

Cost and Constructability: Foundations Investigations

Planning a major construction project like the Detroit River International Crossing (DRIC) requires a thorough understanding of soil conditions, groundwater conditions, and bedrock conditions. This information is used to determine the strength of the underlying soil and rock and its ability to support foundations for bridges and retaining walls as well as utilities and the roadway itself. The DRIC study team has reviewed much of the available soils data provided from other investigations that have been completed in and around the Area of Continued Analysis. The generation of Practical Alternatives for the crossing, plaza and access road has identified locations of bridges, retaining walls and other structures. One of the activities required to aid in the preliminary design of these features is foundations investigations. These investigations fall under the "Cost and Constructability" evaluation factor.

The foundations program includes:

- A) A deep drilling program in the vicinity of the new proposed international bridge crossing alternatives
- B) A conventional drilling program along the access road corridor.

How the Analysis was Done

A) Current Foundations Investigations Program for International Bridge Crossing Alternatives

The foundations investigations program for the new crossing includes drilling 12 deep boreholes on the Canadian side of the river in the vicinity of Practical Alternative Crossing B and C alignments due to the existence of brine wells from historical salt mining activities in the area. Each borehole will be drilled to a depth of up to 500 m (1640 ft). The drilling program is being undertaken to better understand the effects of solution mining of salt deposits. The program will also confirm the integrity of the underlying bedrock and its ability to support a new international bridge spanning the Detroit River. The drilling of boreholes is not proposed along Crossing A as this alignment is sufficiently removed from areas of solution mining. Drilling operations are expected to be completed in Summer 2007. A similar drilling program has been completed on the U.S. side of the river.

The second part of the investigations includes geophysical and other testing that will be conducted within each borehole during drilling and prior to the installation of the borehole casings. Once drilling has been completed and the borehole casings installed, the ground between boreholes will be characterized using cross-hole geophysics. The geophysical tools are similar to a CAT scan where signals are sent through an object in different directions and the signals are compiled to construct a cross section of the object or, in this case, a land mass. The results of the cross-hole survey will lead to the identification of anomalies that may exist between boreholes, as well as imaging of individual rock layers.

A Geoadvisory Group has been assembled to assist the study team in completing the foundations investigations program. The group is comprised of geotechnical experts from Canada and the United States. The results of the drilling program, including geophysics results, will be reviewed by the group and will be used in the evaluation process for selecting the preferred alternative of the new international bridge crossing.

B) Foundations Investigations Program for the Access Road Practical Alternatives

This program, completed in November 2006, included drilling 24 boreholes and completing specialized testing along the access road corridor. The boreholes extended to a maximum depth of 35 m (114 ft). Most of the boreholes were located within existing road allowances, including Highway 3, Huron Church Road and E.C. Row Expressway. Boreholes along the corridor were required to provide additional information on existing soil types. This information was needed to provide preliminary structural design recommendations for various structural components for the access road Practical Alternatives. Structural components include walls, roof, floor slabs and footings for tunnels, retaining walls for below-grade sections, and bridge abutments for overpasses and underpasses.

Findings to Date

A) International Bridge Crossing Alternatives

As of July 20, 2007, ten of the 12 deep boreholes have been drilled to full depth and the final two are underway. No substantial irregularities in the bedrock have been encountered to date.

B) Access Road Practical Alternatives

Analysis of the 24 boreholes confirms that the existing soils along the access road corridor generally consist of soft clayey silt. West of the Huron Church Road and E.C. Row Expressway interchange, the soil conditions become progressively softer, and less favourable for conventional construction methods. A majority of the bedrock is comprised of limestone, ranging in depths of 25 m (82 ft) below ground surface at Ojibway Parkway and E.C. Row Expressway to 35 m (114 ft) at the existing terminus of Highway 401. The soil conditions generally become softer as depth below the ground surface increases until bedrock is reached.

High groundwater conditions exist within the study limits. Groundwater elevations range between 0.5 m to 6.0 m (1.6 to 19 ft) below the ground surface along the corridor and are artesian (water in the bedrock will rise above the ground level if allowed). Strategies for groundwater control will be required for all methods of construction. Complex staging including stability enhancement measures and groundwater control will be required during construction of below-grade sections in areas of deep excavations (for the tunnel alternatives this requirement would apply along the length of the access road from Malden Road to Highway 3).

It will be necessary to design below-grade sections adjacent to sensitive natural areas in a way that minimizes potential long term impacts caused by lowering the groundwater level near the freeway.

Coring on Southwest Sales Property, May 2007



Rotary Drill Rig Setting Up on City of Windsor Property, May 2007.



Remaining Activities

Work on the remaining deep boreholes is underway, and is expected to be completed in Summer 2007. Cross-hole geophysics has begun, and is expected to be completed shortly after the drilling operations. The Geoadvisory Group will convene later in 2007 to discuss the interpretation of the results from both Canadian and U.S. deep borehole programs, and to verify conclusions. The results of the drilling program, including geophysics results, will be reviewed by the group and will be used in the evaluation process for selecting the technically and environmentally preferred alternative of the new international bridge crossing.

Data obtained from the 24 boreholes for the access road Practical Alternatives will be used in the next phase of work for the preliminary design of structural elements for the preferred access road alternative.