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Supplementary Information

Presentation from
Ontario Power Generation Inc.

On
Aquatic:
Groundwater

In the Matter of

Ontario Power Generation Inc.

Proposed Environmental Impact Statement for OPG's Deep Geological Repository (DGR) Project for Low and Intermediate Level Waste

Joint Review Panel

September 16 to October 12, 2013

Renseignements supplémentaires

Présentation d'
Ontario Power Generation Inc.

Sur
Le milieu aquatique :
Eaux souterraines

À l'égard de

Ontario Power Generation Inc.

Étude proposée pour l'énoncé des incidences environnementales pour l'Installation de stockage de déchets radioactifs à faible et moyenne activité dans des couches géologiques profondes

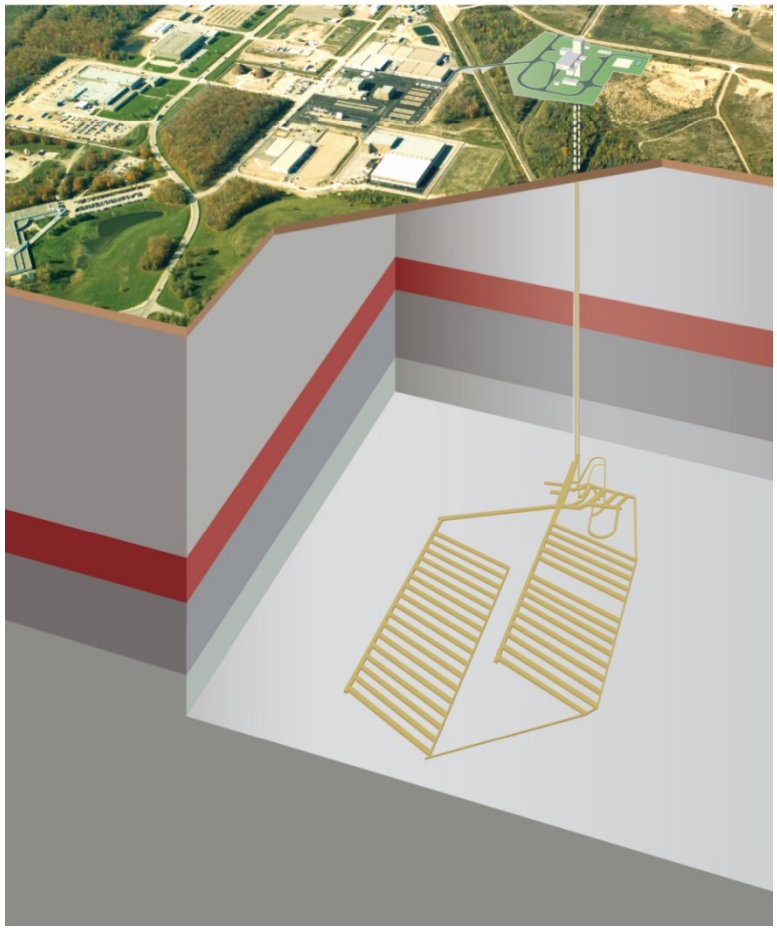
Commission d'examen conjoint

Du 16 septembre au 12 octobre 2013

Canada

OPG's L&ILW DGR Joint Review Panel Hearing

Aquatic: Groundwater



September 30, 2013

ONTARIO POWER GENERATION

Presentation Outline

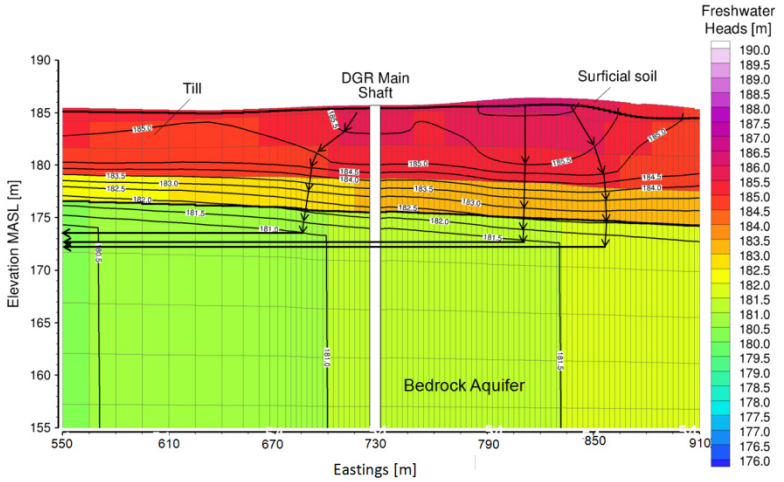
- ❑ Hydrogeologic Investigations/Reviews
- ❑ Shallow Groundwater System
- ❑ DGR Surface Facilities
- ❑ DGR Shaft Construction
- ❑ Conclusions

