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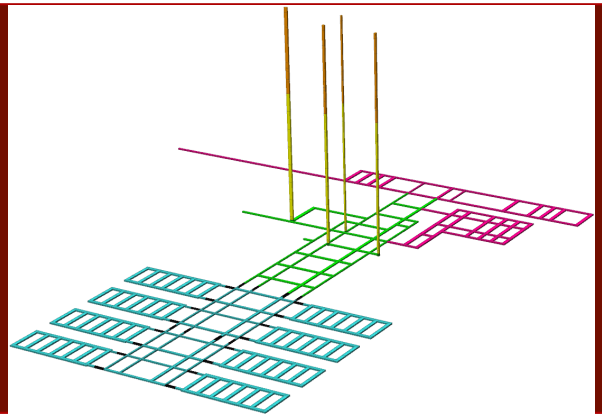

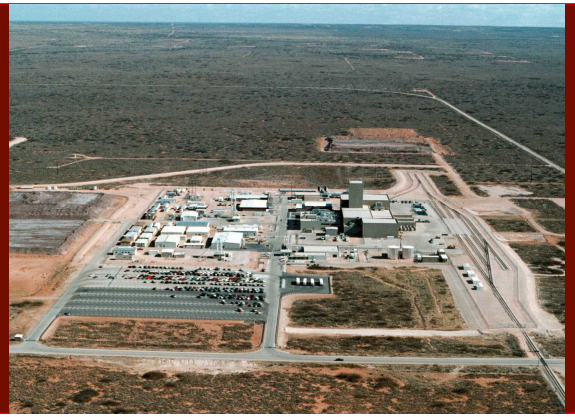

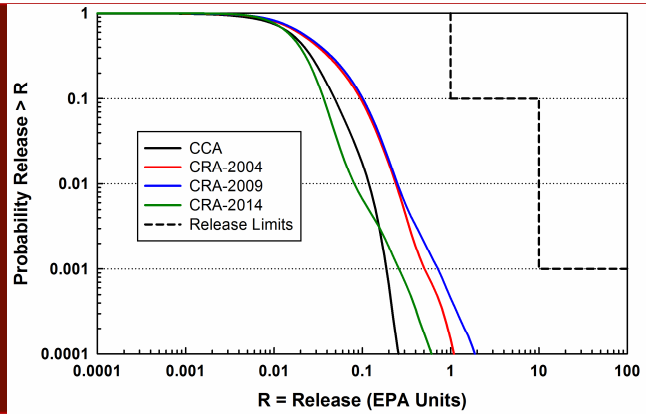

PFLOTRAN Code Development for Waste Isolation Pilot Plant Performance Assessment

