peigan used large mammals, fish, berries, and wild greens from the River valley at some time during the year. A lower proportion of the population (almost half) used small mammals, birds, and other natural resources. Food was the most common use, followed by ceremonial use and medicinal use.

At a public hearing in Brocket, it was suggested that most hunting and gathering by the Peigan was done on the reserve lands. However, the Peigan were concerned that the dam and flooding of the valley upstream would reduce the movement of game animals onto the reserve, that the fish in the river through the reserve would be eliminated or contaminated with mercury, and that the cottonwood forests and the associated riparian ecosystem on the reserve might diminish. Concern was also expressed about the need for a better community water supply on the Peigan Reserve.

The role of Indian and Northern Affairs Canada in carrying out its responsibility to "advocate rights that favour the native perspective when dealing with an issue that has a major impact on present and future generations of native people" has been questioned. There is concern by the Peigan that the federal government is not carrying out its fiduciary responsibility to protect the interests of the Peigan.

The full benefits and costs of the construction of the Oldman River Dam to the Peigan are not clear. However, no one disputed the fact that the overall effects are negative. Active involvement of the Peigan from the beginning **in the decision making** process regarding the dam was crucial but whatever happened was clearly ineffectual. Some of the responsibility for the inadequacy of consultation with the Peigan is certainly that of the Peigan, but the government of Alberta and Indian and Northern Affairs Canada must also accept responsibility.

The importance of these issues to the Peigan nation was evident by the presence of the Elders at the hearing in Brocket. The intimate connection between the land, water and the Peigan spirituality was repeatedly expressed.

Conclusion:

The Panel concludes that the Oldman River Dam project has important adverse consequences for the social and cultural economy of the Peigan. The consequences cannot be detailed at the present time due to uncertainties regarding the effects of the project and possible mitigation strategies. Great weight must be placed on these consequences from the perspective of fairness and equity.

The Peigan were not treated fairly in the decision-making, planning or implementation phases of this project. Impacts on the Peigan might have been reduced and benefits might have accrued if the Peigan were involved from the outset.

There has been no clarification of provincial and federal responsibilities to assist the Peigan in protecting their interests. The Panel believes this is the responsibility of Indian and Northern Affairs Canada.

The Panel suggests that Environment Canada, with Indian and Northern Affairs, take action to implement the development of a common rural and community water supply on the reserve as envisaged under the Green Plan.

#### **Recommendation 19: Peigan Band**

**If the project proceeds, Indian and Northern Affairs Canada should assist the Peigan in carrying out an assessment to identify and mitigate potential effects of the project on the Peigan people, religion, culture and land, and to assist the Peigan in negotiating the implementation of such mitigation as is necessary.**

### **3.10 Economic Aspects of the Oldman Dam Project**

*"...I conclude that even with the dam in place, if one is going to base the decision about whether to use the dam for irrigation or not, on economic analysis, the economically rational thing to do is to not fill the dam, not use it for irrigation purposes, but rather, instead find the least costly way to allow the river to return to as natural a flow as possible."*

Tom Powers, November 5, 1991



The Panel's terms of reference request that it address the socio-economic impacts of the project. This section refers specifically to economic matters. Consistent with the concept of sustainable development, the Panel found that, in order to reach balanced conclusions on the project, environmental and social matters had to be viewed in concert with economic considerations. Many participants expected and even requested that these issues be specifically addressed by the Panel.

### Overview

Information presented to the Panel on the economic value of the **Oldman** River Dam project was varied and contradictory. Views ranged from the assertion that Southern Alberta depends on the dam for prosperity to the assertion that even with the dam built, the dam actually represents a net drain on the overall economy of Southern Alberta.

The belief that the project was economically viable appears to be based mainly on a benefit cost analysis done in 1978 and updated in 1986. This analysis, supported by other studies, indicated that the ratio of benefits to costs for the project was 1.64 or 2.17 depending on whether only regional or regional plus provincial indirect benefits were included in the analysis.

This economic analysis has been controversial since it was first presented because it included indirect benefits not appropriate to benefit cost analysis. The argument that the analysis failed to draw the necessary distinction between economic efficiency and regional income distribution objectives was made throughout the decade-long debate and rose again during the hearings. Now, however, the dam is completed and construction costs must be regarded as sunk costs. Thus, the economic analysis is somewhat different. It was clear however, to the Panel, that many participants were still concerned with whether the original investment decision was sound, whatever the present economic outlook might be. Consequently, the Panel decided to address two questions with respect to the economics of the Oldman Dam project:

1. Was the decision to build the dam justifiable solely on economic efficiency grounds?
2. With the dam completed and construction costs sunk, what are the costs and benefits of operating the dam project?

### Was the Decision to Build the Dam Justifiable Solely on Economic Efficiency Grounds?

*"My only hope is that out of this fiasco will come the realization that a river is worth far more than the water flowing between its banks. It is a rich, vibrant and diversified ecosystem whose value cannot even be considered in traditional financial terms."*

*Phil Handcock, November 8, 199 1*

The Panel's technical specialist reviewed the proponent's 1978 and 1986 benefit cost analyses and drew the following conclusions:

1. Neither the 1978 benefit cost analysis for the dam nor its update in 1986 followed generally accepted guidelines for such analyses. These analyses erred in that they included secondary and spin-off benefits and allocated some construction costs as benefits. When these items are eliminated from the benefit side of the equation, the benefit to cost ratio falls close to 1.0.
2. The proponent's analysis employed a relatively low discount rate of 5% in determining net present benefits and costs and did not discount construction costs. Federal Treasury Board guidelines prescribe a 10% discount rate for assessment of major federally funded projects. At discount rates greater than 5% (e.g. 7.5% and 10%) the ratio of benefit to cost for the dam falls below 1.0.
3. Employment benefits, and other benefits to the regional economy, clearly flow from the construction and operation of the dam. But these are benefits that would accrue wherever a capital investment equivalent to the dam were made. They are not a consequence of the dam but a consequence of a large investment. No analysis was done to compare the secondary benefits from the Oldman Dam project with secondary benefits from other forms of investment or from simply not collecting the tax dollars in the first place.

On the basis of this assessment, the Panel's technical specialist concluded that while the dam may be justifiable on other grounds, it could not easily be justified in economic terms.

Many participants at the hearings disagreed with the conclusions of the Panel's economic specialist and raised the following points:

1. The benefit cost analysis for the dam was based only on agricultural benefits derived from irrigation. Provision of water for irrigation is only one of several purposes of the dam, others being to provide an assured water supply for industry and for domestic use and to provide recreational benefits. These other purposes of the dam contribute to its attractiveness as an investment.

Both the proponent's studies and the Panel's technical specialist argued that inclusion of benefits from non-irrigation uses of water would not significantly alter the ratio of benefits to costs. No information was provided to contradict this assertion.

Substantial potential economic benefits were attributed by some to the recreational opportunities associated with the project. Most of these opportunities could have been realized at much lower cost without construction of the dam. Moreover, their inclusion in the benefit cost analysis would not have significantly affected the outcome.

2. Supporters of the Dam suggested that a discount rate of 10% was much too high to use in the assessment of a project like the Oldman Dam. The 10% rate is prescribed by the federal Treasury Board Guidelines for benefit cost analysis, but these guidelines are more

than a decade old. More recent literature suggests that much lower rates are appropriate in the case of renewable resource analysis. In the U.S., discount rates of 3.5% and 5% were claimed to be used often.

Even at the 5% discount rate, however, the project is marginal from an economic efficiency standpoint and before environmental costs are taken into account.

3. Several participants in the public hearings argued that benefit cost analysis is only one, and not necessarily the best, criterion for assessing the value of the Oldman Dam project. One group proposed a three legged approach to project evaluation, namely:
  - a) Is the project technically feasible (engineering considerations)?
  - b) Is the project economically feasible (benefit cost analysis)?
  - c) Is the project socially desirable (equity or regional development considerations)?

The Panel agrees that both economic efficiency and equity or regional development considerations should be taken into account when deciding on a project like the Oldman River Dam. However, to the best of the Panel's knowledge, the distinction between the two has never been clarified with respect to the Oldman River Dam project. The project has always been presented as a good investment in economic efficiency terms. The importance of new irrigation acreage in regional economic development will be discussed further in the Panel's assessment of the value of the dam now that construction is complete.

4. Several participants also claimed that it was a time-honoured tradition to include secondary benefits in the assessment of agricultural projects.

The Panel is quite convinced that there are secondary benefits from irrigation agriculture. The Panel's economic technical specialist explained, however, and other economists at the hearings agreed, that it is not appropriate to include these benefits in a benefit cost analysis. This is because the secondary benefits represent primarily a redistribution of economic activity, not a creation of new economic activity. There are situations in which secondary benefits would represent new economic activity, but these are rare and not applicable to the Oldman River Dam project. Therefore, although it would be appropriate to include secondary benefits in a regional economic analysis, it is not appropriate to include them in benefit cost analysis.

