Deep Geological Repository for Low and Intermediate Level Nuclear Waste

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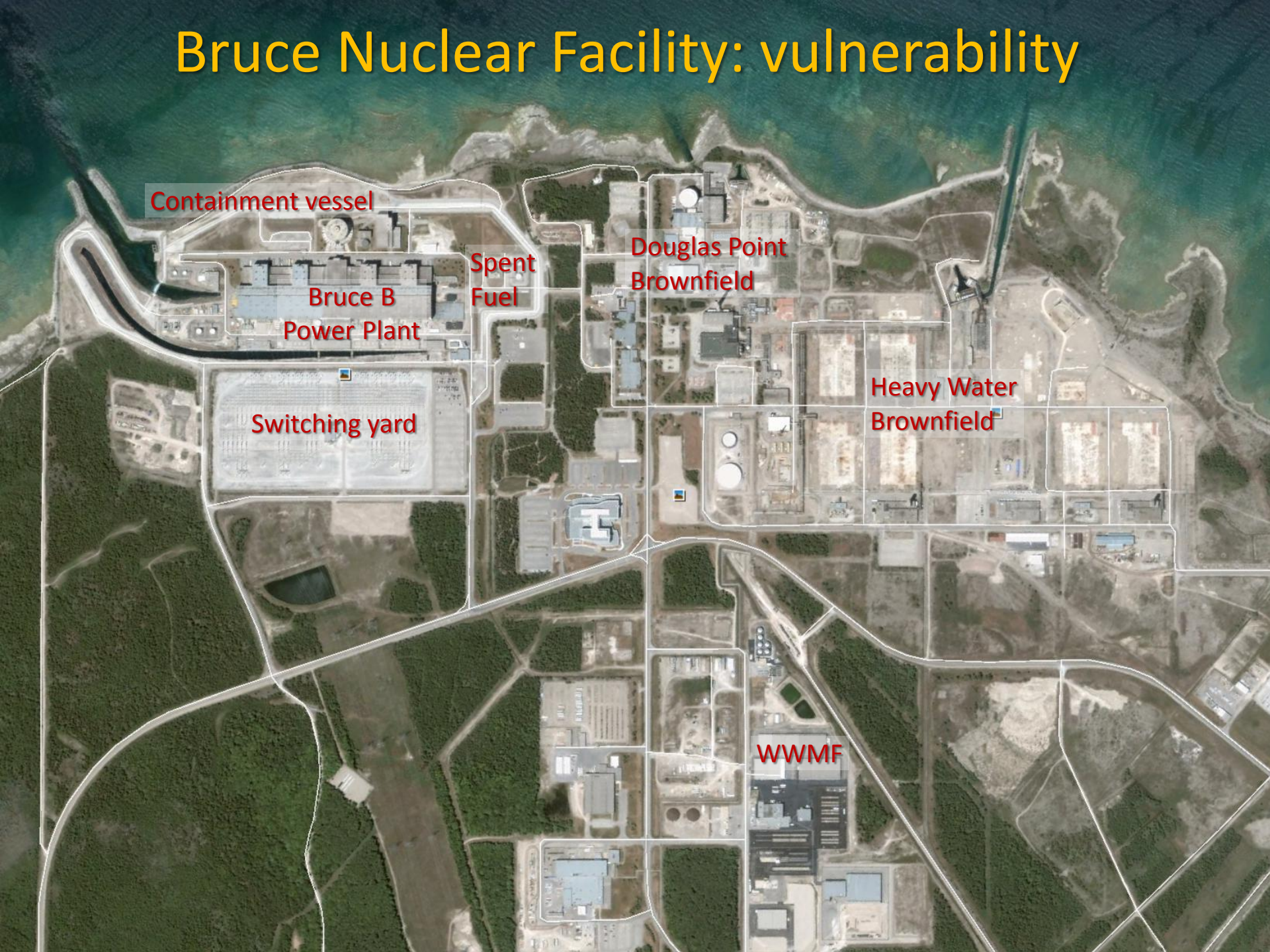
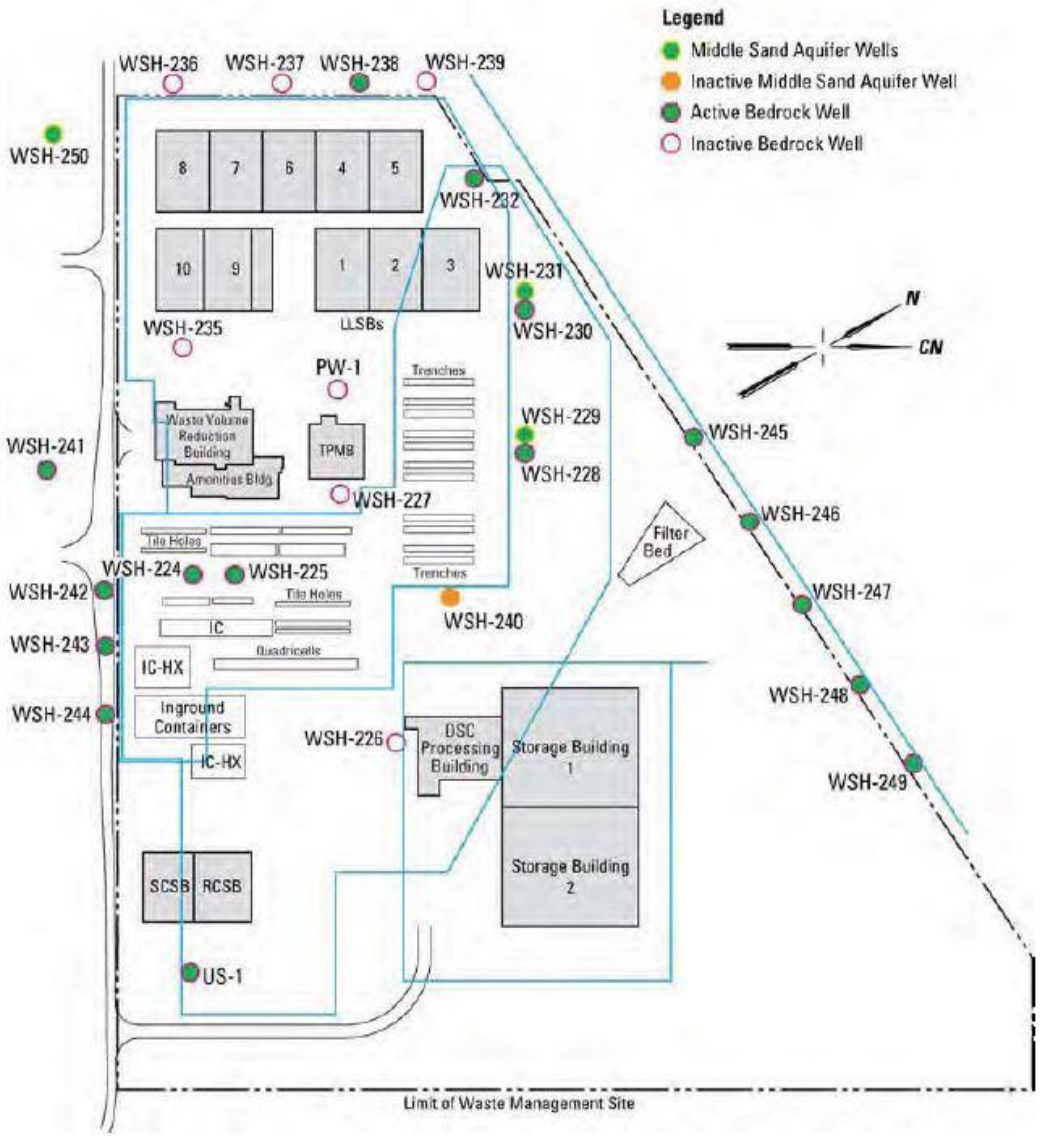
Bruce Nuclear Facility

