

Canadian Brownfields Case Study

BC Hydro Rock Bay Remediation Project



Source: Public Works and Government Services Canada, 2016

Figure 1. Rock Bay site area during phase 3 of remediation

PROJECT SUMMARY

After years of rapid industrialization and hazardous waste dumping on former Indigenous lands, Rock Bay experienced severe contamination in its soil, sediments, and groundwater. This area became known as one of Canada's most toxic sites, thus prompting the need to remediate the site. Initial remediation was done on the surface level to excavate and treat 110,000 tonnes of hazardous waste. However, the remediation process was delayed due to an underground tar well that was discovered, which was estimated to contain 26,000 litres of non-aqueous phase liquid (NAPL) coal tar. Secant barrier walls and sheet piles were installed to help with the excavation process. Ex-situ soil treatment and disposal were done using poly liners to reduce the potential of spillage during transport. Currently, final risk assessments are being conducted before future redevelopment can occur. Plans from the Indigenous peoples to buy back 4.5 acres of the land are being considered.

Rock Bay is found north-east of Vancouver, in Victoria, British Columbia, Canada, and is rich in history as it used to be a place for local Aboriginal communities to live and hunt¹. However, in the mid-1800's, urban development began to infringe onto the land, causing the land to change and stray far from what it once was². With the bay decreasing in size and the continuous city expansion, it experienced a growing industrial presence³. The wastes, mainly being coal tar, were

being dumped directly into the upland area of the harbour⁴. A combination of the coal tar dumping along with the modified Rock Bay drainage basin had contributed to the poor water quality and the loss of the saltwater marsh that had provided a habitat for the fish and the wildlife⁵. After the severe degradation of the landscape, the site became known as one of Canada's most toxic sites as the coal gasification plant ceased operations in the year of 1952⁶.

QUICK FACTS

Location

Rock Bay, Victoria, British Columbia

Project type

Brownfield remediation

Site size

3.75 hectares

Land uses

Industrial, commercial

Keywords/special features

Hazardous waste, excavation, in-situ stabilization, sheet piles, secant barrier walls, ex-situ remediation

Brownfield Awards

2017 Brownie Awards Winner for - REMEDIATE Category: Sustainable Remediation and Technological Innovation

Website

<https://www.qmenv.com/portfolio-items/rock-bay/>

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Case studies were prepared as a course assignment by students enrolled in PL8312/PLE845: Brownfields & Sustainable Development, School of Urban and Regional Planning, Ryerson University (Winter 2021). Information for the case studies was obtained from online sources, available reports, and, in some cases, site visits and direct communication with stakeholders.

If you are aware of any errors or updates to the case studies, please contact chris.desousa@ryerson.ca

The opinions expressed in this case study are those of the authors only and do not represent the opinions and views of either Ryerson University, the School of Urban and Regional Planning, or the Canadian Brownfields Network.



The remediation project for Rock Bay, handled by Transport Canada and BC Hydro, began in 2004 over four stages, and was finally concluded in 2016.

Site Characteristics

Rock Bay was a site that was of great importance to the Songhees and Esquimalt First Nations groups, the former residents of the land⁷. Once the surrounding areas experienced rapid industrialization, so did the Rock Bay site⁸. The effects of the rapid industrialization resulted in significant shoreline alterations as it was needed to accommodate the growing city⁹. In the 1860's, the area was occupied by a coal gasification facility that was first owned by Victoria Gas, then later by BC Electric (See Figure 2)¹⁰. Other activities on the site included a tannery, sawmills, an asphalt plant, a propane tank farm, and a concrete batch plant¹¹. The area was also home to many working families and businesses¹². Further urbanization of the site has altered hydrological conditions and changed runoff rates¹³. This case study focuses on the 1.73 hectares of land and 2.03 hectares of seabed that was to be remediated¹⁴.

Assessment & Cleanup

The site was assessed for contamination between 1990 and 2003¹⁵. Between 2004 and 2006, the majority of the Rock Bay area began remediation¹⁶. The cleanup process of Rock Bay included environmental remediation, hazardous materials abatement, and water treatment over the course of three stages¹⁷.

Stage 1 occurred between 2004 - 2005 where over 110,000 tonnes of contaminated materials from BC Hydro and Transport Canada lands were excavated and disposed of off-site¹⁸. During this excavation phase, a tar well, with a depth of 14 metres, was identified as the source for the contaminated groundwater¹⁹. It was estimated to contain 26,000 litres of coal tar NAPL²⁰. The tar was stabilized in-situ using hog fuel, a type of wood product that consists of bark and wood chips²⁴, to satisfy treatment facility requirements while further options for remediation could be considered²¹.

