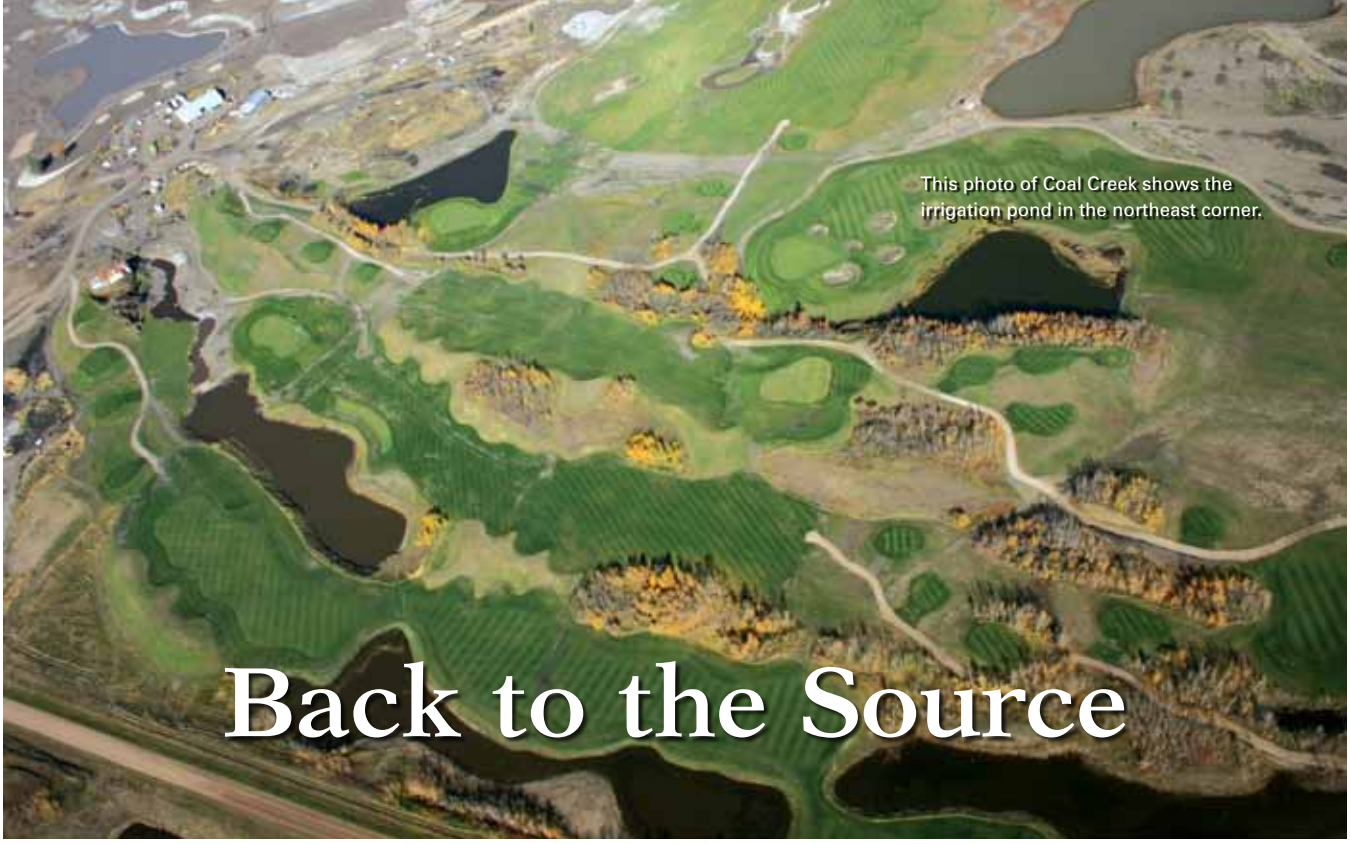

This photo of Coal Creek shows the irrigation pond in the northeast corner.

Credit: SD Consulting

Back to the Source

Consultant **Shane Sparks** weighs Alberta's use of traditional and alternative methods to return treated effluent to the natural environment.

DESPITE THE IMMENSE QUANTITY OF CHEAP OIL AND GAS IN ALBERTA, fresh water is still the province's most important natural resource. Recently, rapidly retreating glaciers and prolonged drought have brought increased attention to this resource. In response, Alberta created Water for Life, a policy promoting water conservation, protection, and sustainability. Coinciding with this policy, a rapidly expanding market for cluster and rural developments has required a whole new set of regulations to govern the treatment and discharge of effluent from small, decentralized wastewater treatment plants serving new developments or small communities. Development authorities, such as Rocky View County, are now encouraging new developments to implement community systems and to utilize disposal methods that provide a benefit to or return the water to the natural environment.

