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Modifications Implemented for the 2014 WIPP Compliance Recertification Application and their Impacts on Regulatory Compliance

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The Waste Isolation Pilot Plant (WIPP)

WIPP is a permanent disposal facility for transuranic (TRU) waste

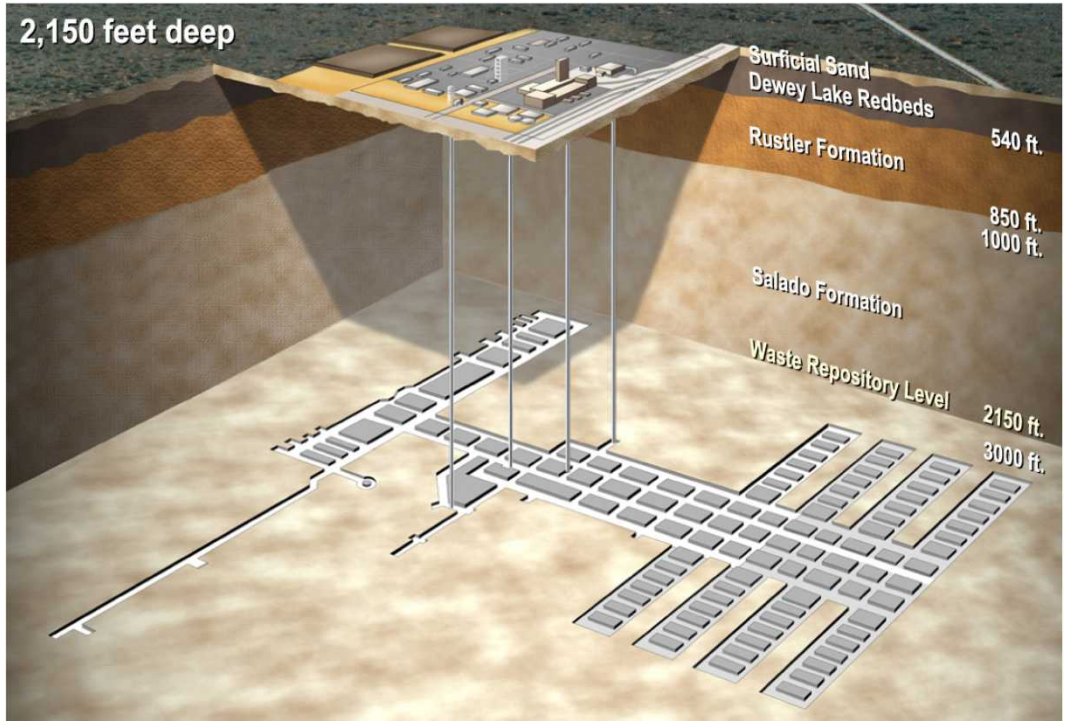
- Located in southeast New Mexico, USA

- Operated by U.S. Department of Energy (DOE)

- Regulated by U.S. Environmental Protection Agency (EPA)

- Waste is emplaced in a salt formation deep underground

- Regulatory compliance is demonstrated via Performance Assessment (PA)



