

**Water Treatment**

Vector Engineering designed the sedimentation and erosion control plan for the entire Millennium Water development. This plan included a sediment pond and a variety of sediment control products (such as portable wheel washes, silt fencing, catch basin silt sacs, etc.) that mitigated the release or tracking of sediment out onto city streets and into the city storm sewer system.

Due to the sheer volume of water to be treated, the pond had to be supplemented with water treatment tanks that used a flocculent to settle out the total suspended solids (TSS). This wastewater treatment system was designed, built and operated by Storm Guard to deal with the TSS and also the contaminated water that was pumped out of some of the parcels during the excavation and foundation stage. Challenges at the site were significant given its historic use (heavy industry and related

contaminants), its proximity to False Creek, the ambitious development footprint and timeline. Storm Guard's discharge consistently satisfied all regulatory criteria, specifically relating to the following: heavy metal content, pH, total petroleum hydrocarbons, TSS, surfactants, organic toxicants and LC50 tests. The treatment plant ultimately treated over 88 million gallons (333,116 cubic metres) of water at flow rates of 500 gallons (just under two cubic metres) per minute. Analytical results obtained through a mobile onsite laboratory were used to ensure peak performance during changing influent water conditions (such as storm events and fluctuating contaminant loads). Results obtained on site were consistently supported by those obtained independently by the site's environmental monitor, Keystone Environmental.

Vector also designed the dewatering plan for the entire development, which consisted of a network of

pipes that conveyed the accumulated water from each parcel to the water treatment facilities. This water was first treated in the treatment tanks and then discharged into the sediment pond for further settling prior to discharge to the city sewers. Sediment loading could not be discharged if there were more than 75 ppm of suspended solids and the pH of the water was outside of the accepted range. Vector monitored the sediment control plan as a whole and ensured that all parties working in the Millennium Water site followed the plan. Keystone Environmental monitored the quality of the discharge water from the treatment facilities (sediment pond and tanks).

As part of the SEFC Plan, the City developed a wetland for Hinge Park to treat stormwater from upstream of the area (the catchment area south of the site) and from the surface runoff on the city streets within the Millennium Water site.



During excavation, all rainwater that fell on the site had to be captured and treated for contamination – more than 88 million gallons in total.

**Jet Grout Wall**

With more than 1,100 jet-grouted columns installed by Geopacific Consultants, this was the biggest jet-grouting contract completed in Western Canada. Jet grouting is a soil improvement technique that involves breaking up the soil structure completely and mixing the *in situ* soil with water cement grout. The grout mix is jetted back into the soil, with the aid of special tools, at very high speeds (800-900 km/hr) created by high pressures (7,000 to 9,000 psi or approximately 48,000-62,000 KPa). Technical and logistical challenges, due to the variable soil conditions and the proximity of the site to a tidal body of water, were resolved. The jet grout columns, in proximity to the ocean, create a soil-cement wall with two purposes: providing an impervious water cut-off wall and supporting the streets and other public space improvements constructed adjacent to the building excavations.

**Wheel Wash**

With a high volume of trucks entering and exiting the site daily, the potential for contaminated soil carried on their wheels to be tracked through city streets was viewed as a significant environmental issue. A 7 metre (24 foot) truck wash supplied by Wheel Wash International solved this potential problem. Units are fully self-contained requiring only city power (three phase or by means of generators) and a water supply. Water used to wash the undercarriages and wheels of exiting trucks is constantly filtered and recycled. Sensors placed ahead and beyond the mobile wheel wash function to activate and deactivate the wash cycle.

Top: Specialized drilling using the 'Klem drill' to form a jet grout wall.

Middle and bottom: Wheel-wash stations remove contaminants from all truck wheels before they leave the site.



FEATURE PROFILE

**Metro-Can Construction, Ltd.**

The remediation of the SEFC brownfield site was a critical step before construction. Metro-Can, a diversified general contracting company headquartered in BC, took on the job.

"The sheer size of this job was our first challenge," says Derek Pilecki, Metro-Can's Director of Preconstruction. "The Olympic Village excavation contract was possibly the largest building excavation contract in Vancouver's history."

Metro-Can worked with Matcon Excavation and Shoring Ltd. and Keystone Environmental to complete the remediation, with Vector Engineering providing surveying and quantification services for Millennium Development. The team removed the soils, categorized them and trucked them to certified fill sites or treatment facilities as required. A second challenge was constructing a jet grout water cut-off wall to keep False Creek out of the excavations.

"Our third challenge was removing vast quantities of rainfall," Pilecki remembers. "A 12 hectare site collects lots of water, which gets contaminated from the exposed soils. We couldn't discharge it to False Creek, so it was a serious problem." With assistance from Storm Guard Water Treatment Inc. and Devon Environmental Services, the water was acceptable for discharge in Vancouver's sanitary systems.

Metro-Can started excavation in January 2007. The Olympic Village site was declared remediated in September, 2008.