



Chapter II.

# Irrigation Development

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Irrigation in southern Alberta has a 100-year history. The historical circumstances that set a pattern for the development of most of the irrigated area in Alberta provides a perspective on the land bases, design and layout of infrastructure, and the water licences that have been inherited by current districts. These factors continue to play a significant role in the management of today's districts. More recently, the province has taken steps to address water supply concerns and environmental issues, as water development in the South Saskatchewan River Basin approaches the limits of its water supply. These circumstances and events, described below, provide background and context for the Irrigation Water Management Study.

### A. HISTORY OF IRRIGATION IN SOUTHERN ALBERTA

The development and management of irrigation districts in Alberta have evolved during the past 100 years through an interesting series of events and circumstances, some of which are noted on the overleaf and in Figure 2. Each of the 13 existing districts has its own unique history, often involving a community-minded champion with desire and dogged determination to better the economic and social standing of his own family and his neighbours. An account on the formation of each individual district is beyond the scope of this report. However, a review of the history of the districts reveals a pattern of four distinct phases that apply to most irrigation districts and to the industry as a whole. These four phases are discussed in turn below.

#### 1. The Early Years: Pre-1920

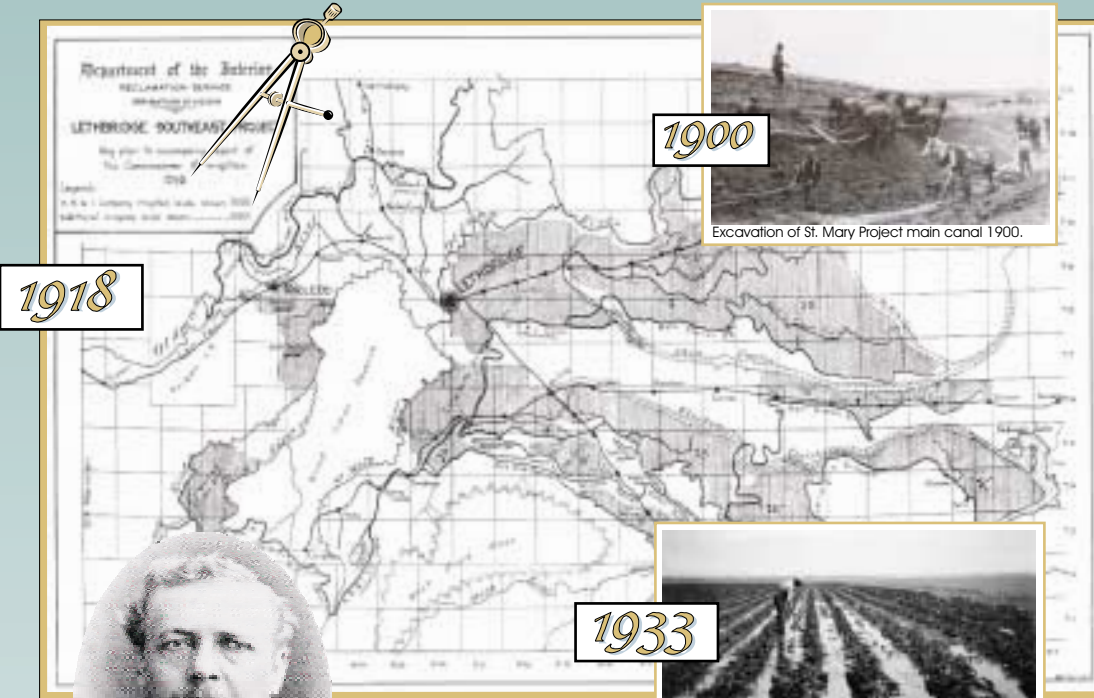
The early years of irrigation in Alberta were characterized by admirable foresight, optimism, enthusiasm and speculation.

William Pearce, a Department of the Interior federal government official in the late 1800s, has been credited with playing a major role in formulating policies on resource development in western Canada. Pearce, an enthusiastic promoter of irrigation, saw irrigated agriculture as a key to stimulating settlement on the drought-prone Canadian prairies. Recognizing that the water law of the day, British common-law riparian rights, was a deterrent to large-scale irrigation, he and Col. J. S. Dennis, the Interior Department's Chief Inspector of Surveys, were largely responsible for developing the Northwest Irrigation Act of 1894. The Act suppressed individual riparian rights and vested in the Crown the right to control the diversion and use of water through a licensing system, in a manner they believed would encourage investment in irrigation infrastructure, protect individual and corporate water users, and result in the greatest public good (Dennis 1894).

Government policy of the time was to conduct land and water surveys to determine, in a general way, the location and engineering feasibility of potential irrigation developments. Actual development was left to private enterprise. In the early years, there was a lack of information on the agro-climatic and agronomic parameters important to determining the feasibility of irrigation projects. Nevertheless, Department of the Interior officials identified and publicized numerous potential, large-scale projects. Some of these projects have not yet been developed, some were developed and have failed, and others were developed and have endured and prospered.



# A Century of Irrigation in Alberta



1918

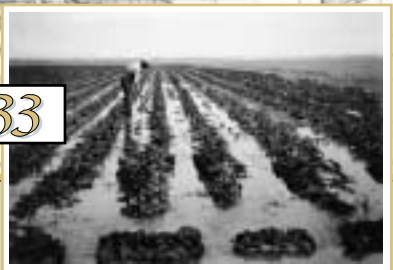
1900

Excavation of St. Mary Project main canal 1900.



