the
WATER HAULER'S BULLETIN

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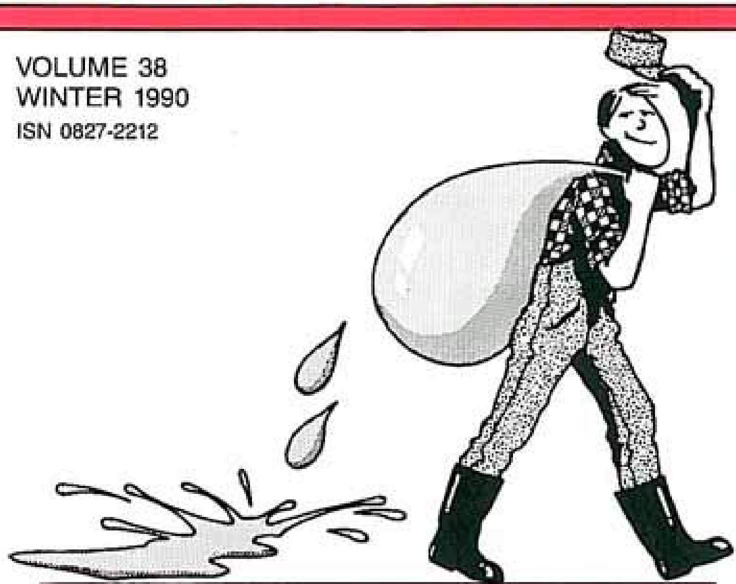


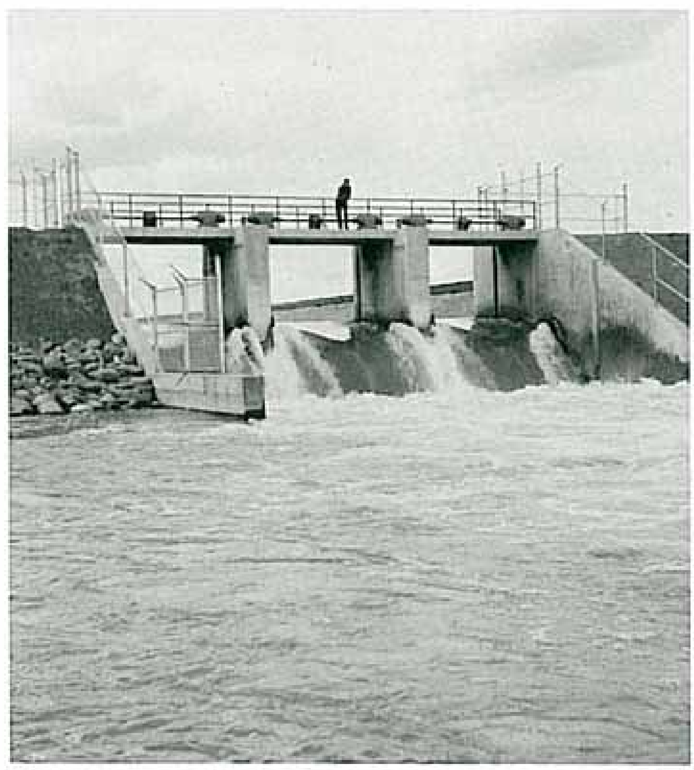
IN THIS ISSUE:

A 1ST FOR AN IRRIGATION STRUCTURE

Automated Overshot Gate Wins "Award of Excellence"

UMA Engineering Ltd. (UMA) is changing the thinking of design engineers on how to control water in open channels (traditionally done with undershot gates) with the development of its award winning "Automated Overshot Gate". The automated overshot gate has not only won the "Award of Excellence", jointly sponsored by the Canadian Consulting Engineer Magazine and the Association of Consulting Engineers of Canada, but has been widely accepted by the "people who run the water".

UMA countered the trend of half a century of hydraulic design work in arriving at this innovative design. The overshot gate is simple! It can best be described as: a rectangular panel, hinged across the bottom, that is raised and lowered by two cables attached to the upper corners. Stationary sidewalls guide the flow of water up and over the gate panel. Liken it to a drawbridge placed in a canal.



