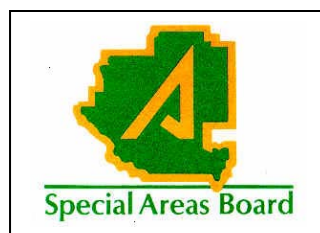




**SPECIAL AREAS WATER SUPPLY PROJECT**

**PROJECT SUMMARY**



**Special Areas Board**  
Hanna, Alberta

May 20, 2005

## **Project Summary**

The population of the Special Areas of Alberta is declining and becoming more urban-based and aged as young people, unable to find long-term employment in the region, relocate to other areas. Population changes have reduced the demand for private and public services, resulting in further reductions in employment and population declines. Arresting this self-perpetuating trend is an ongoing challenge for the Special Areas Board and other government agencies.

Historically, low precipitation and a lack of secure water supply have been the predominant characteristics that have caused severe hardships in the Special Areas. These characteristics still remain the primary impediments to diversifying economic opportunities, stabilizing farm incomes and improving social conditions.

On November 10, 1988 the Special Areas Board and the Prairie Association for Water Management hosted a meeting to discuss the possibility of diverting water from the Red Deer River to alleviate water shortages. It was decided to form a Steering Committee to provide direction and resources for investigating the feasibility of a diversion from the Red Deer River to the headwaters of Berry and Sounding Creeks. The feasibility study was to consider technical, social, economic, environmental and institutional factors.

The study was conducted in two phases. Phase I addressed project concepts and options; Phase II examined the feasibility of the project. This Project Summary provides the results of Phase II investigations and findings.

The Special Areas Water Supply Project (SAWSP) was designed to capitalize on the natural resources and attributes of east-central Alberta and provide widespread, multi-purpose benefits to a large portion of the Special Areas and parts of the Counties of Stettler and Paintearth. Diverting water from the Red Deer River to the headwaters of Sounding and Berry Creeks would make water available to landholders along the conveyance route between the river and the headwaters, and take advantage of natural physiographic features to serve water users along the eastern-flowing Sounding Creek and along the southern-flowing Berry Creek. The project would provide water to a significant portion of the Special Areas. Natural channels would be the primary conveyance mechanism within Sounding and Berry Creek basins. Use of the natural channels would lessen the intrusion on the natural environment, minimize severance of land parcels, and reduce costs. The area of influence of the project could possibly be expanded to adjacent streams by relatively low-cost secondary pumping or gravity diversions. Each expansion initiative would have to be evaluated on its own merits to determine its feasibility and its compatibility with objectives for the entire system.

The project would involve diversion works consisting of a pump station on the Red Deer River south of the Hamlet of Nevis (SSW 15-38-22-W4) and a 4.5 km pipeline. An 84 km main canal or pipeline would convey water to the headwaters of Sounding and Berry Creeks. Storage reservoirs would be developed along the main canal at Shooting Lake and on a tributary to the northwest arm of Sullivan Lake.

A distribution system within Sounding and Berry Creek basins would involve upgrades of existing works or new construction of about 94 km of canals, channel improvements, two water supply reservoirs, and 17 multi-use Projects, which will provide wetlands and riparian habitat for wildlife, stockwater availability and water for pumping to dugouts.

AMEC Earth and Environmental (2004) estimated the cost of the project (Year 2004 dollars) to be:

Diversion Works	\$25,270,000
Main Canal and Reservoirs	\$99,090,000
Distribution System	\$67,920,000
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Total Cost*	\$192,280,000

\*Costs include 20% contingencies and 15% engineering. Land costs are not included. About 50% of the land in the Special Areas is leased Crown land.

For further detailed information on the Diversion Works refer to the Special Areas Web Site [www.specialareas.ab.ca](http://www.specialareas.ab.ca) and search Summary Report on Inbasin Distribution Study.

At full development, annual operation and maintenance costs are estimated to be about \$3.1 million, of which about \$1.6 million would be for energy to power the pumps on the Red Deer River.

It is anticipated that the funding for construction and operation of the project would be on the same basis as other major water supply projects the province operate in the South Saskatchewan River Basin. The province has constructed these projects, operates them in cooperation with local users. The users will pay a user fee for the water they receive from the project.

Simulation modeling indicates that the project as designed would meet the water supply objectives of SAWSP, including the water supply requirements for:

- Stockwatering and domestic or household needs along the conveyance routes.
- Seventeen multi-use projects that would create or stabilize 3350 ha (8280 ac) of wetlands for waterfowl conservation and would provide for a more reliable stockwatering throughout a large portion of the region.
- Sixteen backflood irrigation projects totalling 2340 ha (5780 ac).
- Sprinkler irrigation on 8090 ha (20,000 ac).
- Maintaining 423 km of live stream (canals and natural channels) for wildlife habitat and stockwatering.

