

## Low Level Road Bridges: A Sustainable Project

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### Abstract

The Low Level Road (LLR) Project is a \$101.6 Million strategic transportation infrastructure improvement in North Vancouver, BC that has been recognized for multiple engineering design and sustainability awards to date. This paper is a case study that discusses the innovative design features, sustainability attributes, and construction challenges encountered for each of the three main bridges involved with the LLR project, which have become landmarks in the surrounding community. The three bridges discussed in the paper include the 78m long Neptune/Cargill Overpass, 42m long Spirit Trail Overpass at East 3rd Street, and 58m long Spirit Trail Woodland (Moodyville) Suspension Bridge. In each case a unique sustainable structure solution was developed, which required engineering innovation to meet the project goals.

**Keywords:** sustainability; bridges; transportation; environmental; liquefiable soil; steel-tied arch; integral deck; joint-less bridge construction; suspension bridge; Envision

### 1 Introduction

The Low Level Road (LLR) project is a strategic transportation infrastructure improvement project by the Port of Vancouver (Port) as part of the broader North Shore Trade Area initiative to enhance economic growth and improve efficiency of the terminal operations. As the Project evolved, it adapted a greater vision for the infrastructure improvements that would generate benefits not only to the Port operations but to the City, its residents, and public and private sectors affected by this significant transportation corridor.

The LLR Project involves the realignment and widening of approximately 2.2km of urban and rural arterial road between St. George's Avenue and Gladstone Avenue/ East 3rd Street within the City of North Vancouver, British Columbia (Figure 1). The project also incorporates improvements to slope stability, community transit connections and road safety with the following key features:

- 4 km of retaining wall with 30,000+ m<sup>2</sup> area
- 1 new vehicular overpass to replace three at-grade rail crossings
- Over 5 km of pedestrian and cyclist facilities
- 3 new pedestrian bridge structures
- Rail realignment and new rail tracks
- Utility relocations
- Over 1 km of noise walls
- Intersection improvements and lane signalization

This paper is a case study that focuses on the innovative design features and construction challenges encountered for three main bridges involved with the LLR project:

- Neptune/Cargill Overpass
- Spirit Trail Pedestrian Overpass
- Moodyville Pedestrian Suspension Bridge

Each of these bridges is a unique sustainable solution developed to meet demanding project criteria, performance requirements and design objectives.