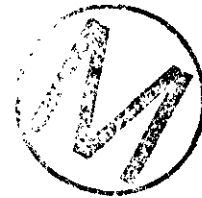


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**Title 40 CFR Part 191  
Compliance Certification  
Application  
for the  
Waste Isolation Pilot Plant**

**MASS Attachment 16-2**



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**INFORMATION ONLY****Conceptual Model Description for BRAGFLO Direct Brine Release  
Calculations to Support the Compliance Certification Application**

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**July 9, 1996**

**Model Purpose**

This model has been developed to support the Direct Brine Release portion of the 1996 performance assessment (PA) of the WIPP repository site. The calculations will be performed to contribute to the complimentary cumulative distribution function (CCDF), the probability distribution of exceeding normalized cumulative radionuclide releases to the accessible environment, that will become part of the Compliance Certification Application (CCA). Direct brine releases may occur when a future driller penetrates the WIPP and contaminated brine is unknowingly brought to surface during the drilling process. These releases are not specifically accounted for in the cuttings, cavings and spallings calculations (CUTTINGS\_S), as that code only models the solids removed during the drilling process. Certain conditions must exist within the waste in order for contaminated brine to flow directly to the surface during a drilling intrusion:

- Pressure in the waste must be greater than that exerted by the column of drilling mud that penetrates a waste panel. Drillers in the Delaware Basin currently use a salt saturated mud while drilling through the Salado, with a specific gravity of 1.23. This corresponds to  $-8.0E+06$  Pascals at the repository horizon, which is the minimum pressure needed to overcome a static column of drilling mud.
- There must be mobile brine present in the waste panels to flow to the surface. Corrosion and biodegradation processes consume brine and release gasses as by-products, and it is possible for the brine volume in the waste pores to drop below its "mobile" (residual) saturation. It is likely for gas-only flows to occur up a drill hole, but these flows are only of concern for the solids releases (Spalls).

**Model Description**

The model is set up as a two-dimensional finite difference mesh of 39 X 39 grid blocks to be solved using the BRAGFLO code (hereafter called DBR\_BRAGFLO - see Figure 1). The mesh compares to the regional 10,000 year model (hereafter called BRAGFLO) in the following ways:

- The DBR\_BRAGFLO mesh is oriented in the areal plane, with the z-dimension (height) one element thick. BRAGFLO is oriented as a cross-section, with multiple layers in height and the thickness (y-dimension) one element thick.
- DBR\_BRAGFLO models flow only in the waste area. The BRAGFLO model includes the surrounding geology as well as the entire WIPP excavation (including operations, experimental, and shaft regions).
- Local scale heterogeneities are included in the DBR\_BRAGFLO model, including the salt pillars, rooms, panel seals, and passageways which contain waste. These are not fully represented in the BRAGFLO mesh.
- The DBR\_BRAGFLO mesh uses constant thickness, while BRAGFLO radially flares the element thickness to account for 3-dimensional volumes in 2-D space.
- The disturbed rock zone (DRZ) is included in both models, but exists above and below the excavated regions in the BRAGFLO model, whereas the DRZ surrounds the waste rooms on the sides for the DBR\_BRAGFLO model.
- Both models include one degree formation dip through the excavated regions.































7. Equivalent radius representing area of abandoned borehole grid block ( $r_{eBC} = [(d_{el} \cdot d_{ey}) / \pi]^{0.5}$ , meters)
8. Flowing pressure at the wellbore for the intrusion well ( $P_{wfBO}$  - Pascals), which is calculated separately using the Poettmann-Carpenter correlation.
9. Wellbore radius ( $r_w$  - meters, from bit size parameter off the database) is assumed to be equal for the abandoned wellbore and intrusion borehole.
10. Flow up the abandoned borehole from the brine pocket ( $Q_{BP}$  -  $m^3/s$ ) is assumed to be equal to flow "injection" into the panel ( $Q_{BC}$  -  $m^3/s$ ), for steady state conditions.

