As a part of ongoing management of the City of Edmonton’s bridge inventory, three bridges in the environmentally sensitive River Valley were identified for rehabilitation in 2011 and 2012. These include: Grierson Bridge (a four-span voided slab structure), MacDonald Drive Pedestrian Underpass (a single-span waffle-slab buried structure) and Rossdale Bridge (a three-span solid slab structure).

The City’s objective was to extend the service life of the structures by 20 to 25 years. Associated Engineering was retained to provide a condition assessment, rehabilitation design and resident engineering services during rehabilitation construction of these bridges.

Associated Engineering completed the Condition Assessment phase of the project in summer 2011. This included a review of each bridge’s history (existing files and drawings), an extensive testing program, a load-rating study, and a review of controlling factors (structural, environmental, geotechnical and traffic accommodation).

Structural/environmental material sampling and testing program was conducted and provided valuable and key insights into the condition of the bridges and, coupled with life cycle costing played a significant role in determining the scope of repairs and appropriate strategy for each structure. Investigation included a deck delamination survey and deck concrete condition survey (cores, strength testing, chloride ion content analysis, copper sulphate electrode testing, and freeze-thaw...
durability). Testing and assessment revealed that these bridges had significant deck delamination, high chlorides and indications of active corrosion.

**Rossdale Road - McDougall Hill Overpass**

The Rossdale Bridge, a three-span 48 m long reinforced concrete bridge constructed in 1957, was identified for a condition assessment due to the poor condition of the superstructure. It was found that the deck concrete had high chloride levels, well in excess of the corrosion threshold for steel in the top 110 mm. The strategy adopted for rehabilitation comprised of removal of the top 175 mm of concrete by hydrodemolition, installation of new stainless steel reinforcing over the piers, conversion of the abutments to semi-integral, and a new high performance concrete overlay complete with waterproofing and an asphalt wearing surface.

**Grierson Hill Bridge**

Grierson Hill Bridge, a 4-span 45m long voided slab/multicell box girder with deep chloride contamination required superstructure demolition and replacement on a strengthened substructure. Bridge investigation included a deck delamination survey and deck concrete condition survey (cores, strength testing, chloride ion content analysis, copper sulphate electrode testing, and freeze-thaw durability).
The rehabilitation design involved removing the existing deck and approaches, salvaging the existing piers, and constructing a new solid slab, post-tensioned concrete deck, and converting the abutments to semi-integral. An innovative concrete jacket around the existing columns allowed the existing substructure and foundation to be effectively re-used in the rehabilitation giving the quality and appearance of a new bridge. “Re-use” of the existing columns as the core of the jacketed piers is more sustainable by reducing use of new materials. The construction was completed in 112 days, months ahead of schedule.

MacDonald Drive Pedestrian Underpass

The MacDonald Drive Pedestrian Underpass, a single-span 6.4 m long, 21.5 m wide cast-in-place waffle slab structure, was identified for a condition assessment due to the poor condition of the superstructure.

The condition assessment was complicated by the absence of design information or drawings for the structure. The testing program included full-depth cores to determine structural depth and concrete surface removal to identify reinforcing. A load-rating showed the structure required upgrading to adequately support vehicle loads.

The MacDonald Drive Pedestrian Underpass rehabilitation included construction of a new structural slab to carry vehicle loads to the foundation. The existing waffle slab was used as falsework for the new slab, and following surface repairs and painting was left in place to provide a consistent architectural finish.