Studies indicate that SAWSP will strengthen and diversify the economy and social fabric of the Special Areas and adjacent municipalities. Employment opportunities would be created through,

- increased tourism and associated activities,
- construction and operation of infrastructure,
- increased and stabilized agricultural production,
- new demands for the commercial and service sectors of the economy, and

- the development of secondary industries have the potential for beef feedlots, intensive hog and poultry operations, processing plants, greenhouses and market gardens, etc.

Additional opportunities for recreational activities would contribute to the quality of life for residents of the Special Areas.

The project is expected to reach its full potential within six years of completion of construction and project flushing. A socio-economic assessment was conducted to identify and, to the extent possible, quantify the economic, social and environmental impacts of the project (Watrecon 2005). From a provincial perspective, and considering only the quantified, direct benefits, SAWSP would generate annual benefits in the range of \$8.5 to \$9.6 million per year as shown on table 31 of the Watrecon Consulting Socio-economic Executive Summary on the Special Areas Web Site [www.specialareas.ab.ca](http://www.specialareas.ab.ca) and between 60 and 91 person-years of new employment. The project would have a provincial benefit to cost ratio of about 0.70, based on benefits that could be quantified. Regional incomes would increase by \$8.7 to \$9.8 million. Regional employment would increase by 65 to 90 person-years.

Construction of SAWSP and related facilities would generate considerable short-term impacts and benefits for both the province and the region. The regional construction benefits would amount to 1327 person-years of employment and \$59.8 million in labor income.

In addition there would be significant unquantified benefits, including,

- improved human and livestock health,
- opportunities for agricultural diversification and intensification,
- opportunities for regional value-added businesses,
- stabilization of regional populations,
- more effective provision of regional education and health services,
- reduced drought relief demands on governments (during severe droughts and low flow periods on the Red Deer River when pumping is curtailed, stock water and irrigation users will be supplied from offstream storage within the project),
- increased opportunities for water-based recreation,
- improved wetland and upland habitat for the protection of wildlife, including species at risk in Alberta, and
- reduced stress and uncertainty for farm families caused by periodic droughts.

Marv Anderson and Associates Limited (2000) reviewed United States and Canadian literature related to environmental values to quantify the environmental benefits of SAWSP. He also reasoned values for drought mitigation and social benefits. Dr. Anderson indicated that,

- the imputed monetary value of helping to sustain nine wildlife species in the area that are at risk in Alberta would be at least \$2.0 million per year, and
- the socio-economic value of reducing the susceptibility to drought, the public cost of drought payments, and the social disruption of continued out-migrations from the Special Areas is between \$2.0 and \$3.0 million per year.

Both quantified and unquantified benefits would contribute to the return on an investment in SAWSP.

Implementation of SAWSP is consistent with Alberta's rural development policies and would help ensure the establishment of a sustainable and vibrant economy in east-central Alberta. In particular, SAWSP would directly contribute to three tasks identified in the strategy:

- Work with communities, industries and others to ensure that there is a sustainable supply of water to support a broad range of development in rural Alberta.
- Expand innovative and value-added business opportunities in rural Alberta.
- Expand tourism opportunities in rural communities by developing new tourism destinations in rural Alberta.

Other priority actions of the strategy are to enhance the quality of Alberta's rural environment, improve access to health care, and expand learning and skill development opportunities.

From an environmental perspective, the Special Areas has some of the largest remaining tracts of native mixed-grass prairie and its associated ecosystem in Canada. SAWSP would result in some losses to the native grasslands and its ecosystem, but the area of native land lost would not be large because of the intent to use natural channels as the conveyance system, and because most of the land area that would be irrigated is land that is currently under cultivation. Land uses on environmentally sensitive Crown leased land would be controlled by the Special Areas Board. With careful water and land use management, the grasslands would benefit from implementation of SAWSP. The project would make possible the implementation of range management systems which would lead to improved range conditions and increased wildlife habitat diversity, foraging opportunities, thermal protection and nesting cover.

SAWSP would provide significant benefits to wetland-related wildlife species. As currently proposed, the project would create or enhance 17 wetland projects that would provide about 3350 ha (8280 ac) of high quality wetlands. In addition, the project would provide about 423 km of flowing streams (natural channels with riparian vegetation, and canals). Pumped diversions and releases from balancing reservoirs would ensure that valuable wetland habitat would still exist in the Special Areas during periods of drought when it is most needed by wildlife.