Drop No. 18 on the St. Mary Main Canal is a check drop structure with three Overshot Gates.

Hydraulically, the overshot gate is a moveable weir where flow over the gate varies as the three-halves power of the head, says UMA engineer Dale Miller. "This means that fluctuations in flow rate are reflected only as nominal fluctuations in water level. With water level held constant by the overshot gate, any diversions from the channel are assured of steady-state conditions. For a typical sluice gate diversion, the water manager needs to set his gate position only once with the knowledge that the flow through the gate will remain stable," says Miller.

How did the overshot gate come into being? Originally patented in 1890, the gate never did seem to catch on with design engineers. A quick review of modern day design manuals mentions no word about it. It was not until the SMRID needed a new inlet structure into Sauder Reservoir and manager Jim Brown's displeasure with existing structures that engineer Jozef Prozniak (then with UMA) began to develop the design. Only two years later, when trying to patent their product did UMA learn that 90 years previously someone had designed and patented a structure similar to theirs. No sooner was the gate designed than automation was pursued by UMA's Ian Daniluk to give the water manager around-the-clock control. All was not lost however, as UMA was able to copyright their automated controls and programs.

This smaller automated Overshot Gate is solar-powered but these gates can also be connected to the local electrical grid system.

Financial assistance for further developing the automated overshot gate was received from the National Research Council of Canada, Farming For the Future and the Irrigation Council of Alberta. With financial assistance and the recent advances in computer and communications technology, UMA has reduced the size of the overshot gate and is now providing economical around-the-clock water level control on small canals as well.

"The overshot gate permits ease of operation by the water manager; a water level change of 10 cm is accomplished with a gate change of 10 cm. The increment of control is very small; precise gate adjustments of as little as 5 mm are possible," adds Miller.

As simple as it may seem, the new design took many days to bring it from the idea stage to a fully functional irrigation structure.

For example, to prevent vibrations (both mechanical and auditory) and uneven flows over the gate, the nappe or overflow portion of the flow requires venting to atmosphere to prevent negative pressures from occurring underneath the gate panel. Venting is accomplished in two ways: by embedding vent pipes in the sidewalls of the larger structures; or by encasing one of the hoist cables with a vent hose on the smaller modular structures.

UMA enlisted the services of Armtec Inc. (a major gate and metal pipe manufacturer), to prototype the gate designs on a trial basis. Today Armtec has added the overshot gate to its product line and is selling them in both Canada and the United States.

Certainly it can be said the UMA development of the award winning automated overshot gate is one more tool in the design engineer's bag. With the control provided by this new structure, more efficient use can be made of a finite resource — water. When coupled with an automated control system, the overshot gate will contribute to improved conservation and management, at a time when the public is more aware of water issues and water managers are demanding more of their operating personnel and the tools they have at their command.

For more information please contact Dale Miller, P. Eng., UMA Engineering Ltd., 514 Stafford Drive North, Lethbridge, Alberta T1H 2B2. Telephone (403) 329-4822. ■

BULLSHEAD CREEK SPILLWAY: NEW GST REVETMENTS

Gets Passing Marks

In recent years, spillways on steep gradients were constructed essentially of Fabriform mats or concrete as the basic material. However, in the fall of 1988, another type of armour called GST Revetment was used on a spillway into Bullshead Creek by the St. Mary River Irrigation District (SMRID). To describe this new spillway one might say it is basically armour blocks strung together in two right angular directions held by polypropylene rope to form mats. The mats, preassembled at the plant, were installed on geotextile overlaying a gravel sub-base and anchored transversely by a duck bill and timber earth anchor system.

The spillway was designed by Pildysh Consulting Services Inc. of Calgary and the GST revetment system was extensively tested hydraulically by Pildysh for steep spillway application. The blocks were installed by Babichuk Engineering and Contracting Ltd. This spillway was designed for a working flow of 2.2 m^3/s and was set on a slope of 1:3.7. Testing in a large flume allowed for evaluation of the revetment stability under various hydraulic conditions involving super-critical flows. Open cell blocks were used in the design to avoid excessive uplift on the revetment due to fast flowing water.

