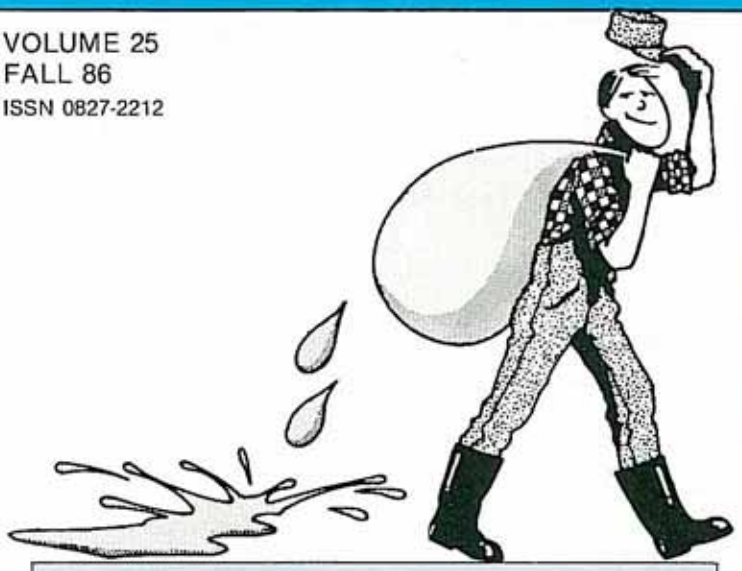
the
WATER HAULER'S BULLETIN

VOLUME 25
FALL 86
ISSN 0827-2212



IN THIS ISSUE:

SUBSURFACE DRAINAGE FOR CANAL SEEPAGE CONTROL

Largest Project in Alberta's History

This fall will see the largest shallow (<2 m deep) subsurface drainage project in Alberta's history taking place in Sections 9, 15 and 16-9-11-W4 south of Bow Island. This drainage system is part of the St. Mary River Irrigation District's main canal upgrading program and is being installed to control canal seepage and reclaim saline and waterlogged lands affected by the seepage.

The project will involve the installation of approximately 76,200 lineal metres of 100 mm and 150 mm diameter corrugated plastic drain tubing (filtered) supplied by Big "O" Drain Tile Ltd. of Taber. The drainage system will be installed on 400 acres of affected land owned by four separate farmers. All of the drain water will be pumped back into the SMRID main canal at four locations. Installation is being carried out by McCutcheon Drainage Ltd. of Ontario using a Canadian built Wolfe plow.

The Canadian built Wolfe plow is installing up to 8200 lineal metres of tubing a day.

The shallow subsurface drainage system was chosen for seepage control along this reach of canal because of natural groundwater discharge in addition to the canal seepage problem. More traditional methods such as canal lining and deep interceptor drainage were not considered practical because of potential damage to the lining by the groundwater and the ineffectiveness of the deep interceptor drain. The subsurface drainage, which was estimated to cost about the same as a deep interceptor drain, was felt to have the best chance of controlling the water table throughout the affected area, regardless of the source. Reclamation of the saline and waterlogged land was also expected to take place much faster.

CH2M Hill are the consultants in charge of this reach of canal and completed the design of the pump lift stations for this drainage project. The Drainage Branch of Alberta Agriculture carried out the investigation and design of the subsurface drainage system and are responsible for the installation inspection. Depending on the weather, installation is expected to be completed by mid October.

The approximate cost of this project breaks down as follows:

Supply & installation of drain tubing	$200,000
Supply & installation of 4 lift pump stations	$270,000
Total cost	$470,000
(approx.)	$1,200/acre

If a gravity outlet was available, the total cost of the drainage would be approximately $500/acre.

Shallow subsurface drainage has proven to be an effective, relatively inexpensive means of controlling canal seepage. It also has the added benefit of allowing the farmer, whose land may have been out of production for many years, a realistic opportunity to achieve relatively fast reclamation. With over 700 subsurface drainage projects currently working in Alberta, the Drainage Branch is confident that shallow subsurface drainage can solve many of the Irrigation Districts' canal seepage problems more effectively and cheaply than the existing control methods.