### E1-E2 Illustrations/Terminology

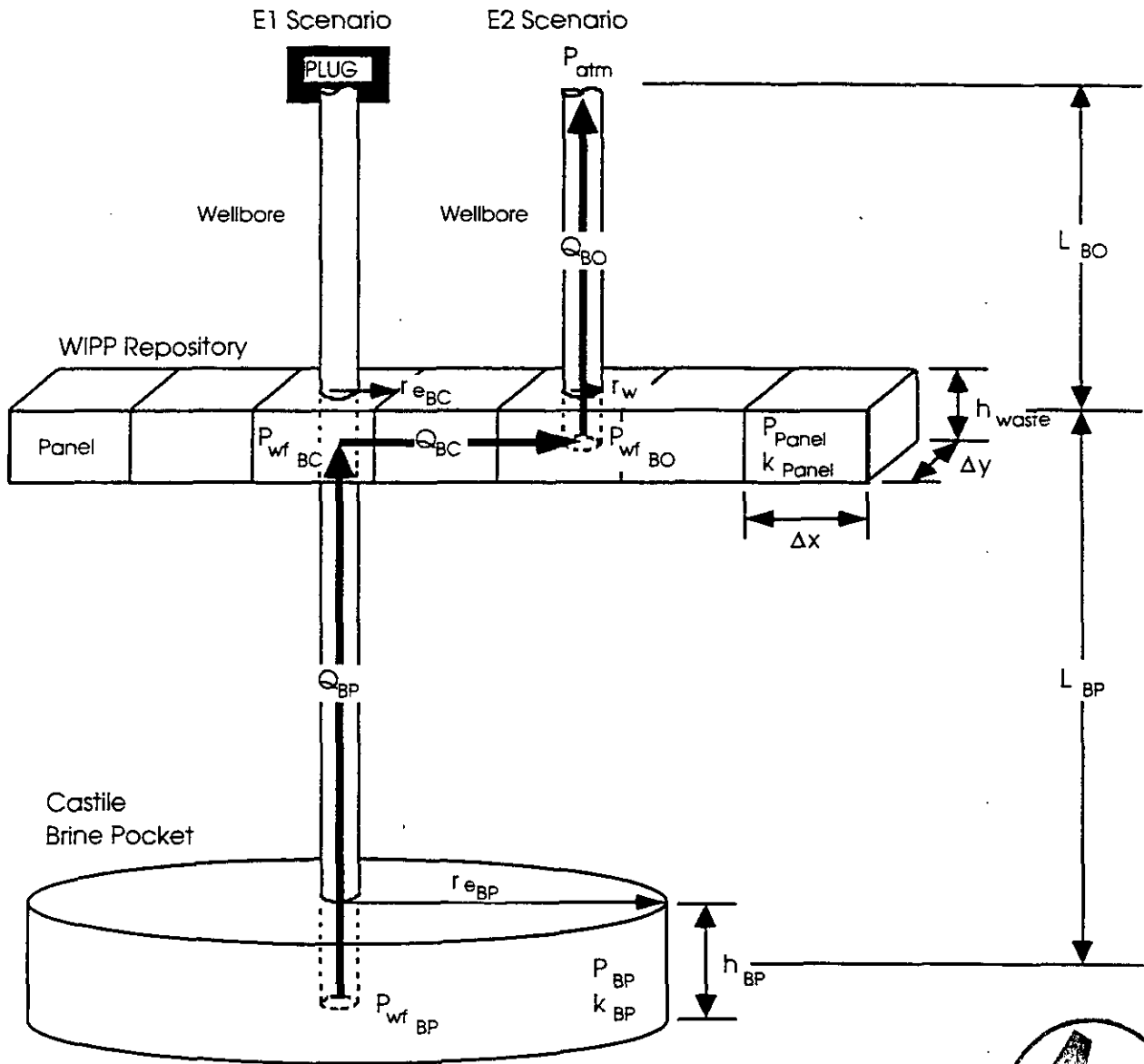


Figure A1: Representation of assumed flow path for E1E2 scenario































