

STRUCTURAL STABILITY EVALUATIONS OF EXPANSION ALTERNATIVES FOR SOLUTION MINING OPERATIONS AT WINDSOR, ONTARIO

by

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INTRODUCTION

This paper presents important results of a more comprehensive study undertaken by Canadian Salt Co. in the interest of establishing practical operating parameters to guarantee structural stability of the solution caverns at the Windsor, Ontario Brinefield. Evaluations of structural stability were carried out for the present field conditions, as well as for the conditions resulting from a series of potential alternatives of future expansion.

The study was developed through a number of tasks which included: First an evaluation of the subsurface conditions in the brinefield and a review of available data regarding past sinkhole activity in the Windsor area. Subsequently a survey was made to establish the size, shape, location and current status of existing caverns in the brinefield and adjacent areas. Based on the data collected from the survey and taking into account the subsurface conditions in the area, several alternatives for future enlargement of the present caverns were outlined.

The stability of the present caverns was assessed using a Finite Element model. The model was calibrated by comparing the estimated shape and magnitude of the ground subsidence for the present caverns with the actual ground subsidence measured in the field. The structural behavior of the present caverns is adequate. Consequently the estimated magnitude and distribution of stresses and deformations in the surrounding media were used as a "bench mark" of acceptable stress and deformation levels for future expansion.

The behavior of alternative expansion schemes was then studied with a series of Finite Element analyses and several "key parameters" which control the structural behavior of the openings. These parameters include, EXTRACTION RATIO, CAVERN SHAPE, MAXIMUM ARCHING SPAN, and MINIMUM PILLAR THICKNESS. Finally guidelines and recommendations for a safe, future expansion of the caverns were developed based on allowable values of these parameters.

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