For more information on this project contact the Drainage Branch, Alberta Agriculture, Agriculture Center, Lethbridge, Alberta, T1J 4C7 at (403) 381-5515. ■

ARE PRESENT DAY CANALS CONVEYING WATER EFFICIENTLY?

Farming For The Future Study Underway

Water losses from irrigation canals in southern Alberta have been the subject of concern since the construction of the first irrigation conveyance systems back in the early 1900's.

Just how much water are we losing? This is one of the questions the Research Section of the Project Planning Branch, Alberta Agriculture, in cooperation with Nanuk Engineering, is trying to answer in a two year Farming For the Future Study.

Svat Jonas, Co-Project Manager, states "the objectives of this study are to determine the efficiency of a water conveyance system, within a chosen block of irrigated land and to ascertain the relationship between soil types, canal lining materials, groundwater levels and water evaporation."

Conveyance efficiency is defined as:

the ratio of water delivered at the farm turnout to the water provided at an upstream point in the water conveyance system. Water losses from the conveyance system can be caused by seepage, spillage, evaporation and evapotranspiration. The system can also gain water from either precipitation or an inflow due to high groundwater. The whole study is, in effect, balancing quantities of water flowing into the system, with quantities of water being used by the individual water users, plus water lost.

A study of the area of approximately 10 square kilometres was selected in Block C of the Bow River Irrigation District near Enchant. The lateral systems, under study, has a main lateral with a capacity of 2 m^3/s (70 cfs) and two smaller sublaterals. The laterals have a total length of 9.2 km and are broken into 2.2 km of concrete lined canal, 1.2 km of buried membrane lined canal and 5.8 km of earth canal.

The system has 9 water users who are using sprinkler systems to irrigate the 2400 acres of irrigable crop land. These water users are operating a total of 15 pumps which are monitored by using seven, 200 mm (8") Rockwell in-line propeller meters. Precipitation and evaporation are measured manually using rain gauges and an evaporation pan.

Recording Station S1 on Lateral C. Instruments are monitored seven days a week.

Since conveyance losses are expected to be between 6% and 15%, therefore, the accuracy of instruments cannot exceed 2%. From laboratory testing, it is estimated that this accuracy is obtainable in the field with the electronic equipment.

Jonas states that besides providing data on irrigation canal efficiencies, this study should also provide information on: (1) operational improvements consisting of flow adjustments to reduce waste to spillways, (2) an evaluation of the effectiveness of various canal liners, (3) the watertightness of turnout gates.

Very few scientific studies have been done in assessing conveyance efficiencies. This study, when complete, may be just the tip of an iceberg. For more information, please contact Mr. Svat Jones, P. Eng., Alberta Agriculture, Agriculture Center, Lethbridge, Alberta, T1J 4C7 at (403) 381-5164 or Mike Thompson, P. Eng., Nanuk Engineering & Development Ltd., Box 817, Cochrane, Alberta, T0L 0W0 at (403) 932-3593.■

LAND CLASSIFICATION BRANCH RESEARCH

The research program of the Land Classification Branch currently comprises four main areas of of emphasis:

(1) Suitability of solonetzic soils for irrigation development.
(2) Reclamation rates of saline/waterlogged soils following canal rehabilitation.
(3) Moisture retention characteristics of coarse-textured soils.
(4) Unsaturated water movement and moisture retention in shallow bedrock soils.

These studies address several areas of concern in land classification wherein modification of existing standards may be required in light of changing irrigation technology.

For further information regarding these research programs, please contact Rod Bennett, Alberta Agriculture, Agriculture Center, Lethbridge, Alberta, T1J 4C7 at (403) 381-5174.■

LEVEL II DITCHRIDER'S COURSE

The Lethbridge Community College (LCC), Irrigation Projects Association and the Resource Planning Division are jointly sponsoring a five day Level II Ditchrider Training Course from December 1 to 5, 1986. This course will be a carry-on from the Level 1 Course and will be geared to meet the needs of the more seasoned ditchrider.