**William Pearce**  
1848-1930  
Father of Irrigation  
in Alberta

1933



1948



1999



**Carl Anderson**  
1899 - 1998  
Irrigation Visionary  
and Champion

1890

Corporate enterprise  
- Optimism  
- Enthusiasm

1920

Irrigation districts  
- Adjustments  
- Reform

1950

Federal government  
involvement  
- Renewal  
- Stability  
- Expansion

1970

Provincial Control  
of Headworks  
- Rehabilitation  
- Growth

1990

District Autonomy  
- Environmental  
responsibility

2000

**1891** April 16 - *Magrath Gazette*  
**Irrigation scheme in southern Alberta rouses interest**

**1893** April 14 - *Magrath Gazette*  
**Irrigation bill finally introduced in Parliament**

**1899** February 23 - *Lethbridge News*  
**Incalculable benefits to accrue to southern Alberta irrigation says E.T. Galt in Medicine Hat**

**1912** May 8 - *Lethbridge Daily Herald*  
**To make the prairie blossom - immense irrigation projects now in progress south of Lethbridge**

**1913** December 23 - *Lethbridge Daily Herald*  
**Great possibilities ahead from irrigation system to be built in Taber area**

**1921** October 5 - *Morning Albertan*  
**Gigantic plan to irrigate vast areas in Alberta - Wm. Pearce outlines plans for project in Hanna**

**1924** February 28 - *Morning Albertan*  
**CPR contract farmers threaten - unless demands are granted**

**1924** March 4 - *Calgary Herald*  
**Receiver appointed for Canada Land and Irrigation Company**

**1931** January 12 - *Lethbridge Herald*  
**Intention of government to implement Wilson Commission recommendations**

**1931** August 6 - *Calgary Albertan*  
**United Irrigation District farmers win relief - interest waived**

**1949** September 17 - *Lethbridge Herald*  
**St. Mary - Milk Rivers Project assures bright future - Dominion government to pay costs of main reservoirs and canals connecting them**

**1957** September 17 - *Medicine Hat News*  
**Province to spend \$4,000,000 on West Block of Bow irrigation system**

**1980** August 30 - *Calgary Herald*  
**A victory for irrigation - half billion dollar plan announced for irrigation improvements in southern Alberta**

**1989** June 10 - *Lethbridge Herald*  
**LNID headworks system rehab wins government, farmer praise**

**1999** September 5 - *Calgary Herald*  
**The water of life: Albertans clamour for larger stake in precious resource**

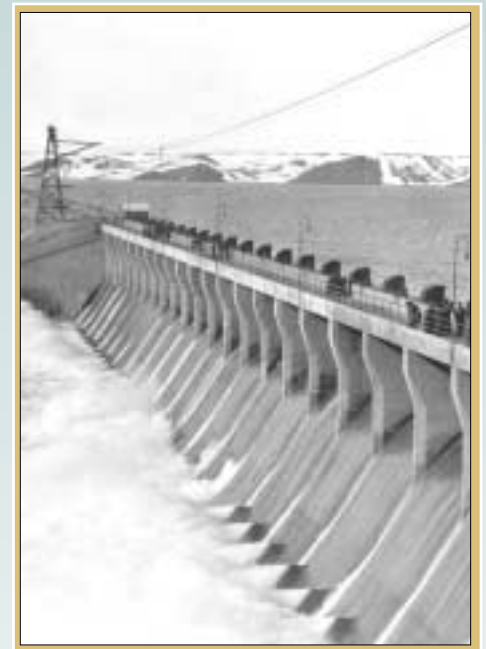


Figure 2. Irrigation issues and events as reflected in the newspapers of the day.



Alberta's major irrigation systems were initially developed by corporate enterprises with the expectation they would increase productivity and land values enough to pay construction and annual operation and maintenance costs, as well as a return on the investment. Companies that had received large land grants in return for constructing railways had the additional objective of hastening the settlement of the Canadian prairies to increase commerce and rail traffic.

Enthusiasm for irrigation was high. Department of the Interior administrators authorized construction of works for delivery of water to a number of corporate irrigation projects and committed large quantities of water for irrigation. In the Department's 1912 report on irrigation, F. H. Peters, Commissioner of Irrigation, stated that:

*"In Alberta the total amount of water granted for irrigation purposes is 23,114 cubic feet per second (655 m<sup>3</sup>/s), or enough to irrigate 3,467,100 acres (1,403,088 ha) of land, according to the authorized duty of water which is 2.023 acre feet per acre (617 mm/ha)." (Peters 1912)*

Five large irrigation projects, all corporate enterprises, accounted for over 97% of this water grant, as shown in Table 1. The term water grant does not necessarily mean that a licence to use water was issued. Not all the works required to divert the quantities noted in Table 1 were constructed. In some cases, works of lower capacities were constructed and subsequently licensed to divert water. As a matter of policy, the Department of the Interior would not issue licences for diversions exceeding the capacities of the works constructed or the capacities required to serve the developed irrigation area.

On some projects, a fiscally cautious, phased approach was taken, each phase initiating operations and generating revenue before proceeding with a subsequent phase. On other projects, construction proceeded on the delivery system and the entire major distribution works at once, in a *fast-track* mode, in an effort to get the land "under the ditch" as quickly as possible and thereby increase its sale value. Some of the works so constructed were never used and have been abandoned; others are still not being used to the capacity for which construction was authorized.

By 1919, close to 76,890 hectares were being irrigated within areas of the current Western, Eastern, St. Mary River, Magrath and Raymond Irrigation Districts. Works were either in place or soon to be completed to irrigate a substantially larger area.

No water licences were issued for irrigation of lands within the current irrigation districts in the pre-1920 period. Diversions were made on several projects under other types of authority, such as a "Permit to use water prior to issue of a Licence" issued by the Department of the Interior.

**Table 1. Large irrigation water grants to corporate enterprises, circa 1912.**

Corporation	Source	Location	Water Grant (cms)		
			Low Stage	High Stage	Flood Stage
Canadian Pacific Railway	Bow River	At Calgary	57	283	283
Canadian Pacific Railway	Bow River	Near Bassano	28	85	142
Southern Alberta Land Company	Bow River S. Sask. River	Near Carseland Near Bow Island	28	57 28	57 28
Alberta Land Company	Bow River	Near Carseland		14	14
Alberta Railway and Irrigation Company	St. Mary River Belly River Milk River	SE of Cardston Near Mtn. View Near Milk River	14 14 14	57 14 42	57 14 42

## 2. The Adjustment Years: 1920 to 1950

The years 1920 to 1950 provided a challenging proving ground for the fledgling irrigation enterprises and ultimately led to a number of adjustments in legislation, administrative procedures and financial management of irrigation projects. This period saw most irrigation projects become farmer-owned irrigation districts, and set the stage for hands-on involvement of the federal and provincial governments in irrigation development and management.

