

Canadian Brownfields 2009: October 26 to 28

## **The Role of Clean Technology in Remediation**

### **Case Study: Vancouver Island Conference Center**

***2008 CUI Brownfields Award:***

“Sustainable Remediation Technologies and Technological Innovation”

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# Project Overview

- Proposed Conference Center to become the centerpiece of downtown core revitalization project
- Goal to replace a cluster of derelict buildings with a modern complex
- Location that was selected was in the heart of the city and close to vibrant waterfront



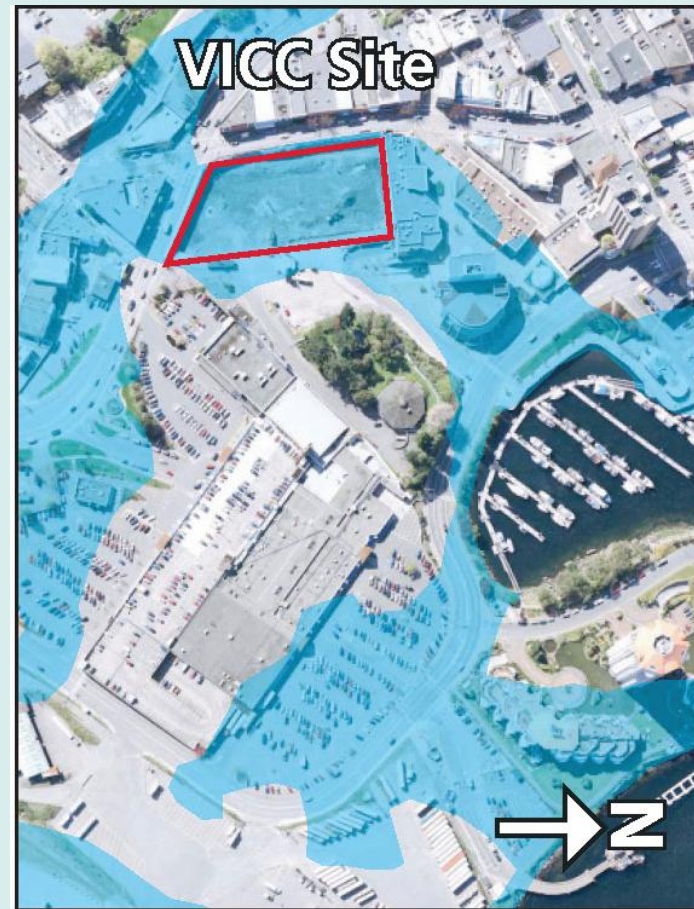


# Project Overview



# Site History and Challenges

- Commercial Inlet historically extended into Nanaimo City Centre, with Commercial Creek flowing into the harbour
- In the late 1800's the inlet was filled with natural and man-made fills that included wood and metal debris, blast rock and coal waste.
- On-going landfilling activities throughout the site history resulted in both soil and groundwater contamination



