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**FCM Sustainable Community Awards**
**2012 Winner – Waste**
Columbia Shuswap Regional District, British Columbia
Population: 50,000


*The landfill gas collection, utilization and leachate management facility at Salmon Arm Landfill*
Credit: Darcy Mooney, Columbia Shuswap Regional District

# *The Capture and Beneficial Use of Landfill Gas and Leachate at the Salmon Arm Landfill*

## Summary

The Columbia Shuswap Regional District (CSRD) undertook a major upgrade to its Salmon Arm landfill site. The first step involved capping a portion of the landfill, capturing the landfill gas and upgrading it to serve the natural gas heating requirements of about 500 local homes. This is projected to reduce about 10,000 tonnes of $CO_2$-equivalent greenhouse gas (GHG) emissions annually, and the sale of these carbon credits will entirely offset the municipality's operational emissions.

The second major component of the project installed a new lining to capture and redirect leachate runoff to a new poplar tree plantation on the closed portion of the landfill. These trees remove contaminants and prevent environmental degradation from leachate, as well as remove more GHGs from the atmosphere through their growth. The system has already treated over one million litres of leachate and eliminated over 5,000 tonnes of $CO_2$-equivalent emissions. The project will ensure that the CSRD meets its goal of carbon neutrality by 2012, while extending the life of the landfill and providing a substantial return on investment for the municipality.

## Background

The Columbia Shuswap Regional District is home to just over 50,000 people and is located in BC's southern interior region, along the Trans-Canada Highway. It includes the area known as Shuswap Country, north of the Okanagan and concentrated around Shuswap Lake; as well as the northern part of Columbia Country including the Big Bend region of the Columbia River valley from the Town of Golden to the City of Revelstoke. The CSRD's municipal office is in Salmon Arm, a city of about 16,000 in the western part of the region. The CSRD maintains and operates four regional landfills, located in the communities of Salmon Arm, Sicamous, Revelstoke and Golden. The Salmon Arm Landfill is a small, rural landfill.

Prior to this project the landfill did not actively treat leachate, since the Ministry of the Environment authorizes leachate to decrease naturally. The municipality saw an opportunity to avoid further environmental contamination by using the leachate as a nutrient source for a hybrid poplar tree plantation. The CSRD was also motivated by a desire to reduce GHG emissions, and this project provided a cost-effective method to do so through the sale of raw landfill gas to Fortis BC and carbon credits to the Pacific Carbon Trust. It provided an environmentally responsible solution that would also ensure the municipality received a return on its capital investment within 15 to 20 years.

## Project Development and Implementation

The CSRD took a self-managed approach to developing this project, designed to enable working with several local contractors rather than tendering the entire project to a single company. This approach required significant internal collaboration with various municipal departments and resulted in cost savings throughout the construction phase.

The complexity of the project also required collaboration with many external groups and stakeholders. The municipality contracted Sperling Hansen and Associates and Fransen Engineering to provide engineering services. Networking solutions were provided by Turn-Key Controls. The phytoremediation portion of the project (the treatment of leachate by vegetation) required collaboration between Sylvis, Ruth McDougall, P.Ag and Passive Remediation Systems. The phytoremediation component also required developing an agreement with Metro Vancouver for the supply and fabrication of soil using biosolids from two sewage treatment facilities in the Vancouver area. The CSRD formed a contractual relationship with the Pacific Carbon Trust for the sale of carbon credits, and with Fortis BC to become the first local government in the province to convert landfill gas into pipeline quality natural gas.

The initial stage consisted of using a synthetic cover to cap the first phase of the landfill, capturing the landfill gas and upgrading it into pipeline quality natural gas. The equipment collects the landfill gas and diverts it to a collection plant, where a Supervisory Control and Data Acquisition system measures and tracks flow, composition, pressure and contaminant removal at two-minute intervals. The CSRD provides the landfill gas to Fortis Gas, who is responsible for upgrading it to pipeline standards and distributing it to local homes. Carbon credits are sold to the Pacific Carbon Trust on an annual basis, and the CSRD reports yearly on the amount of credits generated, in conjunction with B.C.'s Emission Offsets Regulation and North America's Climate Action Reserve Landfill Gas Protocols.

The second stage involved lining the bottom of the landfill's second phase to collect the rainwater that percolates through the waste and produces leachate. The system includes pumps to draw nutrient-rich leachate up to a poplar tree plantation on top of the capped first phase. The plantation consists of 2,300 hybrid poplar trees, selected for their ability to biologically remove contaminants that would otherwise enter the groundwater. Creating the plantation involved applying a thick layer of fabricated soil to support the trees' root growth. The CSRD obtained biosolids from two Vancouver sewage treatment facilities as the basis for the soil, effectively using an existing waste product. Controls monitor and record pump times and the flow of leachate into the plantation. The CSRD also conducts soil and plant tissue testing to determine the update of nutrients and contaminants.