Generally, returns on the pre-1920 corporate investments were discouraging. Collections from irrigation water users fell short of the funds needed to cover construction, operation and maintenance costs. Land sales were much slower than expected. Administration of the projects was cumbersome and onerous, due to the large number of individual contract holders and the difficulty in collecting the assessed water rates.

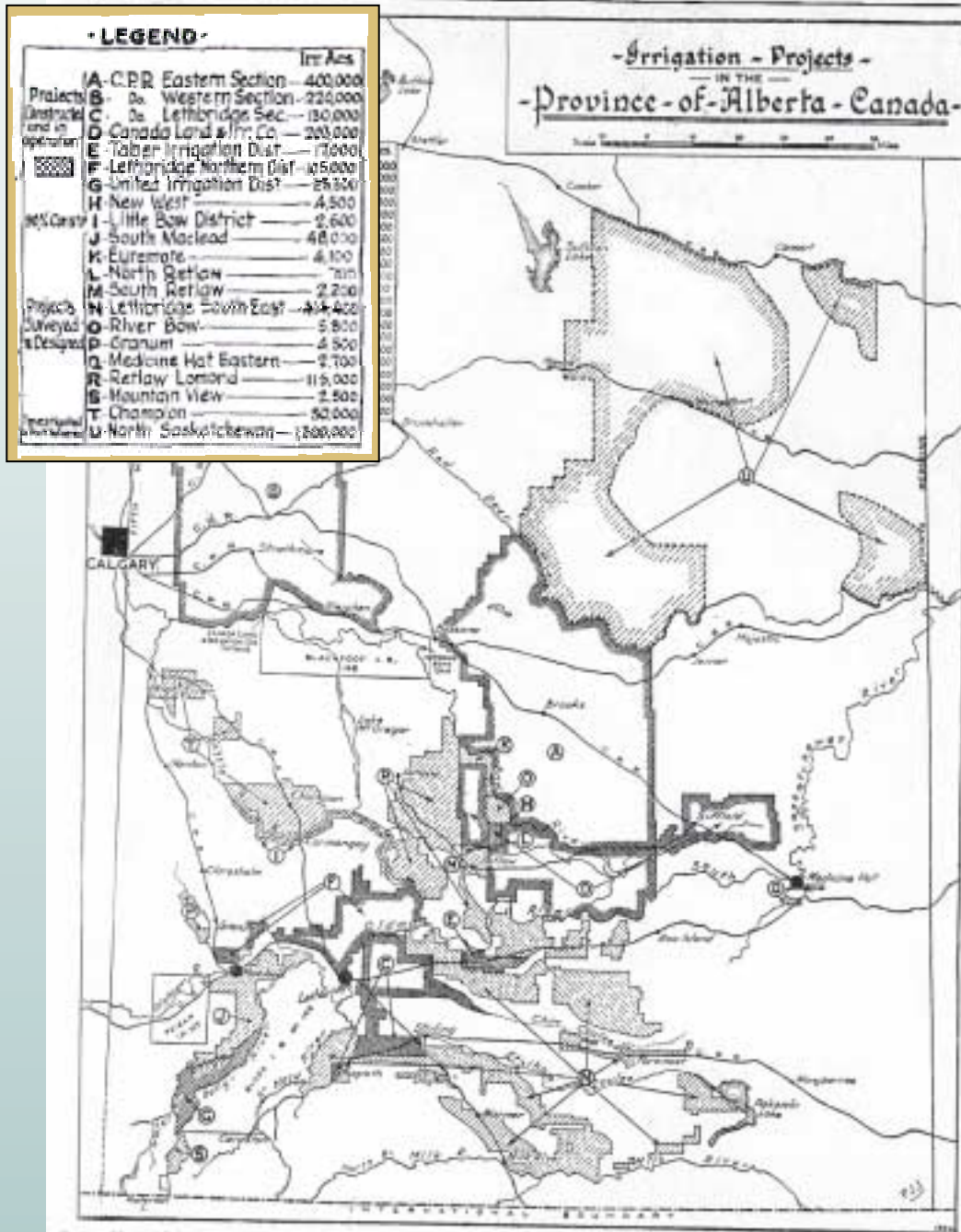
In 1914, the province passed the Irrigation Districts Act to relieve some of the burden to water suppliers of administering contracts with individual producers. The Act also provided the mechanism for cooperative, farmer owned, financed and operated irrigation projects. The Taber Irrigation District was the first established under this legislation. Several others were quick to follow (Table 2).

While the creation of the irrigation districts relieved some of the administrative burden to water suppliers and led to the development of new projects, the economics of irrigation farming remained a serious issue. Irrigation producers could not pay the assessed rates. On some projects, producers demanded their lands be reclassified for dryland agriculture. Capital and operating losses mounted. Most projects continued to operate only with financial assistance from the founding corporate enterprises and/or the governments of Canada and Alberta. Despite the problems encountered, however, most people recognized the overall benefits irrigation could bring (Figure 3).

**Table 2. Establishment of the existing irrigation districts in southern Alberta.**

Irrigation District	Year Established	First Water	Comments
Taber	1917	1920	Water supplied through St. Mary River system.
Lethbridge Northern	1919	1923	
United	1921	1923	
Mountain View	1923	1931	
Raymond	1925	1900	Water supplied through St. Mary River system.
Magrath	1926	1900	Water supplied through St. Mary River system.
Eastern	1935	1914	First water through CPR works.
Leavitt	1936	1944	Extension of Mountain View system.
Western	1944	1907	First water through CPR works.
Aetna	1945	1959	Extension of Mountain View and Leavitt system.
Ross Creek	1949	1954	
St. Mary River	1968	1900	First water through Canada Land and Irrigation Co. works.
Bow River	1968	1920	First water through Canada Land and Irrigation Co. works.

