Soil Concentration File Spreadsheet Import Module Documentation

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October 12, 2001

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1.0 Introduction

1.1 Objective

The objective is to develop a spreadsheet import capability for creating a soil concentration file in the existing FRAMES.

1.2 Definitions

- Requirement: Characteristics and behaviors that a piece of software must possess to function adequately for its intended purpose. A good requirement is also testable. Sometimes a function is called a requirement, although it is not related to a regulatory definition.

- Design: A design is a comprehensive description of how a piece of software will function (i.e., how it will meet its requirements).

- Specifications: Specifications are a detailed description of an interface to a computer program or set of subroutines such that another programmer could develop a program that would make proper use of the subroutines.

- Model/Code: Loosely defined herein to represent the software product for simulating an aspect associated with the release, fate & transport, exposure, intake, or risk/hazard of chemicals released into the environment; however, a model/code can simulate any phenomenon and is not limited to hazardous waste site assessments.

- Module: Model/Code and accompanying 1) pre- and post-processors for communicating with other models, databases, frameworks, etc. and 2) model-specific user interface (MUI).

- System or Framework: Loosely defines a grouping of models, modules, databases, processors, or combination.

- Testable: Refers to the property of having the capability to examine and interrogate, such that a clear and concise conclusion can be drawn.

2.0 Requirements

Requirements are characteristics and behaviors that a piece of software must possess to function adequately for its intended purpose.

2.1 Requirements

The spreadsheet import capability shall meet the following requirements when integrated into the FRAMES architecture:

1) Allow the user to import a spreadsheet containing water concentrations into the FRAMES architecture, and specifically the Soil Concentration File (SCF) format.
2) Operate under Windows 95 and have a user-friendly interface with a standard Windows look and feel.
3) Produce WCF following the FRAMES data file specifications

2.2. Input Requirements

1) Allow for the user to enter the spreadsheet file name
2) Default to first worksheet name within the spreadsheet and give the option to change it.
3) Default to the start date given for each contaminant in the worksheet and give the option to change it.

2.3 Output Requirements

1) Usage location.
2) User-defined, time-varying, instantaneous contaminant mass concentrations for each contaminant.
3) User-defined, time-varying, instantaneous medium release rates.

2.4 Scientific Requirements

The FRAMES water concentration file does not conduct computations that change the values input by the user except to convert units to internal FRAMES units. This is done by the MUI. No other scientific requirements exist for this Module.

3.0 Design

Design elements are strategies for meeting requirements. Many Department of Defense (DoD) installations collect environmental information and store that information in non-standardized (i.e., disparate) spreadsheet formats. Much of these data represent environmental sampling results, which document temporally and spacially varying contaminant concentrations in soil, air, and water. These data are summarized by location, chemical, soil parameters, and include standard statistical data (e.g., mean, median, minimum, maximum, standard deviation, number of samples, number of non detection samples, etc.).

To access these data, which have been stored in disparate formats within and between installations, for use in ARAMS-FRAMES, a standardized Excel format has been defined for chemical and soil data, as illustrated in Tables 1 and 2, respectively. Table 1 only addresses contaminated soils, which can populate an SCF, and presents the spreadsheet format for chemical soil concentration data. Table 2 presents the spreadsheet format for soil characteristics that are typically collected (e.g., cation exchange capacity, total organic carbon, and pH.). When DoD converts their Excel spreadsheets, containing these environmental data, to the formats outlined in Tables 1 and 2, these data would then become available for use in ARAMS-FRAMES. Currently, only Table 1 contains information that can be directly utilized by the models that currently reside in ARAMS-FRAMES.