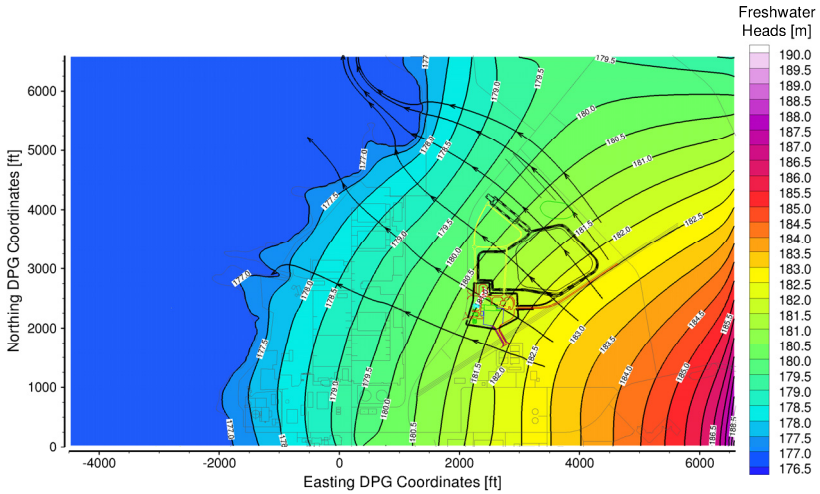
Hydrogeologic Investigations/Reviews

- Detailed Hydrogeologic Investigation late 1970s
- Summary of Geologic/Hydrogeologic Conditions Radioactive Waste Management Areas (Radioactive Waste Operations Sites 1 and 2) - 1987
- WWMF Groundwater Monitoring System Design Review - 1994
- WWMF Groundwater Monitoring System Implementation (11 wells)
- Investigation of Tritium in Groundwater WSH-231- 2001/2002
- WWMF Facility Expansion - Groundwater Monitoring System (18 wells)
- WWMF Assessment - Tritium in Groundwater 2010
- DGR Project Site Geotechnical Investigations 2011/2012
- DGR Project Site Groundwater Monitoring System (10 wells)

Shallow Groundwater System (1)

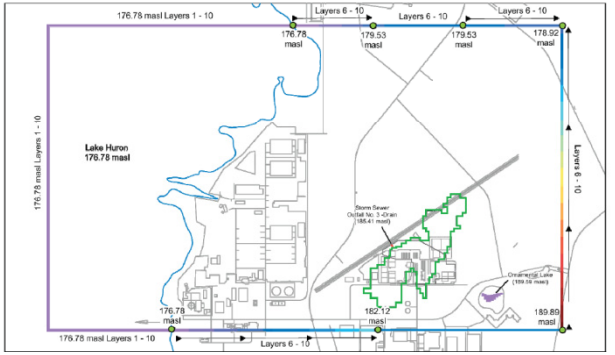
- Hydrostratigraphy (near-surface)
  - Surfical Sand and Gravel
  - Upper Weathered Till
  - Upper Unweathered Till
  - Middle Sand
  - Lower Unweathered Till
  - Carbonate Bedrock
- Groundwater Flow Patterns
  - Glacial Drift - Downward
  - Carbonate Aquifer - Horizontally
  - Discharge - Lake Huron Near Shoreline