A number of different secondary and tertiary treatment technologies have established a market in Alberta over the last 10 years due to their reliability and positive track records in other cold climates; however, the final disposal of the effluent is still an issue. Effluent disposal for each project is site specific and is based on soil, hydrologic, and hydrogeological conditions. Proximity to surface waters, potable water wells, and potential reuse applications must also be considered. All of these factors have led to an increase of traditional soil disposal systems (on a large scale) as well as wetland discharges or reuse through spray irrigation.

Traditional soil dispersal

For most decentralized wastewater projects, wastewater soil disposal is the preferred method of final effluent disposal and demand is on the increase. It is cost effective, commonly accepted; and experienced contractors are available in Alberta's onsite industry. The success of large soil disposal systems is contingent on a number of factors including site condition, proper engineering design, and operations.

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When selecting a soil dispersal system, developers must ask two questions. Will the wastewater be able to infiltrate the soil? What happens to the wastewater after it gets into the ground? The first question is answered during the initial field investigation through a detailed soil characterization involving backhoe pits in the proposed disposal area. Pits are typically excavated to depths of one or two metres and soils are characterized according to standard criteria including evidence of seasonal groundwater levels. These characteristics determine the amount of infiltration area necessary to sustainably dispose of the wastewater design flow.

If the answer to the first question is yes, a detailed hydrogeological investigation must be completed to determine the ultimate fate of the disposed wastewater. Groundwater mounding, or when the water table rises up beneath the drainfield due to the additional water provided by the drainfield, is a concern. Alberta's 2009 Standard of Practice for Private Sewage Systems now requires a groundwater mounding assessment with each proposed drainfield design.

The primary concern is that the mound will rise up and compromise the drainfield or seep out on nearby side hill or slope. Mounding potential is determined through the installation of shallow monitoring wells, hydraulic conductivity testing, and the creation of a subsurface geological cross section. With this information, mound heights can be predicted through various modelling techniques.

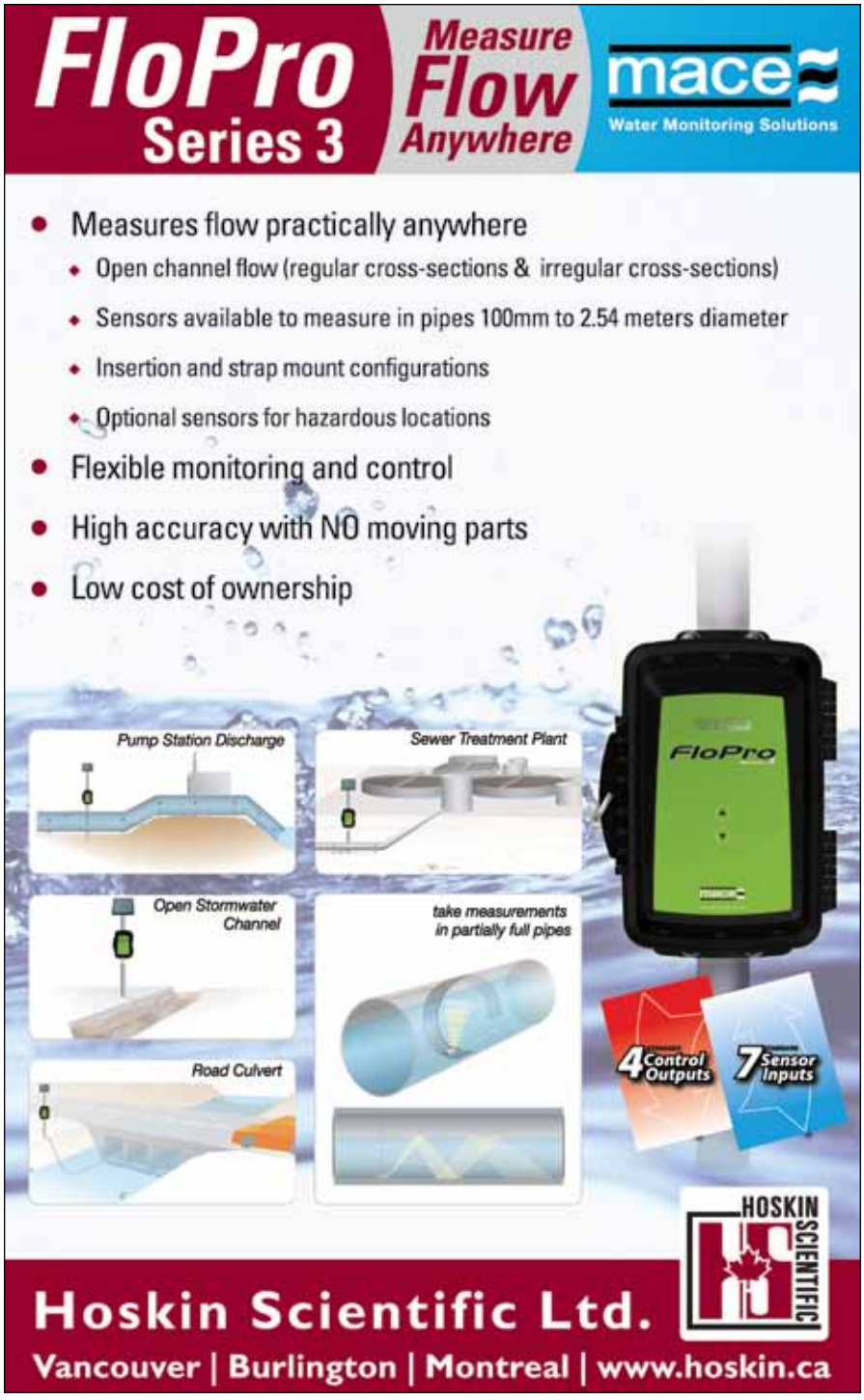
The first large soil disposal system in Alberta serves the Habitat Acres Development in Sherwood Park, Alberta. Constructed in 2006 by Onsite Specialties, Inc., the disposal system has the capacity to discharge approximately 12,000 gallons of treated wastewater per day.