When the first phase of the gas plant was commissioned and the team started to establish maintenance elements it became apparent that the existing health and safety plan was inadequate. The CSRD began the work necessary to ensure it addressed potential safety concerns with contractors, staff and visitors. In partnership with Sperling Hansen and Associates, the CSRD created and continues to develop a comprehensive safety plan.

Under the B.C. Climate Action Charter, the CSRD voluntarily committed to achieve carbon neutral operations by the end of 2012. The municipality developed a Corporate Climate Action Plan in 2010 to guide progress toward this goal, including strategies to reduce emissions. The landfill gas project was a key element in enabling the CSRD to generate carbon credits to offset the emissions produced by municipal operations. The CSRD also recently developed a Solid Waste Management Plan with a vision of a zero waste community that treats all waste as a resource. This plan identified the landfill gas initiative as a project that would bring the municipality closer to that vision.

The CSRD benefited from sustainability expertise through participation in FCM capacity building webinars, the FCM Sustainable Communities Conference and workshops held at the Annual Conference and Municipal Expo. This project was a catalyst for the CSRD signing on to the B.C. Climate Action Charter and led the municipality toward a better understanding of its GHG emissions. It will generate enough carbon credits to allow the CSRD to offset its entire operations, making it the first local government to meet its Climate Action Charter commitment through its own means. The municipality has shared this initiative with others through presentations and several regional and provincial waste management conferences, and the CSRD board of directors has been encouraged to share the experience with counterparts in other communities.

## Results

- As of September 2011, the project has eliminated about 260 tonnes of methane, equivalent to about 4,953 tonnes of carbon dioxide in terms of GHG impact, and equal to removing about 971 passenger vehicles from the road.
- Carbon credits will be sold to the Pacific Carbon Trust (PCT) annually and are estimated to generate about $100,000 each year. The first offsetting period ends December 31, 2011. The CSRD will engage a qualified firm to verify the data collected and expects the project to generate 7,000–10,000 credits in the first year (equivalent to diverting 7,000 - 10,000 tonnes of carbon dioxide).
- The partnership with Fortis Gas will produce an annual revenue stream of $50,000 and supply gas to over 500 homes in Salmon Arm.
- The phytoremediation system has treated over one million litres of leachate, resulting in an average tree growth of 1.35 metres and the ability to absorb even more carbon dioxide from the atmosphere.
- Local tendering of all project components has provided much needed employment in the region, including a summer job position for a University of British Columbia engineering student to gain experience in phytoremediation.

## Lessons Learned

- CONSIDER THE PROJECT OPENLY AND ENTHUSIASTICALLY, FROM ALL PERSPECTIVES. The CSRD emphasizes that local governments should put aside fears that the community will be unresponsive or that certain landfills are too small for such projects. Only by honestly examining the science and the specific context, and eliminating preconceived judgments, can the viability of a specific project be determined.

- OUTLINE COST-SHARING ARRANGEMENTS WITH EXTERNAL PARTNERS UP FRONT. Late in the process, several situations arose where the CSRD was forced to work out payment to cover unanticipated costs. Not every detail of complex projects can be anticipated, but it makes sense to develop clear procedures for dealing with new costs during the preliminary planning stages.

- EXPECT THE UNEXPECTED. Because Salmon Arm experiences relatively mild winters, the design phase did not anticipate problems with a winter start-up date. However, unexpected freezing conditions required staff to spend a considerable amount of time troubleshooting, responding to alarms, and dealing with downtime at the gas plant.

## Related and Future Initiatives

The CSRD is developing a guidance tool to foster future educational opportunities stemming from the project. Several project partners are working together to create a Sustainable Business Centre, associated with the gas plant, that would provide guidance to other municipalities and consulting firms considering similar projects. The municipality also has plans to calculate the GHG emissions that are directly offset by the poplar plantation. In keeping with the Climate Action Charter goal to be carbon neutral by 2012, the CSRD is making efforts to reduce corporate emissions. According to Darcy Mooney, the landfill gas project will enable the CSRD to internally offset all corporate emissions and become carbon neutral by 2012, without having to purchase offsets externally.

## Partners and Collaboration

- Sperling Hansen and Associates – landfill closure specialists
- Fransen Engineering – landfill gas collection design
- Turn-Key Controls – provided networking solutions
- Fortis BC – supplied natural gas infrastructure and landfill gas upgrading
- Pacific Carbon Trust – provided the first landfill gas carbon credit agreement
- Province of British Columbia – Former Premier made many public statements about the project
- University of Calgary – Doctoral students modeled bacterial oxidation of methane in soil
- Sylvis, Ruth McDougall, P.Ag and Passive Remediation Systems – led phytoremediation component including hybrid poplar design and implementation

- Metro Vancouver – supply and fabrication of soil for plantation
- B.C. Real Estate Foundation – showcased the project
- B.C. BioEnergy Network – partnered with the CSRD and Fortis Gas on the Sustainable Business Centre
- Federation of Canadian Municipalities – workshops, conferences and capacity building webinars

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