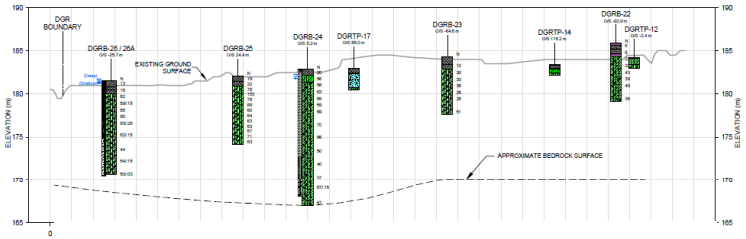


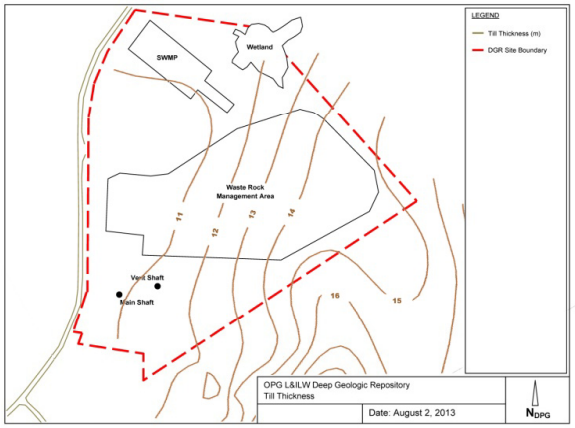


Shallow Groundwater System (2)

- DGR Site Conditions
  - Middle Sand (Aquifer)
    - Absent beneath Project Site
  - Glacial Till (Aquitard)
    - Underlies entire Project Site
    - Deposits >10 m thick
    - Low K (≈10^{-10} m/s)
    - Recharge rates (mm/yr)
    - Groundwater velocities (cm/yr)
  - Carbonate Bedrock (Confined Aquifer)
    - High permeability (K ≈10^{-5} m/s)
    - Groundwater velocities (10s m/yr)