**ENORMOUS IMPORTANCE OF IRRIGATION PROJECTS  
TO CALGARY ILLUSTRATED BY MAP OF SCHEM**



Few residents of Calgary realize the great importance to this city of irrigation with respect to existing systems and the development of future districts, already planned and in some instances surveyed. The accompanying map illustrates vividly the huge areas of central and southern Alberta, portions of which are either already under irrigation or susceptible of irrigation. With irrigation, enormous areas now suffering from the haphazard chances of rainfall will be brought into assured production. Obviously, all land in any project cannot be irrigated but the portions which can be, in effect, provide offset insurance against failure on those sections which cannot be brought "under the ditch."

**Figure 3. Benefits of irrigation and ambitious development plans touted in 1924 newspaper.**

The province established several commissions to address the problems facing the struggling irrigation districts. The commissions pointed the way to various measures of reform. These included the following.

- Relieving the irrigation water users from responsibility for capital works debt. Corporate entities and the senior governments shouldered large portions of capital costs.
- Greater government financial responsibility, recognizing that the benefits of irrigation go beyond the farm gate.
- Cancellation of water contracts and reclassification of land where irrigation was of marginal value. Some projects were reduced in size.
- Payment schedules more in keeping with producer ability-to-pay.
- Smaller land parcels and more intensive irrigation management.
- Aggressive colonization programs.
- Encouragement of higher value crop types.
- Educational programs and technical assistance.

With numerous administrative adjustments and financial assistance from the founding corporations and the two senior governments, the districts endured. By 1950, the era of corporate irrigation enterprises was over. Eleven of the current 13 irrigation districts were established and operating. The remaining two districts, Bow River and St. Mary River, were formally established in 1968.

In 1946, the Alberta Irrigation Projects Association was founded to provide a single voice for the districts in dealing with the public or government on issues common to all or most districts.

The period 1920 to 1950 provided a severe proving ground for the farmer-run irrigation districts. Challenging circumstances faced by the newly formed districts included the following.

- Inadequate information on soil, climate and market conditions necessary to support profitable irrigation enterprises.
- Pre-1920, unrealistic expectations of financial returns.
- Dryland farmers inexperienced in irrigation techniques became irrigation farmers.
- Crash of the economy and of commodity prices in the 1930s.
- Transfer of responsibility for administration of natural resources from the federal government to the provinces.
- Shortages of capital and labour during World War II.

By 1950, the farmer-run organizations appeared to be the most durable and effective administrative bodies for day-to-day management of irrigation projects. About 182,115 hectares were being irrigated within the areas of the current irrigation districts by that year.

Only one water licence was issued for the irrigation of lands within the current 13 irrigation districts in the 1920 to 1950 period – to the Canadian Pacific Railway in 1921. The licence was for irrigation of land that is now within the Western Irrigation District. Diversions to other irrigation districts and projects were made under other types of authorization.





### 3. Rehabilitation and Expansion of the Delivery Systems: 1950 to 1970

The 1950 to 1970 period saw the direct involvement of the federal and provincial governments in irrigation development and management, and subsequent large expenditures for the rehabilitation and expansion of the irrigation infrastructure.

Throughout the adjustment years, funding for rehabilitation of works had been limited, and in some cases maintenance was neglected. Major construction work was required to bring the water delivery systems up to standard and to enlarge the systems where expansion was contemplated. Interest in the resettlement of drought-stricken farmers and returning war veterans on irrigated lands was an additional incentive for involvement of both the federal and provincial governments in irrigation development.

The creation of the Prairie Farm Rehabilitation Administration (PFRA) in 1935 had initiated an era of increased federal government involvement in the development of water delivery systems for irrigation. Initially, PFRA assisted in keeping projects operating by providing subsidies for critical rehabilitation and maintenance. The agency became a major developer in 1950, when the federal government signed an agreement with the province committing to construct and operate the main water storage and delivery works associated with the St. Mary Project. These works included the St. Mary, Milk River Ridge and Waterton Reservoirs, the Belly River diversion, and the connecting canals. On the same project, the province committed to undertake major rehabilitation and expansion work between the Milk River Ridge Reservoir and Medicine Hat.

The federal government also purchased all assets of the Canada Land and Irrigation Company in 1950. PFRA, in cooperation with the province, began rebuilding and enlarging the main water delivery system and increasing storage for the present-day Bow River Irrigation District. Both governments were involved with developing new irrigation blocks for resettlement purposes within the Bow River and other irrigation districts.

By 1970, both the province and the federal government had been involved in rehabilitation and expansion of water delivery works within almost all of the 13 districts. The area assessed for irrigation within the districts had grown to almost 280,000 hectares (Figure 4). In contrast to the previous 30-year period, the 1950 to 1970 period can be characterized as one of increasing stability and modest growth. The willingness of the

two senior governments to assume some responsibility for the continued success of the projects provided irrigation farmers with increased assurance their water supplies would not be suddenly cut off due to structural failure or bankruptcy of the operating agency.

In 1963, water licences were issued to the Eastern, Lethbridge Northern, United and Western irrigation districts. In each case, the water use priority dated back to the application for a water licence. Diversions to other districts were made under other authorities.