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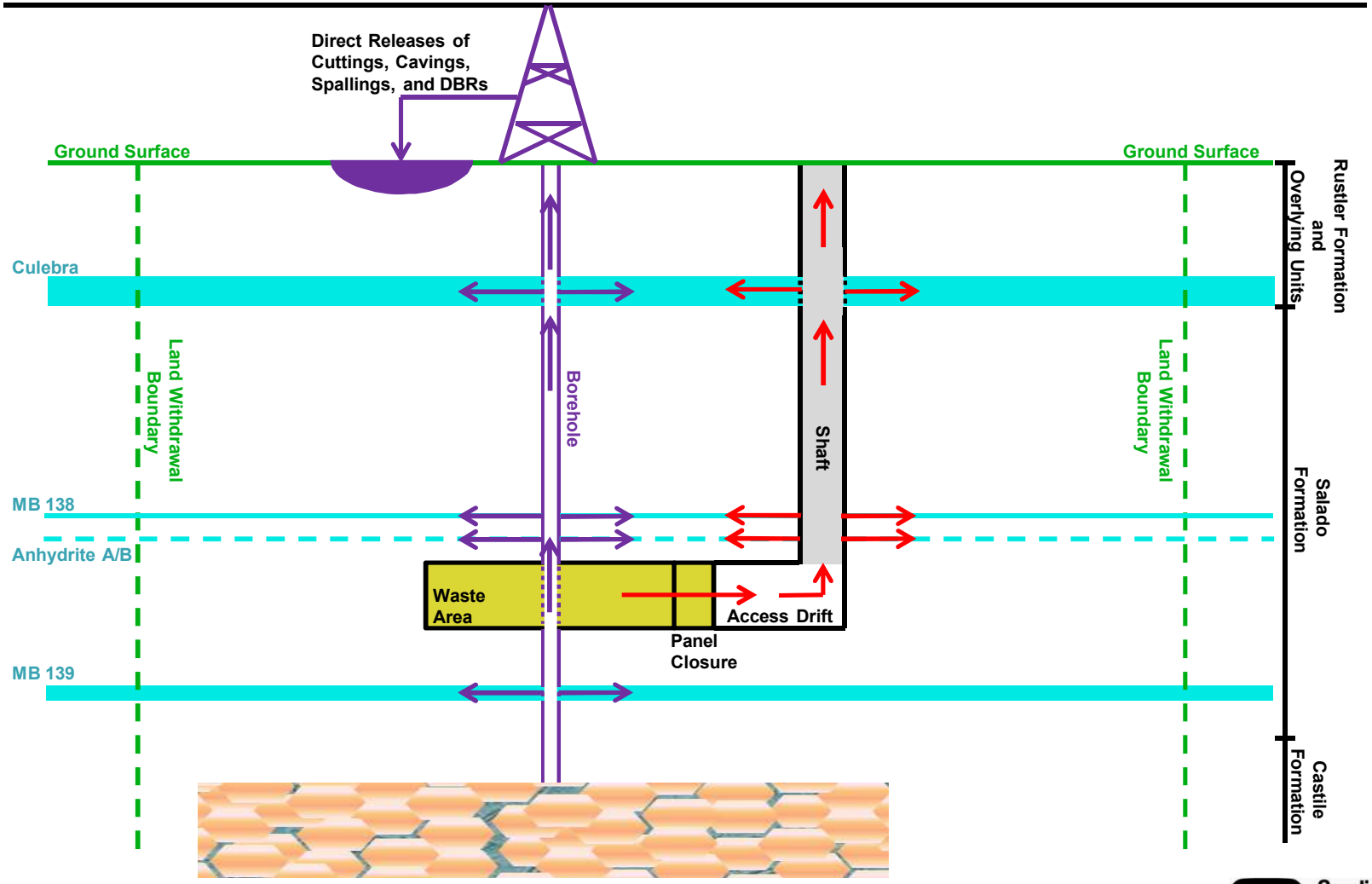
WIPP Long-Term Regulatory Requirements

- Regulatory requirements guide the WIPP PA framework.
  - The WIPP must be designed to provide *reasonable expectation* that *cumulative releases* of radionuclides to the accessible environment for *10,000 years* after disposal from all *significant processes and events* shall be less than specified *release limits*

WIPP Regulatory Requirements

- Reasonable expectation: regulations acknowledge substantial uncertainties
- 10,000 years: PA must predict behavior for entire regulatory time period
- Significant processes and events: PA must include all of these, including the possibility of human intrusion