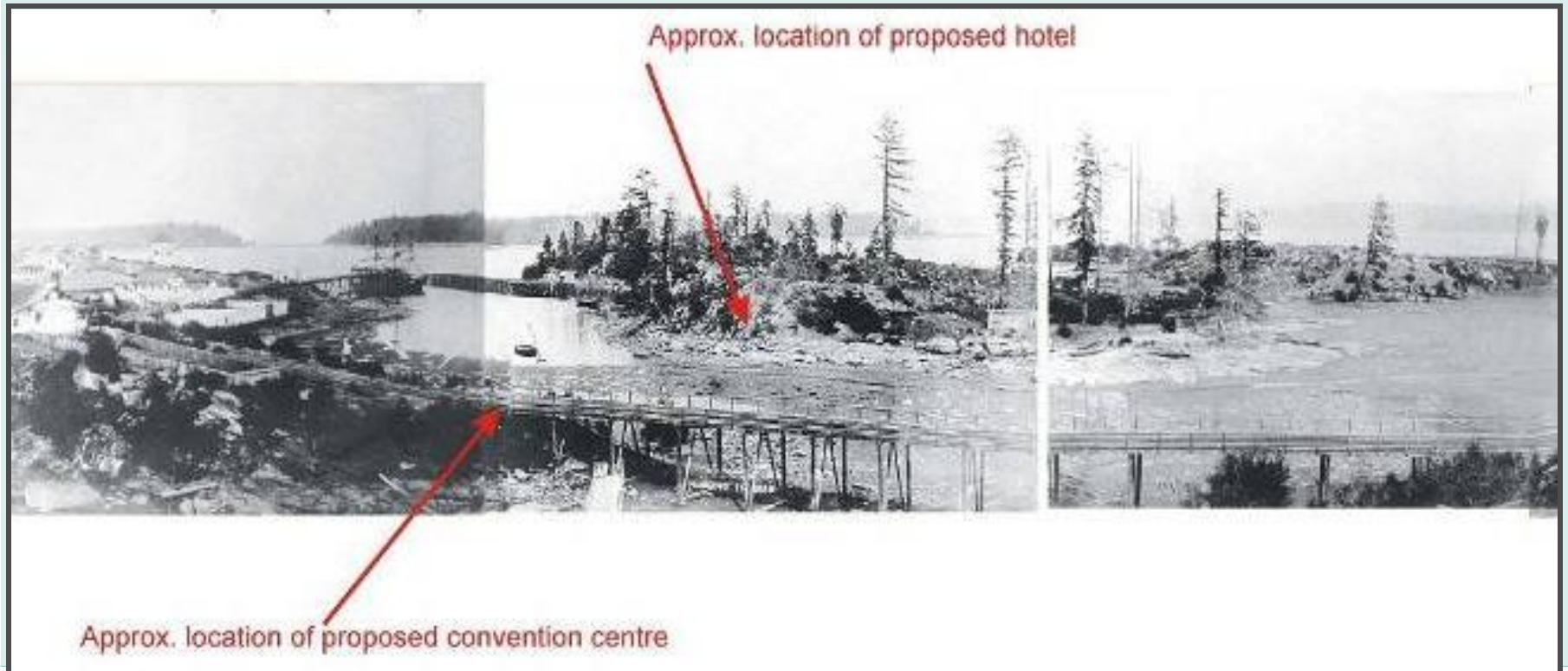
Area covered by sea in 1882\*

*\*Data courtesy of Millennia Research*



# Site History and Challenges

- The Conference Centre would be built across the V-shaped inlet harbor: this presented Geotechnical challenges for both foundation support and seismic liquefaction risks





# Site History and Challenges

The presence of contaminated soil complicated the choice for the geotechnical construction solution by introducing the requirement for soil and groundwater management and/or disposal

- Preliminary options considered:
  - Stone Columns (used on the adjacent Library Building) (~ \$4 M + disposal costs for water and spoil))
  - Bulk Excavation and Replacement with Structural Fill (+ \$10 M estimated)
  - Piled Support (+ \$6 M estimated and did not address groundwater contamination issues)

An alternative solution was required that would address the geotechnical requirement while minimizing the requirement for soil disposal



# Cutter Soil Mixing (CSM)



A Design-Build solution using Cutter Soil Mixing was proposed.



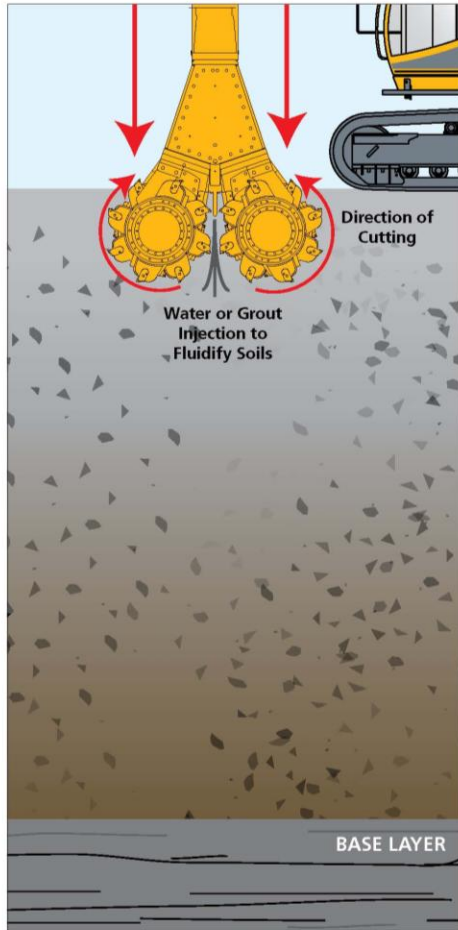
# Cutter Soil Mixing

- Soil Mixing involves blending the native soil with a variety of binder types, most commonly cement, but often lime, polymers, chemicals etc specific to the application and desired final product
- System uses the native soils to create rectangular panels of “Soil-Crete”
- Creates an improved soil zone that has enhanced strength and reduced permeability without requiring excavation and replacement with structural fill

