

# ***Côte-Vertu Underground Garage, Quebec***



Installation of extensometers in the tunnel



Surface monitoring instruments hidden in service boxes



Côte-Vertu garage tunnel – excavation



Real-time data acquisition system, integrated in a service box

For the first time since the 1980s, the STM (Société de transport de Montréal) is adding a new infrastructure to the West end of the Orange line.

A 439 million dollar project, construction of the underground Côte-Vertu garage will double the parking space for trains, which means service will be able to be increased by 25% on this overloaded line.

Three buildings will be constructed at ground level, but it's the underground garage that will be the biggest challenge to build in this project. It will be composed of a 650-metre tunnel located 25 metres below street level, connecting the future garage to the Côte-Vertu métro station. Taking into account the other tunnels connected to it, approximately 1.5 km of corridor will be dug, which is the equivalent of 14 Olympic-size pools of rock.

To measure ground movements along the entire routes of three different tunnels to the underground garage, GKM Consultants was mandated by the EDT Group (EBC, Eurovia – formerly Group TNT, Dragados) to provide turnkey installation of the various geotechnical instruments. GKM took over management of the entire process: from the application for licence to occupy public lands, to the signage and drilling, not to mention the sensor installation.

Our work began by installing approximately 15 extensometers at various points, as well as piezometers above the route of the future corridors to monitor ground movement during tunnel excavation.

All of the instruments installed on the surface were connected to a data acquisition system, accessible online from GKM Consultants' secure servers. This system allowed project stakeholders to monitor data remotely and receive alarms by email in real-time if thresholds were exceeded.

Spread out over an entire block of homes in Ville St-Laurent, the challenge was to install the instruments and data acquisition system in the sidewalks or roadway, without having to pull extensive lengths of cable. GKM Consultants implemented a wireless, weatherproof monitoring solution, powered by long-life batteries, that could be installed in service boxes placed on top of the instruments. This solution eliminated the risk of cable deterioration and the inconvenience of having to install instrumentation beneath the roadway; it also ensured the entire tunnel-monitoring system remained invisible to surrounding residents.

In addition to monitoring surface movements, GKM also fitted tunnel sections with simple extensometers, load cells and crackmeters, all read manually.

It was therefore a comprehensive ground movement monitoring system that was installed for this project, monitoring movement from the surface and in the tunnel.

GKM Consultants is proud to participate in one of the largest construction projects to take place in recent years in the Montreal area.