You can register now by phoning LCC at 320-3323. Participation is limited to the first twenty registrants.

Topics include:
— The Irrigation Districts
— Farm Water Management
— Operations and Limitations of Pipelines
— Automatic Controls and Monitoring Devices
— Weed Identification and Control
— Efficiency and Losses
— Air Photo Interpretation
— Operation to Reduce Risk and Losses
— Water Storage, Control and Delivery
— Water Management Overall
— Hydraulic Laboratory Demonstration
— Public Relations

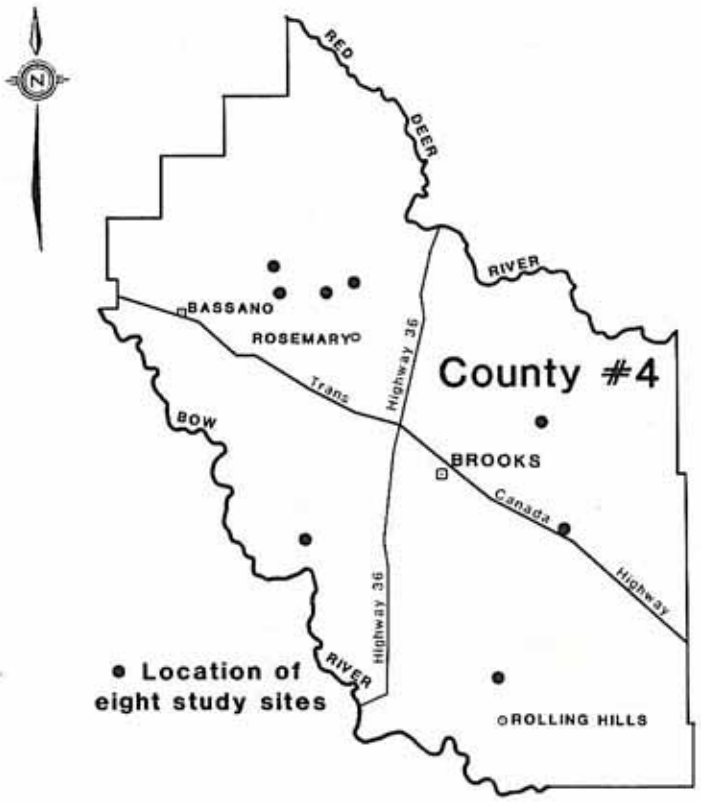
LAND CLASSIFICATION CONTROVERSY CONTINUES

Research May Shed Further Light

One of the most controversial issues in land classification in southern Alberta is related to the suitability of solonetzic soils for irrigation development. Solonetzic soils occur within almost all irrigation districts in southern Alberta but are particularly prevalent in the Eastern Irrigation District and in east-central Alberta. These soils are limited by the undesirable physical characteristics of the solonetzic B horizon which include high bulk density, low permeability, high plasticity when wet and high breaking strength when dry. This hardpan generally occurs within 0.3 m of the soil surface and is underlain by a C horizon with a high salt content. Solonetzic soils are restricted by inadequate aeration, poor root penetration, slow water movement, poor tilth, low fertility and excessive salinity within the underlying parent geological material. Map units characterized by greater than 30% solonetzic soils within the landscape are given a non-irrigable rating under existing land classification standards.

Previous research on irrigation of solonetzic soils has been somewhat inconclusive, reflecting the diverse nature of these soils and their response to irrigation development. Marshall and Palmer (1939) reported marked improvement in solonetzic soils in the Tilley area after twenty years of gravity irrigation. Krogman and Milne (1961), on the other hand, observed Youngstown area within six years under flood irrigation. Earlier standards were formulated on the basis of these studies and work in the Bow River Project by P.F.R.A.