Conclusion:

The Panel concluded that the original decision to build the Oldman River Dam could not be justified on strict economic efficiency grounds. The economic viability of the project would have been even worse if today's economic conditions had been used when the decision to build was made.

The Panel agrees that economic efficiency is not the only basis for deciding to proceed with a project like the Oldman

River Dam. Regional development and social equity considerations are also important. However, the Province did not appear to suggest that the merits of regional development and social equity were important justifications for the dam. As far as the Panel understands, the Province based its economic conclusions on an application of benefit cost analysis which was explicitly contrary to Treasury Board and other accepted guidelines.

### **Recommendation 20: Economic Assessment of Projects**

**In providing environmental assessment panels with terms of reference, the federal Minister of the Environment should require project justification through such means as a thorough and balanced assessment of both the economic efficiency and the regional development and social equity values of projects under review.**

#### With the Dam Completed and Construction Costs Sunk, What are the Costs and Benefits of Operating the Dam Project?:

Even with the construction costs of the dam sunk, estimates of future economic value of the project remained contradictory. The largest economic values, in dollar terms, are those associated with irrigated agriculture, although economic values were also projected from recreational facilities, and assured domestic and industrial water supplies. As noted above, these latter values are small in absolute terms compared with the value of irrigated agriculture and are not really dependent on the Oldman River Dam project. Much of the discussion, therefore, focused on the value of increasing the acreage of irrigated agriculture. For many participants, irrigated agriculture was the core of the regional economy. Others, however, saw Southern Alberta as a "...water welfare state...masquerading as a proud, conservative, self-sufficient society", and that the dam could only be operated at a net economic loss.

Some participants suggested alternative regional investment projects that would provide a greater return on investment. These included such things as improved irrigation efficiency, non-agricultural developments, and tourism that relies on the natural amenities of the region. Other participants argued that irrigated agriculture and irrigation development were the mainstay of the regional economy and still represented the best investment opportunities in Southern Alberta.

In evaluating these conflicting opinions the Panel took account of the wide range of benefits, costs, and intangible values that were expressed by participants in the public hearings. These were:

1. The value of adding new acreage of irrigated agriculture to the region.
2. Secondary and spin-off benefits to the region.
3. The value of water and the need to manage demand as well as supply.
4. The value of the dam in assuring domestic and industrial water supplies.

5. The value of the dam in helping Alberta meet its apportionment agreement with Saskatchewan.
6. The value of the dam in providing for increased low flows for waste dilution.
7. Recreational and amenity values.
- a. Species and ecosystem conservation consequences of the dam, including riparian forests, native prairie, and associated organisms.
9. Historic and prehistoric site losses in the reservoir area.
10. The social, cultural, and spiritual consequences of the dam for the Peigan.

Many of these attributes of the economic equation cannot easily be measured in dollars, but all logically contribute to the final assessment. Most of these attributes are discussed at length in other sections of this report and they will be touched on only briefly here.

1. The value of adding new acreage of irrigated agriculture to the region.

The Lethbridge Northern Irrigation District estimated that \$11.9 million annually in direct agriculture benefits would result from the addition of 70,000 new hectares of irrigated agriculture. The Alberta Wilderness Association estimated that these benefits would be much less (\$1.3 million annually).

The Panel's economic technical specialist suggested that a good index of the real value of irrigated agriculture was the difference in price between irrigated farmland and dry farmland. Reliable data on this price difference were not available, but estimates of the difference provided by irrigation farmers attending the hearings were on the order of \$250-400 per hectare (\$100-150 per acre). These differences in land value are substantially lower than would be consistent with the estimate of direct benefits to irrigation farmers by the Lethbridge Northern Irrigation District of \$11.9 million annually.

It was also pointed out that crop prices and the differences between returns on irrigation and dryland farming are lower now than they were at the time the decision was made to build the dam and no convincing information was presented to the Panel that crop prices were likely to rise in the foreseeable future.

Another point of issue was the real number of irrigated acres that would result from the Oldman River Dam project. Several participants in the public hearings suggested that a substantial proportion, perhaps over half of the 70,000 hectares purported to be irrigated by this project was really attributable to other projects. A member of the St. Mary Irrigation District commented that it was his understanding that projected increases in irrigated acres in his district were not dependent on the Oldman River Dam. Supporters of the dam, however, argued that, although other projects were important to the increased irrigation acres (expansion of

Keho Lake and enlargement of the Lethbridge Northern Irrigation District main canal, for example), these projects could not be put into operation without the increased storage provided by the Oldman River Dam. The Panel was never able to resolve this issue. If fewer than 70,000 hectares should be attributed to the dam, then the net agricultural benefits from the project will be correspondingly less than the estimates given above.

Some suggested that irrigated agriculture was becoming less and less important to the economy of Southern Alberta. This was described as a natural and desirable consequence of the maturation of the economy. Consequently, it was further suggested that it was time for the region to look to other sectors as the future sources of economic growth and that the amenity values of the region attract other kinds of industries.

Others suggested that, regardless of current economic value, irrigated agriculture made an important contribution to world food supplies and that the importance of this contribution would increase as world population grows. This, together with uncertainties in demand, global climate changes, and other issues, suggests that the value of the dam would increase over time.

The Panel concludes that, at current crop prices and provided all of the irrigation expansion depends on the dam, there is a small net positive economic benefit directly to the farmers now that the dam is completed and construction costs are sunk. However, the Panel was impressed by the observation that the economy of Southern Alberta is becoming less dependent on irrigated agriculture and more on other economic sectors.

These facts indicate to the Panel that it is necessary to distinguish between the importance of continuing to support existing irrigated agriculture, in contrast to the need to create new irrigated acres. In the Panel's view, support for existing irrigated agriculture is essential to the region; support for new irrigated agriculture is not.

2. The value of secondary and spin-off benefits to the region.

Several participants commented that, although irrigation farmers did not earn a great deal more than dryland farmers, their earnings were based on a much greater annual cash flow. This greater cash flow supported a wide range of agriculture-related businesses in the region. The existence of secondary benefits was not disputed. However, the Panel's economic specialist argued that most of this increased economic activity in Southern Alberta was activity redistributed from other parts of the Province or the country.

The Panel concludes that significant secondary benefits are associated with irrigation agriculture. However, similar levels of secondary benefit would derive from many other kinds of regional investment at the level represented by the Oldman River Dam.

3. The value of water and the need to manage demand as well as supply.

The issue of the true value of water and the inadequacy of current pricing mechanisms was raised several times. This subject is discussed in the Water Management Section where the Panel concluded that a narrow focus on supply management may have prevented a more balanced assessment of the environmental, social and economic value of water.

4. The value of the dam in ensuring domestic and industrial water supplies.

Supporters of the project frequently pointed out that providing an assured water supply for domestic and industrial purposes were important functions of the dam. Numerous communities in Southern Alberta draw their domestic water from irrigation canals and some of these, such as Nobleford, have suffered occasional water shortages or poor water quality. It appeared to the Panel that most of the problems with domestic water supplies were not directly related to lack of onstream storage, although this storage would alleviate the problems. Furthermore, the Panel was told that domestic water supplies could have been assured in other ways at much lower cost.

Numerous industries are also water-dependent. It was suggested that recent closure of some food processing industry in the Lethbridge area was due to shortage of water. Other communities anticipate that an abundant and stable water supply will attract new industries. On the other hand, some participants argued that the decisions by industries either to locate in Southern Alberta or to move away from the region were not primarily tied to the availability of water. There is a general tendency for some food processing industries to move close to their markets and away from any particular source of agricultural products, for example. Given the clear priority of municipal and industrial water use over irrigation, and given the small volumes of water used by municipalities and industry, it is difficult to see how they could be facing any real water shortages.

The Panel concludes that the presence of the dam may resolve some problems of domestic water supplies but that these problems could have been resolved by other means at lower cost. The Panel also concludes that the presence of the reservoir as an assured water supply will not significantly increase the attractiveness of Southern Alberta to most of the industries discussed at the public hearings. Consequently, the economic benefits that can be attributed to the Oldman River Dam project in terms of assured domestic and industrial water supplies are small.

5. The value of the dam in helping Alberta meet its apportionment agreement with Saskatchewan.

The Oldman River Dam project has been described as assisting Alberta to meet its commitments to Saskatchewan under the interprovincial apportionment agreement. The Panel concluded in the Water Management

Section that further storage on the Oldman River is not required to meet the apportionment agreement.