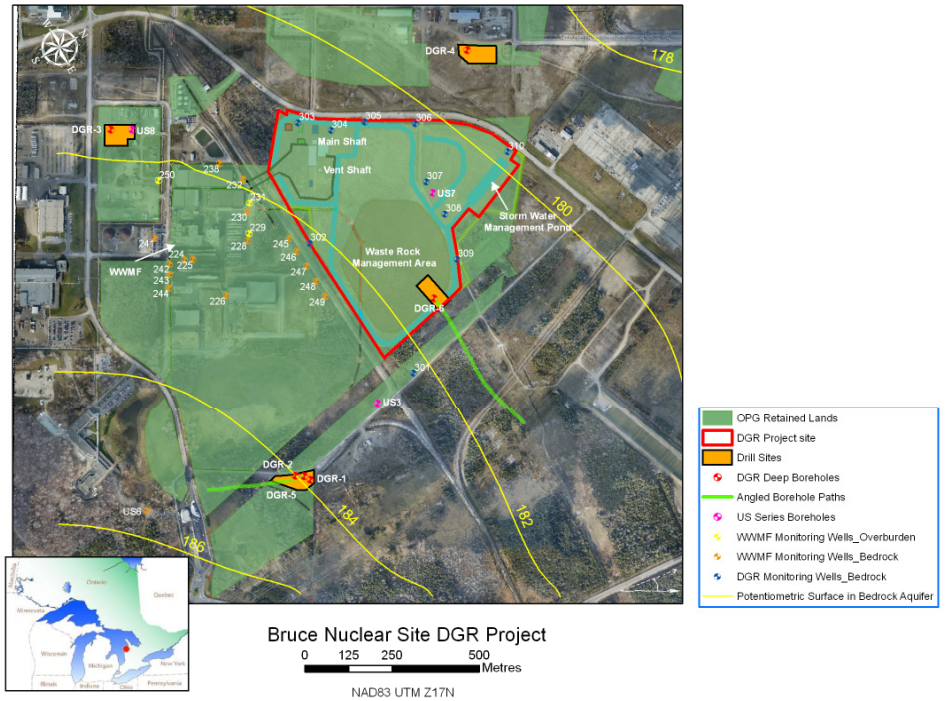






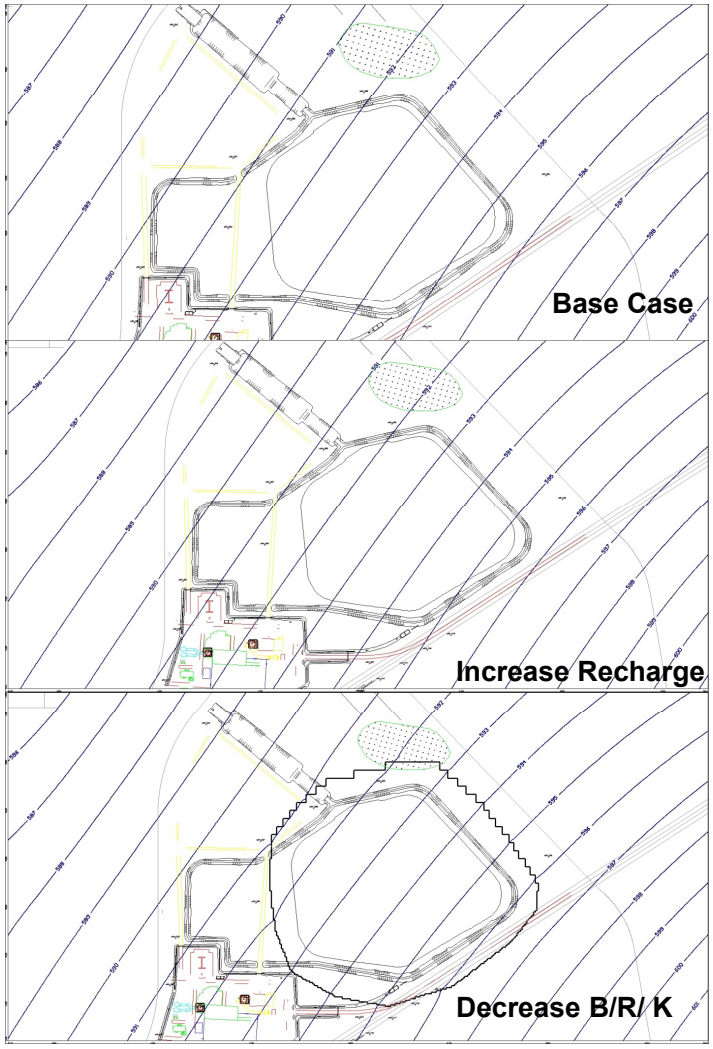
DGR Project Site Surface Facilities (1)

- Management Facilities
  - Waste Rock Management Area
  - Stormwater Management Pond
- Groundwater Assessment
  - Base Case (Present Day) conditions
  - Post WRMA/SWMP Construction
    - Near-surface hydrostratigraphy
    - Surface recharge
  - Estimate Influence of WRMA/SWMP
    - Groundwater flow patterns/rates
    - Adequacy of shallow groundwater monitoring system



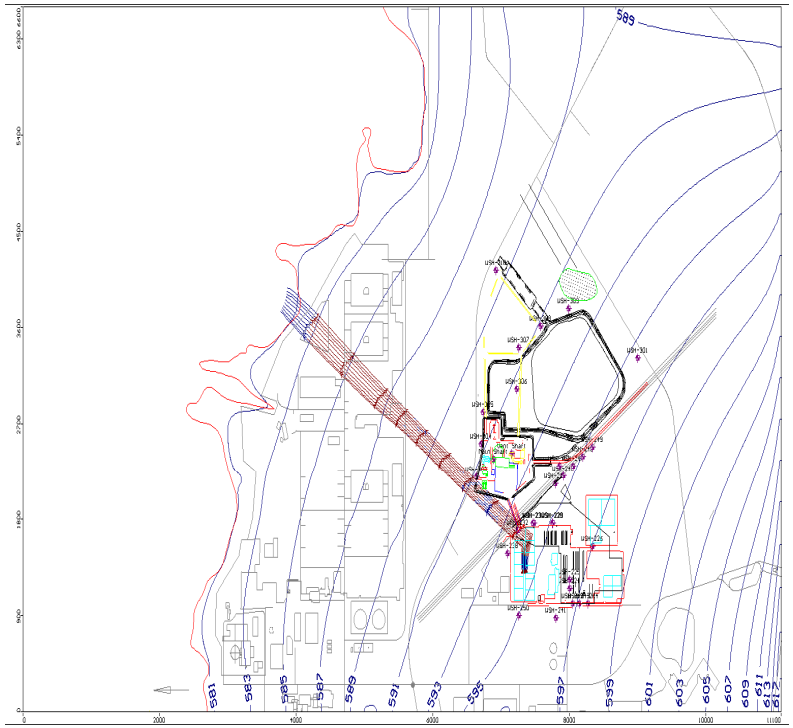
DGR Project Site Surface Facilities (2)