The project has been designed to minimize evaporation losses by bypassing several large natural lakes, and utilizing the most efficient storage sites for water supply reservoirs. Project evaporation losses have been estimated to be about 13 percent of the total water supply to the project. It is expected that almost all irrigators would use low pressure center pivots for onfarm equipment. The project is primarily a linear system; over deliveries of irrigation water to one user would be available to a downstream user or stored in a water supply reservoir. Return flows would be minimal.

Two water quality parameters of particular concern with respect to using stream and reservoir water for irrigation are sodium adsorption ratio (SAR) and total dissolved solids (or salinity), as commonly measured by electrical conductivity (EC). Soil

**Electrical Conductivity (EC)**  
High Concentrations of salt in irrigation water adds to the salt content of soils which can affect water uptake and extraction by plants and also soil structure.

and water quality sampling was conducted during 2002 to 2003 to improve input data for water quality modeling (Golder, 2004). Using the most stringent guidelines for SAR and EC (SAR = 5; EC = 1000), water quality modeling conducted by Golder Associates (2005) indicated that at full development and initial development conditions, SAR and EC are expected to be acceptable for irrigation approximately 90 – 95% of the time at on-line locations with irrigation withdrawals. Modeling results indicate that guideline exceedences in the lower portions of Sounding Creek may occur up to 10% of the time during initial years of the project (prior to full development of sprinkler irrigation). During full scale development conditions, the frequency of guideline exceedence in the lower portions of Sounding Creek junctions with irrigation withdrawals is predicted to be lower (approximately 5%). Overall, exceedences of the most stringent EC and SAR criteria are infrequent, and tend to occur either in early spring (usually May) or late in the fall during the irrigation season.

**Sodium Adsorption Rate (SAR)**

is a measure of the relative concentrations of sodium, calcium and magnesium in water. Excess sodium in relation to calcium and magnesium concentrations in soil (high SAR) destroys soil structure, resulting in hardpan layers which reduce the permeability of the soil to water and air.

Salt loadings from beds of reservoirs are believed to be the major driver for water quality in the system. The bed loading estimates used in the model are considered conservative. However, as with all modeling studies, there remains a risk that water quality in lower Sounding Creek will not perform as predicted, particularly if loadings from beds are higher than predicted. A monitoring program conducted by the Special Areas Board and water users will detect trends in water quality throughout the system. In addition, contingency plans will be developed and implemented in the event of a worst-case scenario. For instance, irrigation development could be shifted to irrigable lands in other areas of the project. The benefits would not be significantly diminished.

With respect to water quality parameters other than salinity and sodium adsorption ratio, guidelines for some parameters, such as coliform bacteria, turbidity, and phosphorus, may be exceeded from time to time, as they are in the Red Deer River and other parts of the South Saskatchewan River Basin. Measures (including monitoring and mitigation) can be and should be taken to minimize water quality exceedences, in conjunction with other stakeholders. Water quality for these other parameters is not expected to be a limiting factor on the feasibility of the project. A monitoring program will be in place to identify any unanticipated effects, and to assist with the design of appropriate mitigation strategies.

Diversions from the Red Deer River for SAWSP would be subject to Red Deer River Water Conservation Objectives being established through Phase II of the South Saskatchewan River Basin planning program involving extensive public involvement. Based on the instream flow objectives recommended by the Red Deer Basin Advisory Committee (public) to Alberta Environment (2004), the Red Deer River instream requirements would not be a limiting factor on the project.

**A Water Conservation Objective**

is the amount and quality of water to be necessary for the protection of a natural water body, its aquatic environment, or any part of them, or for protection of non-withdrawal uses of water. Water Conservation Objectives are established by the *Water Act* Director.

The project would transfer water from the Red Deer River Basin to Sounding Creek Basin and Battle River Basin which is identified under the *Water Act* as an inter basin transfer. Sounding Creek Basin is a closed system; it does not contribute water to the Battle River or North Saskatchewan River. Transfer of biota between major river basins is not an issue as the Sounding Lake is in the upper reaches of the Sounding Creek which does not flow into the Battle River Basin as researched through:

- Historical evidence
- Modeling
- Saskatchewan Watershed Authority
- PFRA/Water Survey of Canada
- Environment Canada
- Hydrology Branch, Alberta Environment
- Atlas of Saskatchewan.

A Historical Resources Impact Assessment would be conducted prior to construction of SAWSP to assure that historical resources are preserved without damage or destruction. If necessary, mitigation measures will be included in project design, construction and operation.