Release Pathways



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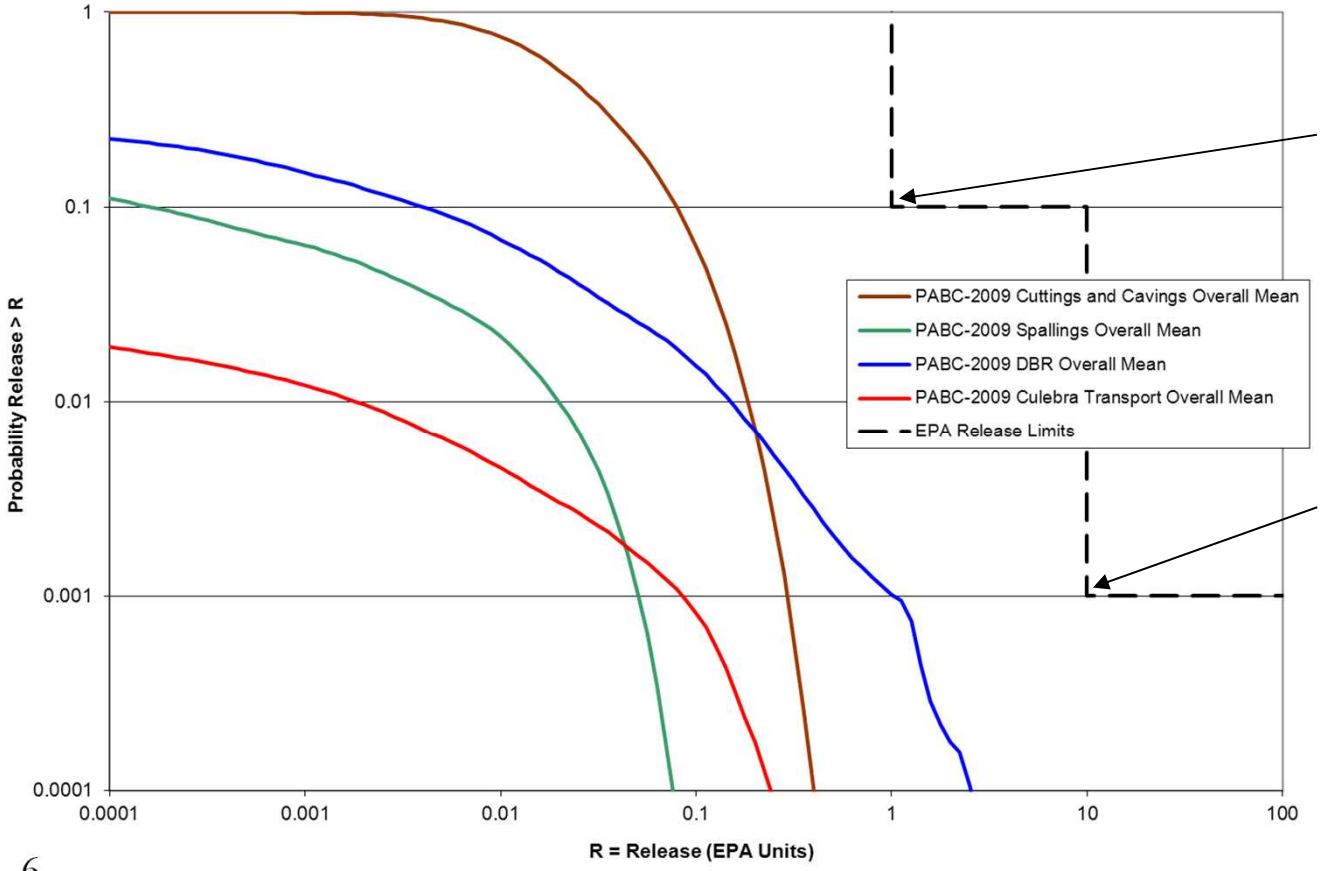
The CCDF is the Measure of Compliance

Each Release Component is Quantified by a Complementary Cumulative Distribution Function (CCDF)