6. The value of the dam in providing for increased low flows for waste dilution.

Participants suggested that increased flows downstream from the Lethbridge Northern Irrigation District weir in summer would alleviate water quality problems particularly downstream from the Taber sugar mill and downstream from Lethbridge. Occasional fish kills due to poor water quality have been observed in the river. Increased flows would reduce the necessity for costly upgrading of treatment facilities at Taber and Lethbridge. The Panel was informed, however, that recent upgrades to the Lethbridge treatment facility had eliminated the problem at Lethbridge.

The Panel concludes that the value of increased flows downstream from the Lethbridge Northern Irrigation District weir for waste dilution is real but small.

7. Recreational and amenity values.

The Oldman River Dam project represents a net loss of fishery and amenity values as well as significant change in the recreational opportunities available in the area. There is a loss of "natural" recreation but a gain in "artificial" recreational facilities.

8. Species and ecosystem conservation.

The Panel concluded that known losses of river valley ecosystem in the reservoir area and probable adverse effects of the project on individual plant and animal species are significant. The potential losses of downstream riparian forest and native prairie over time are potentially of even greater significance. These losses have not been quantified in economic terms but are probably large from a national and international perspective.

9. Historic and prehistoric site losses in the reservoir area.

The Panel concluded that significant historic and prehistoric resources were flooded in the reservoir area. The economic value of these resources is unquantified but significant. Their scientific value was high.

10. The social, cultural, and spiritual consequences of the dam for the Peigan.

Many participants in the public hearings commented that the Peigan had not been given sufficient consideration in the decision to build the Oldman River Dam. The Panel concluded that the project could have important adverse consequences for the social and cultural economy of the Peigan. Great weight must be placed on these consequences from the perspective of fairness and equity.

#### Conclusion on Economic Aspects

The Panel concludes that, under current conditions, the Oldman River Dam project creates a small net positive economic

benefit directly to the farmers, some positive secondary economic benefits to agriculture related industries, and small positive economic benefits from the availability of water for domestic water supplies. These benefits will be reduced if crop prices continue to decline or if fewer than 70,000 hectares are actually irrigated by the project. The Panel also concluded, however, that the positive regional benefits are not mirrored by positive provincial or national benefits.

The Panel also concludes that the economy of Southern Alberta is diversifying and under the current conditions has little need to promote new irrigation agriculture to support economic growth. In fact, other sectors of the regional economy may provide more viable bases of future growth. In this context the amenity value of water is significant. The Panel recognizes that irrigation agriculture has amenity value, but the marginal increase in this value with an additional 70,000 hectares under irrigation is very small. Increased low flows past Lethbridge also have amenity value and this is a benefit from the dam project.

The Panel concludes that the social, economic, and environmental costs associated with the Oldman River Dam project are large. Scientifically and culturally important historic and prehistoric resources were destroyed when the reservoir was flooded. Perhaps most significant from a social and cultural perspective is the effect of the project on the social and cultural economy of the Peigan.

On balance, the Panel concludes that the social, economic, and environmental costs of the project outweigh the social, economic and environmental benefits, even with the construction costs as sunk costs.

### 3.11 Navigation

It is clear that the Oldman River Dam project interferes with navigation. Not only does the dam itself act as a navigation barrier but several related projects (the fisheries mitigation measures, the kayak run immediately downstream from the dam and some of the recreation facilities created around the reservoir) also affect navigation or the safety of navigation on the Oldman River. The question raised by some participants during the review was whether these changes to the navigability of the river were acceptable. Concern was also expressed about the marine safety of the weir used by the Lethbridge Northern Irrigation District for extracting water from the Oldman River. This weir is on the Peigan Reserve downstream from the Oldman River Dam. It was suggested that expanded recreation facilities near the dam could potentially increase the number of canoeists using the river and hence encountering the weir.

Several participants described the effects which the instream fisheries mitigation measures, the kayak run and boat ramps would have on their use of the river for navigation (typically canoeing). No major concerns were raised by these participants. It was also noted that the operation of the Oldman River Dam would have an effect on the operation of the Water-ton and St. Mary Dams and that this change in operation might require a reexamination of the Navigable Waters Protection Act approvals for those dams.

A representative from Transport Canada (responsible for the administration of the Navigable Waters Protection Act) provided the Panel with the approval document for the Oldman River Dam issued in 1987 but subsequently quashed by the Court. That document included conditions of approval which dealt broadly with marine safety. The Transport Canada representative suggested that the conditions imposed in 1987 would still be suitable today but that the related projects such as fish mitigation structures would require further examination in terms of their effects on marine safety.

### Recommendation 21: Navigation

**If the project is decommissioned, Transport Canada should assess the marine safety of the project and identify any requirements to ensure safety of users.**

**If the project is operated and an approval for the Oldman River Dam is issued, Transport Canada should determine conditions for marine safety and include them as a part of the approval. Special attention should be paid to the instream fisheries mitigation measures, to the kayak run, to the recreation facilities around the reservoir and to the safety of the Lethbridge Northern Irrigation District weir downstream.**

## 3.12 Safety and Design

### Emergency Evacuation Plan

The Panel understands that an emergency evacuation plan for the downstream communities has been developed and tested for all areas except the Peigan Reserve. In its Interim Report (June, 1991), the Panel indicated it was concerned by the lack of such plans. The Panel continues to be very concerned about the lack of an effective emergency evacuation plan for the Peigan. Whether the failure to achieve an agreement is the fault of the Peigan or of the Alberta government is not known. The Alberta government indicated that such an agreement would be in place before the 1992 Spring high flows in the Oldman River.

Concern was expressed by the Peigan that the Alberta government was unwilling to provide the costs of implementing the emergency response plan on the Peigan Reserve even though it had done so for other downstream communities. The Panel believes that the responsibility of the proponent should properly extend to the reserve even if the reserve lands are under federal jurisdiction. The Panel believes that the government of Alberta should be responsible for the costs of implementing the emergency evacuation plan on the Peigan Reserve as well as elsewhere. It is the opinion of the Panel that, until it reaches agreement with the Peigan regarding an acceptable emergency response plan, the Alberta government has the responsibility to have a contingency response plan in place.

### **Recommendation 22: Emergency Evacuation Plan**

**Both the Alberta government and the Peigan should agree on an emergency evacuation plan very quickly. Indian and Northern Affairs Canada should provide whatever assistance is needed to encourage meaningful negotiations to achieve such an agreement. If such an agreement is not reached, the Alberta government as the project proponent should develop and make public a contingency plan to deal with evacuation on the Peigan Reserve.**

#### Probable Maximum Flood

The Panel concluded in its Interim Report that the Probable Maximum Flood, although calculated in a manner consistent with international standards, was not conservative due to the lack of allowance for global climate change. This prompted a response in the form of a memorandum prepared by Alberta Environment which was made available to the Panel. The memo is a detailed review of the state of the art and shows that the Probable Maximum Flood estimates may well be affected by climate changes caused by rising greenhouse gas concentrations in the atmosphere. The memo concludes that neither the magnitude nor the direction of the change are certain at this time. The fact that the memo focuses on the results when greenhouse gas concentrations are expected to be double their historical values (well into the twenty-first century) seems unfortunate. The fact that the current twenty percent increase in such concentrations is associated with strong climatic trends in such a direction as to indicate a concern should be reason enough to be cautious. While such trends may not be conclusive, conservative design practice dictates that they must not be ignored. The Panel stands by its earlier conclusions and recommendations on this matter.

#### Clay Samples

Concern was raised at the hearings by consultants for Friends of the Oldman River about the presence of large quantities of smectites in samples of surficial deposits taken from around the dam. It was suggested that the presence of these minerals raised questions about the stability of some slopes and of the dam core. The Panel referred this concern and the accompanying report to the Panel's technical specialist on geotechnical matters related to dam safety. The resulting report concluded that "test results do not appear to be representative of the material actually placed in the core" and indicated that "the monitoring of performance to date has shown stability conditions better than expected and as a result the dam could accommodate significant reduction in the core strength below design values". Accordingly, the Panel does not wish to revise its conclusions regarding the safety of the dam expressed in its interim report. The Panel still believes that the dam's safety performance to date has been entirely satisfactory and that the process used to design the dam was consistent with high Canadian and world standards.

### **3.13 Environmental Impact Assessment Process**

Many participants in this review commented on the review process itself. They expressed doubts about the merits of spending time and taxpayers' money to review a project that was virtually complete. Some felt the project had already been "studied to death" or that a federal review of a provincial project was an infringement on Albertans' rights. Concerns were also expressed over the fact that the proponent of the project did not participate in the hearings. Because public acceptance of a public review process is important, these concerns indicate that confidence in the federal Environmental Assessment and Review Process may have suffered.

While there were difficulties with the process, the Panel is convinced that it received enough information to allow it to reach proper conclusions and that the recommendations in this report are sound. Nevertheless, the following Panel observations about the process are made in the expectation that they may be of use for other reviews.

