



## SWI NAPL RECOVERY DEMONSTRATION: BORDEN, ONTARIO

### PILOT CASE STUDY: NAPL RECOVERY AT A TEST SITE AT CANADIAN FORCES BASE BORDEN, ONTARIO

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#### BACKGROUND

- This was an experimental pilot project conducted by inVentures Technologies incorporated in conjunction with the University of Waterloo at Base Borden. The project was carried out in 3 phases and supported a Master's student in each phase. The 3 phases were:
    1. The lab experiments to verify the theory of NAPL Recovery using CO<sub>2</sub> saturated water through volatilization and mobilization.
    2. Field experiments to see the extent of CO<sub>2</sub> laden water transport in porous media under non-recovery pumping conditions (i.e. no extraction)
    3. The actual NAPL Recovery
  - From the perspective of gPRO<sup>®</sup> performance, the part of the experiments involving the injection of water supersaturated with carbon dioxide at a single injection point under non-recovery pumping conditions is of most interest.
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#### inVentures STRATEGY

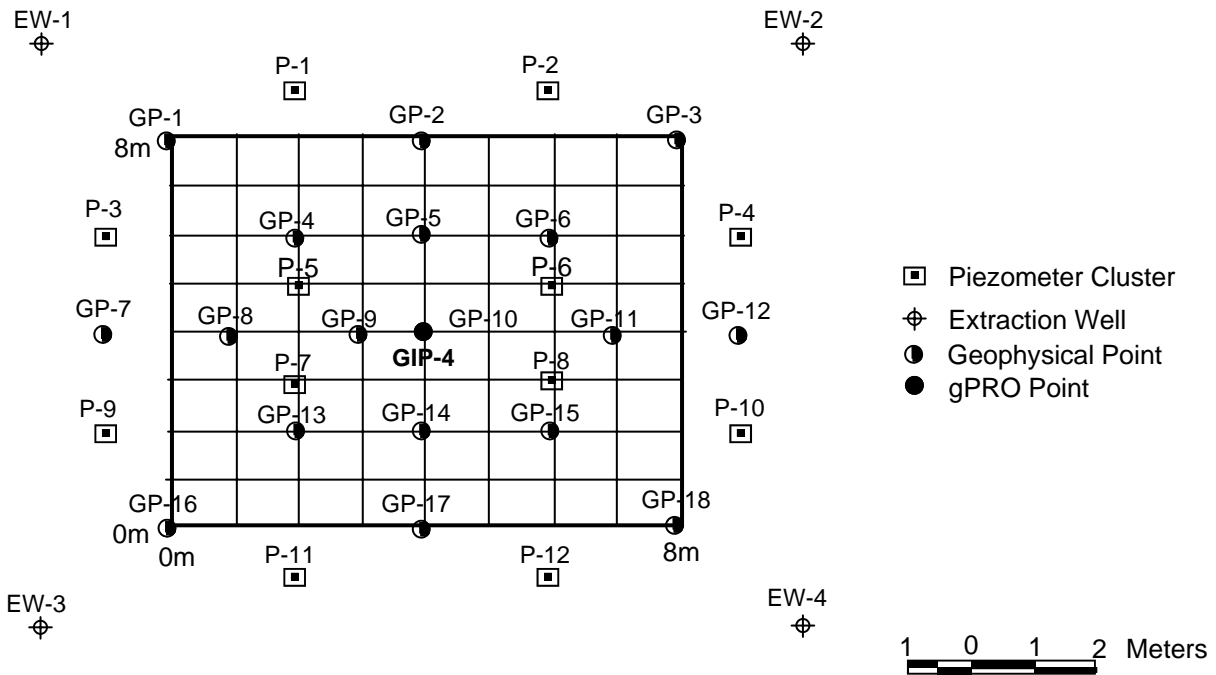
- To determine the radius of influence of CO<sub>2</sub> saturated water at a single injection point under non-recovery pumping conditions and demonstrate gPRO<sup>®</sup> capability.
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#### CLEAN-UP STRATEGY

- gPRO<sup>®</sup> HP will be utilized to inject CO<sub>2</sub> supersaturated water into the porous medium
  - Carbonated water will be injected under pressure at a continuous flow rate until steady state conditions have been achieved.
  - The in-situ evolution of carbon dioxide in the gas phase will be determined by total gas pressure analysis
  - Hydraulic monitoring will be performed to determine if mounding occurs during injection of the carbonated water
  - The saturated water is extracted along with the volatile hydrocarbons and non volatiles using dual phase extraction
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## SITE MAP



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## RESULTS

- CO<sub>2</sub> was measured 6 meters (19.7 feet) in all directions from a single injection point with no mounding – total diameter of 39.4 feet.
- The NAPL recovery was 100% where the CO<sub>2</sub> laden water contacted the NAPL. While the experiments due to costs, did not encompass the vertical control of the CO<sub>2</sub> (it was injected at the tip of each well), it became very evident that vertical control of the CO<sub>2</sub> saturated water is a key component of the NAPL Recovery technology. The vertical control would ensure CO<sub>2</sub> contact.