Less than 1 chance in 10 of exceeding 1 EPA unit

Less than 1 chance in 1000 of exceeding 10 EPA units

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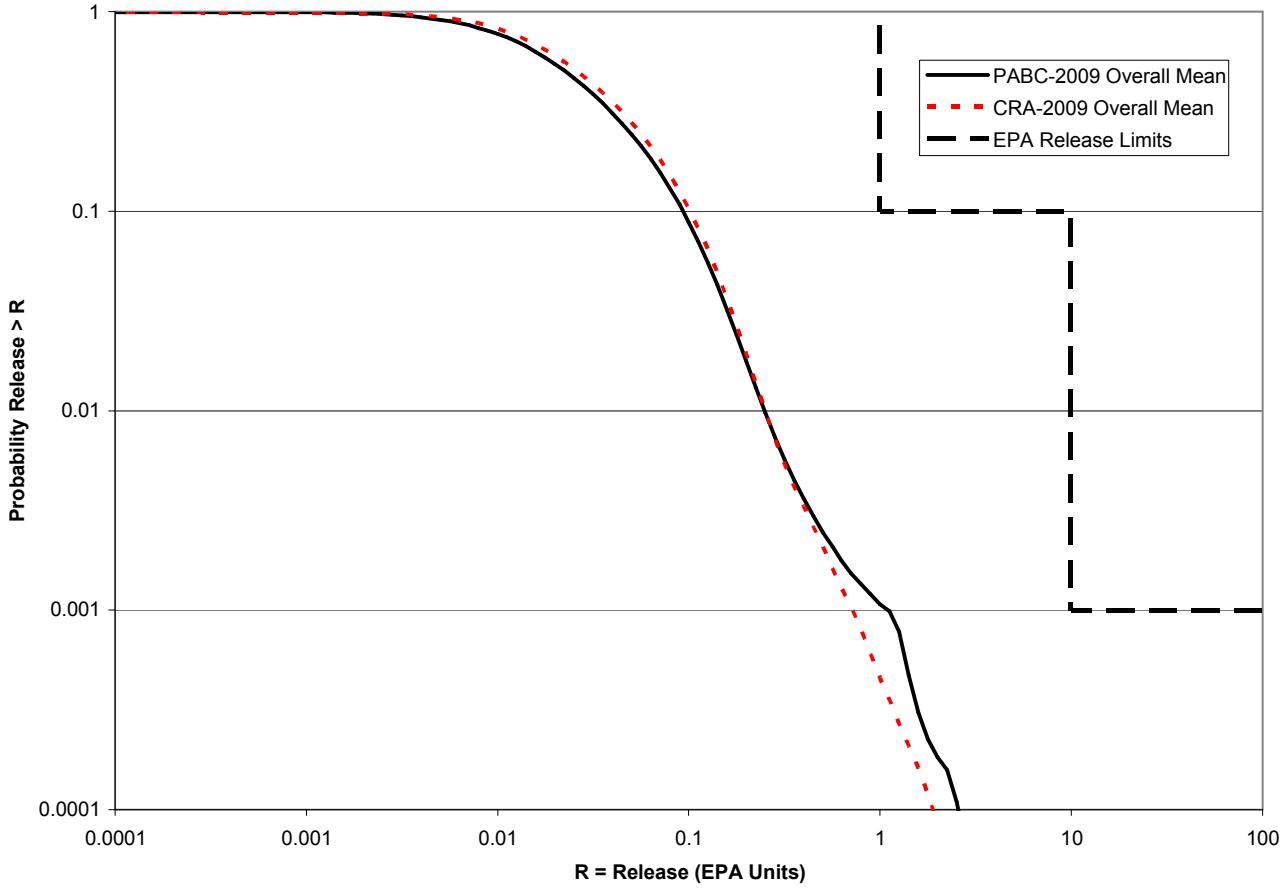
Total Release CCDF

Total releases from the repository are compared to regulatory release limits to determine compliance.