The preparation of the site and installation of the sections of prefabricated strung blocks "went like clockwork," according to the SMRID's District Engineer, Ron Renwick, P. Eng. "The GST blocks attached easily to the existing old inlet structure. There was one problem where several blocks crumbled shortly after installation. They were definitely not fabricated to the design strength of 35 MPa (5075 psi)," says Renwick. However, Babichuk removed the faulty blocks and cast solid block replacements on site, he adds.

Since installation, this spillway has been monitored both by the irrigation branch and the district. Jack Ganesh, P. Eng. of the irrigation branch says both Renwick and himself are impressed with its performance as a flexible mat. However, because of its flexibility, the revetment conforms to the shape of the sub-base below. This is evident from the transverse depressions that developed just upstream of the timber anchors. We hasten to add that this has not affected the hydraulic or structural performance of the revetment, he says.

Note: Arrow points to blocks that have lifted due to the action of the hydraulic jump.

Recent monitoring has unveiled a minor problem. At the lower end of the spillway, the bed section of the blocks are lifted up with an apex of about 150 mm high. Renwick says this was due to the hydraulic jump action. He states that the ends of the blocks were not adequately anchored against the rolling action of the hydraulic jump. This is not a fault of the product, says Renwick.

Notwithstanding these problems, we are convinced that the concept is good, say Renwick and Ganesh. With adequate quality control during manufacturing and the lower end designed to handle the hydraulic jump, this type of spillway should perform adequately and last for a long time, they add.

For more information please contact Ron Renwick, P. Eng., District Engineer, St. Mary River Irrigation District, P.O. Box 278, Lethbridge, Alberta T1J 3Y7 at telephone (403) 328-4401; or Jack Ganesh, P. Eng., Irrigation Branch, Alberta Agriculture, Agriculture Centre, Lethbridge, Alberta T1J 4C7 at telephone (403) 381-5869. ■

DEEP INTERCEPTOR DRAINAGE VERSUS GRID DRAINAGE FOR CANAL SEEPAGE INTERCEPTION

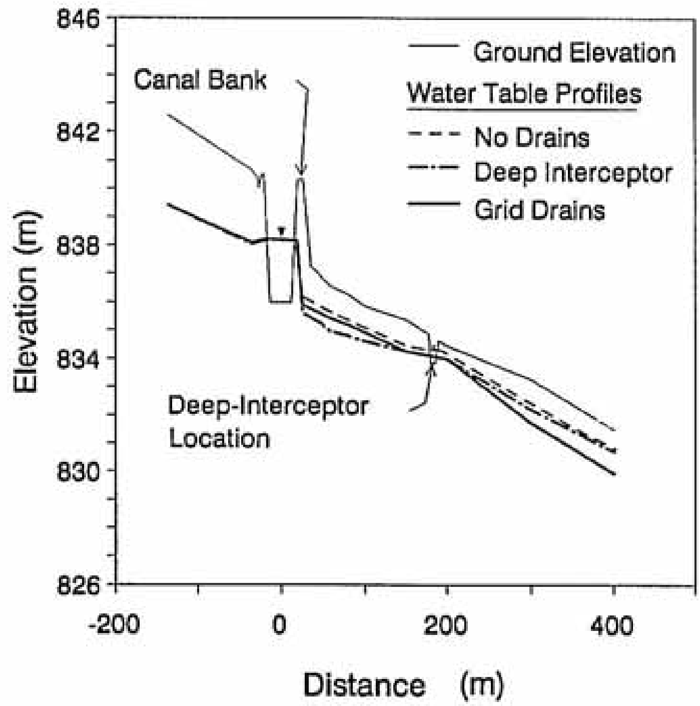
A basic requirement for water resource management is being able to intercept seepage. Modern technology has provided two types of interceptor methods — deep interceptor drains and grid drainage. A Farming for the Future study was conducted from 1987 to 1989 to determine the relative effectiveness of the two types of seepage interception methods under a variety of hydrogeological conditions.