Studies initiated in the Enchant area in the mid-seventies by Pano Karkanis of the Land Classification Branch and Ross Cairns of the Vegreville substation, Agriculture Canada, indicated that crop growth could be improved over the short term with deep plowing, fertilization and sprinkler irrigation. However, even short term changes in the salinity status of these solonetzic soils were difficult to assess due to the proximity of the research site to Lost Lake and the presence of an associated fluctuating water table at relatively shallow depth. Recent findings by Bole (1986) and Chang et al. (1986) at the Vauxhall Substation, Agriculture Canada, indicate that certain types of solonetzic soils may be improved by sprinkler irrigation, provided careful water management is employed.



In light of the uncertainties which prevail on the subject, a five year monitoring program was initiated by the Land Classification Branch in the E.I.D. in 1983 to determine the effect of irrigating a soil complex containing more than 30% solonetzic soils. Eight sprinkler irrigated sites representing nine solonetzic soil complexes were selected and sampled in the fall of 1983. Initial characterization and the first two years of annual monitoring were conducted by Bill Harron, Western Soils Consulting Ltd. (present address — P.F.R.A., Regina). The third and subsequent two years of monitoring are to be carried out by Lakeside Research in association with Doug Cameron, Normac AES Ltd.

Preliminary findings have been very encouraging in terms of crop yield at most of the sites. Differences related to various soil types have been detected. Crop and irrigation management factors appear to be extremely important in determining the results achieved. Details pertaining to changes in water table levels, soil moisture conditions and soil chemistry are contained in annual reports prepared by the Consultants. Funding for this project is provided from the Alberta Heritage Savings Trust Fund, Irrigation Rehabilitation and Expansion Research Program.

Additional information on this Land Classification Branch research program is available from Rod Bennett, Alberta Agriculture, Agriculture Center, Lethbridge, Alberta, T1J 4C7 at (403) 381-5174.■

ALBERTA FARMERS PLEASED WITH DRAINAGE INSTALLATION

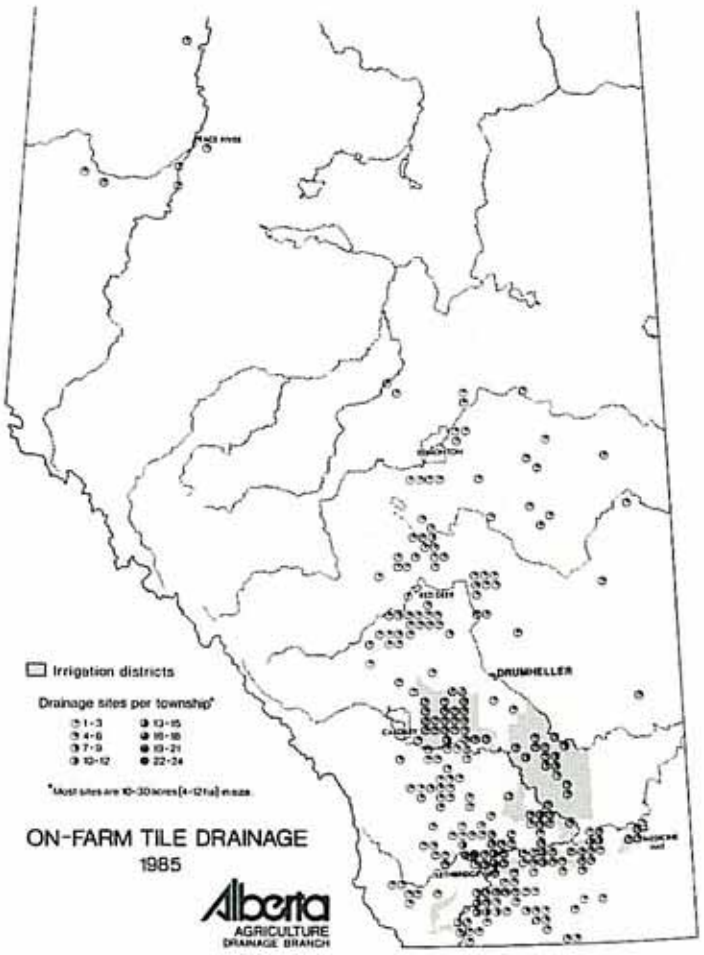
Survey Results Tabulated

The Drainage Branch of Alberta Agriculture recently completed a survey of 242 farmers having subsurface drainage on their land. Irrigation and dryland farmers from across the province were asked to provide details about their drainage systems — part of the 700 on-farm drainage sites now in Alberta. The main findings of the study provide information related to: drainage location; problem causes; investigation/design methods; typical drainage system characteristics; annual installation trends; and overall farmer satisfaction with drainage project completion.

