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A Perspective of Waste Management in the LNID

The Lethbridge Northern Irrigation District (LNID) and water quality have become interrelated due to major livestock operations that exist within district boundaries. The report titled "Agricultural Impacts on Water Quality in Alberta" states that, the risk of water quality degradation appears to be significant for areas of the province where intensive agriculture is practised, as measured by fertilizer or herbicide inputs or by animal unit density.

The risk is greatest in those areas where overall agricultural intensity, based on all input factors, is high. "It should be noted," says Rick Ross, manager of the LNID, "that proper sewage treatment systems do exist in the agricultural areas. Management of feedlot effluent runoff is a

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Livestock operation.

requirement, as part of the development permits, for livestock operations."

Disposal of waste from feedlots provides fertilizer for the land. With the current revised management practices, the application of manure fertilizer to the land is insufficient to meet the nitrogen requirements. However, natural fertilizer not only supplements chemical requirements to the land but also improves tilth and farmability of the lands. Phosphates, which occur naturally in the manure is what needs to be managed to supply crop requirements without an over application and a resulting build-up of phosphates in the soil. Waste from livestock operations becomes fertilizer, thus reducing the necessity for chemical fertilizer processing plants and allowing reduced energy consumption.

In retrospect the farmer is both an environmentalist and a sewage treatment operator.

In retrospect the farmer is both an environmentalist and a sewage treatment operator. He has the land base that enables him to achieve optimum utilization of his total effluent more effectively than municipal treatment situations.

For more information, contact Rick Ross, manager of the Lethbridge Northern Irrigation District, 334 - 13th St. North, Lethbridge, AB, T1J 2R8, telephone (403) 327-3302. ■

New Office Nearing Completion

Anticipation is running high with the management and staff of the Bow River Irrigation District (BRID) as they are getting prepared to move into their new facility. The new facility is located on the BRID's property in Vauxhall, immediately north of the old machine shop, and is expected to be completed in early June.

Construction, which began in September 1997 with C & T Construction Management Ltd. of Lethbridge being awarded the contract, has proceeded smoothly throughout the course of the project. The architect for the building was Savill Group Architecture of Lethbridge. "A great deal of consultation between the BRID and the architect has resulted in a final design which is highly functional, as well as attractive and original," says Richard Phillips, district engineer. Prior to proceeding with construction, the board and management met with BRID water users for approval of the project.

New BRID office and shop.

The old office was built in 1927, while the machine shop, carpenter shop and the boardroom were built separately in 1951. There were some major renovations in 1967. The new building now incorporates the office, machine shop, carpenter shop, and boardroom into one building.

The office portion of the new facility is wood frame construction while the shop area is made with concrete masonry blocks. The total size of the building is approximately 26,000 square feet. The shop area includes three main bays for mechanical work, a large drive-through wash bay, a welding shop and carpenter shop, both with exterior overhead doors, and a machine shop. The shop also has in-slab heating throughout. The office portion of the building houses the current offices on the main floor. The second floor of the office includes a mechanical room for the air handling/air conditioning unit, and partially finished space for storage and future development. The basement has ample storage space and includes a large mechanical/boiler room for the entire building complex.

"Our management and staff," Phillips points out, "is looking forward to improved efficiency and communication between our various departments once we have moved into our new facility. Development of the grounds, including demolition of the old shop and landscaping will continue throughout the summer."

The grand opening of the new building is scheduled for September 15, 1998. For more information contact Bow River Irrigation District, Vauxhall, Alberta, Telephone (403) 654-2111. ■

Countdown – The Year 2000 Is Only 18 Months Away!

Sometime in the next year and a half the official review of the South Saskatchewan Basin Water Allocation Regulation (AR 307/91) will begin in earnest. The review will be the first official update on water use and allocation since AR 307/91 placed limits on irrigation development in the basin.