Deep interceptor drains consist of 150 to 300 mm diameter clay tile or polyethylene tubing placed adjacent to a canal at depths ranging from 2 to 4 m. A gravel chimney is frequently placed above the drain to prevent seepage water from bridging the drain. Grid drainage involves placing a series of parallel, regularly spaced 100 mm diameter polyethylene tubing throughout the saline/waterlogged areas downslope of the canal. Drain depth varies from 1.0 to 1.8 m. Borehole drilling and groundwater instrumentation (piezometers and water-table wells) was done perpendicular to the St. Mary River Irrigation District (SMRID) Main Canal at four sites. Seepage control was by an interceptor drain at one site, grid drainage at two sites, while the final site had no seepage control. Existing groundwater conditions and drain performance were established over a fifteen-month period. A groundwater-flow model was then calibrated to match the observed groundwater conditions. Following model calibration, additional groundwater simulations were conducted by varying the type of drainage system. In this way, indirect comparisons of deep interceptor drainage, grid drainage and no drainage were made.

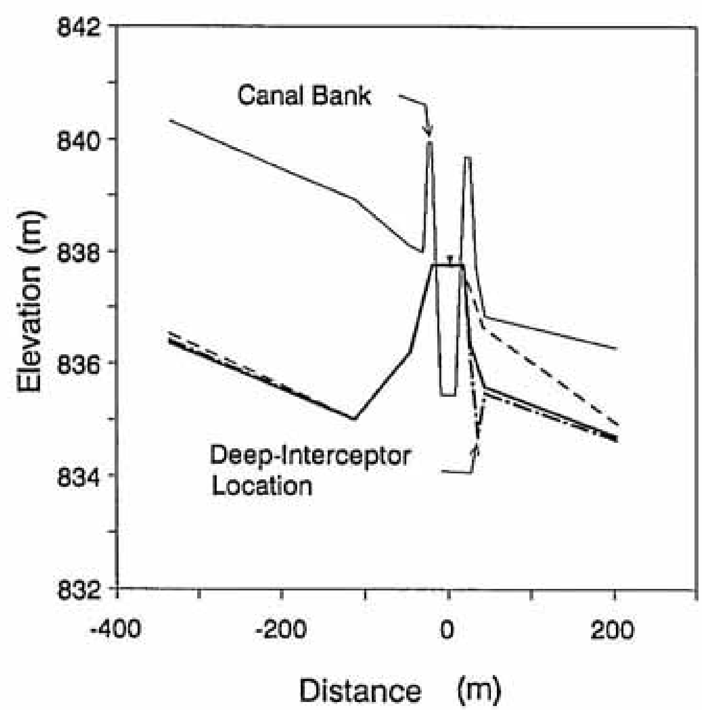
At site 1, the effect of both types of drainage on the water table, relative to no drainage, was limited. The relatively poor performance of the deep interceptor and grid drains at this site resulted from bedrock which underlay the site at depths of 1 to 2 m. This bedrock limited the depth of drain installation and was also a source of natural groundwater discharge.

At site 2, the deep interceptor drain and the grid drains provided approximately equal and adequate control of the water table. The good performance of the two types of drainage was because downslope salinization was mainly associated with canal seepage.