The project will require federal, provincial and municipal government approvals for development. Work will commence on obtaining approvals following support in principal for the project by the provincial government(subject to certain conditions).

To manage the project it has been proposed that a Water Users' Association be established under the *Special Areas Act*. The Association would be locally controlled and responsive to local needs. Responsibilities of the Association would include:

- Delivery of water to users of the system and prescribing conditions of such use.
- Operation and maintenance of works.
- Establishing and collecting water user fees in accordance with other irrigation districts and projects in the province.
- Monitoring.

Operation and maintenance costs would be funded by beneficiaries of the project, including private individuals, corporations, the Special Areas Board and the general public (provincial government). The Special Areas Board is exploring innovative measures to supply energy to the project and reduce costs. The Board has established a trust fund to pay a percentage of the energy costs for the project.

A Water Act licence for the project was applied for on November 3, 2003. Alberta Environment has accepted the application as complete, thus establishing the project's priority. The level of study that has been completed is considered to be adequate to begin the process of seeking federal and provincial government approvals for the project.

## References Cited

Alberta Environment 2005. South Saskatchewan River Basin Water Allocation. Alberta Environment. Lethbridge, AB.

AMEC 2004. Special Areas Water Supply Project In-Basin Distribution Study – Summary Report. Special Areas Board. Hanna, AB.

Golder Associates 2005. Update on SAWSP Water Quality Modelling Studies. (January 28, 2005 memorandum reporting study results). Special Areas Board. Hanna, AB.

Marv Anderson and Associates 2000. Socio-economics Impacts of the Proposed Special Areas Water Supply Project. Special Areas Board. Hanna, AB.

South Saskatchewan River Basin Advisory Committees 2004. Water Management Recommendations in Response to Phase 2 Terms of Reference. Alberta Environment. Lethbridge, AB.

Watrecon 2005. Socio-economic Assessment of the Special Areas Water Supply Project. (Draft report dated March 3, 2005). Special Areas Board. Hanna, AB.

## **Project Overview**

### **Diversion Works**

Pumping Facilities	7 vertical turbine pumps (subject to review) 108 m (354 ft) lift 7.1 m <sup>3</sup> /s (250 cfs) capacity (capacity may be reduced to as low as 5.0 m <sup>3</sup> /s)
Pipeline	1829 mm (72 in) 4.5 km long
Main Canal	84 km, from Red Deer River valley to headwaters of Sounding and Berry Creeks.

### **Storage Reservoirs**

Shooting Lake Reservoir	2000 dam <sup>3</sup> live storage
Sullivan Lake Tributary Reservoir	4000 dam <sup>3</sup> live storage
Lehman Reservoir	24,000 dam <sup>3</sup> live storage
Oyen Reservoir	14,250 dam <sup>3</sup> live storage

### **Distribution System**

Sounding Creek, Berry Creek and Craig Lake Tributary natural channels to the extent possible.  
Some canals and channel improvements required.  
423 km of flowing streams (canals, natural channels) for habitat and stockwatering (plus 84 km Main Canal).  
17 multi-use projects provide 3350 ha (8280 ac) of wildlife habitat.  
16 backflood projects irrigating 2340 ha (5780 ac).  
7290 ha (18,000 ac) of sprinkler irrigation (plus 800 ha (2000 ac) along Main Canal).

### **Costs**

Diversion Works	\$25.27 million (2004\$)
Main Canal and Storages	\$99.09
Distribution System	\$67.92
Total	\$192.28 million
Operation and Maintenance	\$1.5 million/year
Energy	\$1.6 million/year

### **Water Requirements**

Pumping period: Assumed to be Apr 15 to Oct 31; variable in actual operation depending on flow, weather, etc.  
Variable year-to-year, ranging from 13,200 dam<sup>3</sup> to 76,500 dam<sup>3</sup>.  
Mean diversion = 53,400 dam<sup>3</sup>.

### **Benefits**

Stabilized and increased forage production to support the ranching economy of the area.  
Increased hunting and recreational opportunities.  
Secure supply and better distribution of stockwater.  
Better utilization of rangelands and improved upland habitat.  
Domestic and municipal water supplies.  
Environmental benefits associated with wetland and upland habitat.  
Employment and more stable population.  
More efficient and higher utilization of existing infrastructure and services.  
Improved social conditions.  
Potential new industrial developments.  
Contribute to provincial social and economic objectives, particularly Alberta's Rural Development Initiative.

**Opportunities and renewed hope for the future.**