Previous editions of the Water Hauler's Bulletin have provided overviews of the Year 2000 Irrigation Study being carried out in partnership between the Alberta Irrigation Projects Association (AIPA), Alberta Agriculture, Food and Rural Development (AAFRD), Prairie Farm Rehabilitation Administration (PFRA) and Alberta Environmental Protection (AEP). Volume 65 - 1997, of the Water Hauler's Bulletin, reported on the undertakings of the on-farm working group. This article will deal with the modelling working group, which is one of three working groups within the Year 2000 Irrigation Study.

The Year 2000 Review initiative is likely one of the most intensive and comprehensive projects undertaken in North America from an agricultural point of view.

"Our modelling working group," says co-chair Dave Hill, of the Eastern Irrigation District, "is moving along in its task to take the information from the on-farm and distribution working group and implement it in the overall suite of decision computer software support tools." These tools are intended to assist those involved in water management within the irrigated areas of southern Alberta, in evaluating the effects of improved water management efficiencies and changes in operating rules and policies on their respective areas of jurisdiction. The current suite of computer software tools include:

1. Water Resources Management Model (WRMM): This model is predominately used by AEP to evaluate the long-term operations of the South Saskatchewan Basin Water Allocation Regulation from a planning perspective.
2. Data Sim: This model assists in analysing field flow monitoring data.
3. Irrigation District Model: This model is designed to assist the irrigation districts in their long-term planning of irrigation management and potential expansion and their near real time modelling evaluations of current water supply, delivery conditions and operating scenarios. Listed below are three of its specific modules that operate in an integrated fashion.
   a. The Irrigation Requirement Module contains field information required to predict on-farm crop and irrigation system water requirements.
   b. The Water Order Desk Module is designed to take daily water orders, their corresponding deliveries and then assist in scheduling water on a network basis.
   c. The Network Management Module is intended to represent the physical characteristics of each irrigation district. It will take into account, reservoir operations, canal losses (seepage and evaporation) and network related return flows.

"Most of the activities of this working group are converging on tool development and finalization, says Hill. More contact with staff of the irrigation districts will begin to take place over the summer, fall and winter of 1998, to provide training on the use of the tools, assist in the collection of data and begin the process of validation and calibration."

Dave Hill, co-chair of the modeling working group.

The Year 2000 Review initiative is likely one of the most intensive and comprehensive projects undertaken in North America from an agricultural point of view. The intent is not only to provide tools to address the AR 307/91 reassessment but to provide the irrigation districts with the resources which allows them to continue to improve their water management skills well beyond the Year 2000.

For more information contact Dave Hill, Eastern Irrigation District, P. O. Bag 8, 550 Industrial Road, Brooks, Alberta T1R 1B2. Telephone (403) 362-1400 or view internet site www.eidnet.org/local/yr2000. ■

Corrosion Protection

Corrosion is a major problem and can be a significant cost factor in many segments of irrigation. Protection from corrosion has traditionally been through protective coatings of paint, solvent based coatings, epoxies, and more recently, polymers. Most of these traditional coatings can be applied only in good weather, require two or three coats and require lengthy cure time. They are brittle, or become brittle in cold weather, tend to fail in adverse conditions, and are not field repairable.

Thermoplastic resins can provide a range of protection, are impervious to most chemical and acids and are environmentally inert. They are field appliable in virtually any weather condition, and are ready for use within minutes of application. They are field repairable, are extremely resistant to corrosion and abrasion, and have a life expectancy of several times that of most traditional protective coatings. These coatings outlast even stainless steel in many applications, and are much more resistant to abrasion than carbon steel. Some estimates of the life of these coatings exceed 50 years.

The thermoplastic coating process is the thermal application of polymer powders to almost any surface (substrate) including metals (steel, aluminum), concrete, stone, wood, fibreglass and glass.

