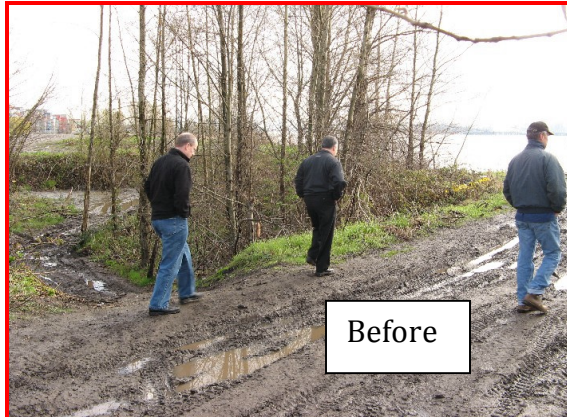


## City of Richmond, Emergency South Dike Construction: No. 7 Road



### PARTICIPANTS

**Owner:** City of Richmond

**Engineering and Environmental:** An integrated design team was assembled with expertise in dike construction and ecological foreshore management.

**KEY WORDS:** green dike, erosion control, rising sea levels, estuary, marsh, native riparian plantings

### PROJECT OBJECTIVE

To protect the City of Richmond dikes from erosion from higher water levels and velocities in a green manner. To upgrade a 1 km stretch of dike while enhancing habitat value before June 17, 2007. Access to a popular fishing location was to be improved as well.

### PROJECT LOCATION

City of Richmond, BC, Fraser River estuary, South Dike between No. 7 and No. 8 Roads.

### PLANTING DESIGN

Over 900 native plants, including 7 species, were planted and natural marshes were protected.

### PROJECT BACKGROUND

The City of Richmond is entirely surrounded by water. For this reason, Richmond's dike system represents one of the City's most important assets. Larger than normal predictions for the 2007 Spring Freshet resulted in significant concern surrounding the stability of portions of Richmond's dike system to withstand higher water velocities. While the water was not likely to breach the City's 49 km of dikes, the increased flow and velocity posed a significant threat of erosion.

### EROSION AND POLLUTION CONTROL

All work was done during low tide. Standard sediment control measures were used, such as silt dams, and muddy water was pumped onto grassy areas to achieve natural filtration. The City also addressed key challenges presented from underlying contamination. Contaminated soil was exposed during construction, which triggered construction, regulatory and health requirements.

## OVERALL DESIGN STRATEGY

In contrast to conventional straight-line dikes, the alignment of the structural works for this project was designed to vary and avoid existing functional riparian and intertidal areas. To retain structural integrity for portions of the dike, which were located further inland, the dike was constructed by excavating material, placing in the structural material to depths required, and back-filling. During these works, foreshore benches were constructed to improve ecological conditions. The re-instatement of the low flow intertidal areas provides an ideal environment for fish to 'rest' as they are navigating the river.

Numerous plantings and arrangement of logs and wood debris was also completed to further enhance the fish habitat and the natural estuarine environment, and to contribute to an aesthetically pleasing final product.

## LESSONS LEARNED

Project participants learned the importance of customized dike design, which considered and responded to actual site conditions. New construction techniques were also learned, which enabled the retention of existing ecological functionality.

Participants also learned to implement a "Net-Plus" approach where ecological health was the focus (rather than solely impact mitigation) and works were designed to result in an overall net improvement both from a flood management and ecological basis.

Ultimately, this project demonstrates the ability to employ practical on- the-ground techniques that can be employed in everyday activities to better advance community sustainability, even under emergency conditions, with a team.

## KEY CHALLENGES

The key challenges were completing the project in a green manner within 10 weeks. Through partnerships with the Federal and Provincial governments, the City of Richmond was able to conduct a major dike upgrade along 1 km of its shoreline within this highly compressed timeframe. Despite the significant time constraints, the City team was able to achieve new standards in habitat protection and restoration.

Dike raising took into consideration the potential sea level rise as a result of climate change. Rather than solely relying on provincial guidelines, Richmond adopted a proactive approach and set dike heights based on current Provincial guideline plus sea level rise over a 100-year period as projected by the Intergovernmental Panel on Climate Change.

## COST

Through partnering with both the Federal and Provincial governments, funding of approximately \$1.4 million allowed the City to upgrade dike bank protection over a length of approximately 1 km. This project, from concept to completion (including preparation of a detailed design, tendering, environmental permitting and construction) was completed in just 10 weeks.