Sean Dunagan

Expansion of WIPP Disposal Capacity Workshop
October 25, 2017

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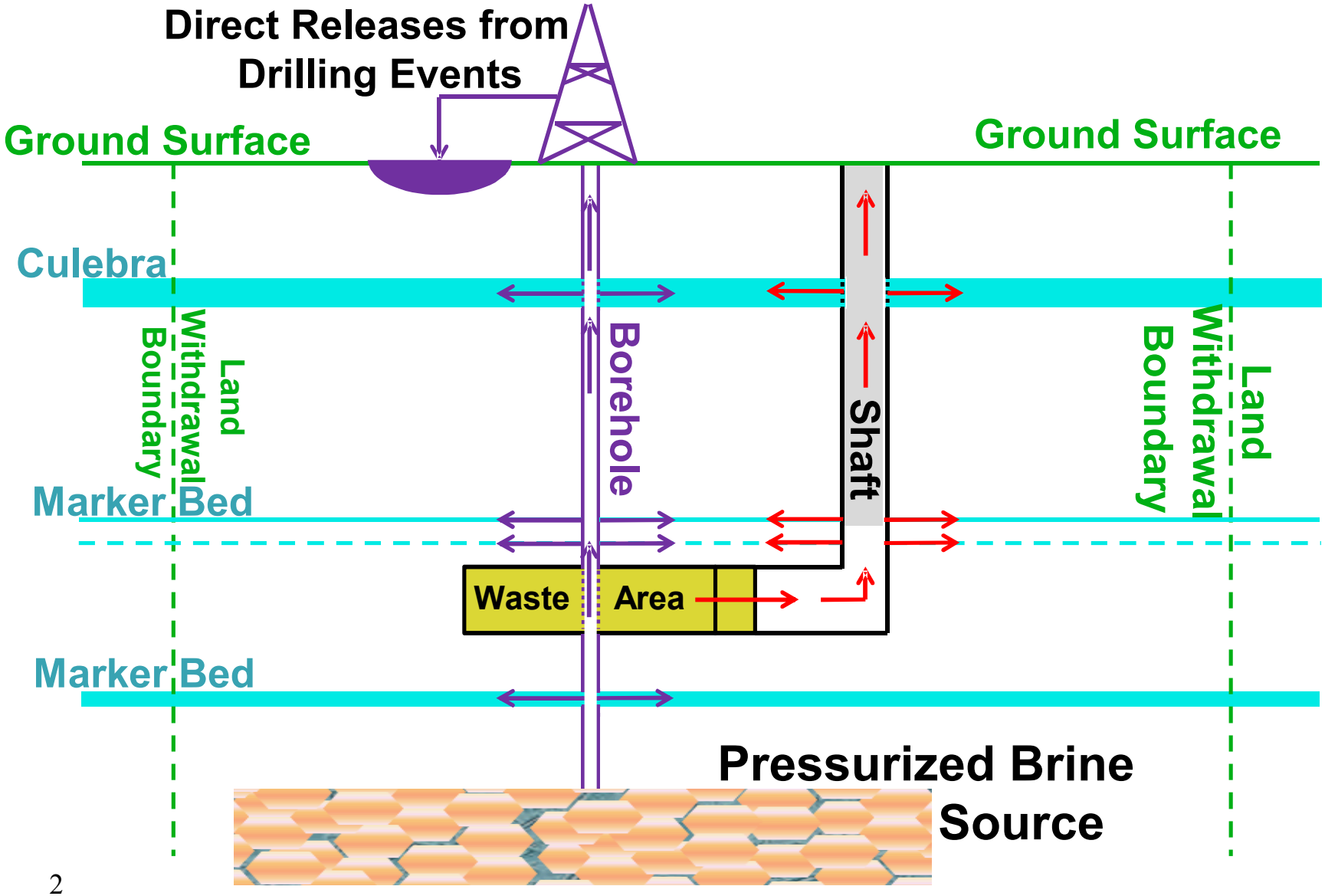
Release Pathways in WIPP PA