Bruce Nuclear Facility: vulnerability

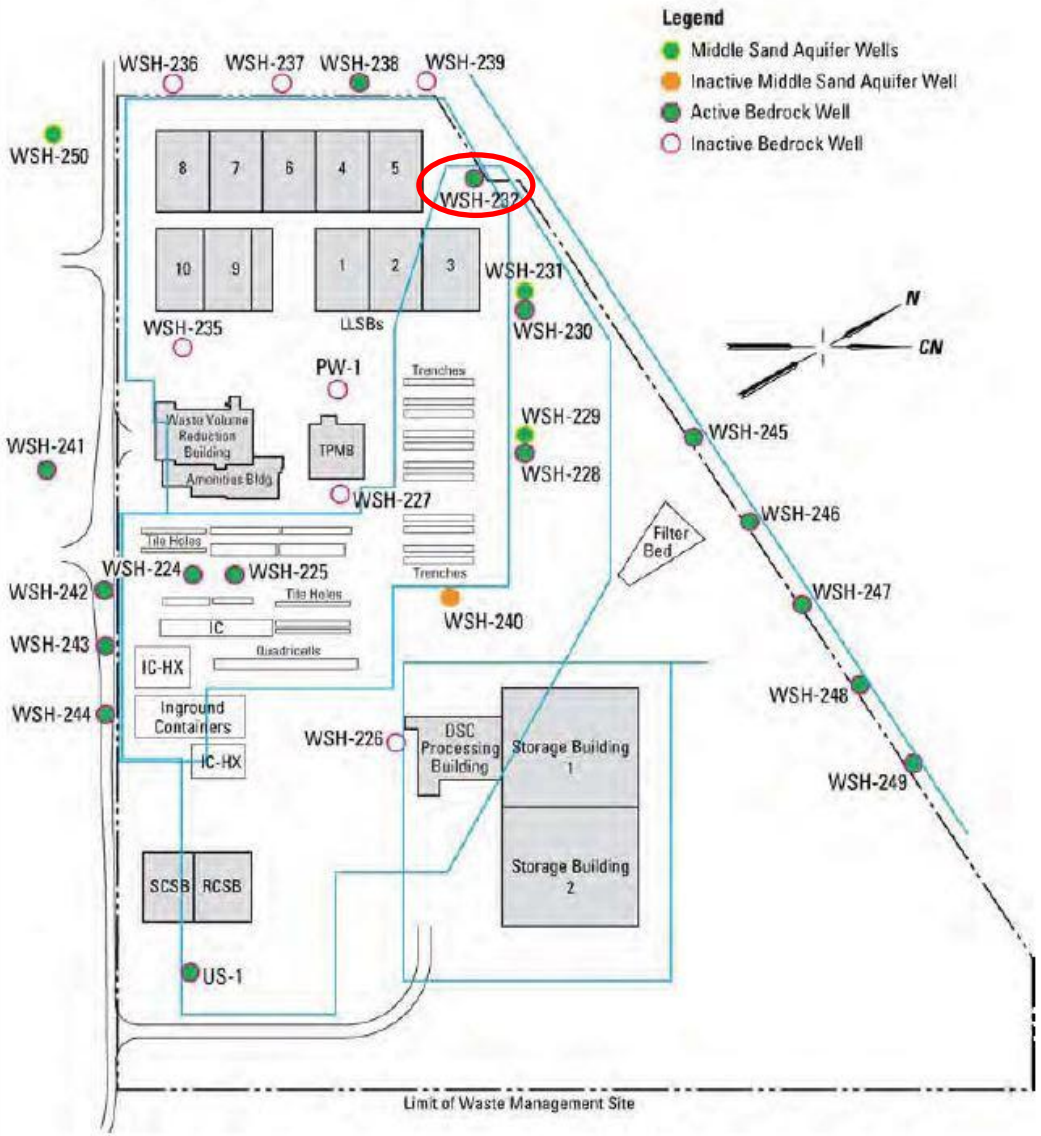


Western Waste Management Facility

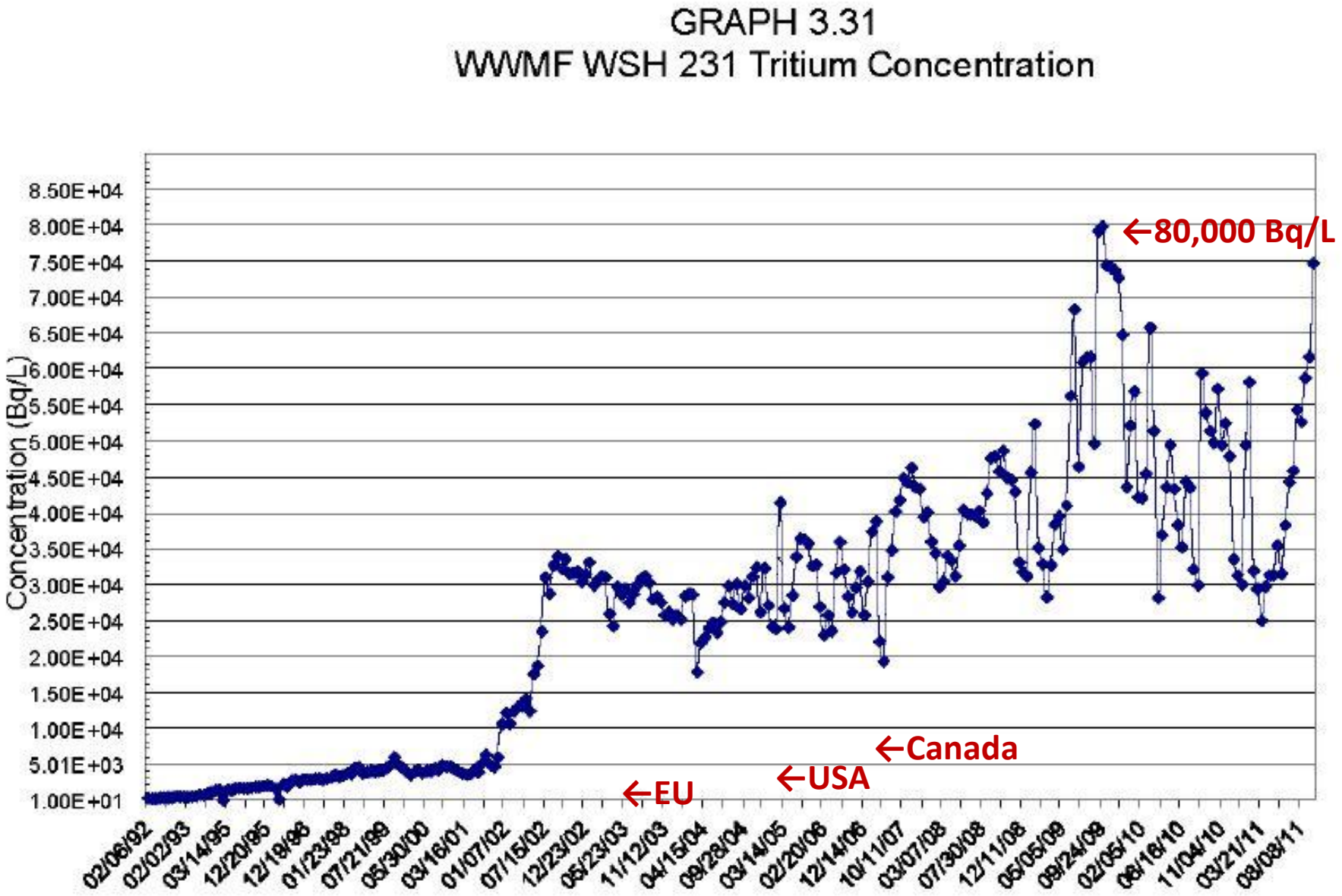