#### Timing of the Review

The review process took place about six years too late. The project was first announced in 1984 and a review should have been undertaken at that time. The Panel understands the historical reasons for the failure to apply the Environmental Assessment and Review Process at that time, but hopes that future panels will not need to undertake such delayed reviews.

Failure to apply a comprehensive environmental impact assessment process in the planning stage of the project resulted in inadequate documentation of the environmental impacts of the project and inadequate consideration of these impacts in the decision process which led to the construction of the dam. Although a great many environmental studies were undertaken by the proponent, important areas were ignored or treated superficially. Moreover, many of the environmental studies were undertaken after the project was well under way. These studies could not be used to assist with project design because critical project decisions had already been taken.

On the other hand, a review at this time had the advantage that technical specialists could visit the facility and see how certain measures were working in the field. The lateness of the review meant that some mitigation measures had already been undertaken and that the effectiveness of these measures was better understood. But if the review had taken place early in the planning phase of the project, the results of the review would have been available to guide the project design and the proponent would have better understood what was required to prevent or avoid significant environmental losses.

### **Recommendation 23: Follow-up Programs**

**So that environmental protection may benefit from experience during the implementation phase of projects, the Panel recommends that follow-up programs (monitoring, evaluation and management of environmental and socio-economic effects during the implementation phase of the project) should be a routine part of all projects proceeding to the implementation stage which are reviewed by panels.**

#### Ongoing Construction During the Review

Had the federal government stopped construction during the review, especially preventing the installation of the valves in the low level bypass tunnels, the credibility of the review process would have benefitted and options open to the Panel would have been increased. If the federal government is really committed to sound environmental assessment, it should ensure that options open to panels are not precluded by ongoing construction.

Conclusion:

Based on its experience with the Oldman River Dam review, the Panel suggests that the Minister of the Environment adhere to the following hierarchy, in order of decreasing priority, when conducting environmental reviews:

1. There should be no exceptions to the application of the Environmental Assessment and Review Process for major projects with federal decision-making authority;
2. If a project commences before the process is implemented, The Minister of the Environment should use statutory power to halt construction, pending compliance with the process; and
3. If the above applications of the process are not possible, the Minister of the Environment should use all available statutory power to implement accepted Panel recommendations.

#### Provincial Government Involvement

In projects such as this one where significant parts of the project fall under provincial jurisdiction, joint reviews by both the province and the federal government would be desirable and efficient. Note that this is so not because the province is

the proponent, but because of the province's regulatory responsibility and the applicability of its environmental assessment process. Indeed, what is most important is that any review should be conducted by a panel independent of both the federal and provincial governments and of the proponent so that it is a credible review even when the province is the proponent.

The Panel's task was made more difficult by lack of involvement by the proponent. Information withheld by the Peigan Band also reduced the input received by the Panel during the hearings.

#### Federal Government Involvement

During environmental assessment panel reviews, agencies of the federal government are required by law to provide information and advice relevant to the project, to provide experts at public hearings, and to advocate the protection of the interests for which they have responsibility. Federal agencies requested to provide advice and assistance in this review were significantly less accommodating than in other reviews. The Departments of Fisheries and Oceans, Environment, Transport, and Indian and Northern Affairs did not provide departmental positions on the issues to the extent that is normal and desirable in panel reviews. Representatives at the hearings contributed when requested to do so but departmental positions were frequently delayed and, in some instances, not even provided. The deadline for submissions to the Panel after the hearings had to be extended to allow some responses by federal agencies to be received. The Department of Indian Affairs and Northern Development must be singled out for its lack of commitment to the process. It tried to deny its responsibility to participate and when it did participate, attended hearings in Edmonton and refused a strong Panel request to attend in **Brocket** (on the Peigan Reserve) as well. The Panel believes that this lack of commitment to Environmental Assessment and Review Process responsibilities by federal agencies will be a problem for future reviews if it is allowed to continue.

#### Quality of Presentations

Finally, the Panel would like to observe that, in spite of the difficult nature of this review, the presentations made at the hearings were generally of extremely high quality. The Panel thanks the participants for their thoughtful contributions and for the time they devoted to this review.

## 4.0 RECOMMENDATIONS

### Recommendation 1: Decommission the Dam

Decommission the dam by opening the low level diversion tunnels to allow unimpeded flow of the river.

### Recommendation 2: Conditional Approval

If Recommendation 1 is not accepted and the **Oldman River Dam is to be operated, attach stringent conditions to the approvals granted by the federal government.** These conditions include the proponent reaching an agreement with the Peigan and making a long term commitment to mitigating the many environmental impacts of the project.

### Recommendation 3: Environmental Management Committee

Create an Environmental Management Committee and give it full authority to mitigate and continue mitigating the major environmental impacts, especially those affecting fish, wildlife and riparian ecosystems. Programs and activities of the Environmental Management Committee should be open to public scrutiny.

### Recommendation 4: Agreement Between the Proponent and the Peigan

Establish a negotiating process by which the proponent and the Peigan can reach an agreement on mitigation and compensation for environmental, social and cultural impacts of the project on the Peigan and Peigan Reserve.

### Recommendation 5: Failure to Comply

If the proponent fails to comply with Recommendations 2, 3 and 4 then decommission the dam in accordance with Recommendation 1.

### Recommendation 6: Hydrology

If the project is decommissioned, assess the extent and frequency of flooding on lands upstream of the dam to determine the best uses for the lands and to design appropriate reclamation projects.

If the project is operated, undertake monitoring and analyze the data to define more clearly hydrologic changes and mitigation options. Such a monitoring, evaluation and management program should be a condition of any approval granted by the federal government on this project.

### Recommendation 7: Water Allocation for Conservation

If the project is operated, apply a condition to any approval issued by the Minister of Transport that a reserve of water for conservation purposes (such as minimum fisheries flows and flows sufficient to ensure protection for riparian cottonwood forests) be set aside. It is further recommended that the determination of minimum flows for conservation purposes be assigned to the Environmental Management Committee.

### Recommendation 8: Efficiency of Water Use

The federal government should support and encourage research, development and implementation of techniques for improved efficiency of water use.

### Recommendation 9: Water Allocation to the Peigan

**Withhold federal approvals** for the project until an agreement between the Peigan and Alberta on water allocation is reached. In the interim, reserve and not allocate to others, the maximum amount of water that might be allocated to the Peigan.

### Recommendation 10: Riparian Cottonwood Forests

If the project is operated, then monitoring, evaluation and management of riparian cottonwood forests should be a condition of any approval granted by the federal government to ensure the survival and continued health of these ecosystems.

### Recommendation 11: Vegetation

If the project is decommissioned, undertake studies to determine to what degree the reservoir area should be revegetated and prepare and implement a reclamation plan.

If the project is operated, conduct surveys of plant species composition and abundance downstream of the dam to identify and quantify the effects of flow regulation. Further, reserve a portion of water in the reservoir to provide adequate flows to maintain riparian ecosystems.

### Recommendation 12: Wildlife

If the project is decommissioned, the Environmental Management Committee should be responsible for identification and implementation of reclamation programs to restore the wildlife habitat of the reservoir area.



If the project is to be operated, the federal government should use its statutory powers to ensure that Alberta undertakes a fully funded, long-term, wildlife mitigation program (inclusive of the concerns of the Peigan people). The implementation of the program should be assigned to the Environmental Management Committee.

#### **Recommendation 13: Rare Fish Species**

If the project is decommissioned, modify at least one of the diversion tunnels to provide upstream fish passage past the dam. Until this measure is in place, upstream migrating fish should be trucked past the dam.

If the project is to be operated, a program to mitigate adverse effects on rare species should be a condition of any approval granted by the federal government. This program would be implemented under the auspices of the Environmental Management Committee.

#### **Recommendation 14: Role of Fisheries and Oceans Canada**

A clearer definition of the role that the Department of Fisheries and Oceans will play in fishery conservation and habitat protection in the provinces is needed. This should include the requirement for an operational definition of no net loss, criteria and procedures for achieving no net loss, and plans for monitoring, evaluation and management of any programs to achieve no net loss.

#### **Recommendation 15: Fish Mitigation**

If the project is operated, encourage the Environmental Management Committee to adopt a realistic goal of upstream enhancement.

#### **Recommendation 16: Reservoir Fisheries**

If the project is decommissioned, establish woody vegetation on the stream banks in the reservoir area as soon as the reservoir is drained, to prevent excessive bank erosion and channel migration during the first few years of ecosystem recovery.

If the project is operated, routinely monitor fish in the reservoir for mercury levels during the first few years of reservoir operation. Provide results of the monitoring programs to the Environmental Management Committee for action as required.

#### **Recommendation 17: Downstream Fisheries**

As a condition of any approvals granted, the federal government should require that Alberta develop a plan of monitoring, evaluating, and

managing downstream fisheries that would protect and enhance these populations. In addition, the Minister of Fisheries and Oceans should investigate the issue of fish passage and entrainment at the Lethbridge Northern Irrigation District weir and ensure that any necessary remedial measures are implemented.