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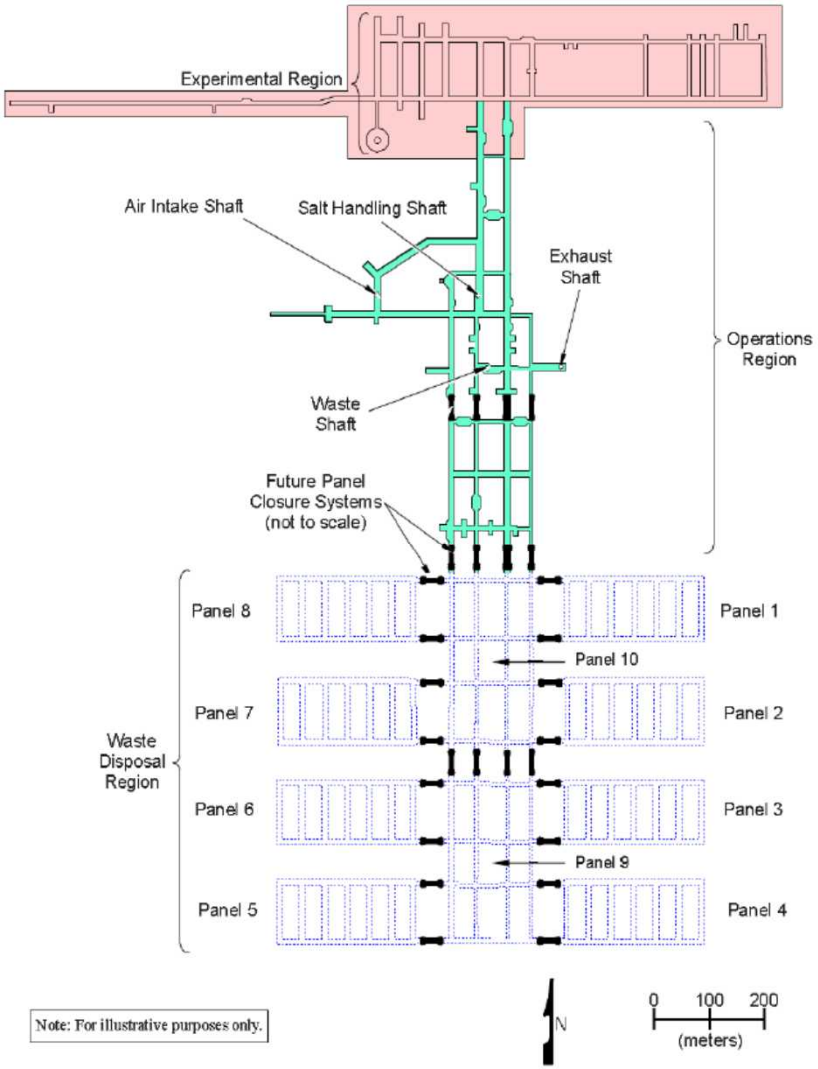
WIPP Recertification

Federal regulations require that the WIPP be recertified every five years following the first waste shipment of 1999.

- The current regulatory baseline is that established by the 2009 Performance Assessment Baseline Calculation (PABC-2009).
- The 2014 Compliance Recertification Performance Assessment (CRA-2014 PA) demonstrates continued compliance of the WIPP with federal containment requirements.
- A number of changes/refinements are included in the CRA-2014 PA (e.g. incorporate new data and experimental results).

Panel Closure Redesign



- WIPP panel closures have been represented in PA since the original 1996 Compliance Certification Application.
- The DOE submitted a Planned Change Request to the EPA to formally request a change to the approved design.
- The panel closure design was changed to a Run-of-Mine Panel Closure System (ROMPCS), with approval via a federal rulemaking process.

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ROMPCS Evolution

The ROMPCS is modeled as having short-term and long-term characteristics, with properties based on three time periods

- 0 to 100 years: Emplaced ROM salt undergoes some re-consolidation with no impact on surrounding salt rock.
- 100 to 200 years: ROMPCS continues to re-consolidate with no impact on surrounding salt rock.
- 200 to 10000 years: ROMPCS is re-consolidated and the surrounding salt rock is healed.

Waste Shear Strength

The waste shear strength is the ability of waste to resist erosion, and is one of the most important parameters in WIPP PA.

Cuttings and cavings are the dominant release mechanism. Cavings volumes are a function of waste shear strength.

SNL vertical flume experimental facility and the data obtained therein enabled a refinement to the waste shear strength parameter.

Surrogate degraded waste samples were used to determine lower value of shear strength uncertainty range

Iron Corrosion

Corrosion of iron generates gas, increasing repository pressures.

Repository pressure directly impacts spallings and direct brine releases. Higher repository pressures typically translate to higher releases.