Western Waste Management Facility



Western Waste Management Facility

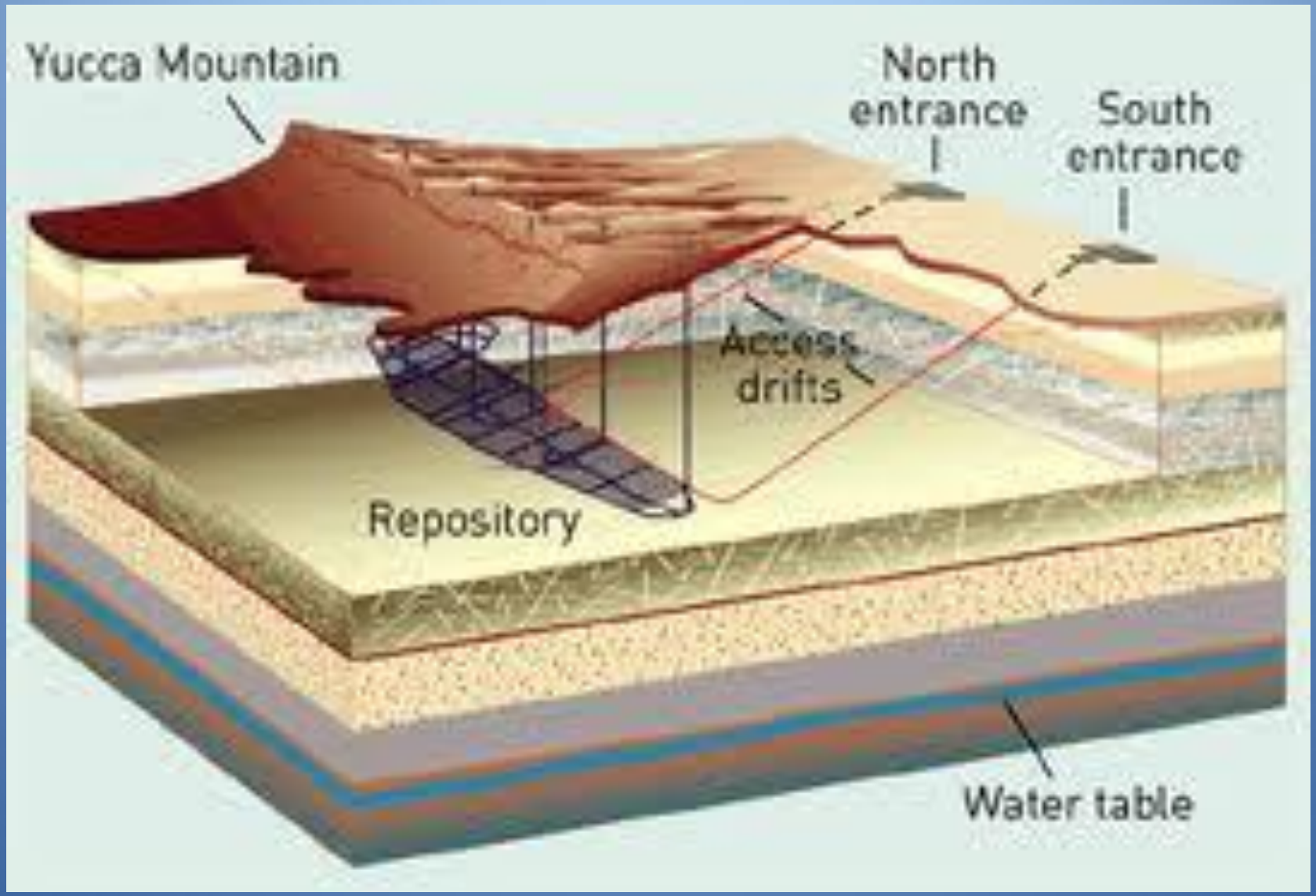


Tritium in groundwater at WWMF

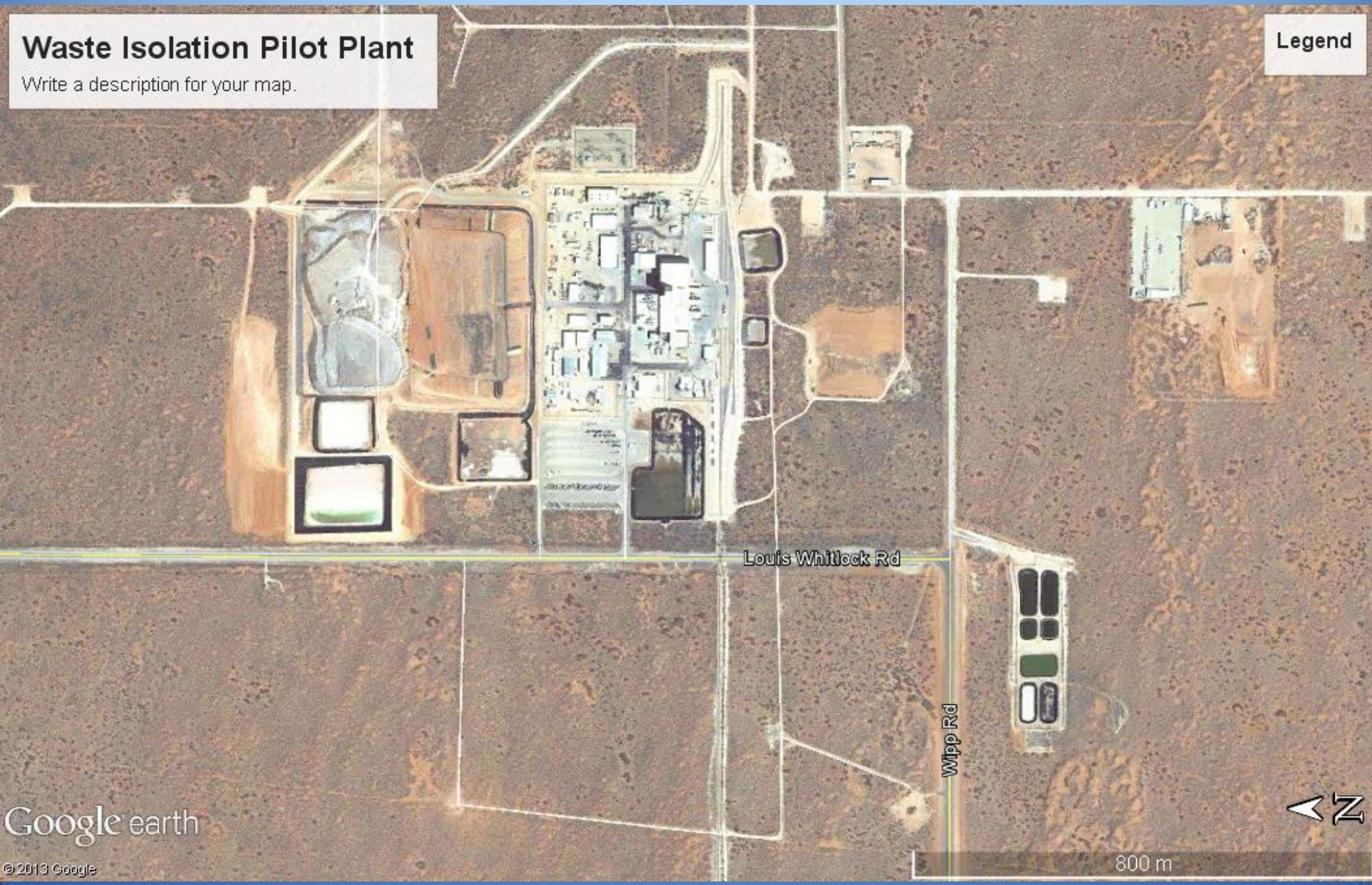