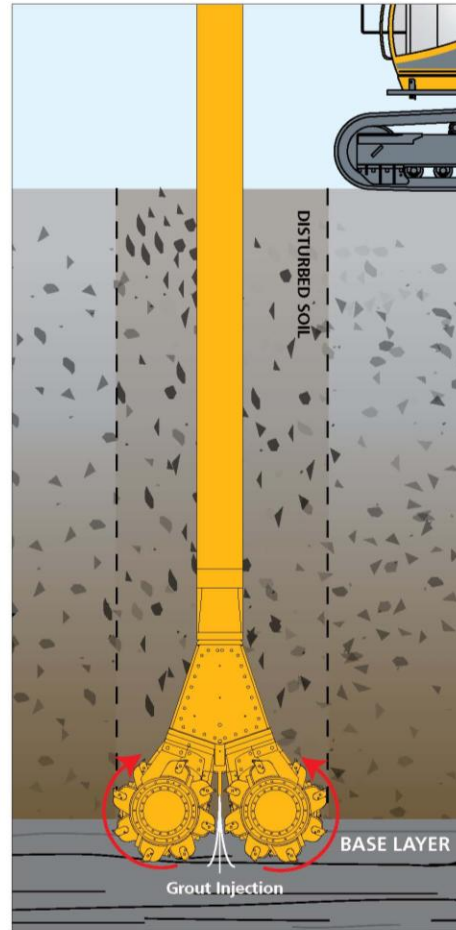


# Cutter Soil Mixing

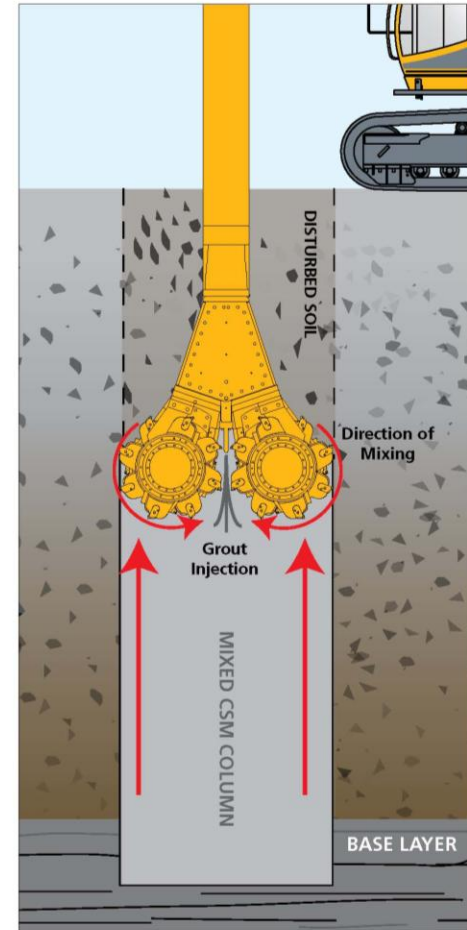
## 1. CUTTING PHASE



## 2. SOCKETING INTO BASE LAYER



## 3. WITHDRAWAL AND MIXING PHASE

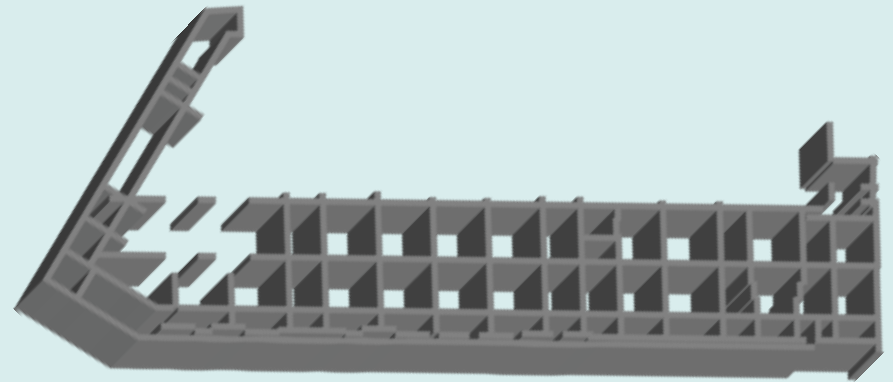




# Cutter Soil Mixing

Solution involved creating a “Grillage” structure that would support the building and design seismic loads

Provides containment of the contaminated groundwater and soil, thereby reducing offsite disposal and mitigating long term risk





# The “Green” Solution

- CSM Solution reduced the amount of contaminated soil that would have gone to the landfill by approximately 85% (40,000 tonnes)
- Reduction of impacts by reducing trucking requirements for both the disposal and the replacement fills (vehicle emissions, fuel, noise and traffic impacts)
- Contaminated soil that remained on site was contained and the low permeability wall prevented the off-site movement of contaminated groundwater
- Entire solution was an estimated 3 to 7 million dollars less expensive than options that included soil and water disposal





# Incorporating “Green” into the solution

- Consider alternative project delivery structures that can foster or drive innovative solutions (Design-Build);
- Ask for innovation by allowing alternate solution submissions to tenders that reduce environmental costs. Be transparent with how the alternatives will be evaluated;
- Work with designers to consider environmental impacts and sustainability when specifying solutions;
- Review construction methods proposed and look for opportunities to include “Best Practices” for environmental protection. Consider defining these best practices as part of the tender process.



Thank You