Federal Contaminated Sites Action Plan (FCSAP)

Colwood Refuelling Facility Engineered Wetlands

After the remediation of a military refuelling facility, engineered wetlands are now a visually pleasing, low-cost solution that provides a habitat for waterfowl and vegetation.

Background

The Department of National Defence (DND) is committed to controlling potential contaminants from entering marine water bodies and implementing green solutions to stormwater management on its properties. At the DND Colwood Refuelling Facility, located outside Victoria, British Columbia, two sites—the refuelling area and the firefighter-training area—had become contaminated with hydrocarbons and suspended solids. These contaminants had the potential to be discharged into the nearby Esquimalt Harbour, which is significant to residents, First Nations, recreational boaters and beachgoers, and is also near a bird sanctuary

Engineered wetland in the firefighter-training area

The Challenge

DND had already engaged in remediation activities at both sites. At the firefighter-training area, some 3000 cubic metres of soil affected by metals and hydrocarbons were removed. DND then backfilled the site and established a 200-car parking lot and bus loop. At the refuelling area, the soil beneath a historic fuel-transfer line was remediated. DND then began to examine post-remediation options to further prevent stormwater from distributing suspended solids and hydrocarbons into marine waters.

Engineered wetland in the refuelling area

A typical post-remediation approach involves backfilling the excavated areas to the original grade level. Drainage from these sites is usually directed to a stormwater system that might include a process to reduce sediment load. While such approaches might provide some improvement to water quality before discharge, they are often costly to install and maintain.

On behalf of DND, Public Works and Government Services Canada brought in SLR Consulting (Canada) Ltd. to design an approach aimed at reducing both the environmental impact of the sites' activities, and the costs of remediation and maintenance.

This project was made possible with support from the Federal Contaminated Sites Action Plan (FCSAP), a program aimed at reducing the environmental and human health risk, and associated federal financial liabilities, from known federal contaminated sites. More information about FCSAP is available at www.federalcontaminatedsites.gc.ca.

The Solution

SLR's plan for the two locations included a series of constructed freshwater wetlands, along with surface-water control and treatment systems. Instead of directly discharging water through stormwater outlets—which would be too fast for contaminants to settle out of the water—it would first be collected from paved surfaces, then passed through surface-water control and treatment systems, such as drainage swales (low areas between ridges of land). The water would take much longer to pass through these features, allowing for more sedimentation and infiltration to the underlying soil. The runoff would then enter the constructed wetlands. The wetlands themselves would be used to treat dissolved metals and hydrocarbons before discharging the water into Esquimalt Harbour.

Drainage swale in the training area

- In the **firefighter-training area**, SLR designed a swale system around the parking lot to capture all the hard surface runoff. Check dams, constructed at regular intervals along the drainage swales, slow the flow and increase water-retention time before its discharge into the wetland. Two retention ponds were constructed and vegetated with aquatic species, while transitional species were placed in the flood zone and native species in the upland area. The first pond functions as a primary settling pond, which then drains to a second pond when the water level is high enough.

Final discharge from the training area

- At the **refuelling facility**, SLR constructed a natural drainage swale with rock riffles and small pools that connected to three constructed wetlands. DND had already established a network of natural drainage swales throughout the catchment area that tied into the stormwater-management system. The wetlands are designed to allow each pond to fill up and then overflow into the next. Each pond has been vegetated with aquatic plants, transitional species and native species. The wetlands have also been designed to capture and treat any upland contaminants that may be directed into the ponds.

Outcomes and Benefits

The DND FCSAP project at the Colwood Refuelling Facility was a collaborative effort between DND, PWGSC and SLR, which was successful in implementing an innovative approach to manage historical contaminants. With the wetlands and natural drainage swales in place, the volume of contaminants has been reduced, and solids discharged to marine waters has been suspended, at much lower installation, overhead and maintenance costs than traditional stormwater-management systems would incur. The wetlands now promote biodiversity by increasing the natural habitat for native vegetation and waterfowl.

Public Works and Government Services Canada is mandated by FCSAP to promote the use of innovative technologies, approaches and best practices in the remediation of federal contaminated sites. This is one of a series of profiles featuring innovative, sustainable and green remediation technologies, approaches, and best practices in Canada.

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