**Assessed Area**  
The irrigable area of land within the districts for which a water rate has been levied.

**Actual Irrigated Area**  
The area that receives water at least once during the growing season.

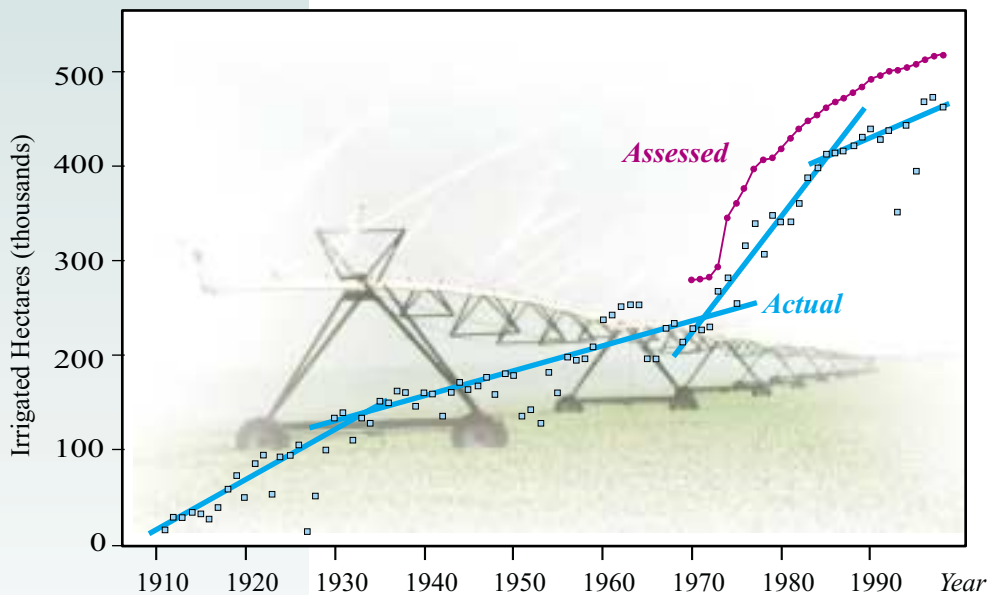


Figure 4. Growth of irrigation within the 13 irrigation districts of Alberta.

#### 4. Provincial and Irrigation District Control: 1970 to Present

Major changes in the irrigation industry have taken place since 1970. Direct, hands-on involvement in irrigation development and management has been transferred from the federal government to the province and the irrigation districts. Major improvements in infrastructure and technological advances have led to unprecedented rapid growth in irrigation area and to efficiency improvements. Above all, the period marks the emergence of the irrigation districts as progressive, forward-thinking entities, seeking to enhance the social and economic standing of their members and the southern Alberta community-at-large through sustainable agriculture.

By 1970, the federal government had accomplished its primary objectives of stabilizing and expanding irrigated agriculture in southern Alberta and resettling drought-stricken farmers and war veterans. It was prepared to relinquish its direct role. Through a 1973 agreement with the Alberta government, the federal government withdrew from hands-on management of irrigation projects and transferred all federal interests in irrigation works within the Bow River and St. Mary River developments to the province. In addition, the province assumed greater responsibility for management and improvement of irrigation infrastructure through several initiatives, as outlined below.

- In 1969, funding was announced to assist the irrigation districts to rehabilitate and expand aging water distribution works within the districts. Under this cost-share program, the districts paid 14% of the construction costs and the province (AAFRD) paid 86%. The distribution of costs approximately reflected the distribution of benefits to the irrigation producer and to the region, province and country (Rogers et al. 1966). This cost-share program was reaffirmed and extended for five years in 1975, and has been extended several times since 1980. The cost-sharing ratio was changed from 86/14 to 80/20 in 1994, and to 75/25 in 1995. Work is continuing under the 1995 cost-sharing formula.
- In 1975, the province announced a policy whereby AENV would assume responsibility for rehabilitation, operation and maintenance of the major irrigation headworks. (Headworks are loosely defined as the works required to divert water from sources and convey it to the districts.) The objective of provincial ownership was to maintain a secure and continuous supply of water for the districts and all other uses, and to operate the projects for multi-purpose use. Agreements with districts were negotiated, and Alberta Environment took over responsibility for all headworks except those for the EID and UID.
- Also in 1975, AENV introduced a 10-year program for rehabilitating the headworks and the main irrigation district canals. In 1980, the province announced a 15-year extension of this program. Work on the program is nearing completion under Alberta Transportation.
- In 1980, the province announced a water storage project would be constructed on the Oldman River. Construction of the Oldman River Dam was initiated in 1986 and completed in 1992.

The irrigation districts experienced unprecedented growth during the decade from 1970 to 1980 (Figure 4). The area on the assessment rolls increased from 279,877 hectares in 1970 to 419,730 hectares in 1980 – an increase of 50%. This was due, in large part, to the growing popularity of sprinkler irrigation, in particular centre pivot sprinklers. Sprinklers greatly reduced irrigation manpower requirements and increased the area that could be supplied with water from the distribution network. The assessed area in 1999 was 524,528 hectares.

*In years of heavy precipitation the irrigated area drops, particularly in the western-most districts where moisture deficit is normally low. In such years, irrigation water users may feel natural moisture is sufficient for good crop yields.*

*In some districts, older assessments provide permanent water rights for small parcels of 12 to 16 hectares that cannot be economically irrigated by today's methods. The owners of such parcels may use the water for domestic or stock watering purposes, and therefore continue to pay their water rates to ensure deliveries. Cultural practices (such as crop rotations) and individual producer social and economic factors may also contribute to the discrepancy between assessed and actual irrigated areas.*





While rehabilitation is incomplete, for the most part the irrigation infrastructure has been modernized and is in good condition. The irrigation districts are well established and operating as progressive enterprises. A variety of water uses are integrated into their developments and operations and they provide dependable water supplies to their irrigation farmers and to communities, industries, livestock, domestic users, recreation users and wildlife conservation projects within their areas. Crop diversity and value-added commercial enterprises are encouraged and are increasing within the districts, contributing to the regional economic well-being.

The districts are well informed of and responsive to current water management issues. They are aggressively gathering data and developing sophisticated analytical tools to better address environmental, water conservation and operational issues within their respective districts. The new Irrigation Districts Act, passed by the Alberta government in April 1999, provides the districts with more autonomy in decision making, more independence from government, and, of course, more responsibility and accountability to their water users. The districts are working together, and collectively are well-positioned to meet the challenges facing them as a result of changes in the Act.

The Alberta Irrigation Projects Association (AIPA), established in 1946, continues to be an active and respected voice for the 13 irrigation districts. AIPA's primary focus in recent years has been to increase public and political awareness of the wide-ranging benefits of irrigation, and the importance of upgrading and maintaining a modern and efficient network of irrigation infrastructure. AIPA accomplishes its objectives through a variety of means, such as publishing newsletters, hosting conferences, presenting briefs in public forums, and through representation on committees addressing environmental, legislative, and agri-economic issues.

Twenty-one new licences were issued to the irrigation districts in this period – seven in the 1980s and 14 in the 1990s (Table 3). The total volume of water licensed to the 13 districts is 3,434,559 cubic decametres. By August 1999, there were more than 110,000 hectares of private irrigation licensed in Alberta, with an allocation of about 375,000 cubic decametres. The total allocation for irrigation in Alberta would be in the order of 3.8 million cubic decametres. This allocation contrasts with the so-called "water grant" of over 8.6 million cubic decametres noted by F.H. Peters, Commissioner of Irrigation, in his 1912 report on irrigation. Ninety years after Peters made that statement, Alberta has actually licensed only about 45% of the volume of the grant.