US DoE: DGR Yucca Mt, Nevada

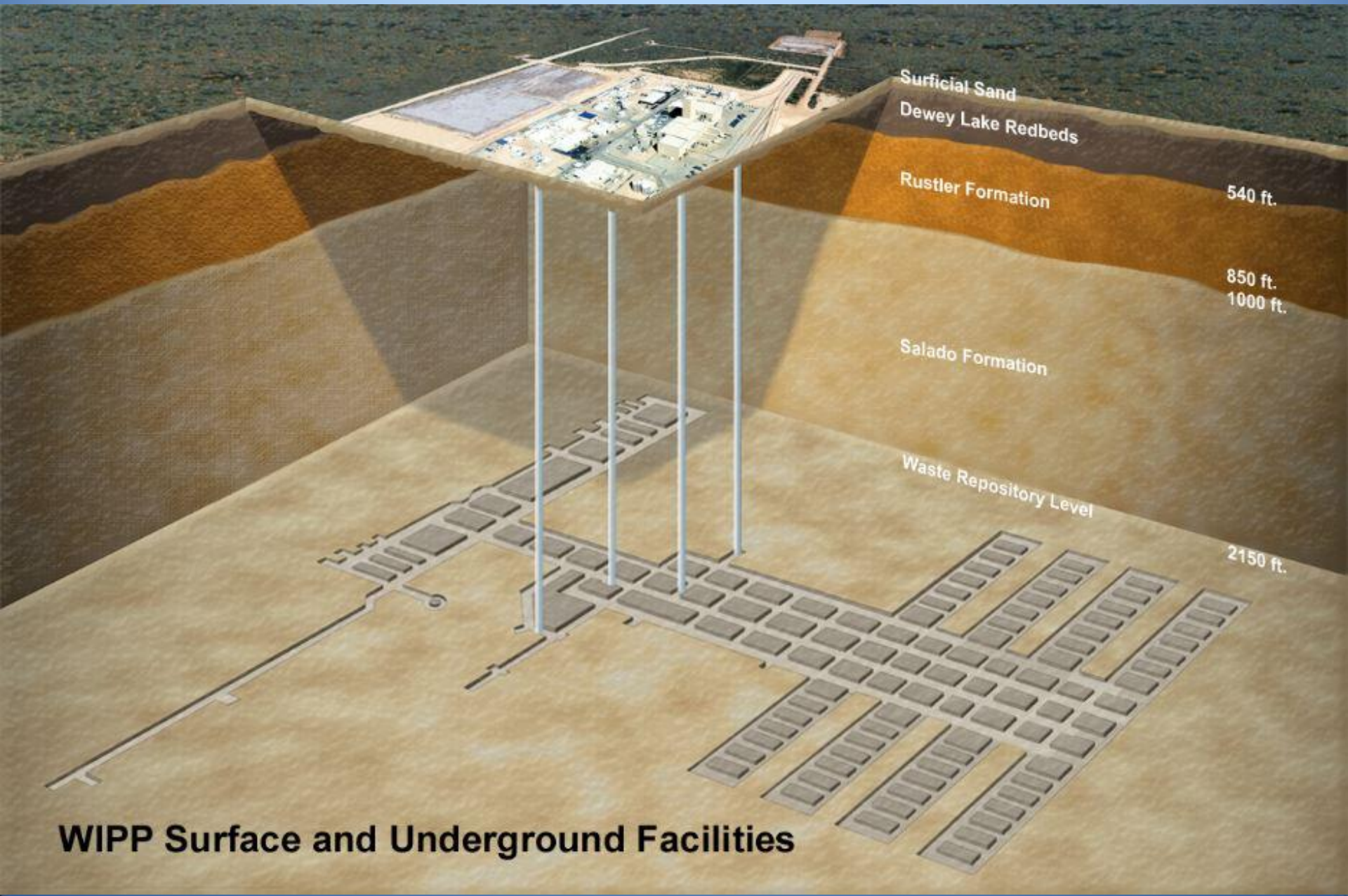
US DoE Yucca Mt.

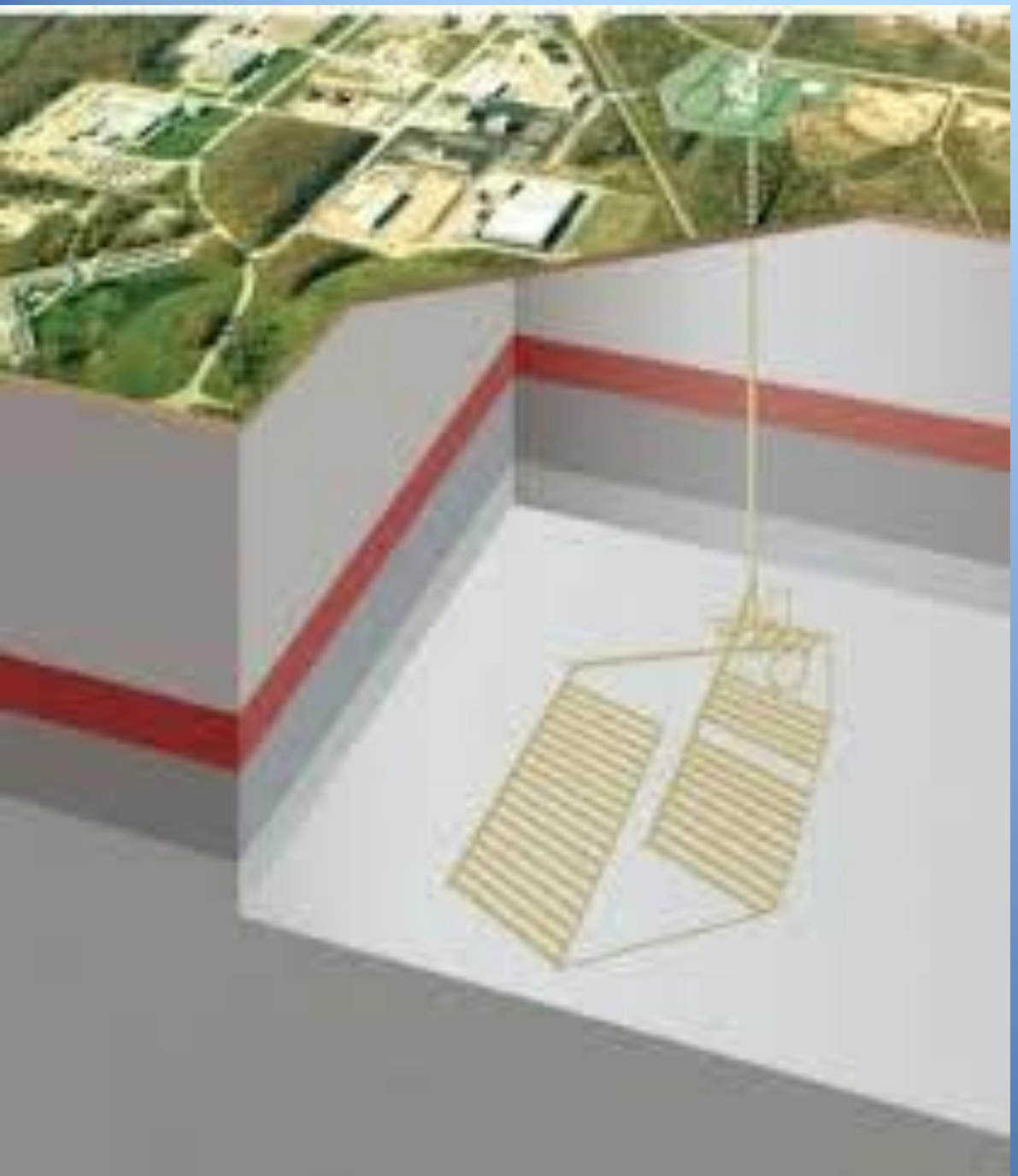


US DoE: WIPP Carlsbad NM.(2/3/12)