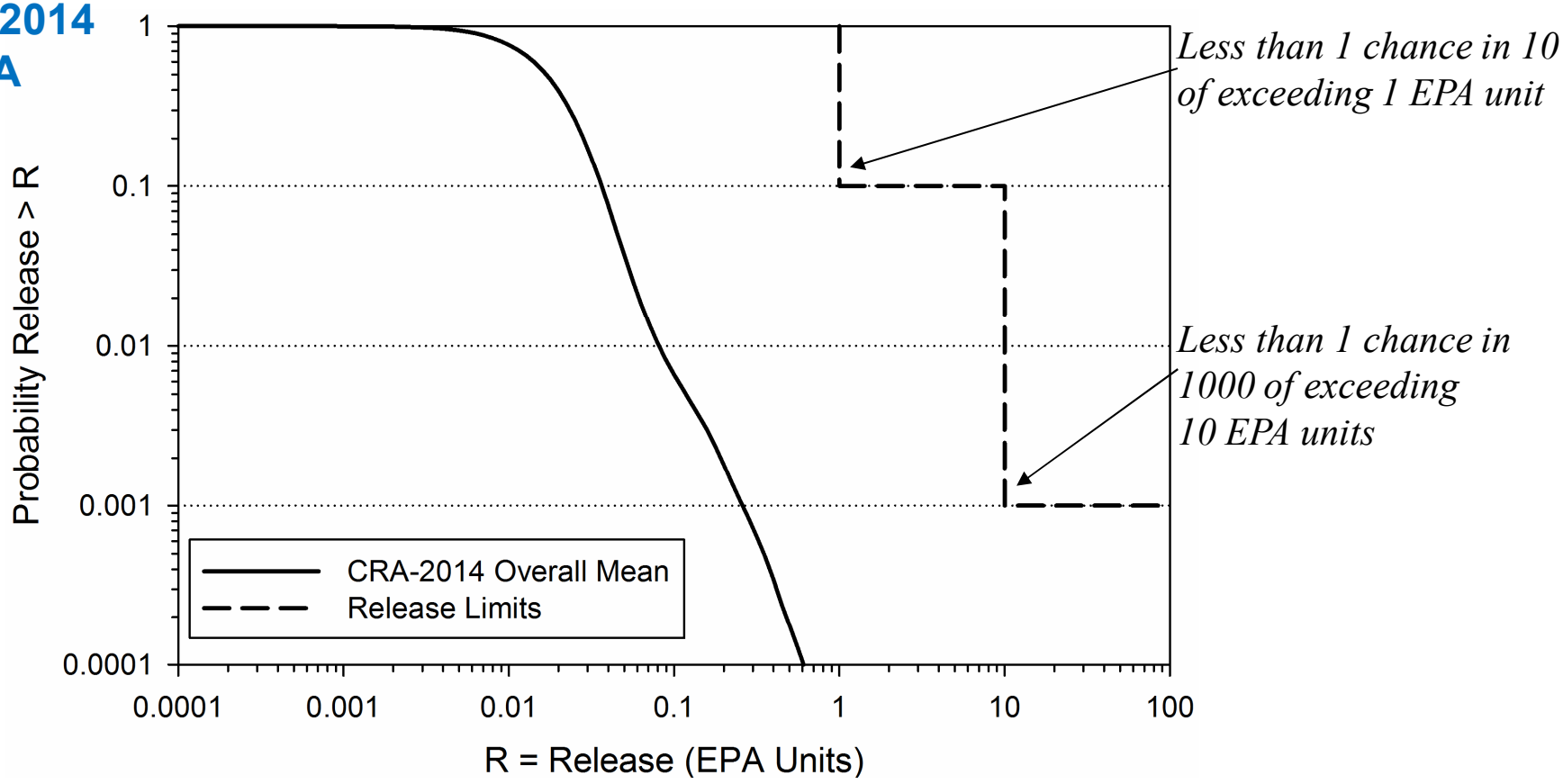


Total Release CCDF is the Measure of Compliance for Performance for EPA Regulations