The thermoplastic applicator consists of a hand-held flame application gun, a powder storage/supply hopper, a powder injection system, a pneumatic air/powder flow control system, a fuel control system and transfer hoses. The flame gun uses propane gas or natural gas to heat the substrate to approximately 450°F, to which the thermoplastic is being applied. The substrate has to be sand blasted prior to application of coating. Thermoplastic powder is conveyed by compressed air through the propane flame. The plastic melts as it passes through the flame and is applied to the substrate in a similar manner to that of spraying paint. Costly curing time is not required. As soon as the thermoplastic powder is cool, the surface is ready for service. Thermoplastic coating is applied up to a thickness of 30 mm depending on the complexity of the surface of the material.

Thermoplastic coating being sprayed on sheet metal.

Thermoplastic protection has been used in southern Alberta on metal bridge pilings, storage bins and potable water tanks. Other uses have included sanding truck boxes, snow plows and impeller blades.

For more information contact Earl Snyder, operations manager of Thermoplastic Industries Inc., Calgary, AB, Telephone (403) 250-7888. ■

Nitrate in Groundwater

The irrigation branch studied nitrate in groundwater in three irrigation districts between 1993 and 1997. The studies received support from the County of Lethbridge, the Chinook Regional Health Authority, Alberta Health, and the Canada-Alberta Environmentally Sustainable Agriculture (CAESA) agreement.

"Excess nitrate in water has been linked to potential health effects," says Joan Rodvang, groundwater specialist with the irrigation branch. Before this study, very little was known about the potential for over-application of fertilizer or manure to cause nitrate contamination of groundwater in southern Alberta. Our objectives were to find out how much nitrate is in the groundwater, to determine nitrate sources, and to determine whether the flow of groundwater to surface water can contaminate it with nitrate.

We characterized the source and fate of nitrate at two drainage basins, one in the Bow River Irrigation District (BRID) and one in the Lethbridge Northern Irrigation District (LNID). Our study area in the BRID received relatively high rates of inorganic fertilizer, while our study area in the Battersea drainage basin in the LNID was located in an area with a high density of intensive livestock operations. We also studied five field-scale irrigated sites that received known quantities of fertilizer and/or manure.

Nitrate derived from natural sources occurred in groundwater in clay-rich sediments (glacial till and lacustrine clay), at levels of up to 30 to 40 times greater than acceptable for human consumption. Natural geologic nitrate (several thousand years old) generally occurred at least 6 metres below ground, although it occurred near ground surface in groundwater discharge areas. Groundwater containing geologic nitrate almost always contained sodium, sulphate and manganese, and often selenium, at levels that made it unacceptable for drinking. This groundwater flowed at less than 1 to 30 centimetres per year, and discharge volumes were far too low to affect the quality of surface water.

"We found nitrate from manure and inorganic fertilizer leached to groundwater through both sandy and clay-rich sediments when fertilizer or manure were applied at rates greater than crops required," states Rodvang. The amount of leached nitrate increased significantly as the amount of excess nitrogen increased and the results suggested nitrate leaching can be minimized by applying nitrogen at rates recommended by soil testing.

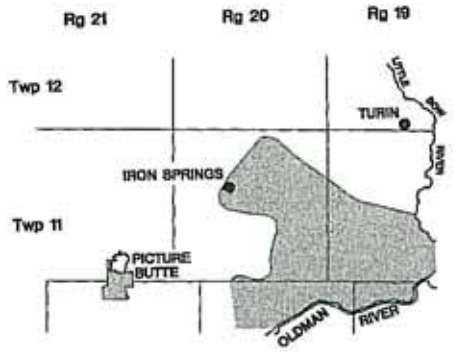

Figure 1. Approximate extent of the unconfined aquifer in the LNID

Nitrate from fertilizer occurred at 2 to 30 times the level acceptable for human drinking water below fertilized fields. Nitrate derived from a combination of fertilizer and manure occurred at 1 to 8 times the acceptable level in the LNID.