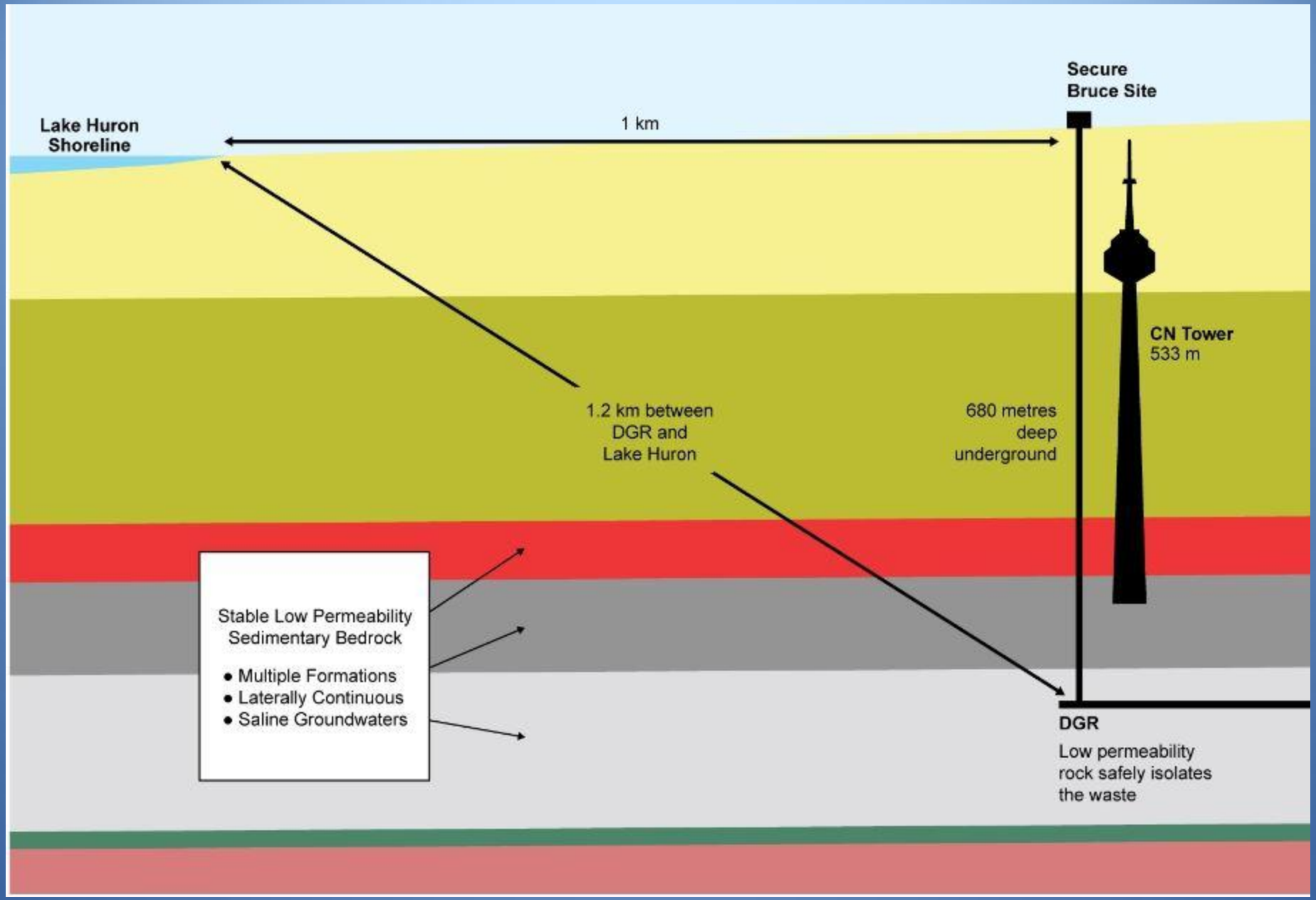
Waste Isolation Pilot Plant (Carlsbad NM)