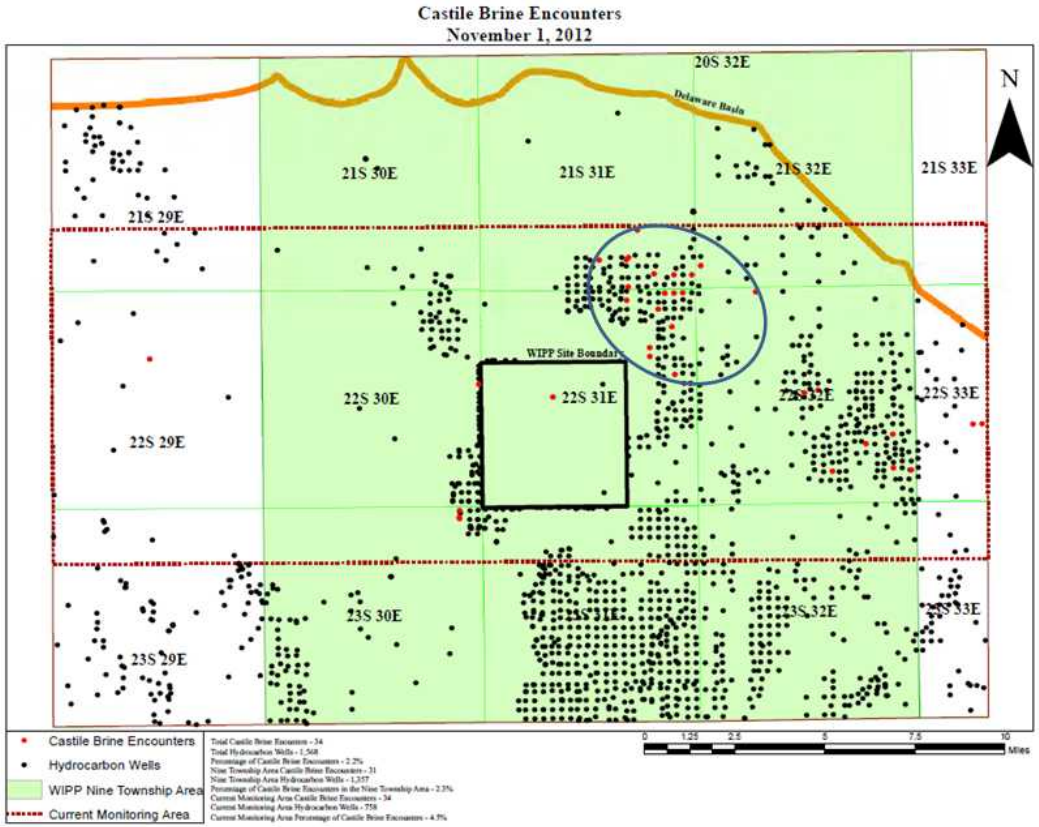
Steel coupon samples were used at SNL Carlsbad to experimentally determine iron corrosion rates

Iron corrosion experiments were performed over a number of years

Experimental results enabled a refinement to the gas generation rate used in WIPP PA, resulting in lower repository pressures on average

Pressurized Brine Encounters

WIPP PA includes intrusion scenarios that model borehole drilling through the repository and into underlying pressurized brine.



Underground regions of pressurized brine have been encountered at the WIPP site. Brine inflow to the repository can increase direct brine releases.

New data and analyses enabled a refinement to the probability of encountering pressurized brine in the CRA-2014 PA.

Direct brine releases were reduced as a result.

