Introduction to the Ecology Alternative Model for Evaluation of Vadose Zone Heterogeneities in WMA C: Development of a 2-Dimensional Numerical Model using STOMP

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Why do we need vadose zone modeling in tank farms?

The basics

• To estimate the nature and extent of contamination within the vadose zone (the space between the ground surface and the water table) for WMA C – also known as C Farm.

• To assess potential future impact in the groundwater below.
  • How much flux of contamination and at what rate?
  • How long will it continue?

• To plan remediation/corrective action
  • In the soil to stop further migration of contaminants from the vadose zone.
  • In the groundwater.

• To close WMA C.
Challenges to vadose zone modeling in the C tank farm

• The geology of the vadose zone is very complex, with many differences in its physical, hydrologic, and geochemical properties. (e.g. gravel, clay, sand)
  - We need reliable data and we don’t have everything.

• This geologic complexity, together with waste water and natural precipitation, leads to a three dimensional movement of moisture and contaminants through the vadose zone. Wilson et al. (1995).  - It’s an evolving process to understand better as we gather more information.

• Development of the complex conceptual model is a big challenge!
  - Another evolving process.

General Vadose Zone Conceptual Model Concepts after Caggiano (1996) and Johnson and Chou (1998)
Ecology’s emphasis on the vadose zone modeling and C tank farm approach

• Involved since mid 2000.
• Many letters* highlighting specific needs such as :
  • Incorporation of small scale heterogeneity.
  • Incorporation of structural features (e.g. sloping beds).
  • Incorporation of a range of hydrogeologic parameters.
  • Use of soil moisture data under different recharge scenarios.
  • Use varied and more sensitive modeling scenarios, such as stratigraphy and moisture content, to address uncertainties of various input parameters.

*(e.g. 14-NWP-240; 17-NWP-07, etc.)
Today’s Specific Presentation: C Farm

• Develop a conceptual model as outlined in the last slides (sloping beds, small scale heterogeneity, moisture data, and hydrogeological properties).
  • Ecology used the small scale heterogeneity as described in the Nez Perce Tribe’s 2014 interpretation.
  • Applied published data on various hydrogeological parameters.
  • A 2-D approach compared with the results of USDOE’s modeling.
• Using all of these modeling results we can make better closure decisions.
C Farm: Small Scale Heterogeneity