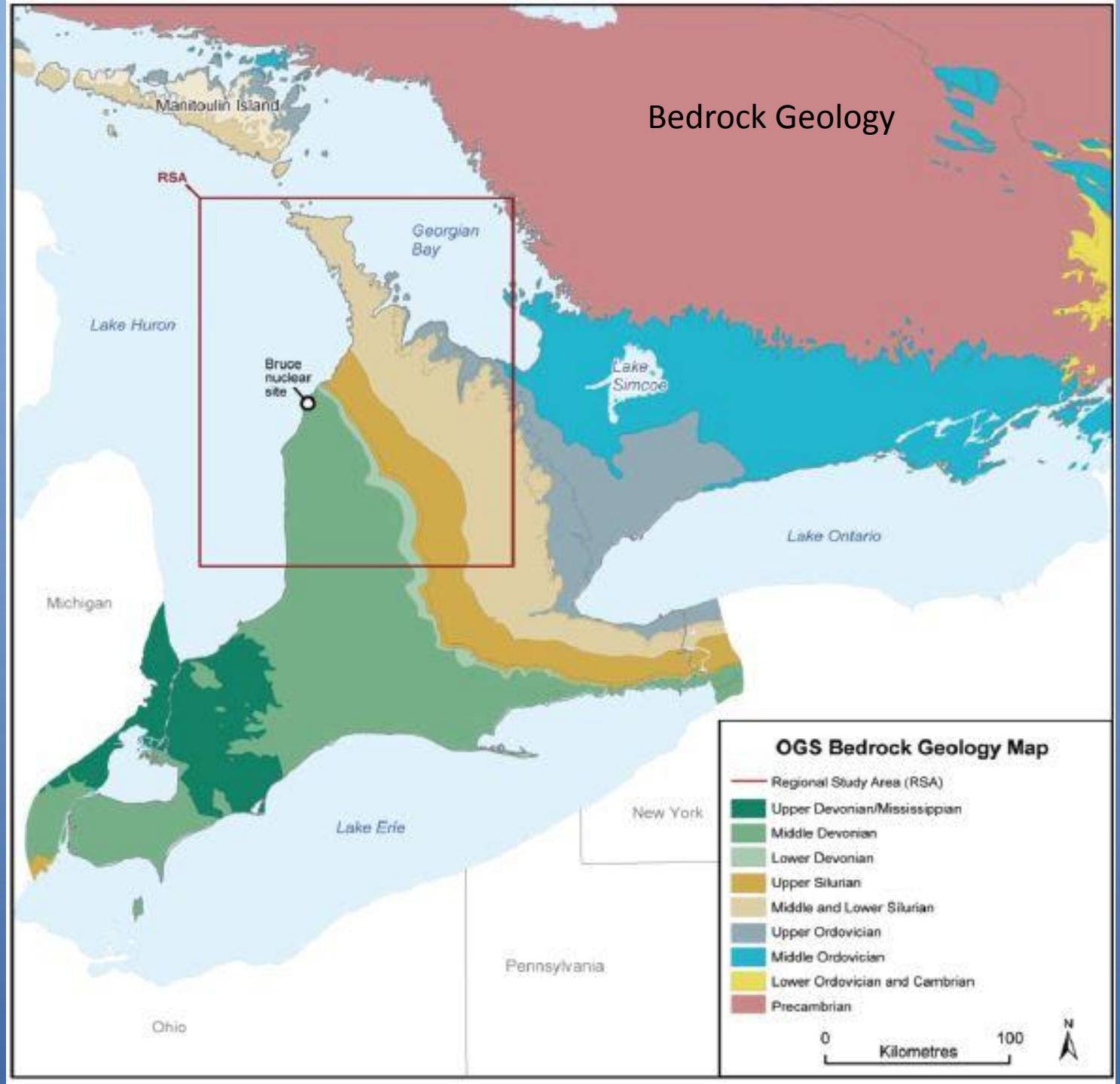


BRUCE Deep Geological Repository

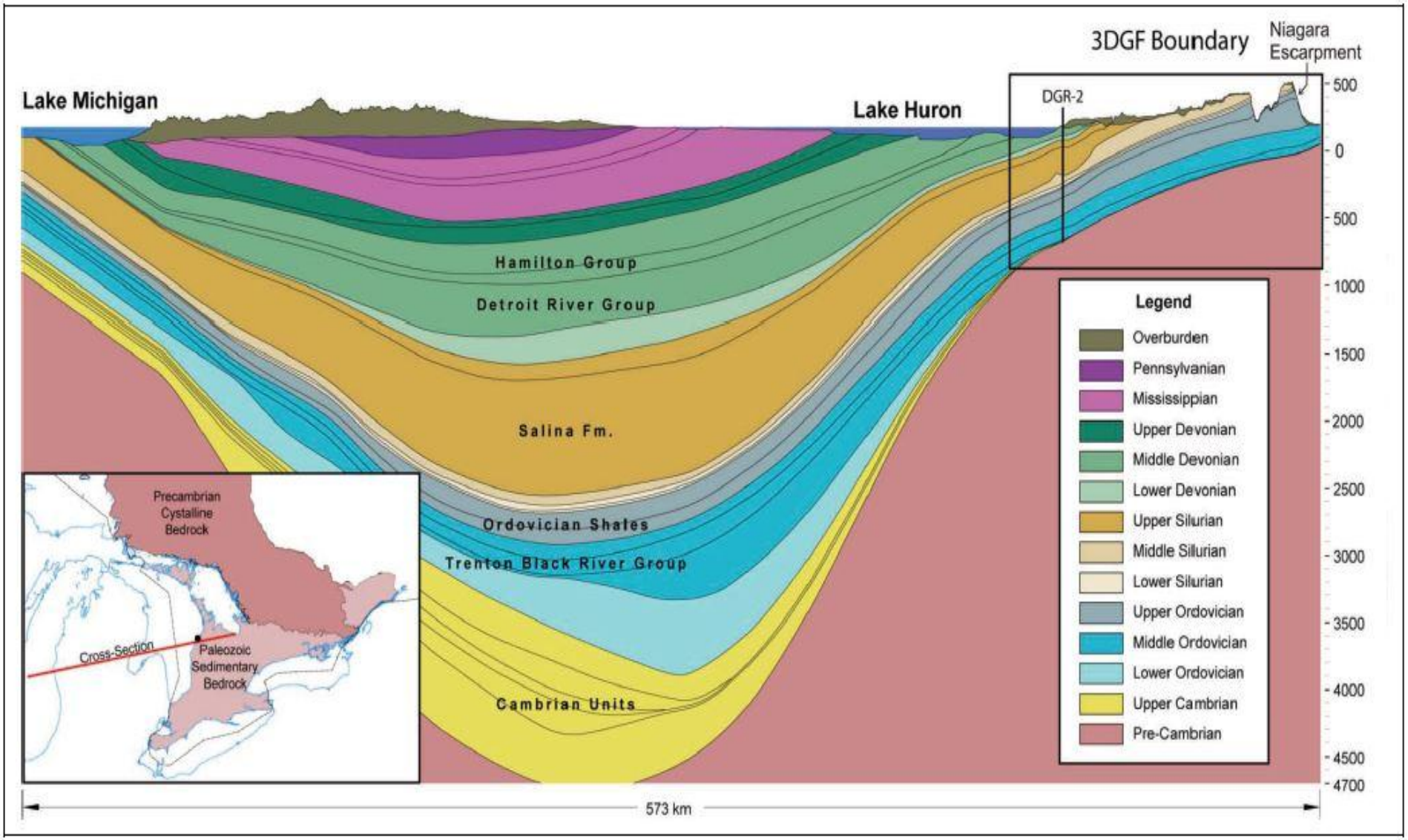
Deep Geological Repository

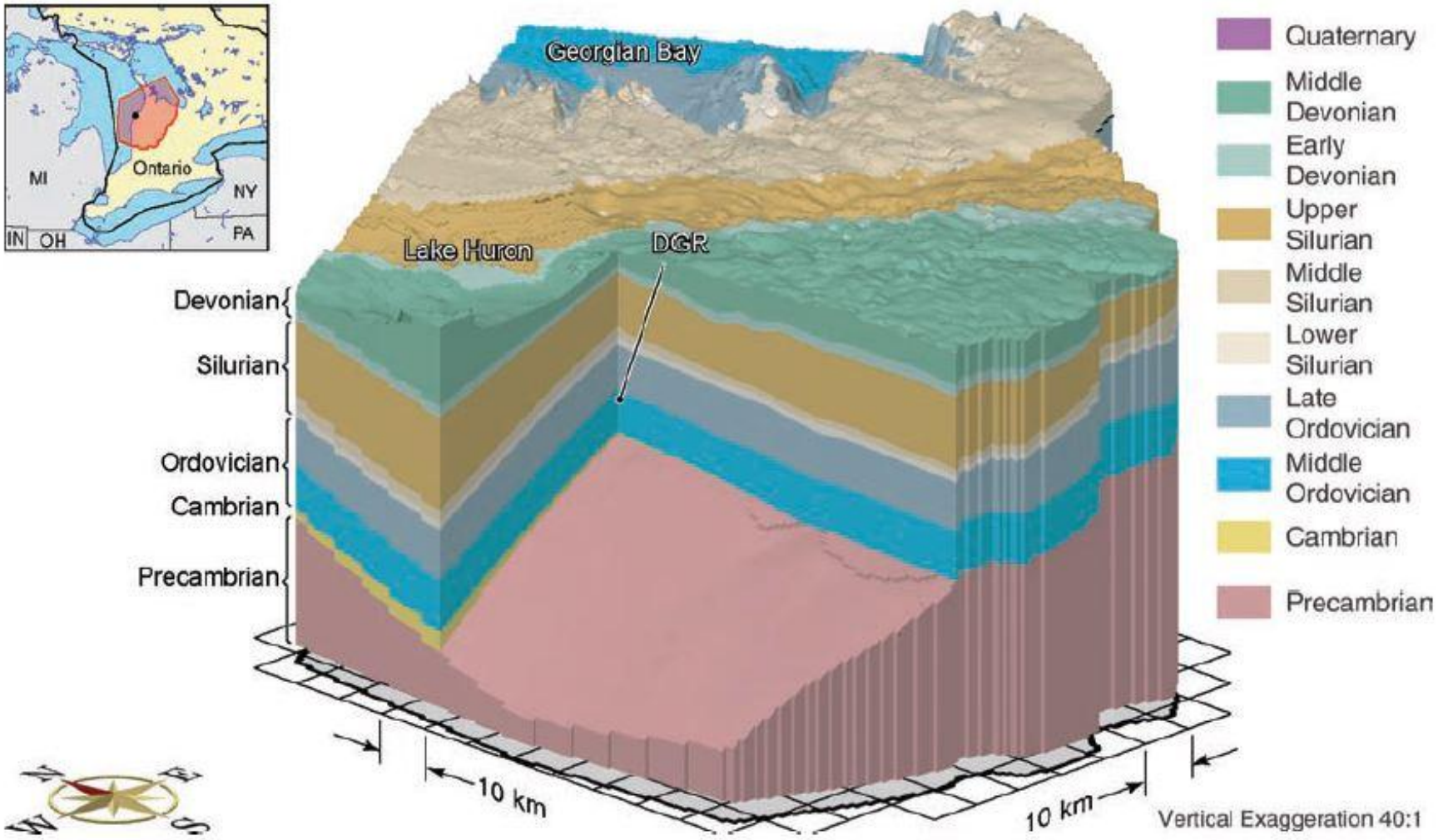

Secure
Bruce Site
Lake Huron
Shoreline
1 km
CN Tower
533 m
1.2 km between
DGR and
Lake Huron
680 metres
deep
underground
Stable Low Permeability
Sedimentary Bedrock
• Multiple Formations
• Laterally Continuous
• Saline Groundwaters
DGR
Low permeability
rock safely isolates
the waste