Sandia National Laboratories

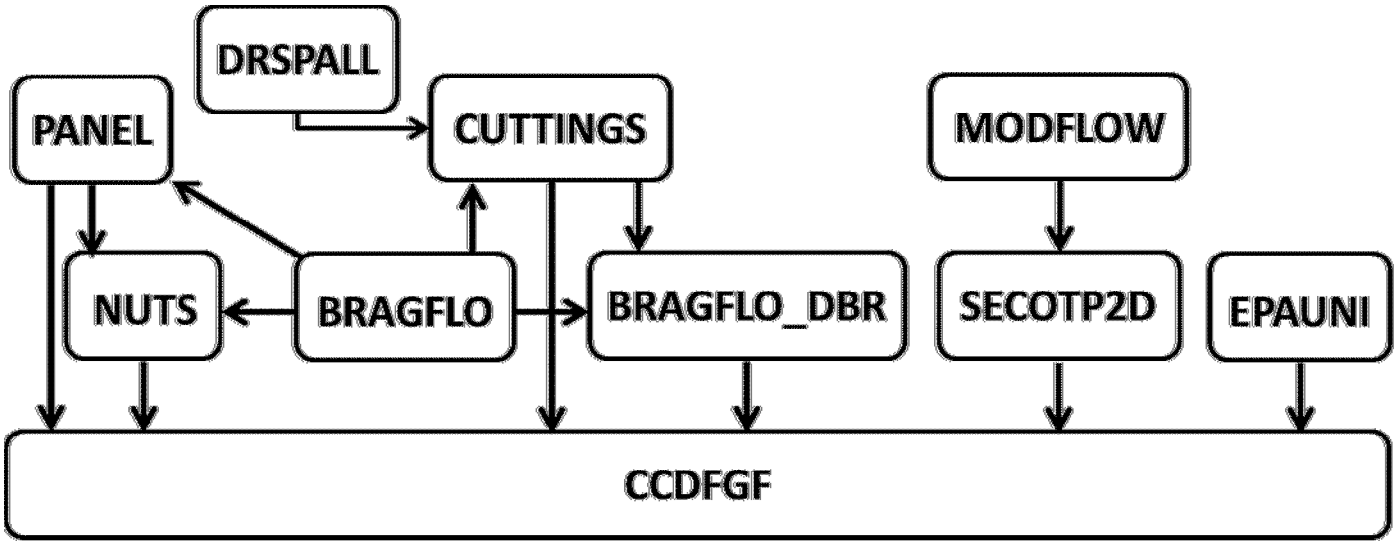
Total releases from the repository are compared to regulatory release limits to determine compliance via a Complementary Cumulative Distribution Function (CCDF).

CRA-2014 PA



WIPP Performance Assessment

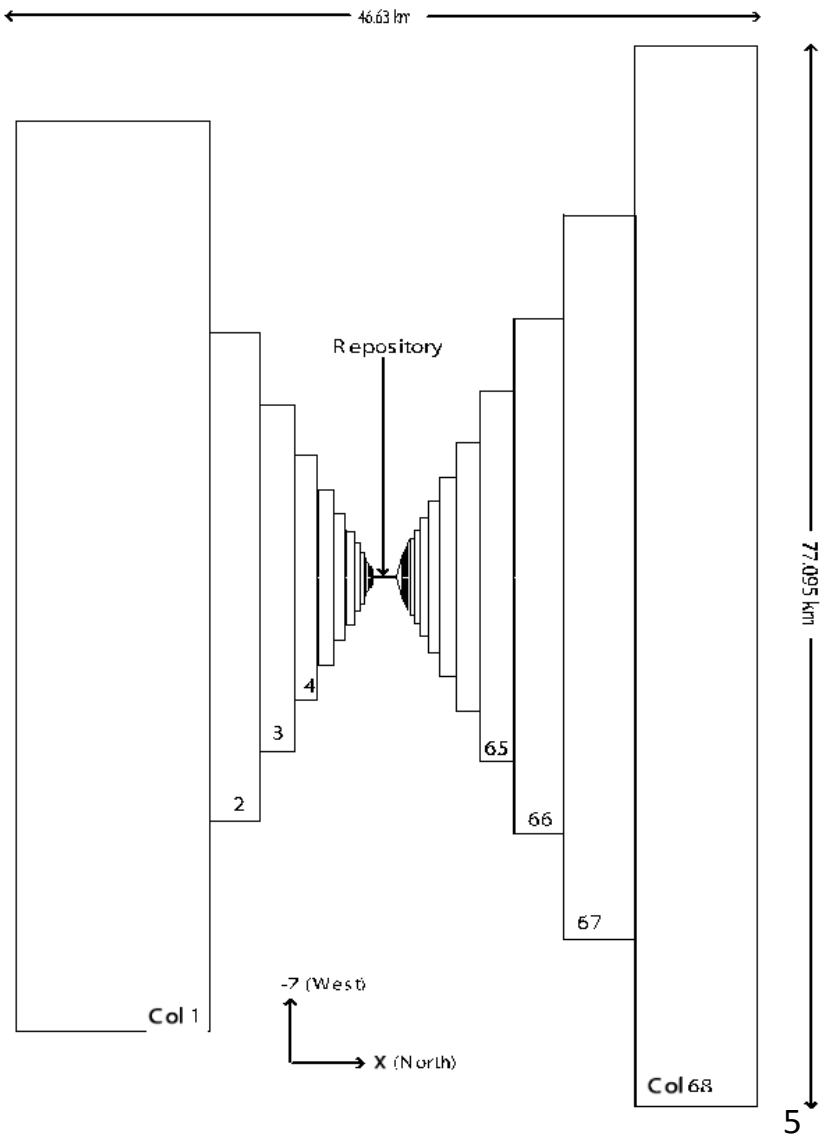
- PA calculations cover 24 peer-reviewed conceptual models
- PA codes include 10 principal codes and many utility codes