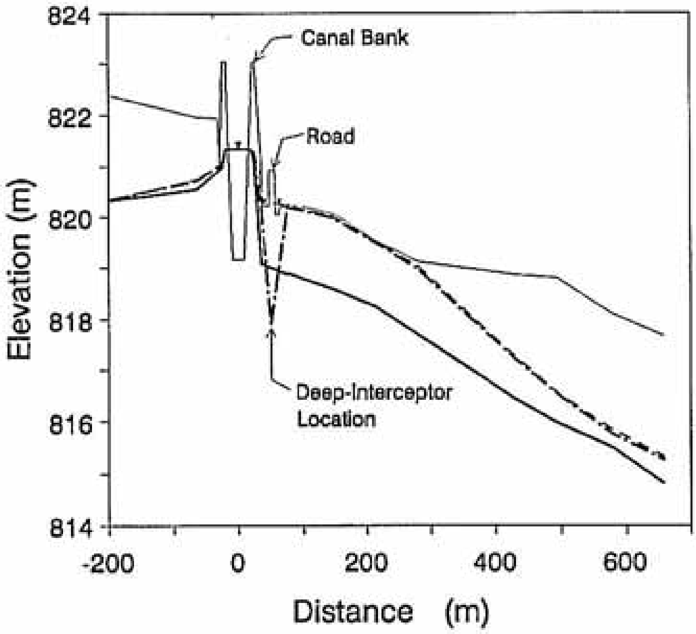
SITE #1



SITE #2

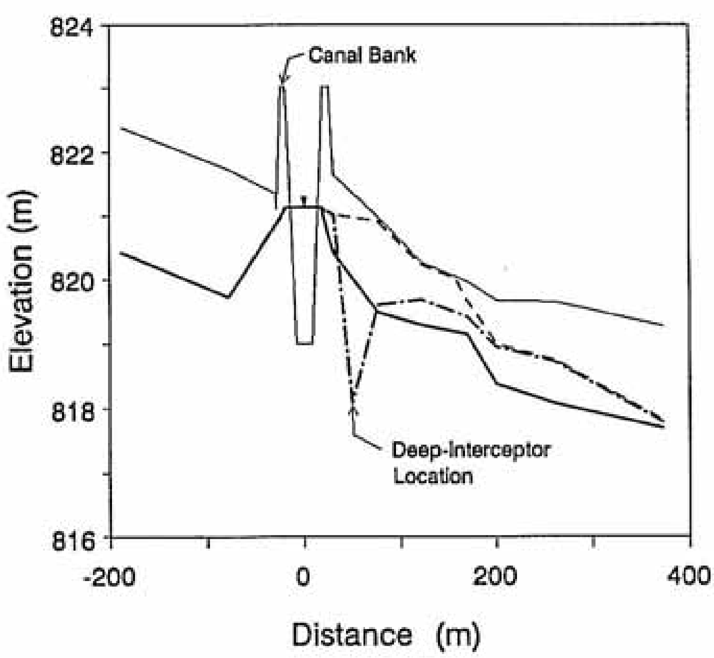


SITE #3



At site 3, a deep interceptor drain would lower the water table only within 50 m of the canal, while grid drainage would lower the water table throughout the monitored transect. Similar results were observed at site 4, although the influence of the deep interceptor extended to about 200 m.

SITE #4



Both sites 3 and 4 had similar hydrogeology; 5 to 6-m thick lacustrine or till materials overlying a coal seam which in turn overlay bedrock. Groundwater in the coal seam was under pressure and there were strong upward gradients towards the water table. This coal seam was largely responsible for salinization at these two sites and was the principal reason for the poor performance of the deep interceptor drain.

Simulations were also done using irrigation recharge to simulate leaching which would enhance reclamation of the soils. Results indicated that at all sites the grid drains would provide better water table control than the deep interceptor drain.

Construction of the deep interceptor and grid drains were comparable in cost when expressed on a per metre of canal basis (Table 1). However, grid drainage provided better water table control when leaching was simulated to reclaim the soils, and thus costs per acre of soil potentially reclaimed were lower for grid drainage compared to interceptor drainage.

Costs of deep interceptor drains were relatively constant regardless of whether the outlet was by gravity or pump (see Table 1). Cost of grid drainage, however, varied according to the availability of gravity versus pump outlet. This is illustrated in Table 1 by comparing the $/acre cost of grid drainage at sites 3 and 4, which used pump outlets, to those at Monarch, which used mainly gravity outlets.

Table 1. Approximate construction costs of grid and interceptor drainage.

