Regional District of Nanaimo Landfill: Environmental Protection Programs

Geography 352: Managing Natural and Social Capital

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# Introduction

Five kilometers to the south of downtown Nanaimo, off Cedar Road, lies the Nanaimo regional Landfill that opened in the 1940s. The functioning part of the site, opened in 1991 was designed with a heavy-duty plastic liner. This was just one step in a still evolving design that not only protects the environment, but increases several different types of capital. In 2007 the RDN Landfill started a new Design and Operations plan. The BC Ministry of Environment in 2010 approved the plan. It involved monitoring leachate levels, monitoring local water quality, reducing and managing green house gas emissions and even a post closure plan.

# Prevention programs

## Leachate Monitoring

Leachate is any liquid that, in passing through matter, extracts solutes, suspended solids or any other component of the material through which it has passed. (Wikipedia, 2012) In environmental terms this is water that has dissolved or absorbed environmentally harmful substances. In this case we are talking about water that has percolated through the waste and picked up harmful materials. This is not only toxic, but can lead to bacteria and fungi spreading and using up all the oxygen in the area and also a higher pH.

Liners come in a few different types, but all share a few characteristics: they must have tensile strength, flexibility, and elongation without failure as well as withstand temperature variation and UV light. The latter is accomplished by using a black material as opposed to white.

All of the areas of the landfill opened since 1991 contain such heavy-duty plastic liners as well as perforated pipes for enhanced leachate collection.

A Highly Durable Plastic Liner (Regional District of Nanaimo, 2012a)

The original 8.8-hectare section is not lined (Regional District of Nanaimo, 2012e). In 2004 the RDN and local residents came up with a post-closure plan, which I will discuss in further detail later. One of the things this plan addresses is this area they call Cell One. Leachate levels around Cell One have been recorded as high. One of the things the RDN is doing to reduce this is the re-grading of slopes by adding fill. This allows for greater surface runoff and leachate collection.

## Water Quality

The RDN is constantly monitoring the local water around the landfill. They implemented the Groundwater, Surface Water, and Residential Groundwater Well Monitoring Program. The goal is to monitor the water quality at the landfill boundary and there are many testing sites spread around the perimeter. The water is tested for a variety of properties from physical properties, dissolved metals or inorganics and geo-chemical indicators.

## Diversion

One of the best ways to prevent harmful substances from leaking out of the landfill is not to put them there in the first place. The RDN has several programs intended to reduce the amount of waste coming into the landfill.

They use what is called a Zero Waste approach. Since the implementation of this approach, residents of Nanaimo now divert more than 55% of their waste from the landfill (Regional District of Nanaimo, 2012e). They have targeted a 75% diversion rate by 2010 but I have yet been unable to confirm the completion of this goal. One of the more recent changes was the ban of commercial food waste.

The RDN cites studies that have shown that every tonne of food waste diverted from the landfill results in a nearly equal reduction in greenhouse gas emissions (Regional District of Nanaimo, 2012e). The RDN also reports that later this year, up to 2,000 households in the region will participate in a residential food waste collection pilot project to determine the costs and the diversion potential of removing this material from the waste stream.

## Landfill Gas

One material is dumped into the landfill; all that’s left is for it to decompose. This sounds like the circle of life. It is, and it isn’t. Yes, the release of gases is a normal part of decomposition and every organic compound on the planet produces some. The challenge is that all this organic matter is man-made and all in one location. That is not good for local conditions. The extensive landfill gas collations system at the landfill is fairly impressive. There are a few different parts to this system.

## Collection and Monitoring

In 2002, the RDN received a $500,000 grant from Green Municipal Investment Fund to increase the landfill gas collection efficiency by ~65%

The system is designed so that the majority of the gas is collected and sent to the flair station that is on site. Flairing is one of the three most common ways of disposing of landfill gas, along with internal combustion to produce electricity, and boiling to produce heat energy. The RDN claims that flairing the gas reduces its harmful effects on the environment but there are no long-term studies available to support or deny the claim.

The landfill has around 30 vertical extraction wells, two horizontal extraction trenches and network of collection pipes. It uses a fan that generates a centrifugal vacuum to extract gas from the site. The leachate is then analyzed at the Regional Landfill in accordance with BC Ministry of Environment guidelines and WorkSafe BC requirements.

Landfill gas collection well (Regional District of Nanaimo, 2012b)

## Usage

Everybody is familiar with the idea of burning natural gas as an alternative to electricity when choosing a stove or oven. North America has the largest amount of natural gas resources in the world (CIA, 2006). What is less commonly known is that natural gas is ~90% methane, and methane is about 72 times worse than carbon dioxide as far as global warming is concerned. Than number drops to around 25 after about 100 years but it is still significant. As a result, landfill gas, which is basically half MH4, half CO2, is a little less harmful to the environment.