Boreholes were drilled to investigate the contaminants in the ground and to determine the best remedial course of action, leading to several options to be evaluated: temporary sheet pile



Figure 2. Historical photo of site area from 1862 showing the coal gasification plant with a context map outlining the division of property

box, steel caisson shorting, and secant barrier wall²². Ultimately, sheet piles were used where ripraps were not present and in 2013, secant barrier walls were installed around the tar well²³. Soil, brick, and tar were removed from the initial working area and the residue on the secant walls were cleaned (See Figure 3)²⁴.

Stage 2 occurred from 2005 - 2006 to manage the excavated contaminated materials²⁵. All hazardous waste soil had to be approved before being sent off-site by truck and by barge for treatment and disposal²⁶. Shipments were carefully planned and coordinated to minimize odour and vapours²⁷. The hazardous waste soil

was also wrapped with poly liners to reduce the potential of spillage during transport²⁸. Stockpile soil tracking was used to classify and track soil based on in-situ data to ensure proper stockpiling of the excavated material²⁹.

Stage 2 also consisted of river and open channel engineering, to design a remediation plan to protect the reconstructed harbour foreshore in Working Area 2³⁰. Kerr Wood Leidal's (KWL) design consisted primarily of riprap foreshore protection with habitat features including oversized boulders, two gravel beaches, boulder and cobble fields on the bay floor, and riparian vegetation benches³¹.

Figure 3. Photo of tar well excavation and clean up process



The focus was to maintain the upland area to be suitable for future development, maintain the aquatic habitat area within Rock Bay, and meet the marine habitat objectives set out by Fisheries and Oceans Canada³².

Stage 3 began in 2013 - 2016 and was done independently; the remediation was continued by Public Works and Government Services Canada (PWGS) on behalf of Transport Canada, while BC Hydro completed the remediation in the upland areas³³. PWGS was in charge of addressing the contaminated materials found within the head of Rock Bay and the adjoining portions that were adjacent to the federal uplands³⁴. In the third stage of this remediation project, BC Hydro focused on the modified sheet pile for further excavation towards the property line as an additional 80,000 tonnes of coal tar was found under the seawater in Rock Bay³⁵. The excavation process was extended to go deeper by 0.5 metres (See Figure 4), removing up to 1 - 2 metres of the underlying clay to diminish the possibility of any residual contamination to affect the post-remediation groundwater quality³⁶. BC Hydro also rerouted and replaced the stormwater discharge pipes in the area due to its proximity to the excavation site³⁷.

The PWGS focused on removing and remediating 140,000 tonnes of contaminated materials along with building a temporary cofferdam over the contaminated bay in order to seal it and prevent water infiltration from the rest of the harbour³⁸. This section of the project also includes the

building of 300 metres of sheet metal walls around the bay in the uplands area to connect to the cofferdam³⁹. The cofferdam spans over 130 metres and up to 15 metres in depth, and will be removed upon the construction of the temporary support walls and outfall bypasses that will drain into Rock Bay⁴⁰. An on-site wastewater treatment facility was also constructed in order to treat the wastewater that will be returned to the harbour⁴¹.

Stage 4 is focused on doing a risk assessment on the residual contaminants that have migrated across the bay and the contaminants that have been deposited or buried under Rock Bay during the process of filling the bay⁴².

Planning and Redevelopment

The most prominent planning issue is the preservation of Indigenous lands. Historically, this site area was occupied by Indigenous peoples, but was then colonized and developed into a rapidly growing urban area⁴³. After the remediation of the site, the Songhees and Esquimalt First Nations groups plan on purchasing 4.5 acres of the land once the final monitoring is complete⁴⁴. Articles published by CBC and Victoria News suggest that the remediated land will remain largely commercial or industrial after the land transfer is completed⁴⁵. The Esquimalt Nation Chief Councillor is looking forward to engaging with the surrounding communities to develop a community vision for the land that reflects their economic, social, environmental, and cultural goals⁴⁵.

As this area is shared by a number of landholders including: BC Hydro, Transport Canada, Lehigh/Ocean Concrete, Old Victoria Properties, Vancouver Island Brewery, and Island Asphalt⁴⁶, there were several planning and regulatory issues that arose during the redevelopment process. Since 1988, BC Hydro and Transport Canada had undertaken various environmental actions in the Rock Bay area, while the majority of the other landholders remained indifferent⁴⁷. As time progressed, there had been more reports of tension between the involved parties. According to the Environmental Appeal Board (EAB), early approvals for remediation had multiple appeals on the grounds of filed grievances by neighbouring properties or with regards to the inclusion of neighbouring properties in the remediation⁴⁸. These appeals were ultimately dismissed due to the lack of jurisdiction⁴⁹.