Drainage Type	Total Cost	
	$/m	$/acre
Grid		
Sites 3 and 4	141	1660
Monarch	104	850
Interceptor		
Sites 1 and 2	115	5460
Bow Island	117	6310

For further information on this study, or to obtain a copy of the Farming for the Future final report, contact Gary Buckland, Land Evaluation and Reclamation Branch, Alberta Agriculture, Agriculture Centre, Lethbridge, Alberta T1J 4C7 at (403) 381-5882; or Kevin Spencer, CH2M Hill Engineering Ltd., 920 - 3 Avenue North, Lethbridge, Alberta T1H 0H3 at (403) 320-6678. ■

STRUCTURE DRAINAGE

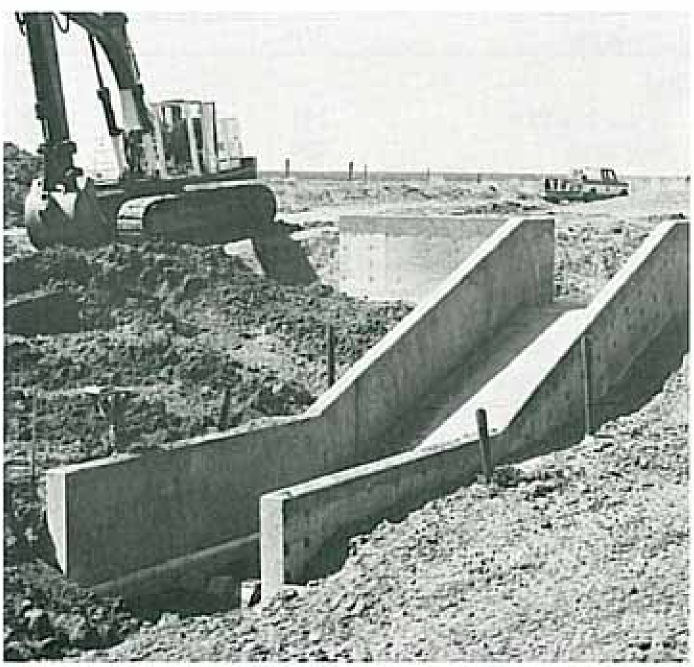
If They Clog There Could Be Trouble

Ever wonder in an aging structure if the sub-drainage system beneath the floor slabs is still working? The Bow River Irrigation District (BRID) began experiencing pressured chute slabs on existing main canal drop structures due to blocked sub-drainage systems beneath the floor slabs. District engineer, Steve Topping, is taking no chances with his new design that this problem cannot be solved easily and cheaply.

Instead of plugging the ends of the plastic drainage tubes, Topping has extended them out underneath the structure footings and up above the backfill. The risers are capped to prevent debris from getting into them. If the need should ever arise to backflush the system, Steve says it's just a matter of uncapping them, connecting a pump to the riser and letting the reverse flow do the rest.

The BRID's operations and maintenance branch has been installing these cleanout risers on existing structures' sub-drainage systems to facilitate future cleaning.

For more information please contact Steve Topping, P. Eng., District Engineer, Bow River Irrigation District, P.O. Box 140, Vauxhall, Alberta T0K 2K0. Telephone (403) 654-2111. ■



The capped risers will stick up slightly above ground once backfilling is completed.