Most drainage sites (60%) are located in dryland areas with the remainder within irrigation districts. Farmers believe the principal cause of drainage problems within irrigation districts is canal seepage and seepage related combinations (60%). Groundwater and natural high water tables are the other major problem approximately a third of the time. Only about 5% of farmers believe their own irrigation practices are the major cause of the problem. In dryland, a large part of the problem (40%) is due to surface ponding — more so north of Drumheller. Natural groundwater/water table contributions are the other major problem on dryland (45%).

Farmers say that about half of irrigation drainage investigation/designs are performed by the government, the remaining half by contractors. Contractors do most dryland work. According to the Drainage Branch, much of the province's drainage investigation resources have been located adjacent to irrigation districts, hence the higher government input there. These resources are now being expanded province-wide.

Half of all site investigations involve simply walking over the affected area. Only about a third involve drilling for soil textural and chemical samples. Drainage Branch experience has shown that this lack of soils data may limit drainage performance where soil characteristics are critical to optimum drainage design. Farmers say many drainage systems (45%) are constructed according to a final drafted plan. One-third of drainage systems are constructed according to field calculations only.



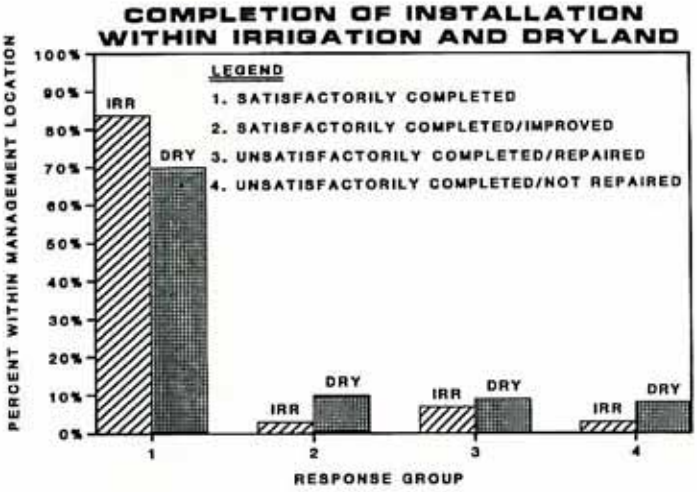
On-farm subsurface drainage in Alberta - 1985.

Half of all irrigation drainage systems are grid installations. Dryland installations are predominantly slough (40%) and grid (20%) systems. Survey results show slough drainage systems dominate north of Drumheller. Most drainage sites (70%) are less than 30 acres (12 ha) and about half are less than 20 acres (8 ha). Most projects contain less than 1500 m of drainage tubing. Over 90% of all subsurface drainage outlets are gravity free-flow. A gravity outlet is preferable if the receiving channel is deep enough to keep the outlet free from obstruction.

Fall is the busiest season for drainage installation (45%) according to landowners. Most sites requiring drainage are driest in the fall. Other busy times are spring for irrigated land and summer for dryland drainage. The annual rate of drainage installation in southern Alberta has declined lately — perhaps due to the recent drought and economic climate.

Farmers indicate that 90% of drainage installations are completed to their satisfaction.

Only 5% of sites are deemed to have unresolved installation problems. This high level of overall satisfaction indicates farmers are pleased with current drainage installation practices and do not see them as a limitation to further drainage expansion within the province. The Drainage Branch concludes that farmers can be expected to continue installing subsurface drainage. With an improved economic climate and/or possible drainage funding, the rate of subsurface drainage installation across Alberta should escalate once again.