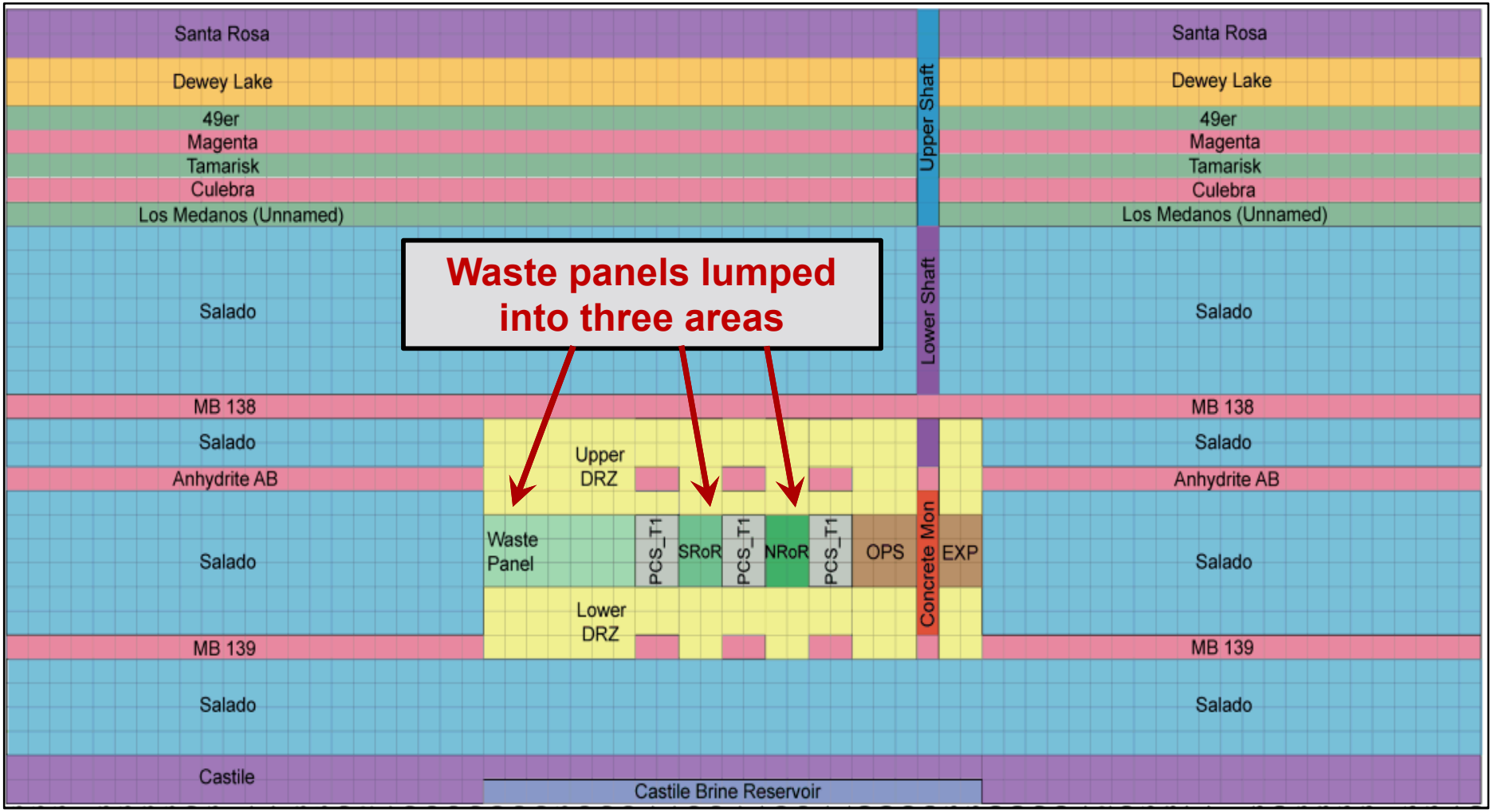
2-D Representation of Repository

Current 2-D "Flared" Grid (top view of repository)

- Approved for use in Compliance Certification Application (CCA)
- Shown to give similar results to a 3-D representation using BRAGFLO
- Rectangular Grid Flaring
  - Applicable to flow represented as divergent/convergent from the center of flaring (i.e., radial concentric flow)
  - Accounts for all of the volume surrounding the repository
- Relies on (approximately) symmetric repository layout



