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Burnaby Gun Club, Burnaby, BC

Overview

The north side of Burnaby Mountain, located in the City of Burnaby, a suburb of Vancouver, had been used as a target and skeet range since 1954. The gun club had separated the site into three sections: short target practice, a 1400 ft. long target range, and a skeet area.

The City of Burnaby made the decision to end the gun club lease and sought to return the ranges to park use. Burnaby had the three target areas checked for contaminants. After half a century of target practice, it was no surprise that the ground contained lead, copper, and coal tar pitch containing polycyclic aromatic hydrocarbons (PAHs) used to bind skeet birds. Materials in soils ranged from the smallest particles to pieces the size of complete bullets, shell casings, buck shot, and sections of skeet birds. Contaminants were also found in the back stop materials, tree trunks and branches, and in many other locations.



Key questions were: how can the metals be separated from the soils; where will the contaminated soils/materials be shipped; and when can a Certificate of Compliance (CoC) be obtained so the park can be used safely and the City of Burnaby be legally protected from liabilities associated with the contaminants.

Innovations

Site investigations showed that a 1.8 hectare area contained lead, zinc, copper, and antimony, with concentrations high enough to be designated hazardous waste under British Columbia's Hazardous Waste Regulation. Stabilizing this amount of material in place would have proven difficult as the metals might continue to leach into the surrounding soils. On the other hand, using a screening technique to separate the soils from the metals would have included significantly more waste material in the removal process than necessary. Screening of the bullet fragments, therefore, was not considered practical.





Innovative remediation plan

Keystone Environmental was retained by the City of Burnaby to develop a solution for the closure of the rifle ranges and the area's conversion to park use. Keystone concluded that the best solution lay not in removing materials but in coalescing them and retaining them on site.

Under the Contaminated Sites Regulation, the Ministry of Environment can certify compliance with the regulations if the remediation plan showed that the contaminants, following implementation of mitigation and management strategies, no longer posed an unacceptable risk to human health and/or the environment.

Following a rigorous human health and ecological risk assessment, Keystone clearly demonstrated the effectiveness of the proposed solution. Using a combination of onsite treatment methods the existing contamination was effectively managed so as not to present an unacceptable risk to the future park users. This included separating the materials that were contaminated but not classified as hazardous waste.

Stabilization of hazardous waste

Once separated, the hazardous waste material was treated and combined with cement powder and sealed within a vault built beneath the proposed parking lot. For the purpose of

stabilizing the metals and solidifying the soils, materials such as limestone, fly ash, slag, gypsum, phosphate mixtures, cement kiln dust, and lime kiln dust can be used. For this project cement was selected due to its local availability. The cement binding reagent chemically reacts with many contaminants, fixing, and/or encapsulating the contaminants, reducing their solubility, and, in some cases, decreasing their toxicity. At the same time, cement encapsulates the waste particles in an impermeable coating.

Onsite hazardous waste landfill

To facilitate the construction of the secure hazardous waste landfill within the park, two options were explored: classification of the material as historical hazardous waste, enabling a relaxation of siting requirements, or removal of the parking lot from the park and zoning it for commercial usage. Other siting requirements could not be met, including those for clearance to the groundwater, proximity to surface water courses, and facility capping.

Designs for the onsite solution included the creation of a hazardous waste facility under the proposed at-grade parking lot. Keystone was able to show that the hazardous waste had been on site for nearly 50 years and an historic hazardous waste classification was agreed to. This did not require other hazardous waste facility siting requirements to be addressed.



Flexible design criteria

Negotiations with the Ministry of Environment resulted in the allowance of numerous design equivalencies to achieve higher levels of protection, via the use of liners and continuous monitoring, to compensate for the hazardous waste facility being:

- closer than 3 meters to an area of water table,
- closer than 300 meters to an intermittent water feature, and
- in a regional park.

In the range areas materials remain that exceed park Contaminated Sites Regulation standards, but are not hazardous wastes. These materials have been capped using a barrier of limestone to prevent leaching of the metals by rainwater, and to keep out the roots of the surrounding trees. Incursion of tree roots would break the seal on the cap and compromise the site. A final topsoil cap blocks human, animal and plant contact with the contaminants.

Stream beds, banks and channels were re-designed and redirected to divert water flow away from the treated areas and to ensure that the runoff of sediment, rocks and boulders that flowed down the mountain in a 200 year storm event would not impact the managed areas of the site.

Key lessons learned

Keystone's design and onsite management completed the project at a cost approximately \$1 million dollars less than other solutions considered by the City prior to Keystone Environmental's engagement. The new park, a highlight for the increasing number of residences in the area, comes with interpretive trails and a pedestrian bridge, beautiful landscaping, and a new parking lot.



The City of Burnaby was very pleased with the effectiveness and economy of Keystone's design. The project achieved the environmental compliance required and preserved the environmental aspects of the site while keeping costs in control.

With sustainability now at the forefront of urban design, the revitalization of contaminated sites is frequently a part of redevelopment. Compared with the 'dig and dump' approach, the innovative remediation strategies used by Keystone Environmental reduced risks more effectively and much more economically.

Note: This summary is solely for the convenience of the reader. Site investigation/remediation reports and ministry file records should be consulted for complete information.

For more information, contact the Environmental Management Branch at site@gov.bc.ca.