9. PIPELINE SYSTEMS CONTROL

9.1. Pipeline Control System

Enbridge's Supervisory Control and Data Acquisition ("SCADA") includes redundancy of SCADA systems and associated hardware within the Edmonton control centre and a redundancy of control centres through the implementation of a backup control centre. The telecommunications system used to monitor and control the pipeline and facilities uses a combination of wide area network, telephone line, satellite communication circuits and radio communications to Remote Terminal Units and/or Programmable Logic Controllers ("PLCs") at all terminals, pump stations and automated valve locations along the pipeline.

The SCADA system provides automatic backup pressure protection through a number of subroutines, including an extension to the Line Pressure Monitor ("LPM") alarm system. The LPM alarm system monitors station discharge and suction pressures and can initiate set-point reductions, unit shutdowns, or entire line shutdowns as necessary to avoid overpressure situations. In addition to SCADA's primary functions, it runs several analytical tools, including the generation of preconfigured or customized graphical trends and reports that may be used in the analysis of pipeline operations and that assist in the assessment of the accuracy of SCADA data and the volume and content of alarms. The graphical trends and reports may also support initiatives to modify operations where necessary.

Locally, a pump station's control system is comprised of numerous instrumentation and electrical devices that are all connected directly or indirectly to a PLC. The PLC's main function is to control, monitor and protect the station and various electrical equipment from overpressure, surges, abnormal operating conditions, and other anomalies by shutting down and locking out the appropriate equipment in order to protect the environment, facilities, public and station personnel. Depending on the problem encountered, the PLC will simply shut down individual mainline pumps; the PLC will isolate individual mainline pumps by closing valves and opening up power sources; or the PLC will isolate the entire station by closing valves, shutting down all of the mainline pumps, and opening up power sources until an Enbridge representative arrives at the site to investigate. This information is monitored 24/7 by the pipeline controllers at the control centre through the SCADA system. For other remote sites, such as critical valve sites, redundant systems ensure that communication and valve actuation are available in the event of a communication ~~main power~~ interruption.

Each terminal and station on the line is equipped with a pressure control valve along with an emergency shutdown device to protect from overpressure scenarios. Where required, relief systems exist and have been designed to be capable of handling overpressure scenarios on the pipeline and all stations/terminals.

9.2. Leak Detection System

Enbridge uses multiple approaches for leak detection on its oil pipelines. These approaches are designed to provide comprehensive and overlapping leak detection capabilities. Four primary methods of monitoring for possible leaks are used on Enbridge pipelines. Each of these four leak detection techniques has a different focus and a different application of technology, resources and timing. These methods include controller monitoring, visual surveillance and reports, scheduled line balance calculations and Computational Pipeline Monitoring ("CPM"). The CPM for Line 9 will be designed in accordance with OPR-99, CSA Z662-11 Annex E, the U.S. Department of Transportation CFR 49 part 195 and API 1130. The CPM applications will reside on dedicated high-capacity servers that are separate from the SCADA servers.