Bedrock Geology



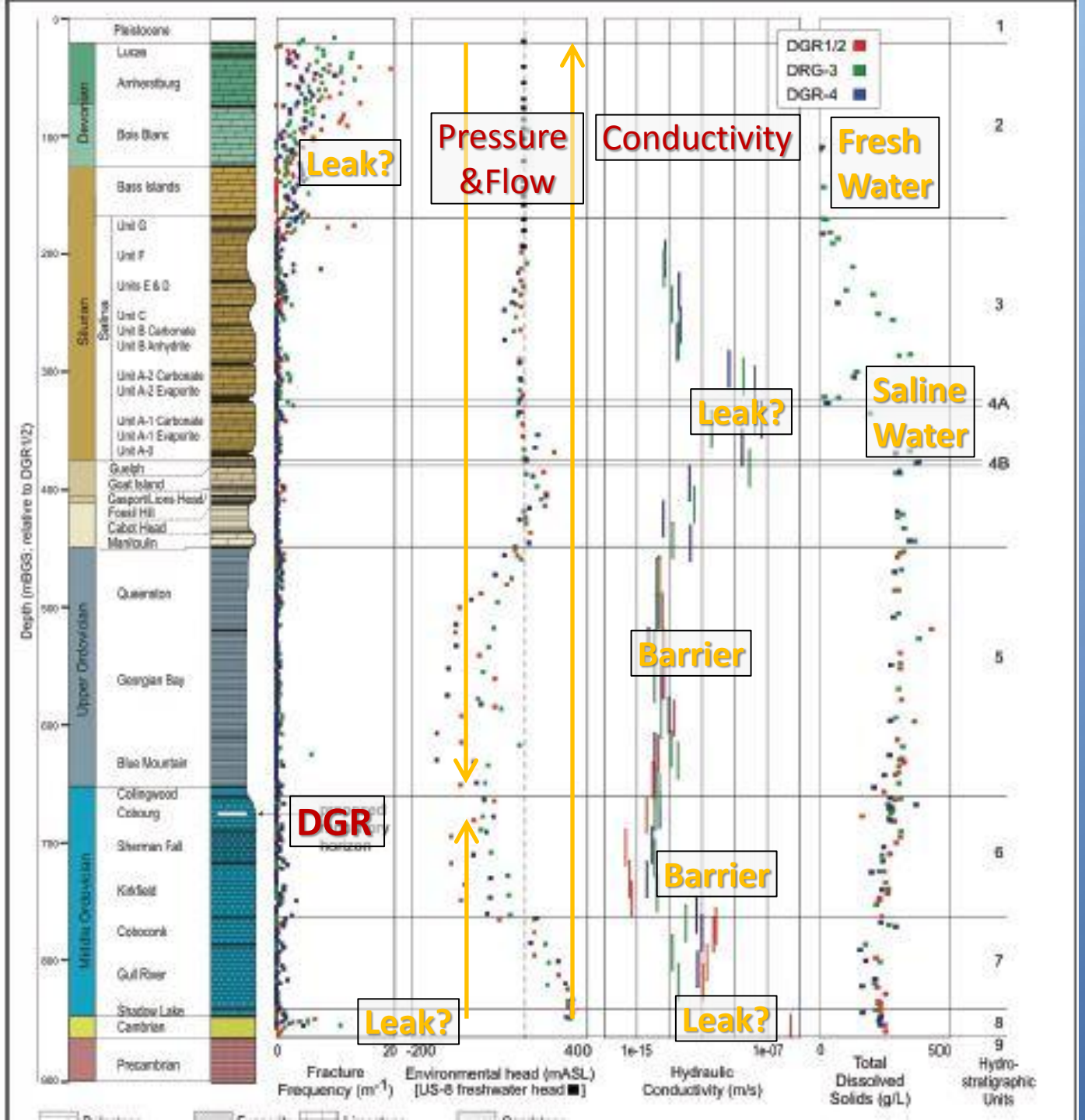
Geological Cross section



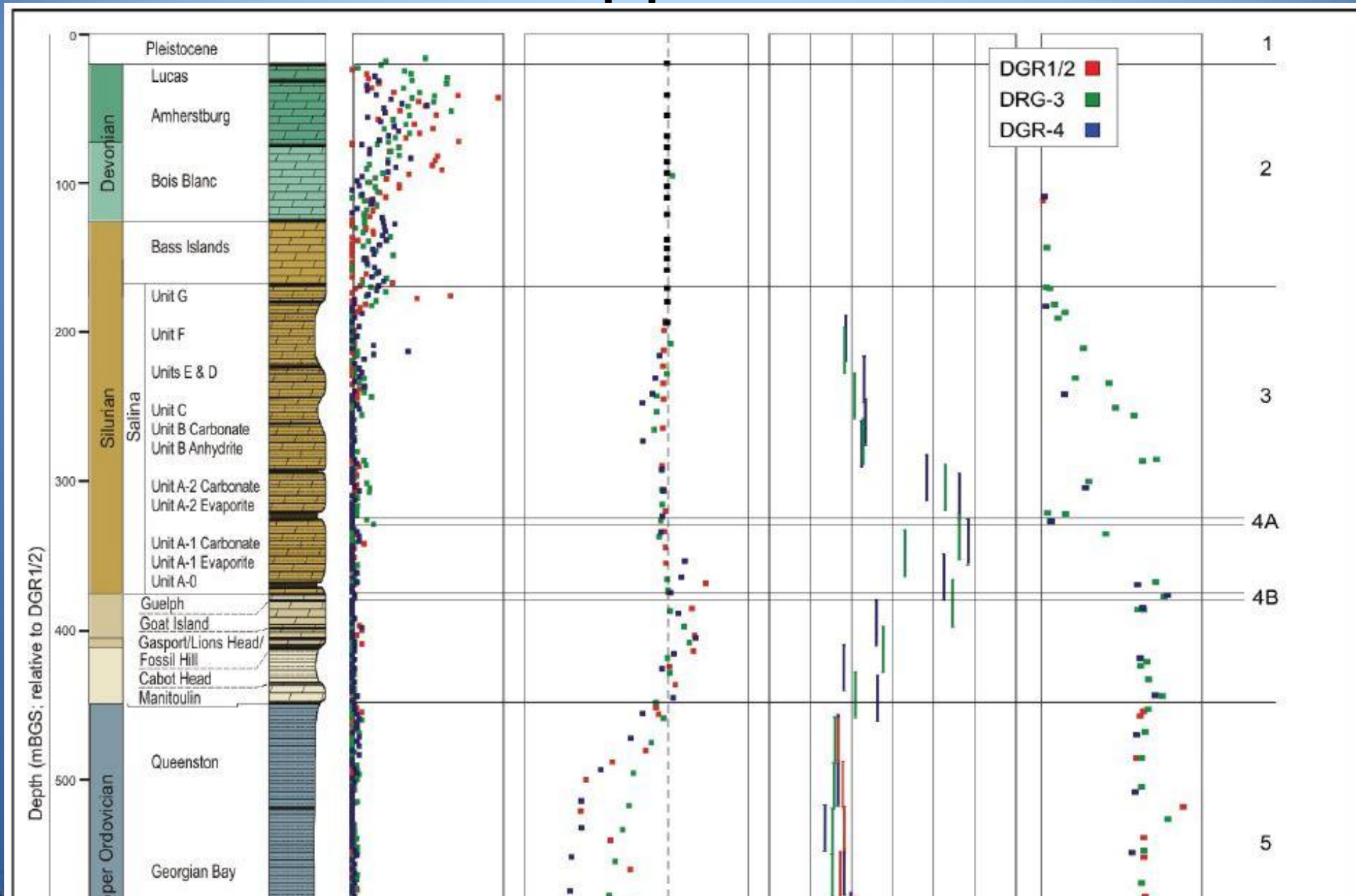


Notes: From Sykes et al. (2011).

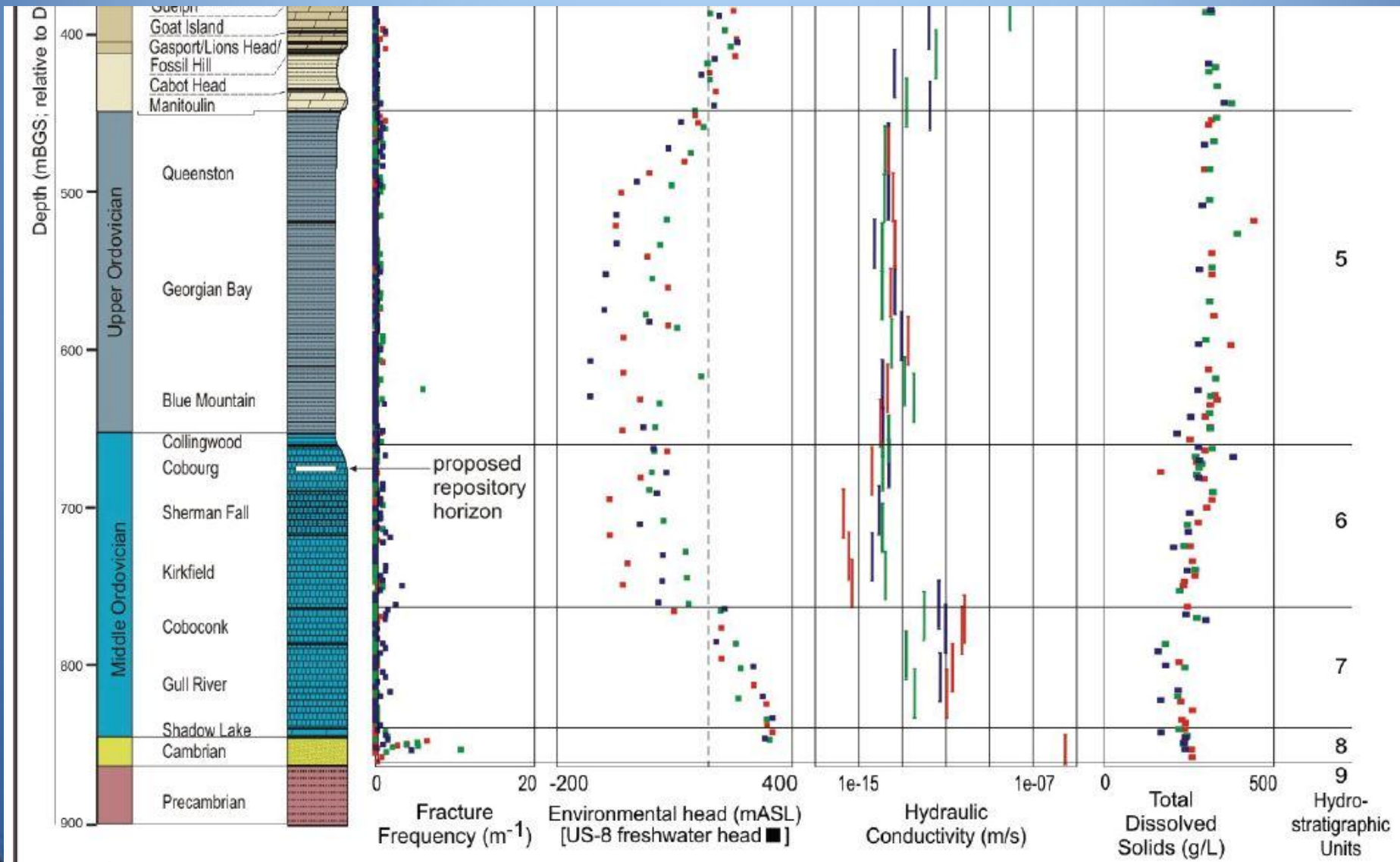
Figure 5.15: Block-cut View Showing Subcrop of the Bedrock Units Beneath Quaternary Drift Deposits for the Regional Modelling Domain


