

NICHOLS ENVIRONMENTAL (CANADA) LTD.

STATEMENT OF QUALIFICATIONS



Client:	Confidential Client	Project start date:	Nov. 1999
Location:	Edmonton, Alberta	Project end date:	Jun. 2000
Project Type:	Geotechnical Investigation	Project Manager:	M. McCormick
Project Value:	\$167,000		

Project Title: **Geotechnical Evaluation, Computer Model Simulation, Design, and Construction Management**

Project Description: Nichols Environmental (Canada) Ltd. was retained to conduct a geotechnical evaluation to determine the extent of frozen soil under a concrete floor, provide an installation design for a new heating system, and monitor the remedial work. The site is a grocery freezer at a distribution warehouse.

Three-point thermisters were installed to determine the extent of freezing and soil cores found ice lensing. The field observations and thermister readings confirm that portions of the existing below-floor system were not functioning and the subsoils had frozen. Settlement was also found where soil dessication had occurred due to a failure of the air heating system.

The temperature profiles generally concurred with the field observations of the frozen/thawed soil interface. Temperature readings show that under-slab insulation was moderating the soil temperatures and had minimized the depth of frost penetration.

The heaving and resulting slab movements were not a self-limiting condition, such that the depth of frost penetration would increase over time, which would result in additional heaving. Progressive failures of other portions of the air heating system were likely; this would result in heaving in other areas under the concrete slab. Air movement below the floor slab has resulted in dessication of the underlying soils and subsequent shrinkage. Continued shrinkage would result in slab damage of the same or greater magnitude as the heaving due to freezing.

Nichols Environmental recommended the following:

- The air heating system should be replaced as soon as possible;
- Minimum installation depths for a new heating system were determined;
- Based on a rigorous computer model simulation (TEMP/W), heating line spacing recommendations were provided for frozen and unfrozen soils;
- Horizontal directional drilling was the recommended heating line installation method.

Nichols Environmental also provided detailed installation cost estimates for turn-key installation, as well as construction monitoring services. Long term temperature monitoring several months after installation of new electrical heating cables confirmed that previously frozen soils were thawing and survey data showed that previously frozen sections had settled as thawing progressed.