- Assessment Outcome
  - Glacial Till Aquitard
    - Recharge small fraction of precipitation
    - Groundwater velocities ≈ 2 cm/year
  - Confined Carbonate Bedrock Aquifer
    - No mounding of potentiometric surface
      - Decreased recharge beneath WRMA/SWMP
      - Contrast with Low K in overlying glacial till
  - Shallow Bedrock Groundwater Monitoring Program
    - Can reliably verify assessment



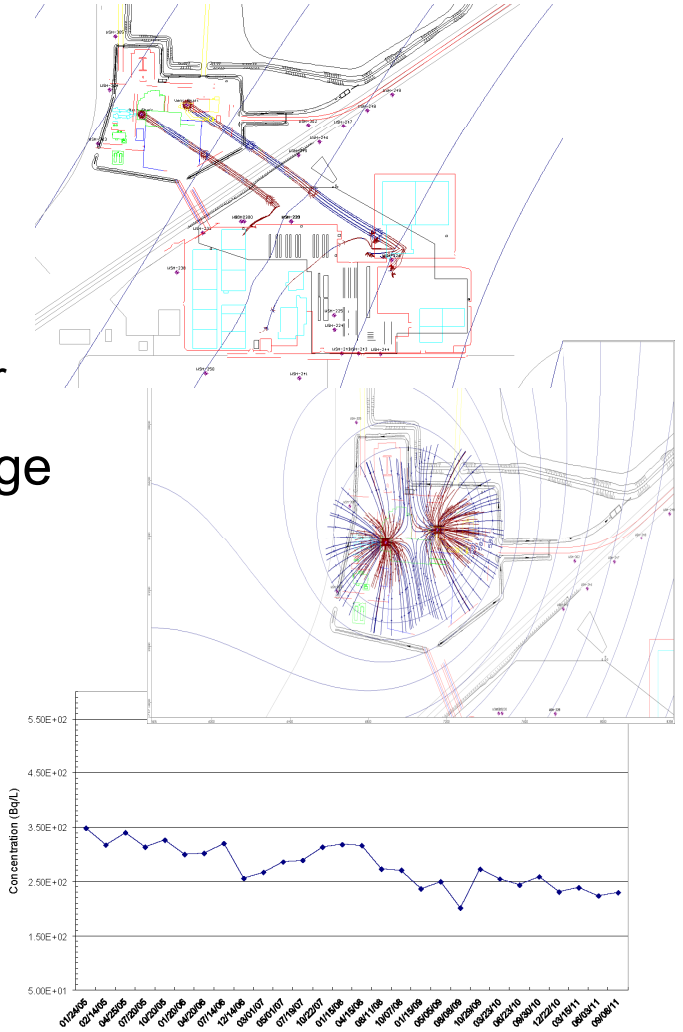
DGR Shaft Construction (1)

- DGR Shaft Construction
  - Duration 9-12 months (upper ≈ 200 m)
  - Dewatering control measures
  - Hydrostatic shaft liners
- Groundwater Assessment
  - Dewatering rates during shaft advance
  - Shaft zone of capture during construction
  - Tritium concentrations in shaft discharge during construction



DGR Shaft Construction (2)

- Assessment Outcome:
  - Shaft hydraulic zone of influence
    - Extended 10s of metres from shaft
    - Hydraulic influence temporary
    - Groundwater system isolated by shaft liner
  - Tritium Concentrations – Shaft Discharge
    - Confined Bedrock Aquifer
      - Up-gradient - 500 Bq/L
      - DGR Project Site/Background 10 Bq/L
    - Natural attenuation in shallow bedrock aquifer significantly reduces tritium concentrations
    - Conservative estimate for shaft discharge 250 Bq/L or less



Conclusions

❑ DGR Surface Facilities

- Glacial till aquitard underlying the DGR Project Site protects the shallow groundwater system
- DGR Surface Facilities construction will not have a significant influence on the shallow groundwater system

❑ DGR Shaft Construction

- Baseline groundwater tritium concentrations at background levels
- Temporary (months) localized influence on shallow bedrock aquifer
- Change in groundwater tritium concentrations due to WWMF activities not significant

❑ Groundwater System Monitoring – DGR Project Site

- Groundwater monitoring systems are able to reliably establish baseline conditions and verify assessment of DGR project influence on shallow groundwater system