2-D Representation of Repository

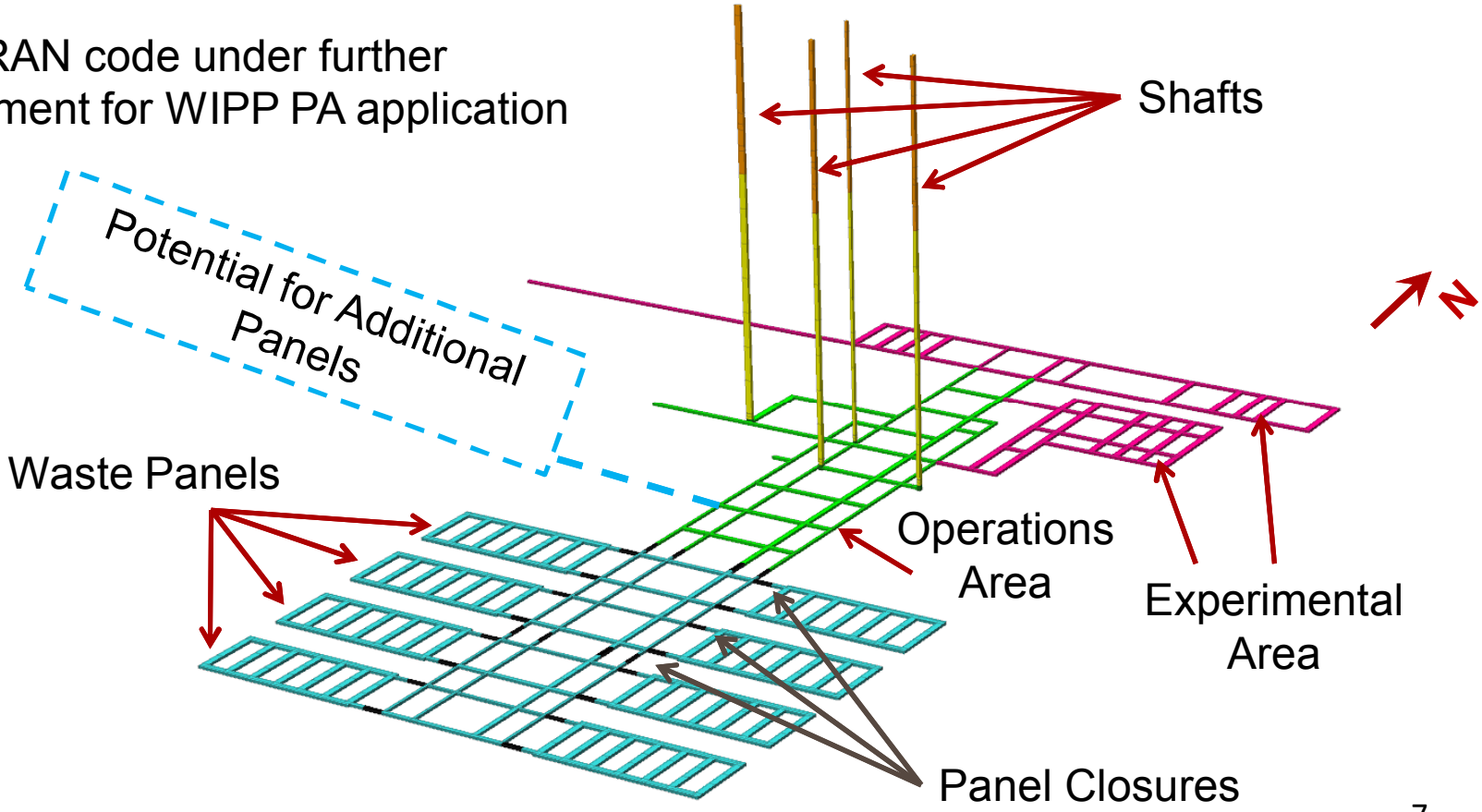


Current 2-D Grid (cross-sectional view)

- Used by BRAGFLO code
- Two-phase flow (brine and gas)

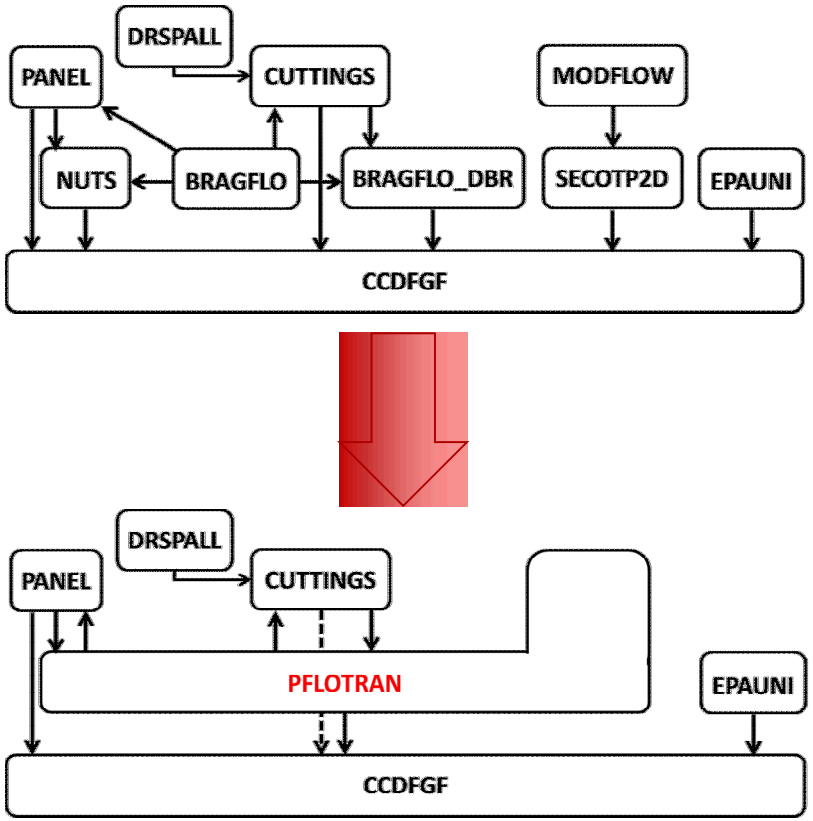
Potential for Asymmetric Layout

- Potential for additional waste panels challenges the radial concentric flow assumption implicit in the 2-D rectangular flared grid
- PFLOTRAN code under further development for WIPP PA application