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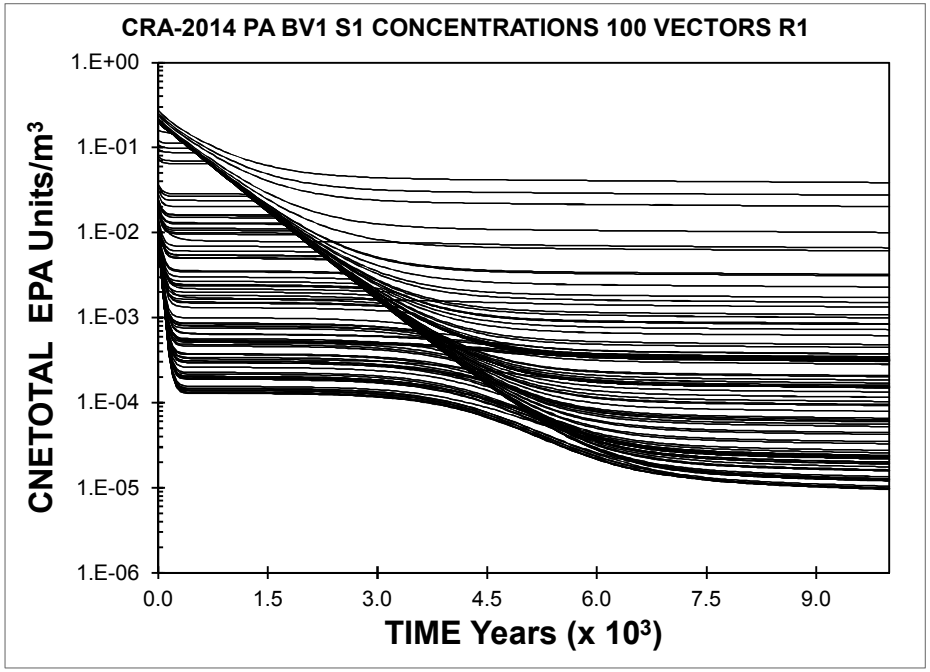
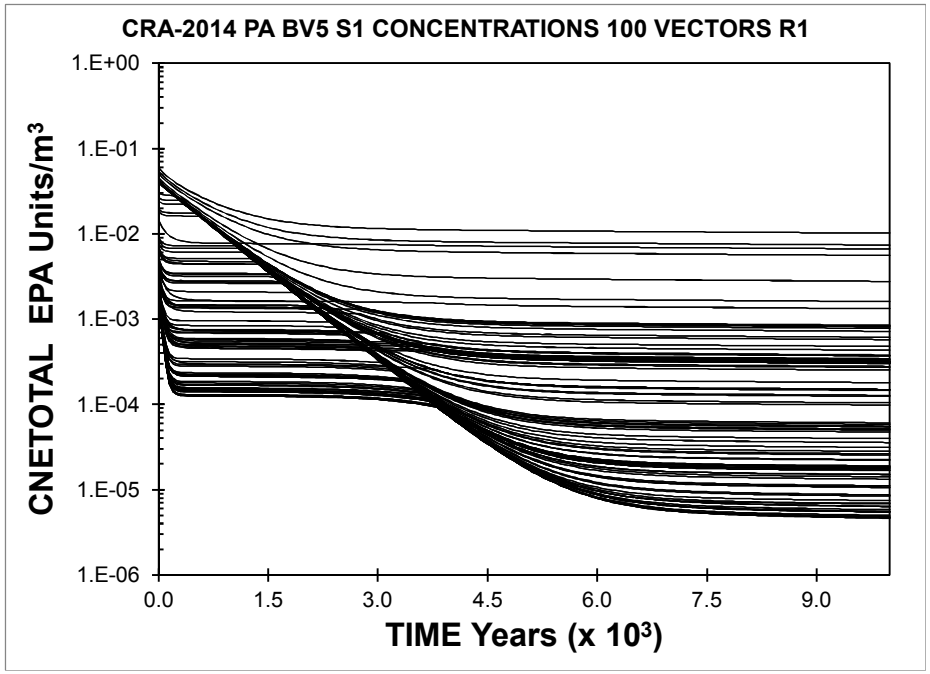
Radionuclide Concentration Dependence on Repository Brine Volume

Radionuclide concentrations in brine are more directly dependent on the repository brine volume.





Total mobilized radionuclide concentrations decrease as brine volumes increase.