The federal government should exercise its fiduciary responsibility to Native people and ensure that the rights of the Peigan to fish on their reserve are protected. One requirement is that a routine monitoring program for mercury in fishes downstream from the Oldman Dam be instituted.

The federal Minister of Fisheries and Oceans should seek a reserve of water in the reservoir for fishery management purposes. This reserve should be sufficient to ensure minimum flows downstream from the Lethbridge Northern Irrigation District weir and to provide flexibility in flow regimes to manage for conservation and enhancement.

The Environmental Management Committee should determine whether a multilevel water release structure is required to permit control over downstream water temperatures. If deemed necessary the Minister of Fisheries and Oceans should require its construction.

#### **Recommendation 18: Archaeology and the Peigan**

Withhold federal approvals for the dam until such time as the Peigan have reached an agreement with the proponent on the extent to which the Peigan should be compensated for cultural and spiritual losses in the reservoir area.

#### **Recommendation 19: Peigan Band**

If the project proceeds, Indian and Northern Affairs Canada should assist the Peigan in carrying out an assessment to identify and mitigate potential effects of the project on the Peigan people, religion, culture and land, and to assist the Peigan in negotiating the implementation of such mitigation as is necessary.

#### **Recommendation 20: Economic Assessment of Projects**

In providing environmental assessment panels with terms of reference, the federal Minister of the Environment should require project justification through such means as a thorough and balanced assessment of both the economic efficiency and the regional development and social equity values of projects under review.

**Recommendation 21: Navigation**

If the project is decommissioned, Transport Canada should assess the marine safety of the project and identify any requirements to ensure safety of users.

If the project is operated and an approval for the Oldman River Dam is issued, Transport Canada should determine conditions for marine safety and include them as a part of the approval. Special attention should be paid to the instream fisheries mitigation measures, to the kayak run, to the recreation facilities around the reservoir and to the safety of the Lethbridge Northern Irrigation District weir downstream.

**Recommendation 22: Emergency Evacuation Plan**

Both the Alberta government and the Peigan should agree on an emergency evacuation plan

very quickly. Indian and Northern Affairs Canada should provide whatever assistance is needed to encourage meaningful negotiations to achieve such an agreement. If such an agreement is not reached, The Alberta government as the project proponent should develop and make public a contingency plan to deal with evacuation on the Peigan Reserve.

**Recommendation 23: Follow-up Programs**

So that environmental protection may benefit from experience during the implementation phase of projects, the Panel recommends that follow-up programs (monitoring, evaluation and management of environmental and socio-economic effects during the implementation phase of the project) should be a routine part of all projects proceeding to the implementation stage which are reviewed by panels.

**OLDMAN RIVER DAM  
ENVIRONMENTAL ASSESSMENT PANEL**



**William Ross (Chairperson)**



**Michael Healey**



**Helen Tremaine**



**Rolf Kellerhals**



**James Gladstone**



**Tracy Anderson**

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## APPENDIX A

### TERMS OF REFERENCE

#### FOR THE OLDMAN RIVER DAM ENVIRONMENTAL ASSESSMENT PANEL

*Issued by the Minister of the Environment*

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#### Mandate

The Environmental Assessment Panel is to undertake a review of the potential environmental and socio-economic effects of the **Oldman** River Dam project. The Panel has the mandate to evaluate and make recommendations on the design and safety of the proposed dam, the significance of potential environmental and socio-economic effects of the proposed dam and its operation, and options for mitigating these effects. The Panel will submit its recommendations to the Ministers of Environment, Transport, and Fisheries and Oceans in the form of a report.

#### Scope of the Review

The Panel will review all existing studies prepared in association with the environmental reviews conducted by the province of Alberta and information prepared in accordance with the Navigable Waters Protection Act and the Fisheries Act. Further information may be required in order for the Panel to fully understand the project and its potential impacts.

#### Review Process

The main components of the process will be:

- 1) Appointment of an Environmental Assessment Panel and issuance of the Panel's Terms of Reference by the Minister of Environment;
- 2) Development of Operational Procedures by the Panel for approval by the Executive Chairman of the Federal Environmental Assessment Review Office;
- 3) Review by the Panel and the public of the available information mentioned in the Scope of the Review to determine whether any additional studies or information is required;
- 4) Completion of additional studies to address any information deficiencies;
- 5) Publication and distribution of information received by the Panel to facilitate public participation in the review;
- 6) Convening of hearings by the Panel to receive public comment; and
- 7) Preparation of the Panel's Final Report containing its findings, conclusions and recommendations. The Panel's report will be formally submitted to the federal Ministers of Environment, Transport, and Fisheries and Oceans. All reasonable efforts should be made to have this report completed as expeditiously as possible.

## APPENDIX B

### PANEL MEMBER BIOGRAPHIES

#### OLDMAN RIVER DAM ENVIRONMENTAL ASSESSMENT PANEL

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##### WILLIAM A. ROSS

Dr. Ross is a Professor of Environmental Science at The University of Calgary's Faculty of Environmental Design. He has been involved in a number of panel reviews including the federal-provincial Alberta-Pacific pulp mill review. Dr. Ross was also involved in the Walsh Study Group which made recommendations on procedures for conducting public reviews. Dr. Ross' current research centres on environmental impact assessment, and environmental and energy resource management.

##### JAMES L.F. GLADSTONE

Mr. Gladstone, a Treaty Indian and member of the Blood Indian Reserve, is a self-employed lawyer whose work has focused primarily on criminal, administrative, corporate, commercial and Native law. His practice is centred in the Southern Alberta area. His lifestyle has led him to develop a deep sense of commitment to resolving the complex problems facing the Indian people. He also has extensive experience as a professional rodeo competitor, a cattle rancher and farmer, a tribal administrator and a financial manager.

##### ROLF KELLERHALS

Dr. Kellerhals is a consulting engineer, specializing in river engineering and hydrology. He has extensive experience in environmental assessment and studies related to large-scale hydroelectric projects in Alberta and British Columbia. Principal areas of environmental studies have included reservoir sedimentation, downstream channel changes and effects of flow regulation and river engineering works on aquatic resources.

##### HELEN TREMAINE

Ms. Tremaine is presently Executive Director of the Ecomuseum Trust in the Crowsnest Pass and has been a resident of the area for the past four years. Ms. Tremaine has been involved in several community and regional planning exercises incorporating various aspects of tourism, recreation, culture, and heritage in Alberta and British Columbia. Ms. Tremaine has studied at the Universities of Western Ontario and Victoria.

##### MICHAEL C. HEALEY

Dr. Healey has spent twenty years working in the field of fisheries ecology with the Department of Fisheries and Oceans and is currently the Director of the Westwater Research Centre at the University of British Columbia in Vancouver. He has served on numerous committees, boards, and task forces on resource management policy and practices. Dr. Healey's principal areas of research are the distribution and abundance of animals in natural populations and the dynamics of exploited fish populations.

##### D. TRACY ANDERSON

Mr. Anderson worked for over 35 years with Agriculture Canada, spending most of this time at the Canada Agriculture Research Station in Lethbridge, Alberta. This period includes 10 years overseas experience in the development of applied agricultural research in India and other areas of the semi-arid tropics. His research included studies of factors that influenced the susceptibility of soils to erosion by wind and water, the occurrence of soil salinity, and means of managing soils to avoid salinity problems. Mr. Anderson is now retired from Agriculture Canada and makes his home in Lethbridge.

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## APPENDIX C

### TECHNICAL SPECIALISTS

#### OLDMAN RIVER DAM ENVIRONMENTAL ASSESSMENT PANEL

#### ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACT

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FISH AND FISH HABITAT	Dr. Gordon F. Hartman, Nanaimo, B.C.	VEGETATION	Ms. Kathleen Wilkinson and Mr. David Kerr, Calgary, Alberta, Environmental Management Associates
FISH HABITAT MITIGATION	Mr. Mike Miles, Victoria, B.C. M. Miles and Associates Ltd.	ECONOMICS	Dr. Si Brown, Vancouver, B.C. Erythana Ventures Corp.
FLUVIAL GEOMORPHOLOGY	Dr. Michael Carson, Victoria, B.C.	ARCHAEOLOGY	Dr. David Meyer, Saskatoon, Saskatchewan, University of Saskatchewan
WILDLIFE	Dr. Brian Horejsi, Calgary, Alberta	ENVIRONMENTAL IMPACTS	Ms. Elizabeth Neil and Ms. Kathy Pomeroy, Vancouver, B.C., Pomeroy and Neil Consulting
SOCIO-ECONOMICS	Dr. George Kupfer, Calgary, Alberta Fresh Start Social Consultants Company Limited		
DAM SAFETY AND DESIGN GEOTECHNICAL ASPECT	Mr. Graham C. Morgan, P.Eng., Victoria, B.C. Consulting Engineer		

**APPENDIX D**

**KEY REVIEW DOCUMENTS**

**ON THE ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS**

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1. Compendium of Submissions, February 11, 1991
2. Additional Information Requirements Document, March, 1991
3. Response to Additional Information Requirements Document, September, 1991
4. Compendium of Submissions, October — November, 1991
5. Addendum to the Response to the Additional Information Requirements Document, October, 1991
6. Compendium of Submissions, December, 1991 (plus two-volume Addendum)
7. Transcripts of the Proceedings, November 5 — 20, 1991

NOTE: Appendix E lists all those who contributed submissions to the December 1991 Compendium of Submissions (including the Addendum).

