

Tunneling Technology and the Environment Environmental Aspects of the Niagara Tunnel Project

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Abstract

The Ontario Power Generation (OPG) Niagara Tunnel Project involves the excavation of a 14.4 m outside diameter hard-rock tunnel 10.4 km in length reaching depths of 140 m below the surface. The intake is located in the bed of the Niagara River 1.5 km upstream from the Falls. The Project will provide additional water to the existing Sir Adam Beck generating stations that are presently operating under capacity. The Design-Build contract was awarded in 2005 to STRABAG AG of Austria. Power generation on the Niagara River has a long history, commencing in the late 1800’s. The most recent Canadian development was in the 1950’s when 2 diversion tunnels (15.45 m (51 ft) in outside diameter) and a 1200 MW generating station were constructed. The older residents of the City of Niagara Falls clearly remember the disruption caused by mucking from 5 large service shafts as these drill and blast tunnels were excavated, followed by the movement of trucks bringing concrete for the cast in place tunnel liner. During the planning phase for the Niagara Tunnel Project, means of lessening disruption to the City residents, and its all important tourism industry, were a major consideration. The environmental assessment and the engineering design were undertaken together such that the environmental impacts could be minimized by use of appropriate design and technologies. The use of a tunnel boring machine was selected as the method of excavation. This minimized the amount of material to be excavated, enabled mucking only from the outlet portal (and thus avoiding trucking of muck throughout the City) and eliminated the requirement for service shafts to deliver concrete and ventilation. To further address concerns of the local municipalities, a Community Impact Agreement was signed. This agreement provided some compensation to the municipalities for the construction impacts, and provided a mechanism to address transportation, municipal services, tourism issues and citizen concerns arising from the Project. For a Project of this size, a number of environmental approvals are required. Some of these were obtained by OPG, and its predecessor Ontario Hydro, prior to construction, including the environmental assessment and authorizations under the Federal Fisheries Act. For the on site construction activities, the Contractor, STRABAG, has been required to obtain certificates of approval for water treatment and operation of a concrete batch plant, as well as permits to take water and to work in the bed of the Niagara River. The major environmental issues STRABAG has been required to address to date are the treatment of the water being pumped from the tunnel and fugitive dust sources. Innovative methods have been implemented to control these issues. Ongoing diligence is required for compliance with the approvals. Tunneling commenced in 2006 and the forecast for Project substantial completion is 2011.

Keywords: largest hard rock tunnel boring machine; fugitive dust; sediment laden water; Fisheries Act; Sir Adam Beck complex; limestone/dolostones; petroleum hydrocarbons; water treatment; clarification system; chemical injection system; sludge handling system; carbon absorption system; pH adjustment system; chloride monitoring; intake activities.