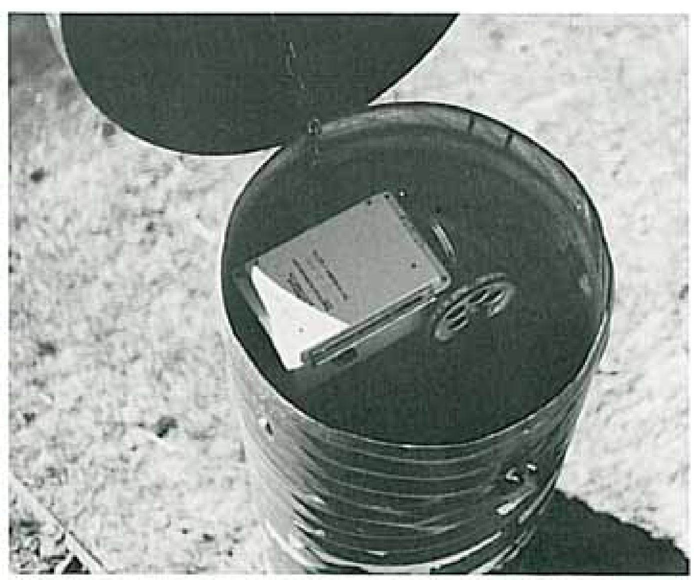
ELECTRONIC DATALOGGERS FAIL IN STEEL RECORDING WELLS

During the summer of 1989, the staff of the irrigation branch of Alberta Agriculture noticed the repeated failure of their electronic dataloggers installed in corrugated metal pipe (CMP) and steel recording wells. Replacement instruments would record data for about two weeks and then fail again.

Brian Cook, an electronics technologist with the branch, believes "the problem occurred when the CMP or any other metal in contact with moist soil becomes a primitive battery or galvanic cell generating between 0.7 to 1.1 volts." This voltage, he says, along with the high humidity found in recording wells and manholes is enough to destroy most micro chip based instruments and computers. Where possible, he suggests electronic equipment should be installed in PVC, fibreglass, concrete or other nonconductive recording wells and manholes.

If however, electronic equipment must be installed in a buried metal structure, he recommends using a desiccant product such as Silica-Gel in a tightly closed instrument box which is electrically insulated from all other metal.

For further information please contact Brian Cook, Electronics Technologist, Irrigation Branch, Alberta Agriculture, Agriculture Centre, Lethbridge, Alberta T1J 4C7. Telephone (403) 381-5879. ■



Alberta Agriculture has discontinued use of corrugated metal pipe and steel recording wells to house their electronic dataloggers.

FROM THE FARM PERSPECTIVE

"An Editorial For and To the Irrigation Farmer"

In this otherwise normally technical publication, I hope you will allow me, Wally Chinn, a few moments to "climb upon the soapbox" and editorialize in respect to the on-farm irrigator.

Not many of us in the irrigation industry in Alberta need to be informed or reminded of the scrutiny that the irrigation sector has been under in the past few years . . . or do we?? With irrigation receiving considerable criticism from a vocal segment of the Alberta public in regards to such things as its impact on the available water resources, the environment, and the public purse, the irrigation farmer is the one who seems to be bearing the brunt of the attack as the sole benefactor, or perpetrator, as some would have it. Alright, so I'll admit that I'm an advocate of the on-farm viewpoint, but my intent here is to neither run to the defense of the beleaguered irrigator nor join the fight to condemn him.

The concern that I wish to concentrate on is the apparent situation that, in general, the irrigator himself is being considered very little in the issues at hand, and the real on-farm perspective is not being adequately represented.

There is little question that much has been accomplished by the proponent organizations on behalf of the "irrigation industry" in Alberta. But at the same time, I fear that the perspective of the actual irrigator, the end-user of the water, the main and original consumer for which the systems were/are built, has not nearly been adequately dealt with.

For example, the perspective of an uninformed public is that the irrigation funding from the public purse is going directly into the pockets of the "few" irrigation farmers in the Province in the form of another direct cash subsidy making that "select rich farmer" even more wealthy. I wonder how many of these anti-irrigation protagonists have been enlightened as to the reality that the irrigator has received no direct compensation for his own out-of-pocket irrigation costs. In view of costs and expenditures from 1976 to 1988, the public contribution of some $585 million to irrigation storage and conveyance system development and rehabilitation still lags behind the estimated $642 million expended by the irrigators themselves in purchasing, operating and maintaining their own on-farm systems as well as contributing to the development, rehabilitation and operation programs of the conveyance works. Have any of them bothered to consider the net returns on the average irrigated farm in 1986 diminishing to minus $22 per acre, while the average dryland farm on the same land base was returning a net one dollar per acre profit? (Not a pretty picture in either case). Has anyone queried the dryland farmer as to why he is not prepared to enter the "high capital risks arena" that his irrigation neighbor works in each year?