## APPENDIX E

### OLDMAN RIVER DAM ENVIRONMENTAL ASSESSMENT PANEL

#### PUBLIC HEARINGS ON ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

#### LIST OF WRITTEN SUBMISSIONS

DECEMBER 13, 1991

NOTE: Submissions are available individually or in the form of a compendium from the Panel Secretariat, Suite 1150 — 555 West Hastings Street, P.O. Box 12071, Harbour Centre, Vancouver, B.C. **V6B 4N5**

Code: **ALF 1-NC12/11/91**  
Submitted by: Alberta Flyfishers Club, Lloyd Shea, member

Code: **ALL 1-1990**  
Submitted by: **Allan, John**

Code: **ANPC 1-NC-11/11/91, ANPC 2-NC-12/11/91 and ANPC 3-NC-13/11/91**  
Submitted by: Alberta Native Plant Council, Elisabeth Beaubien, President

Code: **ASW 1 -NC-05/11/91**  
Submitted by: Alberta Soft Wheat Producers Commission, John Nikkel, President

Code: **AWA 1-22/11/91, AWA 2-NC-05/11/91 and AWA 3-NC-20/11/91**  
Submitted by: Alberta Wilderness Association, Dr. Thomas Power

Code: **BAR 1 -NC-25/11/91**  
Submitted by: Baresco, Dennis

Code: **BREF 1 -NC-1 2/11/91**  
Submitted by: Bert **Riggall** Environmental Foundation, Judy Huntley

Code: **BRID 1-NC-14/1 1/91**  
Submitted by: Bow River Irrigation District

Code: **BVN 1 -NC-26/11/91**  
Submitted by: Bow Valley Naturalists, Martin Finnerty, President

Code: **COL 1 -NC-25/11/91**  
Submitted by: County of Lethbridge, Sheldon Steinke, County Manager

Code: **COLL 1-NC-12/11/91**  
Submitted by: Collier, Barbara C.

Code: **CPWS and FOR 1-11/11/91**  
Submitted by: Canadian Parks and Wilderness Society and Friends of the **Oldman** River Society

Code: **DFO 1-23/11/91 and DFO 2-06/12/91**  
Submitted by: Department of Fisheries and Oceans, P.H. Sutherland, Director General

Code: **DIC 1 -NC-19/11/91**  
Submitted by: Ken Dickie

Code: **DOE 1-NC-190 1/91**  
Submitted by: Department of Environment, David Munro, Head, Environmental Assessment Division

Code: **DOE 2-NC-25/11/91**  
Submitted by: Department of Environment, R.A. Halliday, Director, Inland Waters Directorate

Code: **DOE 3-NC-05/12/91**  
Submitted by: Department of Environment, Gerald **McKeating**, Regional Director, Canadian Wildlife Service

Code: **DOE 4-NC-30/12/91**  
Submitted by: Department of Environment, C.E. Rodger, Environmental Assessment Biologist, Canadian Wildlife Service

Code: **DOT 1-NC-12/11/91**  
Submitted by: Department of Transport, Reg Watkins, Area Officer, Navigable Waters Sectional, Western Region

Code: **EMA 1-NC-22/11/91 and EMA 2-NC-22/11/91**  
Submitted by: Environmental Management Associates, David Kerr, Principal and Panel Technical Specialist

Code: **FAN 1 -NC-07/11/91**  
Submitted by: Federation of Alberta Naturalists, Maryhelen Posey, Chair, Land Use Committee

Code: **FEN 1-NC-01/11/91**  
Submitted by: Fenske, D.Wm.

Code: **FER 1-NC-19/11/91**  
Submitted by: **Fernet**, David, Environmental Management Associates and consultant to Alberta Public Works, Supply and Services

Code: **FOR 1-22/11/91, FOR 2-22/11/91, FOR 3-NC-04/11/91,**  
Submitted by: Friends of the **Oldman** River Society



Code: FOR 4-NC-07/11/91 Submitted by: Friends of the <b>Oldman</b> River Society, Martha Kostuch	Code: <b>LNID 4-NC-06/11/91</b> Submitted by: Lethbridge Northern Irrigation District, F. A. Ross, P. Eng. Manager
Code: FOR 5-NC-08/11/91 Submitted by: Friends of the <b>Oldman</b> River and Sweet Grass Consultants Ltd., Cliff <b>Wallis</b> , President	Code: <b>LNID 5-NC-18/91</b> Submitted by: Lethbridge Northern Irrigation District, UMA Engineering on behalf of Roy Jensen, Chairman of the Board
Code: FOR 6-NC-1/I/1/91, FOR 7 NC-I I/1/91, FOR 8-NC-1/I/1/91, FOR 9-NC-20/11/91, FOR 10-NC-20/11/91, and FOR 1 I-NC 29/11/91 Submitted by: Friends of the <b>Oldman</b> River Society, Cliff <b>Wallis</b> , President	Code: <b>LNID 6-NC-20/11/91</b> Submitted by: Lethbridge Northern Irrigation District, K. Dale Russell, UMA Engineering on behalf of the board of Directors, <b>LNID</b>
Code: FWR 1 -NC-30/I 1/91 Submitted by: Freshwater Research Limited, David <b>Mayhood</b> , President	Code: MAW 1-NC-18/I 1/91 and MAW 2-NC 27/11/91 Submitted by: Maw, Roland R., PhD., Lethbridge Community College, Department of Environmental Sciences
Code: FYF 1-NC-20/I 1/91 Submitted by: <b>Fyfe</b> , Richard, consultant on <b>raptor</b> management for Alberta Public Works, Supply and Services	Code: MFBS I-NC-1 I/I 1/91 Submitted by: Milner Fenerty Barristers & Solicitors
Code: GRE 1-NC-20/I 1/91 and GRE 2-NC-22/11/91 Submitted by: Green, Jeffrey E., Delta Environmental Management Group and consultant to Alberta Public Works, Supply and Services	Code: MHCC 1 -NC-13/11/91 Submitted by: Medicine Hat Chamber of Commerce
Code: HAM 1-NC-21/I 1/91 and HAM 2-NC-27/11/91 Submitted by: Hammond, Scott	Code: MOR 1 -NC-29/I 1/91 Submitted by: Morgan, Graham, Panel Technical Specialist
Code: HAN 1-22/11/91 and HAN 2-NC-08/11/91 Submitted by: Phil R. <b>Handcock</b>	Code: <b>NHRI 1-NC-24/10/91</b> and <b>NHRI 2-NC-24/10/91</b> Submitted by: National Hydrology Research institute, Environment Canada, Dr. W. Nicholaichuk, Chief, Hydrological Sciences Division
Code: HAR 1-NC-25/11/91 Submitted by: <b>Hartman</b> , Gordon, Panel Technical Specialist	Code: NOV 1 -NC-I 8/11/91 Submitted by: Novotny, Rob, <b>Oldman</b> River Canoe and Kayak Association (ORCKA)
Code: HIR I-NC 05/11/91 and HIR 2-NC 29/11/91 Submitted by: Hironaka, Robert	Code: OLS 1 -NC-22/11/91 Submitted by: Olson, Dennis, Fish and Wildlife Sub-committee, Local Advisory Committee, <b>Oldman</b> River Dam Project
Code: HOL I-21/12/90 Submitted by: Holmes, Owen G.	Code: PAC 1 -NC-20/11/91 Submitted by: <b>Pachal</b> , Dianne
Code: HOR I-NC 29/11/91 Submitted by: Horejsi, Brian, PhD. and technical specialist to Panel	Code: PAL I-1990 Submitted by: Byron Palmer, UMA Engineering
Code: HRW 1-NC-16/I 1/91 Submitted by: Holy Roads Woman, Peigan Indian Band	Code: PAR I-NC 17/11/91 Submitted by: Parker, David
Code: INAC I-27/09/91, INAC 2-NC 12/11/91, INAC 3-NC-27/11/91, INAC 4-NC 24/12/91, and INAC 5-NC-31/12/91 Submitted by: Indian and Northern Affairs Canada, Garry Wouters, Regional Director General	Code: PAS 1-NC-12/11/91 Submitted by: Paschen, G.F., Director, Canadians for Responsible Northern Development
Code: KLA I-1990, KLA 2-1990, and KLA 3-1990 Submitted by: Klassen, Stan	Code: PAS 2-NC-31/12/91 Submitted by: Paschen, Elizabeth E., Alberta Greens
Code: KUP 1-NC-02/12/91 and KUP 2-NC-27/12/91 Submitted by: Kupfer, George, PhD, Panel technical specialist	Code: PBA 1-05/91 Submitted by: Picture Butte Alberta, Town of
Code: LAW 1-NC-12/11/91 and LAW 2-NC-18/11/91 Submitted by: Lawrence, Randy	Code: PBCC 1-NC-13/11/91 Submitted by: Picture Butte Chamber of Commerce
Code: LCC 1 -NC-05/I 1/91 Submitted by: Lethbridge Chamber of Commerce	Code: PCCC I-NC 19/11/91 Submitted by: Pincher Creek and District Chamber of Commerce, Roy Davidson, Vice President
Code: LFS 1-NC-15/I 1/91 Submitted by: Lonefighters Society	Code: PCED 1 -NC-30/04/91 Submitted by: Pincher Creek Economic Development Advisory Committee
Code: LNID I-15/08/91, LNID 2-NC-06/11/91, and LNID 3-NC-06/11/91 Submitted by: Lethbridge Northern Irrigation District, Roy Jenson, Chairman of the Board	Code: PEI I-NC 12/11/91 Submitted by: Pei, Charles
	Code: PER 1 -NC-08/11/91 Submitted by: Perras, James D.