Of the 26 licences that have been issued to the 13 irrigation districts (including two that have been superceded), one was issued by the federal government under the Irrigation Act, and the remaining 25 were issued under the provincial Water Resources Act. As such, none of the existing licences have expiry dates. The new Water Act recognizes licences issued under the predecessor Acts, and protects their original priorities, terms and conditions, and all rights of the holders of those licences.

**Table 3. Water licences for irrigation districts in Alberta.<sup>1</sup>**

District	Date Licence Issued	Water Source	Priority <sup>2</sup>	Licence Volume (dam <sup>3</sup> )	Notes
Aetna	May 15, 1992 Dec 7, 1992	Belly River Belly River	<b>1945</b> 063001 <b>1991</b> 122301	6,784 4,317	<p>1) This table is intended for general information only. Its contents should not be used for purposes of interpreting and applying the law. The legislation and the licences should be consulted for these purposes.</p> <p>All licences have conditions attached to them. For instance, some licences are subject to instream flow conditions; others are not. Some are subject to instream flow conditions that <u>may be established</u> in the future.</p> <p>Some of the licences are subject to "stage" constraints on the source stream. Low stage is the period when the flow is less than the long-term median during the irrigation season. High stage is the period when the flow is greater than the median but less than the 15% exceedence flow. Flood stage is the period when the flow is greater than the 15% exceedence flow. The 15% exceedence flow is the flow that is expected to be equalled or exceeded not more than 15% of the time during the irrigation season.</p> <p>2) Priority is based on the date of application for a licence. The priority number represents the year (bolded), month and day of the application. The last two digits prioritize same-day applications.</p> <p>3) The BRID 1982 licence includes headworks evaporation losses.</p> <p>4) In the EID 1963 licence, of the total allocation, 246,700 dam<sup>3</sup> is for diversions outside the "irrigation season," May 1 to Sept 30. The maximum rate of diversion during the irrigation season is subject to Bow River stage: Low Stage 28 cms; High/Flood Stages 85 cms. The diversion rate during the non-irrigation season is not to exceed 23 cms**.</p> <p>5) For the LNID 1963 licence, the maximum rate of diversion was subject to Oldman River stage: Low Stage 20 cms; High/Flood Stage 23 cms**.</p> <p>6) The LNID 1982 licence replaced the 1963 licence.</p> <p>7) For the UID 1963 licence, the maximum rate of diversion is subject to Belly River stage: Low Stage 5 cms; High and Flood Stage 10 cms.</p> <p>8) For the WID 1921 licence, the maximum rate of diversion was subject to Bow River stage: Low Stage 59 cms. High/Flood Stage 64 cms**.</p> <p>9) For the WID 1963 licence, the maximum rate of diversion is subject to Bow River stage: Low Stage 11 cms, High Stage 17 cms; Flood Stage 21 cms**.</p> <p>The WID 1963 licence replaced the 1921 licence and reduced the allocation. The WID does not believe it consented to this change and is disputing the right of the province to reduce the allocation.</p>
Bow River	Dec 30, 1982 <sup>3</sup>  Oct 31, 1996	Bow River  Bow River	<b>1908</b> 102702 <b>1913</b> 032501 <b>1953</b> 062501 <b>1992</b> 020510	185,025 185,025 98,680 86,345	
Eastern	Jan 4, 1963 <sup>4</sup>	Bow River	<b>1903</b> 090402	939,927	
Leavitt	Jun 18, 1992 Dec 8, 1995	Belly River Belly River	<b>1939</b> 061701 <b>1991</b> 123004	9,560 5,242	
Lethbridge Northern	<del>Jan 8, 1963<sup>5</sup></del> Mar 25, 1982 <sup>6</sup>  Aug 27, 1992 Dec 7, 1992	<del>Oldman River</del> Oldman River  Oldman River Oldman River	<del><b>1917</b>111601</del> <b>1917</b> 111601 <b>1974</b> 110401 <b>1982</b> 041501 <b>1991</b> 082301	<del>185,025</del> 185,025 82,645 61,675 61,675	
Magrath	Nov 26, 1982  Dec 7, 1992	St.Mary River St.Mary River Waterton River Belly River SM, W, B*	<b>1899</b> 020704 <b>1950</b> 053108 <b>1950</b> 053109 <b>1950</b> 053110 <b>1991</b> 082204	11,324 5,329 16,652 3,701 4,934	
Mountain View	Dec 22, 1988 Dec 7, 1992	Belly River Belly River	<b>1923</b> 071003 <b>1991</b> 121702	9,251 617	
Raymond	May 10, 1983  Dec 7, 1992	St.Mary River St.Mary River Waterton River Belly River SM, W, B*	<b>1899</b> 020703 <b>1950</b> 053114 <b>1950</b> 053115 <b>1950</b> 053116 <b>1991</b> 082302	15,098 15,431 30,529 6,784 32,071	
Ross Creek	Apr 26, 1989	Gros Ventre Cr	<b>1951</b> 030201	3,701	
St. Mary River	Sept 24, 1991 Dec 7, 1992	St.Mary River SM, W, B* SM, W, B*	<b>1899</b> 020701 <b>1950</b> 053107 <b>1991</b> 082309	207,441 409,309 273,837	
Taber	Aug 27, 1982  Dec 7, 1992	St.Mary River St.Mary River Waterton River Belly River SM, W, B*	<b>1899</b> 020702 <b>1950</b> 053117 <b>1950</b> 053118 <b>1950</b> 053119 <b>1991</b> 082602	41,939 41,322 83,261 18,503 9,868	
United	Jan 14, 1963 <sup>7</sup> Mar 13, 1996	Belly River Waterton River	<b>1919</b> 032401 <b>1993</b> 051701	62,909 20,970	
Western	<del>Sept 21, 1921<sup>8</sup></del> Jul 2, 1963 <sup>9</sup>	<del>Bow River</del> Bow River	<del><b>1903</b>090401</del> <b>1903</b> 090401	<del>773,624</del> 197,853	

\* SM, W, B = St. Mary River, Waterton River, Belly River; \*\*cms = cubic metres per second.