Camp Chief Hector, a YMCA Camp located in the Kananaskis Improvement District, is another large-scale wastewater soil disposal project in the province. The camp recently installed a large drainfield capable of discharge the approximately 5,000 gallons per day (gpd). Constructed in the fall of 2010 by A.M. Mackay Construction, this system will initiate operations in the spring of 2011. Other projects currently under review by Alberta Environment have projected drainfield sizes up to 50,000 gpd.

Alternative wastewater disposal approaches

Soil disposal usually meets Water for Life criteria by returning water to its original watershed. This contrasts sharply with a traditional project utilizing groundwater wells and a surface water discharge to a river, which removes the source water from the aquifer that was likely put there by a melting glacier over 10,000 years ago. This water leaves the watershed, and the water cycle is left incomplete in the local area. On the downside, soil disposal systems do require larger land areas and generally need to be located in areas of good soil and drainage. These areas often conflict with developable areas, so system owners have been considering spray irrigation of adjoining croplands or forested areas as well as wetland discharges.

Several alternative methods of wastewater disposal are allowed in Alberta. Surface water discharges can be an option for large municipal wastewater treatment plants. However, due to strict discharge limits, intensive monitoring requirements, and advanced treatment technologies necessary to meet limits, this is likely not a feasible option for small systems. In addition, it does not meet Water for Life criteria as water is taken out of its natural watershed and not returned as a benefit to the environment. It also puts a strain on surface water supplies. For example, Calgary prohibits discharges to the Bow River and surrounding tributaries due to the concern of potential impacts to the Glenmore Reservoir, a major water supply to the city.



Credit: SD Consulting

An aerial shot of the first large soil disposal system in Alberta.