Code:	PHA 1-NC-071 1/91	Code:	TFM 1-28/05/91
Submitted by:	Pharis, Vivian	Submitted by:	Town of Fort Macleod
Code:	PNA 1-NC 01/11/91, PNA 2-NC 15/11/91, PNA 3-NC 15/11/91, PNA 4-NC 15/11/91, PNA 5-NC 15/11/91, PNA 6-NC 15/11/91, PNA 7-NC 15/11/91, PNA 8-NC 15/11/91, PNA 9-NC 15/11/91, PNA 10-NC 15/11/91, PNA 11-NC 15/11/91, and PNA 12-NC 28/11/91	Code:	THO 1-NC 16/11/91
Submitted by:	Peigan Nation Administration	Submitted by:	Thompson, Dixon, PhD.
Code:	PNC 1-22/11/91	Code:	TID 1-11/1 1/91
Submitted by:	Pomeroy and Neil Consulting Inc.	Submitted by:	Taber Irrigation District, Kent Bullock, District Manager
Code:	REE 1-NC-07-11/91	Code:	TTG 1-08/10/91, and TTG 2-NC 21/11/91
Submitted by:	Reeves, Brian, PhD.	Submitted by:	Truitt, Wayne and Terrie; Vern and Lucille Thompson; and Harold and Merle Ganske
Code:	RUS 1 -NC-20/11/91	Code:	TUC 1-22/11/91, TUC 2-23/11/91, TUC 3-NC-05/11/91, TUC 4-NC-08/11/91, TUC 5, -NC-08/11/91, TUC 6-NC 29/11/91,
Submitted by:	Russell, John H.	Submitted by:	Trout Unlimited Canada, Don Pike, <b>General</b> Manager
Code:	RUSS 1-NC-12/11/91	Code:	UofL 1-NC-07/11/91, and UofL 2-NC-18/11/91
Submitted by:	Russell, Andy	Submitted by:	University of Lethbridge, Stewart Rood and John Mahoney, Department of Biological Sciences
Code:	SAW 1-22/11/91, SAW 2-22/11/91, SAW 3-NC-09/04/90, SAW 4-NC-O2/O2/87, and SAW 5-NC-29/11/91	Code:	VAN 1-NC 19/11/91
Submitted by:	Southern Alberta Water Management Committee, Don LeBaron, Chairman	Submitted by:	Van Tighem, Kevin
Code:	SBG 1-22/11/91	Code:	VON 1 -NC-05/11/91
Submitted by:	Sugar Beet Growers' Marketing Board	Submitted by:	Village of Nobleford
Code:	SCA 1-22/11/91	Code:	WEI 1-NC 18/11/91 and WEI 2-NC 28/11/91
Submitted by:	Sierra Club of Alberta	Submitted by:	Weing, John
Code:	SHE 1-NC-12/11/91	Code:	WEST 1-NC-19/11/91
Submitted by:	Sherwood Park Fish and Game Association, Andy Boyd, President	Submitted by:	<b>Westrop</b> , Audrey
		Code:	ZYB 1-NC 21/11/91
		Submitted by:	Zybach, Paula

## APPENDIX F

### LIST OF PRESENTERS AT PUBLIC HEARINGS

**NOVEMBER 5, 1991**  
LETHBRIDGE, ALBERTA

AFTERNOON SESSION

City of Lethbridge  
Presentation by Mayor David Carpenter

Alberta Soft Wheat Producers' Commission  
Presentation by John Nikkei

Village of Nobleford  
Presentation by Kirk Hofman

Lethbridge Chamber of Commerce  
Presentation by Jim Duff

Southern Alberta Water Management Committee  
Presentation D. LeBaron, S. Clark, and G. Ayers

EVENING SESSION

Archaeological and Historical Resources  
Presentation by Dr. David Meyer

Socio-economic Impacts  
Presentation by Dr. George Kupfer

Local Advisory Committee  
Presentation by Hilton Pharis

Economic Impacts  
Presentation by Dr. Si Brown

Alberta Wilderness Association  
Presentation by Tom Power

Friends of the Oldman River Society  
Presentation by Cliff Wallis

**NOVEMBER 6, 1991**  
LETHBRIDGE, ALBERTA

AFTERNOON SESSION

Presentation by Henry Dyck

Fluvial Geomorphology  
Presentation by Dr. Michael Carson

Wildlife  
Presentation by Dr. Brian Horejsi

Trout Unlimited Canada  
Presentation by Don Pike

Taber Irrigation District  
Presentation by Kent Bullock

Fort MacLeod Chamber of Commerce and Fish and Game  
Assoc.  
Presentation by Shawn Patience

Presentation by Bill Arsene

EVENING SESSION

Lethbridge Northern Irrigation District  
Presentation by Roy Jensen

Vegetation  
Presentation by David Kerr

Fish Mitigation  
Presentation by Michael Miles

Fish and Fish Habitat  
Presentation by Dr. Gordon Hartman

Christian Farmers' Federation  
Presentation by P. Eastwood, J. Kolk, and M. Puurveen

**NOVEMBER 7, 1991**  
CALGARY ALBERTA

MORNING SESSION

Economic Impacts  
Presentation by Dr. Si Brown, Panel Technical Specialist

Socio-Economic Impacts  
Presentation by Dr. George Kupfer, Panel Technical  
Specialist

Archaeological and Historical Resources  
Presentation by Dr. David Meyer, Panel Technical  
Specialist

Presentation by Dr. Brian Reeves, Private Citizen of Calgary

Presentation by Vivian Pharis, Private Citizen

EVENING SESSION

Friends of the Oldman River Society  
Presentation by M. Kostuch, C. Wallis, T. Abbe, and C.  
Wershler

Federation of Alberta Naturalists  
Presentation by Maryhelen Posey

Sierra Club  
Presentation by Russell Johnson

**NOVEMBER 8, 1991  
CALGARY, ALBERTA**

MORNING SESSION

Wildlife

Presentation by Dr. Brian Horejsi, Panel Technical Specialist

Fluvial Geomorphology

Presentation by Dr. Michael Carson, Panel Technical Specialist

Vegetation

Presentation by Dr. David Kerr, Panel Technical Specialist

University of Lethbridge

Presentation by Dr. Stewart Rood, J. Mahoney

EVENING SESSION

Fish and Fish Habitat

Presentation by Gordon Hartman, Panel Technical Specialist

Fish Mitigation

Presentation by Michael Miles, Panel Technical Specialist

Trout Unlimited Canada

Presentation by Gary Szabo and Don Pike

Presentation by Phil Handcock, Private Citizen of Calgary

Presentation by Dave Mayhood, Private Citizen of Calgary

Presentation by Paula Zybach, Private Citizen of Calgary

Presentation by James Perras, Private Citizen of Cochrane

**NOVEMBER 12, 1991  
EDMONTON, ALBERTA**

AFTERNOON SESSION

Presentation by Wayne Roberts, Private Citizen of Edmonton

Presentation by Charles Pei, Private Citizen of Edmonton

Friends of the Oldman River Society

Presentation by Cliff Wallis

Sherwood Park Fish and Game Association

Presentation by Andrew Boyd

Canadians For Responsible Northern Development

Presentation by Gerry Paschen

Alberta Native Plant Council

Presentation by Elizabeth Beaubien

Alberta Flyfishers

Presentation by Lloyd Shea

EVENING SESSION

Department of Indian Affairs and Northern Development  
Presentation by Garry Wouters and Glen Bloodworth