Aquifers are geologic formations that can supply a usable quantity of relatively high-quality groundwater, as opposed to the till and clay where geologic nitrate occurs. We found nitrate does not occur naturally in aquifers. The aquifer in the eastern portion of the LNID (see

Figure 1) is used by people and livestock. It is called an unconfined aquifer because it isn't covered by a clay-rich deposit. Nitrate from manure and/or fertilizer was present in 71% of samples, and about 35% of samples were unacceptable for human consumption, due to high levels of nitrate, sulphate and manganese. Elevated levels of faecal bacteria, chloride, sulphate, sodium, magnesium, manganese, iron, lead and selenium were sometimes detected. Groundwater travelled through the aquifer to the Little Bow and Oldman rivers at about 50 metres per year. Discharge from the aquifer will not affect nitrate concentrations in the Oldman River, but discharge from a number of highly contaminated aquifers could have a more significant effect. If the aquifer in the LNID became highly contaminated with salts from manure, salt levels in the Oldman River could be affected by discharge from this aquifer alone.

Our study indicates fertilizer and manure must be applied according to crop requirements to prevent contamination of shallow groundwater with nitrate. The over-application of manure can also cause groundwater contamination with salts and certain trace elements. Salts sometimes contained in inorganic fertilizer, such as chloride, can also contaminate groundwater. Shallow aquifers are very vulnerable to contamination, and discharge from aquifers could affect surface water. "Therefore, in planning future development we must consider groundwater setting, including the depth to aquifers and the permeability of overlying materials," states Rodvang.

For more information contact Joan Rodvang, groundwater specialist, phone (403) 381-5883, email joan.rodvang@agric.gov.ab.ca, Irrigation Branch, Alberta Agriculture, Food and Rural Development, Lethbridge, Alberta, T1J 4C7. ■

Pipeline Inlet Screening in EID

One of the most persistent problems that irrigation districts face each year during irrigation is how to screen their irrigation water before it enters their closed pipeline systems.

Southern Alberta has relatively clean water, but nevertheless a considerable amount of debris, vegetative matter and trash is generated within the irrigation distribution system itself.

View of self-cleaning screen.

The Eastern Irrigation District's divisional superintendent Kevin Tebo, needed a self-cleaning screen to prevent weeds from clogging up the inlet structure to Lateral G, North Bantry, a closed gravity pipeline system. "This pipeline draws approximately 3.03 m^3/s at full capacity and it was imperative that we kept the pipeline inlet structure free of weeds," says Tebo. The North Bantry canal which supplies water to Lateral G, will lose approximately 1/3 of its capacity throughout the irrigation season due to vegetation growth. "We clean that canal once a year which uproots a lot of

weeds, which compounds our weed problem at that pipeline inlet structure," states Tebo.

A Duperon self-cleaning trashrack made from lightweight, corrosion resistant steel was installed. A 1/8 HP motor powers, through a gear box, a continuous chain of urethane rakes that travel up a bar screen. As the loaded rake travels over the top, the weeds fall into a cast-in-place enclosure which is easily accessible by a front end loader. The urethane scrapers can vary in width and style depending upon the debris and intake requirements.

Self-cleaning screen in operation.

"We run the self-cleaning screen continuously through the peak irrigation season and it worked very well in keeping the weeds clear of the pipeline inlet structure," says Tebo.

For more information, please contact Kevin Tebo, Divisional Superintendent, Eastern Irrigation District, P. O. Bag 8, 550 Industrial Road, Brooks, Alberta, T1R 1B2. Telephone (403) 362-1400. ■

Editor's Notes

This bulletin is designed to provide the operation and management personnel of Irrigation Districts with items of interest in their line of work. If you would like to submit articles or provide us with input, feel free to contact Brian taylor, the editor, by phone in Lethbridge at (403) 381-5542 or e-mail brian.taylor@agric.gov.ab.ca.

Copies can be obtained on the internet from the Department of Agriculture's home page at http://www.agric.gov.ab.ca/irrigate/hauler/index.html.

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