At a glance

> New infiltration estimator

> Enhanced pore-water velocity module which includes assignment of layer hydraulic functions

> Pre-loaded soil hydraulic parameters

> Analyte database includes US EPA TAL/TCL listings

> Enhanced radiological SSLs and groundwater calculations

> Mass transfer adjustment for soil and groundwater concentrations

> Screens soil data for single component NAPLs

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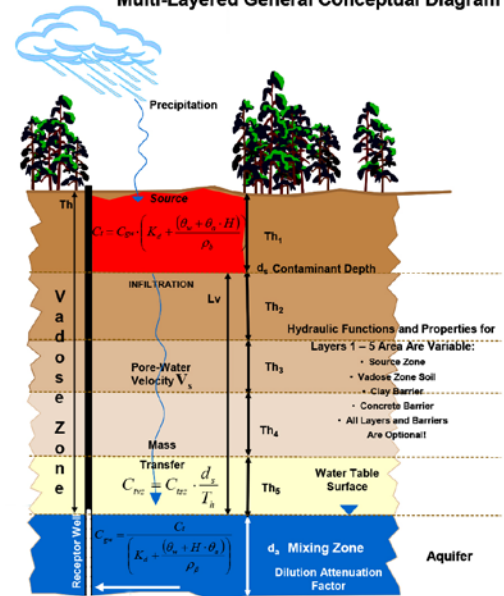
VZCOMML© Version 4.0
A Multi-Layer Vadose Zone Contaminant Migration Modeling Program

A researcher at the Savannah River Site has developed an analytical software application to simulate contaminant fate and transport through the vadose zone to groundwater. VZCOMML© (pronounced Vee-Zee-Com-M-L) is a one-dimensional, three-phase equilibrium, analytical contaminant transport model incorporating massbalance and time-limit criteria to calculate key fate and transport result output data. The program automatically uses decision logic to determine the contaminant(s), the peak groundwater concentration and the time to reach peak groundwater concentration. The model also performs non-aqueous-phase liquid (NAPL) screening of analytical soils data.

Vadose Zone Contaminant Migration Model
Multi-Layered General Conceptual Diagram

Background

The VZCOMML© model uses fundamental fate and transport processes and is easy to use and understand. The increased analytical complexity of this newest version is invisible to the user. The model design minimizes the need for extensive input data. It is preloaded with chemical parameters for all 221 compounds on the USEPA target compound/target analyte list (including volatile organic compounds, semi-volatile compounds, pesticides, PCBs and metallics) and for 40 radionuclides. All compounds can be screened simultaneously, eliminating the need for multiple runs. The most important feature of the new software version is the capability to assign any combination of hydraulic functions, such as a source zone, soil layers or barrier layers, to any layer within the soil column. The program can use up to five separate layers to more accurately simulate flow through the vadose zone. Default parameters are easily modifiable to match site-specific conditions. The new version includes a Custom Analyte Module where any compound not included on one of the preloaded lists may be evaluated.

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TechBriefs Savannah River National Laboratory

Technology transfer

The Savannah River National Laboratory (SRNL) is the U.S. Department of Energy's (DOE) applied research and development laboratory at the Savannah River Site (SRS).

With its wide spectrum and expertise in areas such as homeland security, hydrogen technology, materials, sensors, and environmental science, SRNL's cutting edge technology delivers high dividends to its customers.

The management and operating contractor for SRNL is Battelle Savannah River Alliance, LLC. BSRA is responsible for transferring its technologies to the private sector so that these technologies may have the collateral benefit of enhancing U.S. economic competitiveness.

The VZCOMML© program is built in a Microsoft Excel workbook containing individual modules for various analyses. Analyses are simplified by use of linked algorithms containing physical and chemical constants, macros, and input information. The program runs on a standard PC and requires only 500 kilobytes of memory. The fundamental and established equations built into the program have been verified by many experts and the software has received national and international attention and review. The calculations and equations can be printed out on a spreadsheet for easy verification of specific analyses.

VZCOMML© has been documented to calculate higher (but still protective) cleanup levels when compared to USEPA Soil Screening Guidance or some other commercially available vadose zone models. This software eliminates multiple simulations, generates less restrictive clean up levels, and contaminants of concern are eliminated earlier in the fate and transport evaluation, thereby reducing modeling and cleanup costs.

Successfully demonstrated

VZCOMML© has been approved by regulators and used at hundreds of cleanup sites at the U.S. Department of Energy's Savannah River Site for more than 10 years. The Software has been sold commercially to a global market of consulting companies and universities. It has also been recommended by an independent environmental consultant to protect groundwater resources in New Zealand.

Partnering opportunities

SRNL invites interested companies with proven capabilities in this area of expertise to enter into a licensing agreement with SRNL to market this nuclear material detection system. Interested companies will be requested to submit a business plan setting forth company qualifications, strategies, activities, and milestones for commercializing this invention.

Qualifications should include past experience at bringing similar products to market, reasonable schedule for product launch, sufficient manufacturing capacity, established distribution networks, and evidence of sufficient financial resources for product development and launch.

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