For more information about this farmer survey or the detailed final report, contact Brook Harker of the Drainage Branch, Alberta Agriculture, Agriculture Center, Lethbridge, Alberta, T1J 4C7 at (403) 381-5159.■

THE JENSEN DRAIN

Simple, Economic, Yet Very Effective

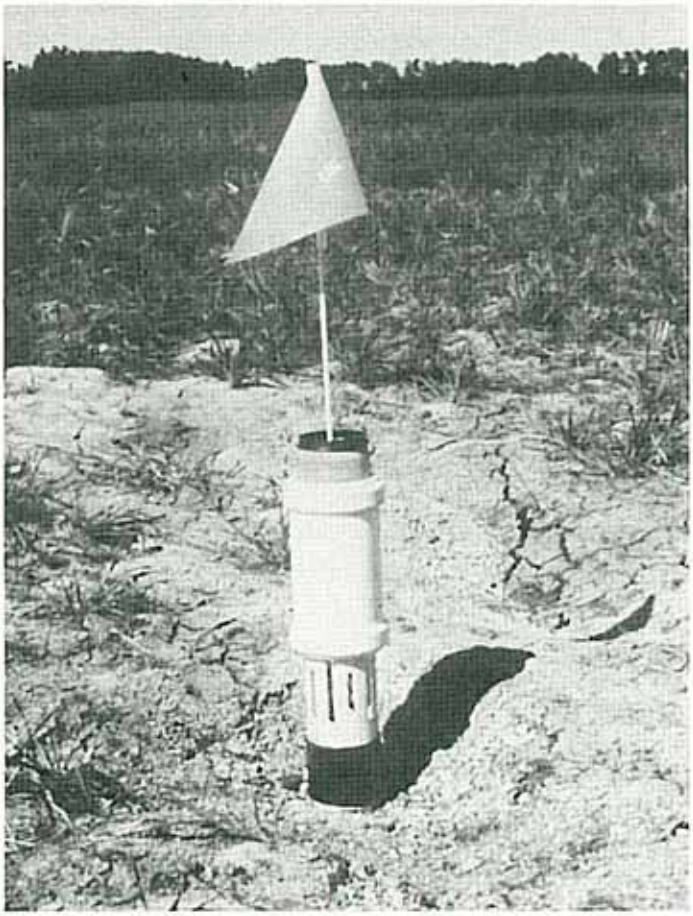
Jensen Engineering Research & Development of Olds, Alberta, has a notion that there is money to be made in finding a better way to improve the flow of surface water to buried plastic pipe drainage systems. That notion has led to the development of an inexpensive PVC inlet valve.

Underground plastic drainage pipe has been installed in about 300 sites within the Irrigation Districts of Southern Alberta. These drainage systems generally work well in sandy soils where the water moves rapidly to the perforations in the pipe. However, in clay soils, water movement is very slow, and vertical inlets are required to convey ponded water to the pipe. Many types of inlets have been tried; including crushed gravel, sawdust, and corn cobs. The gravel inlets perform satisfactorily when initially installed, however, flow rates decrease significantly as the crushed rock becomes mixed with the soil. Regular maintenance is required, which means replacing the gravel with new clean material.

The second, more serious problem with the gravel inlets is freezing. Since the inlet provides a direct access for surface water to the buried drain, water entering very late during a wet fall or Chinook in winter will cause the water in the tubing to freeze when cold temperatures return. Investigations by the Drainage Branch have found that once water in the drain tubing has frozen, thawing of the system may take until mid June, rendering the drainage system useless during critical spring flooding.

To better protect the inlets from these freezing conditions and reduce the maintenance costs, Jensen Engineering Ltd. has designed the "Jensen Drain."

Several inlet prototypes were fabricated and tested. Assistance from the National Research Council permitted laboratory testing of various inlet slot configurations. The inlet developed, consists of a simple slotted PVC pipe with a sliding valve. In operation, the valve is placed in the lower position in the fall. This prevents early inflow of snow melt from winter thaws. In spring, when the water level reaches the top of the valve, it automatically drains away through the upper slots. After the main runoff is removed, the valve can be raised to drain the remaining water, or the water can be allowed to stay ponded.