Presentation by Charles Truscott, Private Citizen of Edmonton

Mother Earth Healing Society

Presentation by Lorraine Sinclair

Edmonton Friends of the North

Presentation by Lorraine Vetsch

Presentation by Barbara Collier, Private Citizen of Bon Accord

Presentation by Randy Lawrence, Private Citizen of Edmonton

**NOVEMBER 13, 1991  
MEDICINE HAT, ALBERTA**

EVENING SESSION

Lethbridge Northern Irrigation District

Presentation by Rick Ross

Medicine Hat Chamber of Commerce

Presentation by Al McLeod and John Hamill

Presentation by Dawn Dickinson, Private Citizen of Medicine Hat

Presentation by Doug Sheppard, Private Citizen of Medicine Hat

Presentation by Rob Gardner, Private Citizen of Medicine Hat

Presentation by Gary Lehr, Private Citizen of Medicine Hat

**NOVEMBER 14, 1991  
PICTURE BUTTE, ALBERTA**

AFTERNOON SESSION

Alberta Sugar Beet Growers Association

Presentation by Art Bergen Henengouwen

Southern Alberta Water Management Committee

Presentation by Dr. James Byrne

Alberta Softwheat Producers' Commission

Presentation by Theo Klooster

Lethbridge Northern Irrigation District

Presentation by Roy Jensen

EVENING SESSION

Presentation by Mayor Richard Casson, Town of Picture Butte

Bow River Irrigation District

Presentation by Fin McPherson

Picture Butte Chamber of Commerce

Presentation by Everitt Tanis

**NOVEMBER 16, 1991  
BROCKET, ALBERTA**

MORNING SESSION:

Chief Leonard Bastien  
Paul Smith  
Joe Crow Shoe  
Nelson Small Legs  
Nick Smith  
Billy Strikes With a Gun  
Eddy Yellow Horn  
Reggie Crow Shoe  
Holy Roads Woman

AFTERNOON SESSION:

Joe Crow Shoe  
Eddy Bad Eagle  
Holy Roads Woman  
Romeo Yellow Horn  
Nick Smith  
Elsie Crow Shoe  
Joe Yellow Horn

Peigan Administration Presentation, Devalon Small Legs  
David Blacksmith  
Judy Williamson  
Thomas Saunders  
Lyle Morsell  
Kevin Daniels  
Mr. Stanger  
Hilton Pharis  
Lorna Born With a Tooth  
Evelyn Kellman  
Maurice Little Wolf

**NOVEMBER 18, 1991  
LETHBRIDGE, ALBERTA**

AFTERNOON SESSION

Presentation by Mr. John Weing, Private Citizen of Magrath

Department of Fisheries and Oceans  
Presentation by Mr. John Jensen

Transport Canada  
Response to Questions by Mr. Reg Watkins

Presentation by Mr. Roland Maw, Private Citizen of Lethbridge

Oldman Canoe & Kayak Association  
Presentation by Mr. Rob Novotny

Southern Alberta Water Management Committee  
Presentation by Mr. Don LeBaron

EVENING SESSION

Agriculture Canada  
Response to Questions by Mr. Craig Wood

Department of Fisheries and Oceans  
Presentation by Mr. Drew Bodaly

County of Lethbridge  
Presentation by Mr. Roy Neidermier and Dr. Jim Byrne

Presentation by Dr. Jim Byrne, Private Citizen of Lethbridge

**NOVEMBER 19, 1991  
PINCHER CREEK, ALBERTA**

AFTERNOON SESSION

Presentation by Audrey Westrop, Private Citizen of Pincher Creek

Presentation by Ms. Valerie Haig Brown, appearing for Mr. H. John Russell, Private Citizen of Pincher Creek

Bert Riggall Environmental Foundation  
Presentation by Ms. Judy Huntley

Presentation by Mr. Kevin Van Tighem, Private Citizen of Okotoks

Chamber of Commerce  
Presentation by Mr. Roy Davidson

EVENING SESSION

Presentation by Dr. George Kupfer

Environmental Management Associates  
Presentation by Mr. Dave Fernet

Presentation by Truitt, Thompson and Ganske, Private Citizens

Presentation by Scott Hammond, Private Citizen of Pincher Creek

Presentation by Mrs. Howard Davis, Private Citizen of Cowley

**NOVEMBER 20, 1991  
PINCHER CREEK, ALBERTA**

AFTERNOON SESSION:

Pincher Creek Economic Advisory Committee  
Presentation by Mr. Doug Thornton

Alberta Wilderness Association  
Presentation by Dr. Tom Power

The Delta Group  
Presentation by Mr. Jeff Green

Presentation by Mr. Richard Fyfe, Independent Consultant

Eastern Slopes Rangeland Consultants  
Presentation by Clare Tannas

Wildrose Consulting  
Presentation by Ms. Ann Smreciu

Lethbridge Northern Irrigation District  
Presentation by Ken Craig and D. Russell

EVENING SESSION:

Presentation by Ms. Diane **Pachal**, Private Citizen of Calgary

Presentation by Mr. Ed Wolf, Private Citizen of Calgary

Presentation by Mr. Dennis Olsen, Private Citizen of Pincher  
Creek

Friends of the **Oldman** River  
Presentation by Mr. Cliff **Wallis**

Southern Alberta Water Management Committee  
Presentation by Don **LeBaron** and Mayor **Elfred** Lowe

Presentation by Mr. David Wilms, Private Citizen of Pincher  
Creek

## APPENDIX G

### ACKNOWLEDGEMENTS

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In conducting this environmental review the Panel benefited from the work of many people. While it is not possible to identify each person who contributed, the Panel would like to acknowledge the assistance it received. First to be thanked is Patricia Woodward, the Executive Secretary to the Panel whose help was invaluable in too many ways to list.

The Panel would also like to thank the Staff of the Federal Environmental Assessment Review Office in Vancouver, notably, Paul Scott, Bob Greyell, John Mathers, Margrett Veger, Theresa Salway, Roberta Lauer, and Janis Heal. The Secretariat was also assisted by Praxis Limited in Calgary, Alberta. The Panel would like to thank Richard Roberts, David Cuvilier, Philippe Reicher and Shawna Walsh of Praxis for assisting with the logistics of the public hearings, and Gail Fritz for being the Panel's Information Officer in the Pincher Creek Office.

One of the most challenging tasks of this review was to provide the Panel with a comprehensive response to its Additional Information Requirements Document. The Panel would

like to thank all of the technical specialists and government resource people who provided input and most particularly Elizabeth Neil and Kathy Pomeroy of Pomeroy and Neil Consulting who compiled and contributed to this response.

Certain individuals within the federal and Alberta government were particularly helpful in providing the Panel with information throughout the review and during the public hearings. The Panel gratefully acknowledges the assistance of Mr. Dan Bader and Mr. Jim Barlishen of Alberta Public Works, Supply and Services; Mr. Glen Hopky and Mr. Jeff Stein of the Department of Fisheries and Oceans; and Mr. Reg Watkins of the Department of Transport.

Perhaps most importantly, the Panel would like to thank all of the individuals, agencies and organizations which contributed to the review process. The time and effort given by so many participants made this review possible. Thank you for your comments and guidance and for welcoming us into your communities.

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## APPENDIX H

### GLOSSARY OF TERMS

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Archaeology	The study of the lives and cultures of historic and prehistoric peoples.	Hydrology	The study of water and its movements in rivers, in the earth and in the atmosphere.
Ecosystem	A set of organisms, both plant and animal, and their associated physical environment, that interact and behave in accordance with a set of natural laws.	Mitigation	To reduce a given impact.
Floodplain	The relatively flat valley floors adjacent to and formed by rivers which are subject to occasional flooding.	Probable Maximum Flood	The theoretically greatest flood flow which could occur at a specified point on a river.
Full Supply Level	The maximum level to which a reservoir will be allowed to fill under normal conditions. Higher water levels may be permissible under flood conditions.	Return Flow	Waters returned from an irrigation system to the river.
Gas Supersaturation	Release of dissolved gases from supersaturated water immediately downstream of dam spillways which result in the formation of air bubbles in the body tissue of fish. This condition adversely affects the physiology of the fish and can be fatal.	Soil Salinity	The accumulation of soluble salts in soil.
Geomorphology	The study of landforms.	Spillway	A passage in or around a dam for the release of surplus water.
		Supply Management	A water management approach which seeks to ensure an adequate water balance by increasing the amount of water available in the system to meet increased demand.
		Tributary	A stream that feeds or flows into or joins a larger stream or lake.