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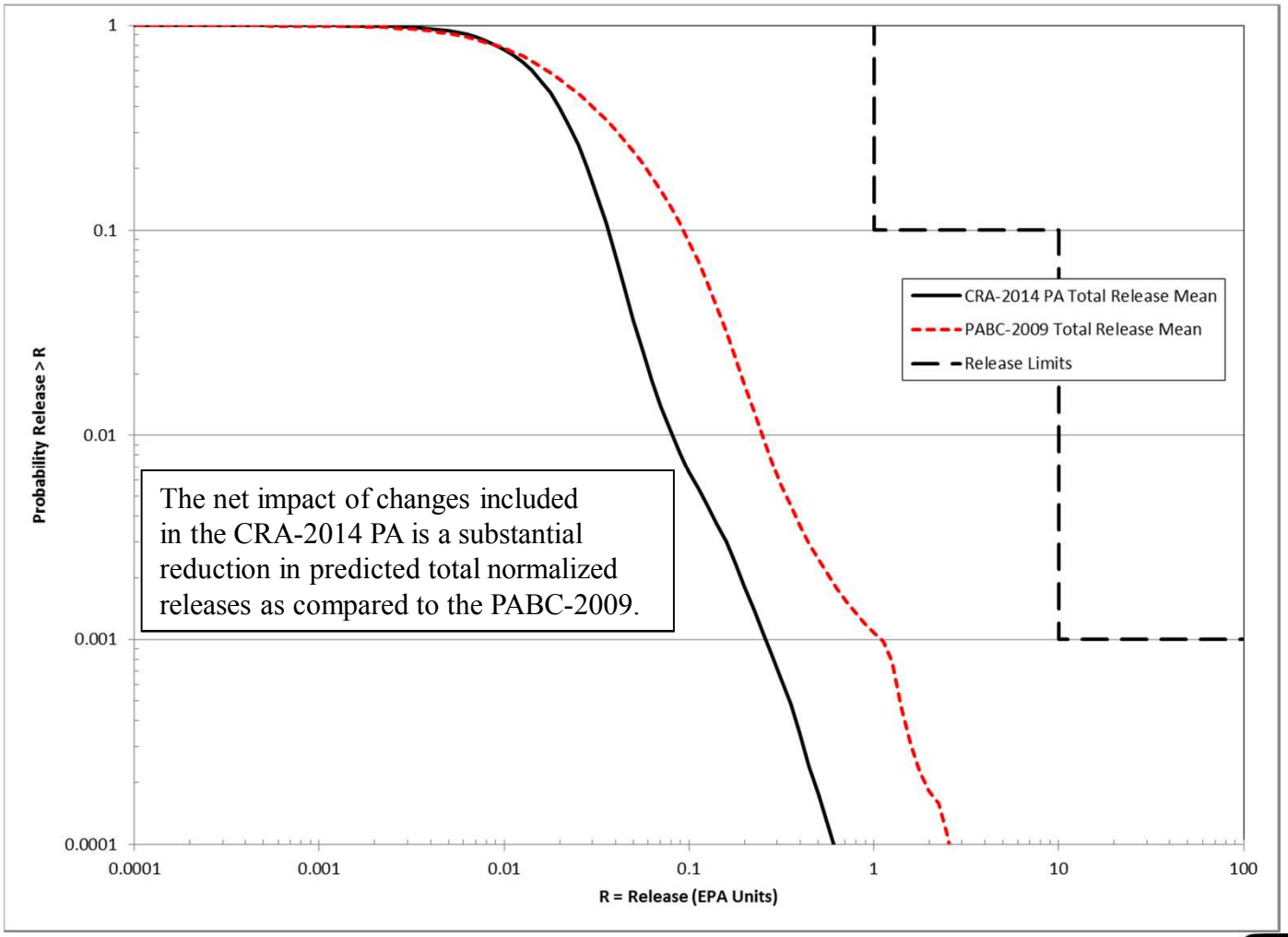
CRA-2014 PA Main Result



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Conclusions and Status

- The CRA-2014 PA demonstrates continued regulatory compliance of the WIPP.
- All completeness questions posed by the EPA as part of their review of the CRA-2014 PA have been addressed.
- The EPA has mandated two sensitivity studies be performed that investigate compliance impacts resulting from modified parameters (see Brad Day's paper and presentation).
- A supplemental Performance Assessment Baseline Calculation is scheduled to begin toward the end of 2016.