Another important planning and regulatory issue involved the preservation of heritage value. The contaminated site had three heritage buildings, the Administration Building, the Rock Bay Powerhouse Building, and the Instrumentation Building⁵⁰. Thorough community engagement and consultation with the Planning Department, Heritage Advisory Committee, City Council, and Community Groups led to the Heritage Revitalization Agreement in 2012, to ensure the stabilization of two heritage buildings in the site, in exchange for the demolition of the third heritage building (Instrumentation Building) to allow unfettered access to the tar well⁵¹.

To prevent future contamination in the site and other areas of the surrounding neighbourhood, many associations and committees have developed a watershed education program, residential pledge program, and best management practices manuals to educate the public about nonpoint source pollutants and what can be done to reduce their negative impact on the environment and Rock Bay⁵². A new Rock Bay-Burnside Gorge-Douglas Street planning process was launched to begin to develop a shared vision for the neighbourhood⁵³. The City of Victoria is also increasing the size of the catch basins in the watershed and has installed two stormwater rehabilitation units, which will help in reducing the amount of contaminants entering Rock Bay⁵⁴.



Source: condiff.ca

Figure 4. Photo of excavation within the newly installed secant barrier walls

Financing

This project was a joint remediation project between the federal and provincial governments. It is known to be one of the most significant remediation projects in Canadian history as a lot of funding was invested⁵⁵. Since 1988, BC Hydro has spent up to \$90 million to clean up sections of the site⁵⁶. As of August 2006, more than \$32 million had been spent by the land owner to dispose/treat 250,000 tonnes of excavated material⁵⁷. Transport Canada has spent \$21 million on the project thus far and is expected to spend around \$27.3 million⁵⁸ along with the \$18.8 million that BC Hydro had provided for the final phase of the project⁵⁹. Around \$150 million was spent on the remediation project in total⁶⁰.

Key Challenges

A significant challenge that was present throughout the project was the issue of contamination and environmental degradation. A detailed environmental assessment of the site concluded that approximately 85% of this land was contaminated with coal tar, metals and other hydrocarbons⁶¹. Air quality, ground and surface water impacts, fish and wildlife habitats, as well as heritage and archaeological values were also at risk⁶². Several buildings on the property had hazardous materials that required removal⁶³. Moreover, challenges were also identified during the remediation process. The need to install and extend more support walls along the property boundaries resulted in concerns about the pile-driving noise in the adjacent neighbourhood⁶⁴. Draining the bay and removing contaminated soil also resulted in emissions, odours, and dust, which may have negative effects for the surrounding neighbourhoods⁶⁵.

Benefits

A clear benefit of remediating the site is its potential to improve the environment for aquatic life, and the possibility for redevelopment. Additional benefits may also arise for redevelopment through the preservation of heritage value that the now cleaned area provides for the surrounding communities. This project has also opened up new opportunities to strengthen and improve the relationship with the Indigenous communities, as evident through the 250 metre long mural (See Figure 5) that serves as a countdown to the completion of the project and as a reminder of how important a healthy environment is⁶⁶.



Figure 5. Photo of the Rock Bay mural

Lessons Learned

An important lesson that was learned from this project is the need to do a thorough analysis on what contaminants are actually on the site. After unexpectedly finding the tar well, the project needed to go through a lengthy process of tests and remediation options in order to properly remediate the area, which ultimately led to further delays. Therefore, it is important that a detailed and comprehensive study is done to be aware of any possible contaminants that may be on the site and be able to prepare for it beforehand.

This project has been an excellent example in proving how important it is to make an actionable effort in fixing the extensive environmental issues and problems found in the city⁶⁷. Not only is action on already contaminated sites important, as reflected through this project, but also the importance of prevention⁶⁸. Through the Rock Bay Contaminant Reduction Initiative, led by the Burnside Gorge Community Association, it seeks to strengthen the ability of citizens to monitor and be aware of how their daily lives affect not only their health but also the local environment⁶⁹. Making the citizens aware of their responsibility by empowering them with knowledge can help to create a cleaner and healthier environment and waterway⁷⁰.



Figure 6. Photo of the remediated harbour at Rock Bay to remove the contaminated sediment

Endnotes

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