## **B. SOUTH SASKATCHEWAN RIVER BASIN WATER MANAGEMENT POLICY**

Rapid expansion of irrigation during the 1970s and growing interest in environmental issues led to concerns about the limits of the water supply in the SSRB. Irrigation water supply shortages became noticeably more frequent, particularly on uncontrolled streams. At the same time, public concern about environmental issues was becoming more prominent.

In the early 1980s, Alberta Environment initiated a process to address water management policy issues in the SSRB. The process included the following.

- The SSRB planning program, culminating in the Summary Report (Alberta Environment 1984).
- Public hearings conducted by the Alberta Water Resources Commission.
- The Commission's report and recommendations (Alberta Water Resources Commission 1986).
- Policy development and Cabinet approval.

The SSRB Water Management Policy was announced on May 28, 1990 (Alberta Environment 1990). It provided guidelines related to:

- Multi-purpose use of water;
- Priority of uses, and minimum and preferred instream flows;
- Irrigation expansion;
- Administration of the Prairie Provinces Water Board Agreement;
- Water conservation; and
- Public consultation.

The policy is used to guide water management and allocation decisions in the SSRB.



## C. IRRIGATION EXPANSION GUIDELINES

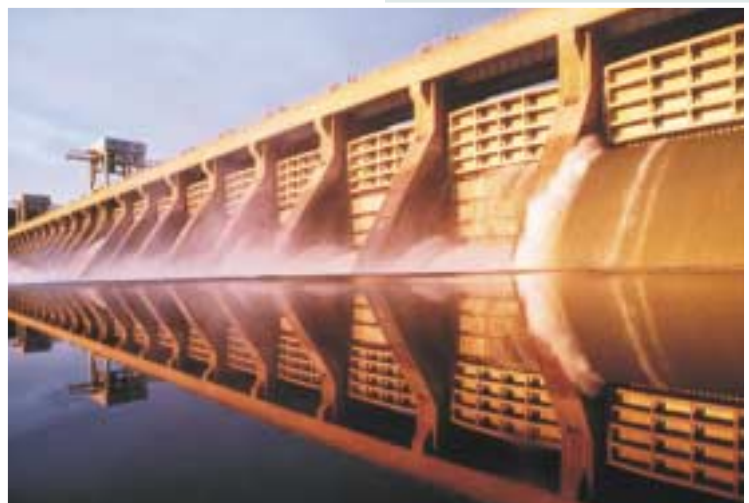
The 1990 SSRB Water Management Policy called for establishing the maximum amounts of water that can be allocated for irrigation, with due consideration for the needs of all other users, including instream users and interprovincial apportionment. Alberta Environment worked with other government agencies to establish the guidelines. The process considered the following.

- Alberta Water Resources Commission recommendations on the location and magnitude of irrigation expansion. Their recommendations took into consideration extensive public input.
- SSRB Water Management Policy statements related to instream flow needs and interprovincial apportionment commitments.
- The results of computer simulation modelling.
- Information on irrigation expansion desires provided by existing and potential irrigation farmers.
- Consultations with Irrigation Council, individual irrigation districts, and existing and potential private irrigation water users.
- Discussions with Members of the Legislative Assembly and government committees.

The guidelines were approved by Order-in-Council on September 20, 1991. They are defined in and are being implemented through the *South Saskatchewan Basin Water Allocation Regulation* (Alberta Environment 1991) pursuant to Section 173 of the Water Act. Recognizing the limitations of the databases and estimates of current and future water uses, the government committed to reviewing and refining the *Regulation* in 2000.

The *Regulation* states that the amount of water allocated to each expansion area must not exceed the amount sufficient for the irrigation of a specific maximum area for each of the 13 irrigation districts. The maximum area for each district is shown in Column (8) of Table 4.

For licensing purposes, the volumes of water considered to be sufficient for the irrigation of the maximum areas for each of the districts were determined by AENV and AAFRD. Referring to the columns in Table 4, the following criteria were used to determine the licensing volumes for administration of the *Regulation*.



**Table 4. 1991 Regulation irrigation area limits and licence volumes.**<sup>1</sup>

Irrigation District	(1) Optimum Farm Irrigation Demand (mm)	(2) Canal Losses (mm)		(4) Reservoir Evaporation Losses (mm)	Return Flow (mm)		(7) Total Projected Diversion Demand (mm)	(8) Irrigation Area Limit <sup>2</sup> (ha)	(9) Regulation Licence Volumes <sup>3</sup> (dam <sup>3</sup> )	(10) 1999 Licence Volumes (dam <sup>3</sup> )
		(2) circa 1990	(3) Projected		(5) circa 1990	(6) Projected				
Aetna	457	244	219	9	503	91	776	1,429	11,102	11,102
Bow River	555	95	82	9	186	82	728	84,984	619,217	555,075
Eastern	576	128	98	67	189	85	826	111,289	918,958	939,927
Leavitt	457	232	207	6	503	91	761	1,930	14,802	14,802
Lethbridge Northern	442	70	70	15	52	52	579	67,583	391,020	391,020
Magrath	442	76	73	0	61	52	567	7,406	41,939	41,939
Mountain View	457	113	88	9	503	91	645	1,497	9,868	9,868
Raymond	436	46	43	0	61	52	531	18,818	99,914	99,914
Ross Creek	686	168	76	0			762	486	3,701	3,701
St. Mary River	463	58	55	21	61	52	591	150,543	890,587	890,587
Taber	479	46	43	12	61	52	586	33,265	194,893	194,893
United	457	95	70	3	347	79	609	13,759	83,878	83,878
Western	485	366	305	6	399	98	894	38,445	342,913	197,853
Totals								531,434	3,622,792	3,434,559
Weighted Means	500		88	24		67	683			

<sup>1</sup> Section II.C. of the text outlines the criteria used in deriving the data in each column of the table.