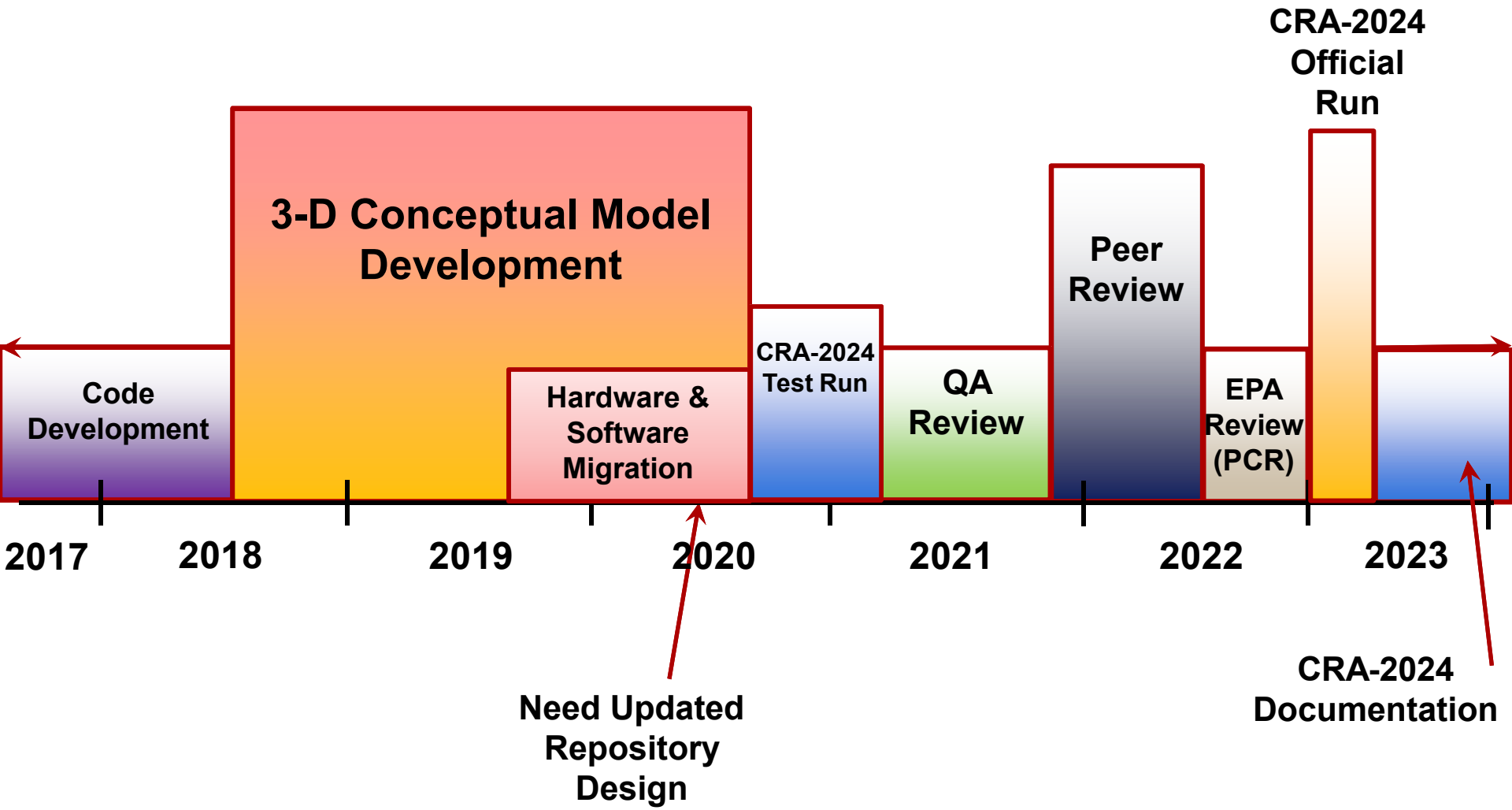


Long-term Approach to Code Integration

- Implementation of WIPP-specific process models
  - Gas generation, creep closure, etc.
- Quantify impact of 2-D→3-D
- Development of 3-D grid and 3-D conceptual model
- Formal reviews
  - EPA review
  - Peer review
- Use in Compliance Recertification 2024 PA (CRA-2024 PA) (and beyond…)



3-D Capability Development Timeline



Questions