I would reiterate that the intent here is not to plead to the sympathetic ear of the irrigator's plight. In fact, I propose that we may have, to his detriment, held his hand too long and shielded him from the issues at hand in terms of irrigation's place in the water management complexities of today . . . so much so that the irrigator almost has an air of complacency about the matter. "Just give me my water and leave me alone", or "I know there's a water shortage, but it doesn't apply to me", are all too often his replies.

As well, the harsh realities could unfortunately not be fully recognized or accepted by some of our District Boards of Directors, who are of course themselves irrigators. The matter at hand isn't to continue to justify irrigation as an important segment of Alberta's agriculture and to the economy of southern Alberta. Everyone in the industry has to look beyond that tunnel approach to the self-righteousness of irrigation (a position we've come to accept because of our belief in irrigation's merit) and wake up to and work in the awareness of the increasing pressures that the public's high mushrooming priority on the environment and all its amenities is going to have on the soil and water resources business.

In particular, the individual irrigators, both private and district alike, need first to be roused to the state of affairs and the serious nature of the interest, influence and impact of other interest groups in the sharing and/or apportioning of that water resource that we should be enamoring so preciously. Strict adherence to water rights legislation, environmental impact studies, restricted irrigated acreage developments, curtailment of discretionary water allocation and modes of operation, compulsory joint water allotments for integrated and complementary water use, minimum water use efficiencies and (the dreaded!) water metering, are all issues that will likely become considerably more commonplace in the days ahead.

One thing is for certain, if the irrigation water user remains complacent and overconfident about his place in this scheme of things and shows almost complete disregard for the "wants" of other water consumers or environmental interest groups, decisions affecting his fate will be made by somebody, with or without his input.

I would hope that as irrigation districts plan for their annual water users meetings, they will consider presentations and discussions for their irrigators that reference the realities that these users should be addressing with the more "global" context in mind. Hopefully these discussions will earn at least an equal portion of the meeting lime-lite as do the debates on whose canal should be next on the rehabilitation list!

Wally Chinn, P. Eng. Head, Irrigation Development Section, Irrigation Branch, Alberta Agriculture, Agriculture Centre, Lethbridge, Alberta T1J 4C7. Telephone (403) 381-5864. ■

IRRIGATION DISTRICT BOARD & MANAGERS ONE-DAY WORKSHOPS

The Lethbridge Community College (LCC), the Irrigation Districts and the Irrigation Branch of Alberta Agriculture have designed specifically for the elected officials and their managers, three one-day workshops which will address the following topics:

Session #1, Friday February 9, 1990
Are You An Effective Director? and Relationships Between Board, Managers & Chairman.

Session #2, Friday, February 16, 1990
Legal Limits & Liabilities.

Session #3, Friday, February 23, 1990
Effective Meetings.

The cost is $50.00 per session or $125.00 for all three. For more information please contact John Calpas at LCC. Telephone (403) 320-3311. ■

IRMAA BULLETIN BOARD UPDATE

Effective February 1, 1990 the IRMAA BBS (Irrigation and Resource Management division Alberta Agriculture Bulletin Board System) will be available 24 hours/day seven days/week. The access telephone number is (403) 381-5796.

If you have any questions, comments, or suggestions, or would like a copy of the IRMAA BBS User Guide, please contact Pat McIlhargey, Information Systems Analyst, Irrigation Branch, Alberta Agriculture, Agriculture Centre, Lethbridge, Alberta T1J 4C7. Telephone (403) 381-5855. ■

IRRIGATION DISTRICT MAINTENANCE SEMINAR JANUARY 29, 30 & 31, 1990

This 3-day seminar is especially designed for maintenance staff. It will cover such topics as fundamentals of concrete, soil types, rip-rap and construction supervision. The seminar cost is $50.00 and is brought to you through the cooperation of the Lethbridge Community College (LCC), the Irrigation Districts and the Irrigation Branch of Alberta Agriculture.

For further information please contact Greg Peterson, Program Administrator at LCC. Telephone (403) 320-3319. ■

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) 381-5539, Lethbridge.

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Alberta AGRICULTURE