<sup>2</sup> The area limits and Regulation licence volumes given in the table are as established for the 1991 Regulation. The area limits have been revised in the Irrigation Districts Act for some districts. The revised limit for the EID is 115,740 ha. Other districts have minor adjustments. Total adjusted 1999 Regulation Limit = 535,886 ha.

<sup>3</sup> For districts not yet licensed to the Regulation licence volume, the allocation was based upon the best available information on water requirements, and may differ from the Regulation licence volume.

**Column (1):** The optimum farm demand was based on the following guidelines.

- Crop mixes similar to the pattern for 1987 to 1989 within each district.
- The optimum crop requirement was considered to be the amount of water necessary to maintain moisture in the root zone above 50% of field capacity. The full optimum requirement was used to determine the licensed volume. Typical on-farm irrigation management practice circa 1990 used about 80% of optimum.
- The full growing season precipitation plus 20% of the non-growing season precipitation would effectively contribute to moisture within the root zone.
- The 90th percentile irrigation demand was assumed for computing the proposed licensing volume. The 90th percentile demand would be expected to occur under high temperature and low precipitation conditions. Over a long period of time, it would be exceeded in only 10% of the years.
- An on-farm irrigation application efficiency of 75% for all crops and all districts.

**Column (2):** Circa 1990 canal water losses were estimated using the "Moritz" formula (Alberta Agriculture 1990). Distinctions were made between rehabilitated and un-rehabilitated canals in terms of velocity of flow (0.61 metres per second for rehabilitated; 0.46 metres per second for un-rehabilitated) and water loss per wetted area (0.00170 cubic metres per day for rehabilitated; 0.0116 cubic metres per day for un-rehabilitated). Canal losses shown in Column (2) consider the status of rehabilitation as of 1990, and the canal sizes and lengths unique to each district. Unit canal losses (mm) were computed based on the area limit for each district as shown in Column (8).

**Column (3):** Projected canal water losses were estimated based on the potential for decreasing seepage with continued rehabilitation of the canals.

**Column (4):** Evaporation from reservoirs within the irrigation districts was computed based on the mean surface area of the reservoirs, and the mean shallow lake evaporation, minus the precipitation for the specific geographic locations of the reservoirs. The unit evaporation losses were computed based on the area limit for each district, assuming there would not be a significant change in reservoir evaporation as irrigation expands. Column (4) does not include evaporation losses for storage reservoirs within the headworks system operated by AENV.

**Column (5):** Historical return flows as estimated by Water Survey of Canada for the period 1979 to 1989 were assumed to be indicative of 1990 management practice. Ninetieth percentile return flows are listed. Unit return flows were computed based on actual irrigated hectares. It was assumed the volume of return flow would increase as the irrigated area increases.

**Column (6):** Projected return flows were estimated assuming that district management and infrastructure improvements would reduce return flows by varying amounts within each district.

**Column (7):** The projected 90th percentile unit demand is the sum of the unit values in Columns 1, 3, 4 and 6.

**Column (8):** The irrigation area limit is taken from the *South Saskatchewan Basin Water Allocation Regulation* which was approved by Order-in-Council on September 20, 1991.

**Column (9):** The *Regulation* licence volume demand is based on unit diversion and the irrigation area.

**Column (10):** The licensed amounts within each irrigation district as of July, 1999. Note that only the BRID and WID have licences for volumes that are less than the *Regulation* licence volumes.







***1991 Regulation irrigation area limits and proposed licence volumes -***

*Throughout this report, reference is made to the irrigation area limits that are specified for the irrigation districts in the South Saskatchewan Basin Water Allocation Regulation, and the proposed licence volume developed to assist in administering the Regulation. For convenience and consistency, the irrigation area limits are referred to as 1991 Regulation limits, meaning 531,434 hectares. The proposed licence volume is referred to as the Regulation licence volume, meaning 3,622,792 cubic decametres.*

In establishing the *Regulation*, it was assumed irrigation water users could occasionally tolerate applying less than the optimal water requirement. Irrigation performance criteria were developed to evaluate the performance of simulation modelling output for irrigation expansion scenarios. The criteria considered both the magnitude and frequency of shortages from the optimal requirements. The performance of a scenario was considered to be acceptable if both the following conditions were met:

- There was a growing season irrigation deficit equal to or greater than 75 mm in less than 20% of the years in the simulation period; and
- There was a growing season irrigation deficit equal to or greater than 150 mm in less than 10% of the years in the simulation period.

Alberta Environment has used the 1991 *Regulation* limits and licence volumes to guide the processing of irrigation water licence applications and the allocation of water in the SSRB. The irrigation districts have worked closely with government to develop the principle that allows the districts to expand beyond their area limits if improvements in efficiencies and/or reduced return flows allow such expansion within their respective licensed volumes. The licences fix the amount of water that each district is entitled to divert, subject to priorities, terms and conditions.

**D. AENV'S SSRB WATER MANAGEMENT PLANNING PROCESS**

When the *Regulation* was established in 1991, the government recognized that databases and information on some aspects of water needs, particularly instream needs, were inadequate to make definitive decisions. Analytical tools for the study of water supply and demand also needed to be improved to more accurately represent the physical system and water licence priorities. In its decision to establish the *Regulation* limits and licence volumes, the government committed to review and refine them during the next decade.

Alberta Environment is preparing a water management plan directed toward resolving water management issues in the SSRB, including determining instream flow needs for protection of the aquatic environment and the quantity of water available for future allocations.

The planning process will involve four multi-sector, stakeholder, basin advisory committees and consultations with the public-at-large. The first phase of planning will be devoted to the development of a system for water allocation transfers. Subject to certain conditions, transfers will permit water allocations to be moved to purposes and locations where they are most highly valued. A key goal now is to develop the conditions that will be applied to transfers. The first phase should be ready for implementation by April 2002.

The second phase will focus on determining water conservation (instream flow) objectives for each river. This will require an assessment of the volumes required for consumptive demands and the flows required for protection of the aquatic environment. Studies to address these requirements are ongoing. The key goals of the second phase will be to reach compromises between these sometimes competing interests and to make wise choices for management of water resources. The second phase is scheduled for completion by the end of 2002. Additional phases of the plan are yet to be determined.