## OUTCOME

Through partnership, use of creative and integrated approaches, and focus on the care and well being of workers, the City of Richmond was able to deliver a major dike upgrade under emergency conditions and major on-site challenges. The project resulted in the City being better protected from flooding and enhanced natural foreshore.

# CONCEPTUAL DESIGN GRAPHICS

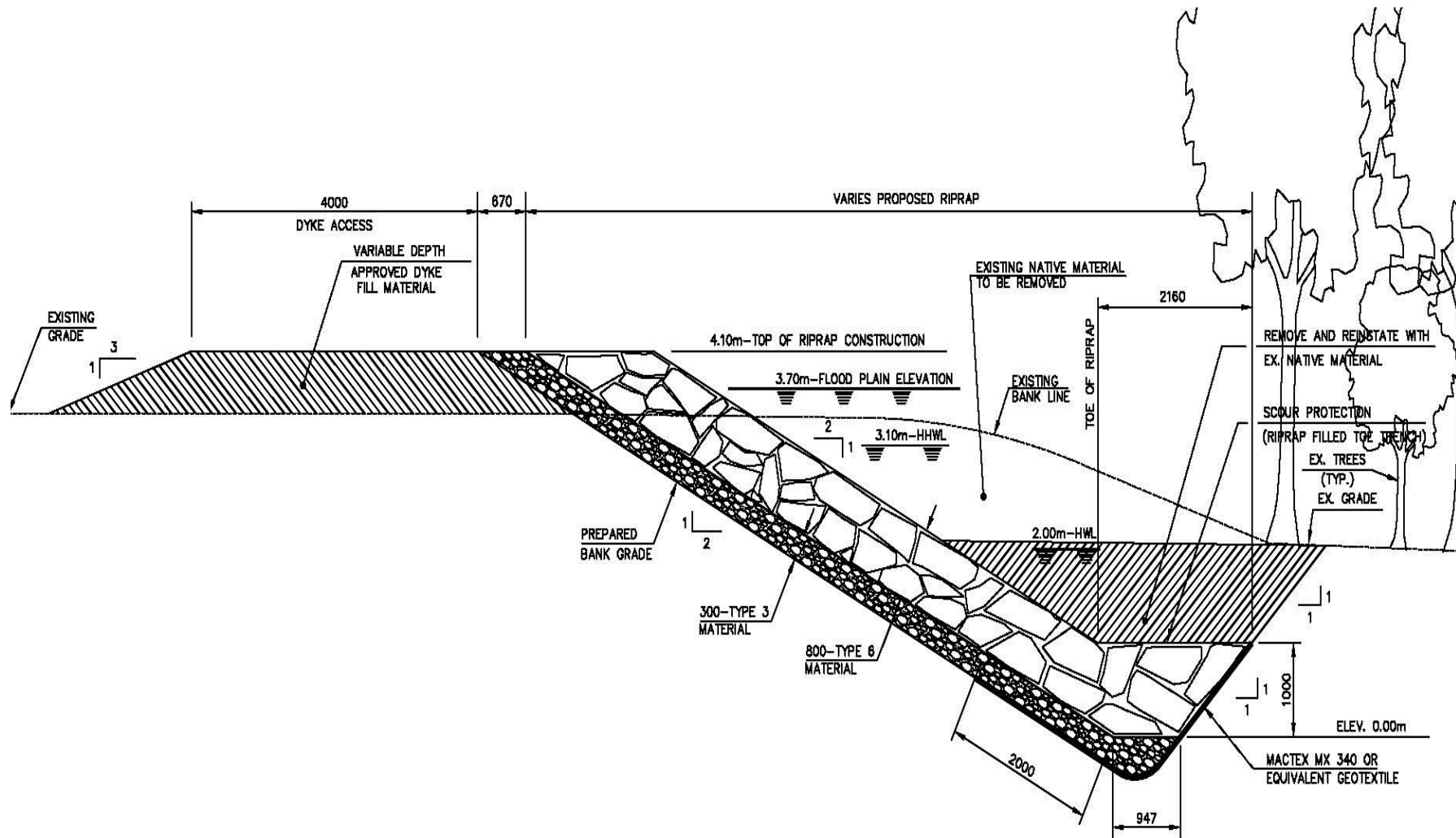


PHOTO DOCUMENTATION:

**Pre-Construction**



**Post-Construction**



**Construction Phase**



Bank Excavation and Shaping of Dike Toe



Native Sediments Placement Over Rip Rap



Arrangement of Logs at Dike Toe



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