PACKAGE ID - 000597IBMPC02 GWSCREEN2.02

KWIC TITLE - Groundwater Screen

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LIMITATION CODE -COPY **AUDIENCE CODE -** LIM

COMPLETION DATE - 10/18/1993 **PUBLICATION DATE -** 10/10/1993

DESCRIPTION - GWSCREEN was developed for assessment of the groundwater pathway from leaching of radioactive and non radioactive substances from surface or buried sources and release to percolation ponds. The code calculates the limiting soil concentration or effluent release concentration such that, after leaching and transport to the aquifer, regulatory contaminant levels in groundwater are not exceeded. The code uses a mass conservation approach to model three processes: Contaminant release from a source volume, contaminant transport in the unsaturated zone, and contaminant transport in the saturated zone. The source model considers the sorptive properties and solubility of the contaminant. Transport in the unsaturated zone is described by a plug flow model. Transport in the saturated zone is calculated with a semi-analytical solution to the advection dispersion equation in groundwater. Concentration as a function of time at a user specified receptor point and maximum concentration averaged over the exposure interval are also calculated. In addition, the code calculates transport and impacts of radioactive progeny. Input to GWSCREEN is through one, free format ASCII file. This code was designed for assessment and screening of the groundwater pathway when field data is limited. It was not intended to be a predictive tool.

PACKAGE CONTENTS - Media Directory; Software Abstract; Engineering Design File (EDF); EGG-GEO-10797; Media Includes Source Code, Executable, Sample Problem Input and Output;

SOURCE CODE INCLUDED? - No

MEDIA QUANTITY - 1 3.5 Diskette

METHOD OF SOLUTION - GWSCREEN employs a Gauss-Legendre and Simpson's rule numerical integration routines to calculate the groundwater concentration from a time varying source. For smooth source release functions, the Gauss-Legendre routine is recommended because it is computationally efficient and accurate for solutions that can be approximated by polynomials. The Simpson's rule routine is recommended for source functions that may oscillate or contain discontinuities because it is generally a more robust solver. However, it is somewhat more time consuming to run. The Simpson's rule solver is iterative and adds additional integration points until the solution converges on a user defined accuracy. A golden

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METHOD OF SOLUTION -(CONT) section search in one dimension is used to determine the peak concentration.

COMPUTER - IBM PC

OPERATING SYSTEMS - MS DOS 5.0

PROGRAMMING LANGUAGES - FORTRAN77

SOFTWARE LIMITATIONS - Program is limited to one contaminant per run, but many runs may be linked together through a batch file.

SOURCE CODE AVAILABLE (Y/N) - N

UNIQUE FEATURES - Several important features of GWSCREEN include: a. The ability to model both radiological and non-radiological contaminants. b. Maximum concentration at user specified receptor points and maximum average concentration (integrated over the exposure period) are calculated and printed. c. Regulatory endpoints used to calculate limiting soil concentrations include maximum contaminant limits (radiological and non-radiological contaminants), radiological dose, carcinogenic risk (radiological and non-radiological contaminants), and non-carcinogenic toxicity. d. The user may select the source release models included in GWSCREEN or generate a separate release to be used as the input to the groundwater model. e. Output may easily be exported to a spreadsheet or other software packages for graphical display. f. GWSCREEN incorporates several solution methods that may be chosen depending on the complexity of the problem thereby making it extremely versatile.

RELATED SOFTWARE - GWSCREEN, version 1.3, 1.4, 1.5 and 2.0 was released for use at the INEL in 1992 and 1993.

OTHER PROG/OPER SYS INFO - The default input file name is GWSCREEN.PAR and the default output file name is GWSCREEN.OUT. The user may use any MS DOS legal file name (Maximum of 12 characters). In the sample problems, the following conventions were used. filename.PAR Input file that contains values to the GWSCREEN parameters and variables. filename.OUT Output file for the maximum concentration calculation and limiting soil of pond effluent concentration. filename.LST Output file for concentration verses time output.

HARDWARE REQS - 512 KB RAM, IBM or compatible XT, AT, 286, 386, 486 SX with math co-processor or 486 DX.

TIME REQUIREMENTS - For calculation of the limiting soil concentration using the Gauss-Legendre integration routine with no concentration averaging, the execution time is usually less than one second for a 486 SX and about 1.5 seconds for a 386 machine. Execution time is significantly increased if the Simpson's rule integration routine

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TIME REQUIREMENTS -(CONT) is selected. The additional time is dependent on the integration parameters selected and the complexity of the problem.

REFERENCES - Rood, A.S., Verification and Validation of GWSCREEN Version 2.02, ERD-93-001.2, October 1993; Rood, A.S., GWSCREEN: A Semi-Analytical Model for Assessment of the Groundwater Pathway from Surface or Buried Contamintion: Version 2.0 Theory and User's Manual, EGG-GEO-10797, June 1993.

ABSTRACT STATUS - Submitted July 1993. Released screened August 1993. No problems encountered during screening. Version 2.01 submitted September 1993. Released screened September 15, 1993. No problems encountered. Version 2.02 submitted October, 1993. Released screened December 20, 1993. No problems encountered.

SUBJECT CLASS CODE - R

KEYWORDS -
COMPUTER PROGRAM DOCUMENTATION
G CODES
GROUND WATER
LEACHING
RADIOACTIVE WASTE DISPOSAL
FLOW MODELS
CONTAMINATION
ENVIRONMENTAL EXPOSURE PATHWAY
RADIONUCLIDE MIGRATION

EDB SUBJECT CATEGORIES -
990200 540230

SPONSOR - DOE/EM

PACKAGE TYPE - SCREENED