The RDN has been using innovative technologies to collect, monitor, reduce and even reuse the landfill gas. The result has been reducing annual greenhouse emissions from the landfill by the equivalent to 21,606 tonnes of CO2 (Regional District of Nanaimo, 2012e). The RDN has also recently joined forces with Cedar Road LFG Inc., which is constructing a facility to use methane collected to produce electricity. The combustion facility is estimated to produce 1.5 megawatts of green power. That is enough to supply 1,200 homes.

Another of the programs on site is the biodiesel conversion plan. All of the heavy machinery that can run on biodiesel does, including compactors, loaders, backhoe, and mowers. This is done with no modification to any of the machinery. They receive the supply of biodiesel from the RDN Transit system. The biodiesel is significantly less harmful to the environment while costing about the same as traditional diesel.

Figure Landfill Gas Collection Piping (Regional District of Nanaimo, 2012c)

# Post-Closure plan

Along with the environmental protection plans the RDN has implemented come the post-closure plan. Locals voted this as the most ideal use of the land after it is closed in 2016. The RDN landfill will eventually become a regional park.

The first step here is to cap all the areas that are no longer receiving waste with clay. This prevents the release of any greenhouse gases and contains the materials such as leachate. This both reduces emissions but also makes collection of gas much easier. There is also an organic biocap; one of the first of its kind to be installed at a BC landfill (Regional District of Nanaimo, 2012e). The goal is to promote the growth of bacterial that consumes the methane that manages to infiltrate the cap. The capping has already been implemented and studies are being conducted as to its effectiveness.

The first stage in closing the landfill is due to start in the summer of 2013. Once it is complete, the entire site will be a park. On top of the clay and biocap, there will be a layer of topsoil to support the trees and vegetation that will be planted. This is not the end of the protective measures though. The RDN is obligated to maintain the monitoring and treatment programs for a minimum of 25 years after closure. The park would include open areas for recreation opportunities, plantings that enhance wildlife habitat and provide a nature experience for users, hiking trails that integrate into the surrounding area's trail network, and picnic areas and scenic viewpoints (Regional District of Nanaimo, 2012e).

Post-Closure Plan (Regional District of Nanaimo, 2012d)

# Capital

There are many different types of capital these days. As the term evolves we use it to refer no only to money (financial capital) but also human, natural and social capital. The RDN Landfill is, of course, doing their part to maximize their own profits. This is done through biofuel use, expense reductions, waste diversion, and so on. More importantly though, the RDN seems to be heavily invested in natural and social capital. They have done a great job of increasing social and human capital by working with local residents, creating jobs, and all-in-all doing everything they can to protect the environment and area. This is incredibly important and should not be looked upon lightly. As well, the RDN is doing so much to increase natural capital, not only for its own use but also for the good of the region and planet. Their GHG and leachate reduction programs go a long way to protect the local watershed and the health of the residents. Suffice it to say, if all goes according to plan, the natural capital of the area should be able to replenish itself within a reasonable time frame.

# Conclusion

At the end of the day I feel like the RDN is taking the proper measure to keep our corner of the island safe. I have read about other landfills in different cities, both American and Canadian, that are implementing similar measures, but as far as I can tell, the RDN’s are the most extensive. I feel that working with the locals to come up with a post-closure park is an amazing thing and more companies should be doing it. What remains to be seen is weather or not it is doable in a truly sustainable way. The only drawback I can see at this time is the lack of long term data. Unfortunately the only thing to do about this is to run the programs and hope for the best, adjusting as one goes long to minimize problems and increase success.

# References

CIA. (2006). CIA Work Factbook: *Natural Gas Production: World*. Accessed from https://www.cia.gov/cia/publications/factbook/rankorder/2180rank.html

Regional District of Nanaimo. (2012a). *A High Density Double Plastic Liner*. Accessed from http://www.rdn.bc.ca/cms/wpimages/wpID1512imgID1457.jpg

Regional District of Nanaimo. (2012b). *A landfill gas collection well*. Accessed from http://www.rdn.bc.ca/cms/wpimages/wpID1512imgID1454.jpg

Regional District of Nanaimo. (2012c). *Landfill Gas Collection Piping*. Accessed from http://www.rdn.bc.ca/cms/wpimages/wpID1513imgID1451.jpg

Regional District of Nanaimo. (2012d). *Post-Closure Plan* . Accessed from http://www.rdn.bc.ca/cms/wpattachments/wpID1512atID2008.pdf

Regional District of Nanaimo. (2012e). *Solid Waste and Recycling: Regional Landfill*. Accessed from http://www.rdn.bc.ca/cms.asp?wpID=1510

Wikipedia. *Leachate*. Accessed from http://en.wikipedia.org/wiki/Leachate