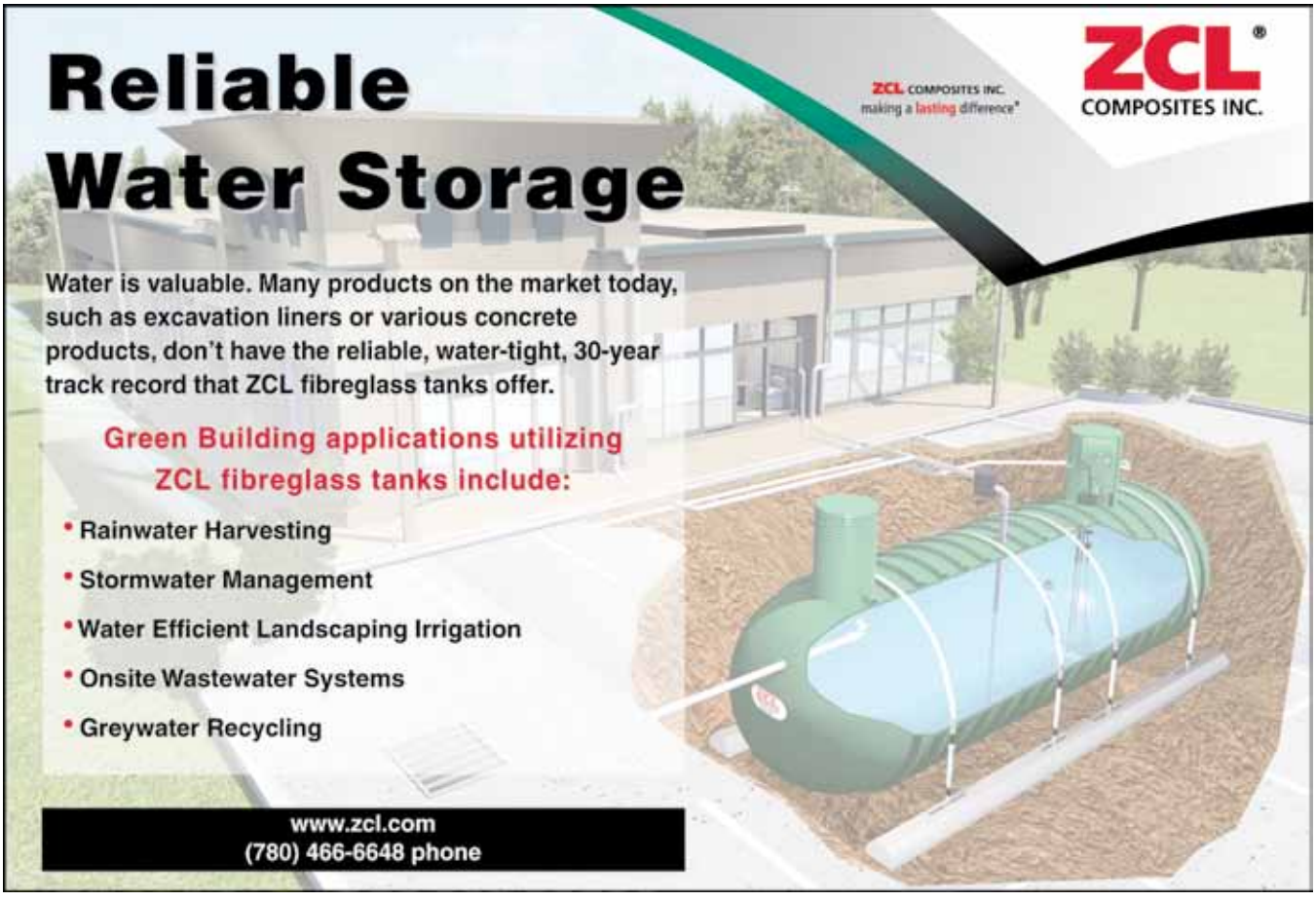
Wastewater reuse

One alternative option is being designed for the Coal Creek Golf Resort located on a 320-acre closed coal strip mining operation near Toefield, Alberta. Following mine closure, the owners had the option of returning the site to agricultural production or reclaiming to other beneficial uses. Due to the existing impact on the site, farmland development would not have been cost effective, so the owners decided on a coal mine themed golf course as well as an RV Park development. Deep mine pits were converted into water features and fairways and greens have been built directly into other former mine recesses.

Wastewater generated by the golf course clubhouse and the RV Park will be collected via low-pressure sewer and treated in Orenco's AdvanTex AX100 units before being reused on the golf course as an irrigation water source. The bulk of the irrigation water will be supplied by dewatering operations from a coal mine located over one kilometre away and this will be supplemented by treated wastewater to meet the irrigation demand of the golf course. Following secondary treatment, effluent will be disinfected and stored in a large storage pond that is capable of storing the treated effluent during the non-irrigation season.

Wetland discharge

In Alberta, wastewater discharges are classified as surface water or a land discharge. As mentioned previously, surface discharge is not usually a viable option for small systems. However, a discharge to a wetland (natural or



created) is considered a land discharge and if conditions are suitable, can be a cost effective option. Although Alberta Environment does provide guidance for this method, wetland discharges are extremely rare in Alberta. The critical issues depend on localized site conditions, but mainly deal with the ultimate discharge location of the subject wetland. If this wetland does not have a discharge or the water is contained onsite through evaporation, the approval process can be easier as offsite conditions do not factor into the permitting process. However, wastewater still must be treated to a minimum of secondary standards with disinfection and a detailed environmental assessment of the wetland must be completed.

The goal of this assessment is to determine the overall quality of the wetland, and the effect that the discharged effluent will have on wetland hydrology, biology, and wildlife. For example, a degraded wetland that has been subject to years of agricultural runoff may be considered a low value wetland and likely subject to less stringent discharge standards. However, an undisturbed fen or bog would be considered a high value wetland and more stringent discharge limits would likely be enforced.

Surface discharge is not usually a viable option for small systems. However, a discharge to a wetland can be a cost effective option.

As Alberta continues to grow and the need for decentralized wastewater treatment that can serve rural communities rises, natural systems that incorporate traditional soil disposal and alternative treatment solutions will both be important to communities as they strive to meet Water for Life criteria. Water conservation, protection, and reuse will continue to be emphasized in the attempt to create sustainable water infrastructure in response to predicted water shortages. Disposal methods such as soil infiltration, spray irrigation, and wetland discharge all meet this goal by providing a beneficial use to an otherwise wasted water source. Providing a groundwater recharge source, an irrigation supply to reduce freshwater demands, and protecting wetland areas through regulated discharge are solid steps in the preservation of Alberta's most valuable natural resource. WC

Shane Sparks is a principal and founder of SD Consulting Group.