Leak?
Pressure &Flow
Conductivity
Fresh Water
DGR1/2
DRG-3
DGR-4
Leak?
Saline Water
Barrier
DGR
Barrier
Leak?
Leak?
Depth (mBGS; relative to DGR1/2)
Pleistocene
Lucas
Amherstburg
Bois Blanc
Bass Islands
Unit G
Unit F
Units E & D
Unit C
Unit B Carbonate
Unit B Anhydrite
Unit A-2 Carbonate
Unit A-2 Evaporite
Unit A-1 Carbonate
Unit A-1 Evaporite
Unit A-0
Guelph
Goat Island
Gasport/Lions Head
Fossil Hill
Cabot Head
Manitoulin
Queenston
Georgian Bay
Blue Mountain
Collingwood
Cobourg
Sherman Fall
Kirkfield
Coboconk
Gull River
Shadow Lake
Cambrian
Precambrian
Devonian
Silurian
Salina
Upper Ordovician
Middle Ordovician
Fracture Frequency (m-1)
Environmental head (mASL) [US-6 freshwater head]
Hydraulic Conductivity (m/s)
Total Dissolved Solids (g/L)
Hydro-stratigraphic Units

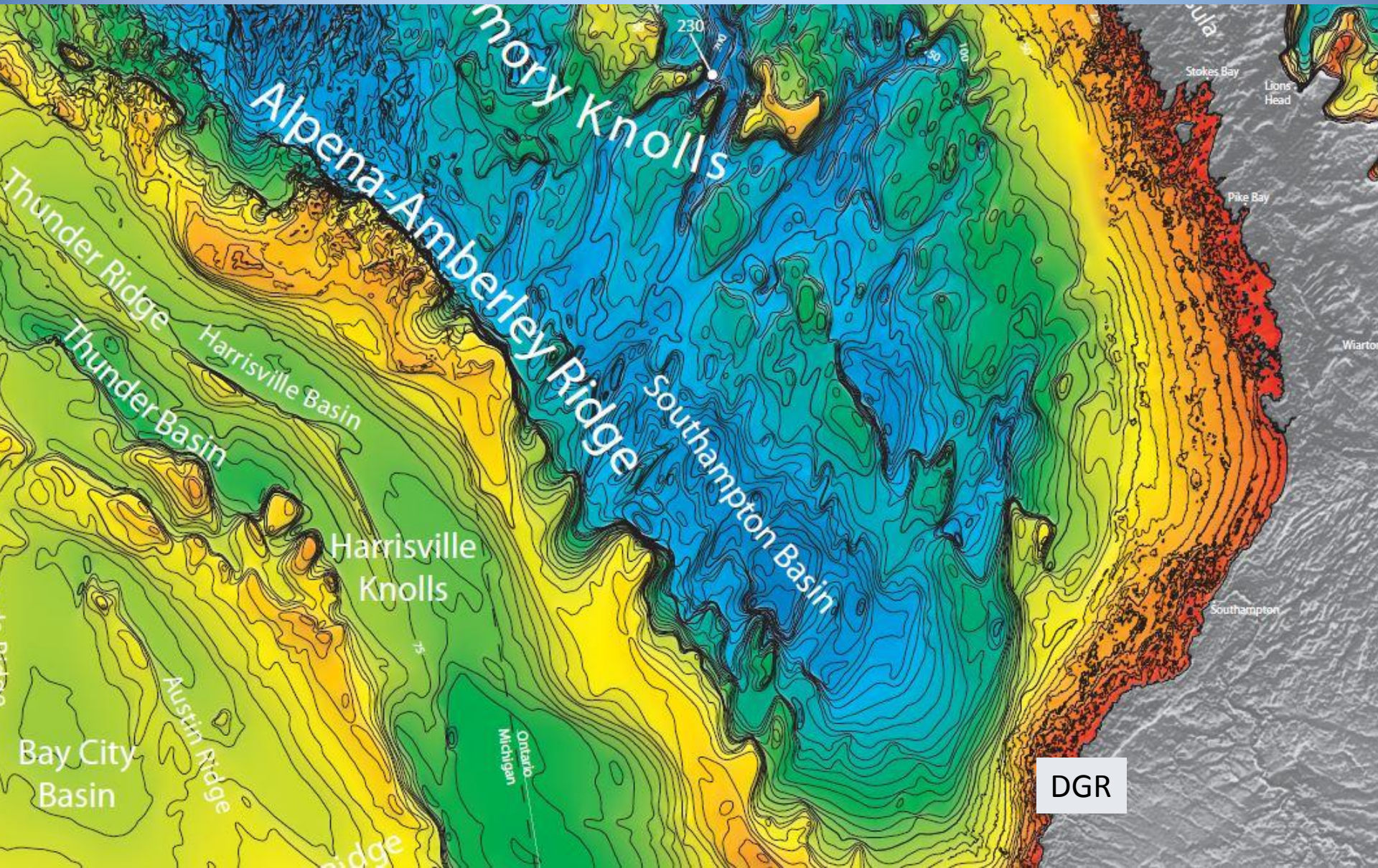
DGR Upper Section



DGR Lower section



Lake Huron Bathymetry



To be considered safe, a concept for managing nuclear fuel wastes must be judged, on balance, to:

Seaborn Criterion	DGR "Score"
1. demonstrate robustness in meeting appropriate regulatory requirements	A
2. be based on thorough and participatory scenario analyses;	B/C
3. use realistic data, modelling and natural analogues	B/B/C
4. incorporate sound science and good practices	B/C
5. demonstrate flexibility	C
6. demonstrate that implementation is feasible;	B
7. integrate peer review and international expertise	A

To be considered acceptable, a concept for managing nuclear fuel wastes must:

Seaborn Criterion	DGR "Score"
1. have broad public support	C
2. be safe from both a technical and a social perspective	B/D
3. have been developed within a sound ethical and social assessment framework	D
4. have the support of Aboriginal people	B?
5. be selected after comparison with the risks, costs and benefits of other options;	D
6. be advanced by a stable and trustworthy proponent and overseen by a trustworthy regulator	C

Positive attributes of DGR

- Real and present danger of status quo
- Ethical responsibility: our power, our waste
- Very favourable hydro/geology
- Minimal transport
- Secure site
- Momentum- active debate and research

Negative attributes

- Incomplete review- bias
  - There are potential engineering problems
- Sanguine assumptions & non critical testing
  - (not worst case)
- Poor social science vision
  - (error & dystopia)
- Weak oversight (CNSC)
- Promotional advocacy [critical scrutiny]

Conclusions

- Imbalanced adversarial process
- Lack of independent oversight
- Winner takes all
- Trojan horse (mission creep)
  - Decommissioning
  - International trade
  - Spent fuel
- Absence of informed debate
- Rejection of DGR will postpone action