The flag on the Jensen Drain warns farmers of the presence of the drain inlet.

At a cost of about $60.00 the Jensen Drain Inlet is: simple, economic, yet very effective in conveying ponded surface water to underground drainage systems.

For more information, please contact Jensen Engineering, Box 1781, Olds, Alberta, T0M 1P0, telephone (403) 556-8755 or Brent Paterson, Drainage Branch, Agriculture Center, Lethbridge, Alberta, T1J 4C7, telephone (403) 381-5160.■

UPDATE:

Manning's "n" For Aqua Liner

In the 1986 Summer edition of the Water Hauler's we reported on the use of Aqua Liner as a surrogate liner placed inside a badly cracked and broken concrete lined lateral in the Bow River Irrigation District. At the time the article went to press, we had not been able to meter the friction coefficient (n) for the Manning's velocity equation, generally used in this type of channel.

In metering tests this past summer, when flows were reaching full supply level, the B.R.I.D. test section revealed a Manning's n of 0.016. Uncracked concrete slip-form lined channels have been designed based on an n of 0.014. This recorded value of n = 0.016 is only true for Aqua Liner laid to the same degree of smoothness. Since Aqua Liner is a flexible material, one cannot overemphasize the fact that wrinkles and other irregularities on the surface will significantly increase Manning's n.

Mr. Jake Friesen, Manager of the B.R.I.D., reports that the Aqua liner has held up in the channel and performed as expected.■

Concrete Sideboards

The Taber Irrigation District introduced our readers to their method of increasing the capacity of a concrete slip-form lined canal from 4.81 m^3/s to 7.08 m^3/s by adding "Concrete Sideboards." (See Volume 20, Summer 1986 Water Hauler's Bulletin.) After nearly two operational seasons, Kent Bullock, T.I.D.'s Engineer, is more than pleased with their performance. He states "we have not encountered any major problems and, in fact, have increased the capacity of one other concrete lined lateral in our system by adding the sideboards."

The District is planning to increase the height of the panels in the check structure.

If any of our readers wish to obtain more information on Taber's method, please contact Kent at (403) 223-2148 or P.O. Box 129, Taber, Alberta, T0K 2G0.■

A.I.P.A. ANNUAL CONFERENCE

November 17, 1986

The Annual Conference of the Alberta Irrigation Projects Association will be held on Monday, November 17, 1986 at the Lethbridge Lodge Hotel. Mr. Gordon Zobell is again the Conference Chairman and he states the theme for this year's Conference is "Multi Use of Water — The Irrigation District Perspective." Speakers will focus on such topics as: Future Considerations with regard to Wildlife Management, Multi Use of Irrigation District Reservoirs, Pollution Control within District Works, Noon Luncheon Speaker — Hon. Ken Kowalski, MLA, Minister of the Environment, and Banquet Speaker — Donald L. Pickens. Cost for the full day session including lunch and dinner is $40.00 or $25.00 for the session and lunch.

If you haven't received a registration form please call:

Mrs. Diane Virostek, Secretary-Treasurer
Alberta Irrigation Projects Association
Box 140
Vauxhall, Alberta T0K 2K0
(403) 654-4150 — (Tuesdays only)
(403) 739-3932 — (Residence)

Your prompt reply would be appreciated, as Diane states, "they may have to limit the number of persons attending to approximately 275." ■

WATER HAULER'S BULLETIN SUCCESS

Communicate your resourcefulness by having an article published in the Bulletin. Its success depends upon your help in obtaining and submitting new and useful ideas.

THE WATER HAULER'S BULLETIN

Designed to provide the operation and management personnel of Irrigation Districts with items of interest in their line of work. Comments are welcome. Please contact Duncan Lloyd, editor, at Area Code (403) 381-5164, Lethbridge.

Published quarterly by the Evaluation & Management Section, Project Planning Branch, Resource Planning Division, Alberta Agriculture, Agriculture Center, Lethbridge, Alberta T1J 4C7.