Table 1. Example Spreadsheet Format for Soil Concentration Collection Data

															Comment
5															Comment Column. Cell A1 refers to # of Header Rows
================================															header info
SCF Contaminant Import file															
Version 2.00															
08-09-2000															
================================															
Medum Type	# of locations														
Vadose	1														
Set of sample data for location #1															
Location Name	**x-coordinate**	**x units**	**y-coordinate**	**y units**	**z-coordinate**	**z units**	**# of parent constituents**					**Usage Location Type (Used by MEPAS)**			Coordinates are relative to the local GeoReference System. Usage Location Type is specific to MEPAS. Current mandatory choices include: "Source," "Agricultural," "Pasture," or "Human Contact."
Site C Surface Contamination at Fort Campbell	50	m	50	m	0.02	m	2					Agricultural			If Usage Location Type is not applicable, leave blank.
Constituent	**CAS ID**	**# of Progeny**	**# of time-concentration pairs**	**Distribution**	**Date**	**Mean Concentration**	**Median Concentration**	**Minimum Concentration**	**Maximum Concentration**	**Standard Deviation**	**95th UCL**	**Sample Field ID**	**# of Samples**		**# of Detects**
Chromium III	16065831	0	4	Normal	(mm/dd/yy)	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg				
					05/13/85	4.46	4.03	2	11	2.16	5.23	C-S0-85	24	24	
					06/16/86	5.55	5.2	1.6	9.9	2.6	6.87	C-S0-86	23	23	
					09/22/87	5.36	4.68	2	13	2.7	6.44	C-S0-87	35	35	
					10/30/90	4.27	3.95	2.1	8.8	1.92	5.11	C-S0-90	22	21	
STRONTIUM-90	SR90	1	4	Normal	(mm/dd/yy)	pCi/Kg	pCi/Kg	pCi/Kg	pCi/Kg	pCi/Kg					
					05/13/85	10	8	2	60	7.5		CR-S0-85	10	9	If data are unavailable, leave blank.
					06/16/86	20	18	3	75	9.4		CR-S0-86	12	10	
					09/22/87	30	28	4	88	6.8		CR-S0-87	11	11	
					10/30/90	10	8	2	65	7.1		CR-S0-90	15	14	
YTTRIUM-90	Y90		4	Normal	(mm/dd/yy)	pCi/Kg	pCi/Kg	pCi/Kg	pCi/Kg	pCi/Kg					Progeny
					05/13/85	10	8	2	60	7.5		CR1-S0-85	10	9	
					06/16/86	20	18	3	75	9.4		CR1-S0-86	12	10	
					09/22/87	30	28	4	88	6.8		CR1-S0-87	11	11	
					10/30/90	10	8	2	65	7.1		CR1-S0-90	15	14	
Set of sample data for location #2															

Location Name	x-coordinate	x units	y-coordinate	y units	z-coordinate	z units	# of parent constituents			Usage Location Type (Used by MEPAS)			
Background Surface Contamination at Fort Campbell	1500	m	2500	m	0.02	m	2			Agricultural			If Usage Location Type is not applicable, leave blank.
Constituent	CAS ID	# of Progeny	# of time-concentration pairs	Distribution	Date	Mean Concentration	Median Concentration	Minimum Concentration	Maximum Concentration	Standard Deviation	95th UCL	Sample Field ID	# of Samples		# of Detects
Chromium III	16065831	0	4	Normal	(mm/dd/yy)	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg				
					05/13/85	2.51	2.25	1.85	3.8	0.59	3.23	C-S0-85	24	24	
					06/16/86	2.55	2.2	0.6	6.9	1.6	6.87	C-S0-86	23	23	
					09/22/87	2.36	2.68	1	10	1.7	6.44	C-S0-87	35	35	
					10/30/90	2.27	1.95	0.1	5.8	0.92	5.11	C-S0-90	22	21	
STRONTIUM-90	SR90	1	4	Normal	(mm/dd/yy)	pCi/Kg	pCi/Kg	pCi/Kg	pCi/Kg	pCi/Kg					
					05/13/85	0.01	0.011	0.001	0.05	0.0012		CR-S0-85	10	9	
					06/16/86	0.02	0.022	0.002	0.06	0.0013		CR-S0-86	12	10	
					09/22/87	0.03	0.033	0.003	0.07	0.0013		CR-S0-87	11	11	
					10/30/90	0.01	0.011	0.001	0.05	0.0012		CR-S0-90	15	14	
YTTRIUM-90	Y90		4	Normal	(mm/dd/yy)	pCi/Kg	pCi/Kg	pCi/Kg	pCi/Kg	pCi/Kg					
					05/13/85	0.01	0.011	0.001	0.05	0.0012		CR1-S0-85	10	9	
					06/16/86	0.02	0.022	0.002	0.06	0.0013		CR1-S0-86	12	10	
					09/22/87	0.03	0.033	0.003	0.07	0.0013		CR1-S0-87	11	11	
					10/30/90	0.01	0.011	0.001	0.05	0.0012		CR1-S0-90	15	14	

Table 2 Example Spreadsheet Format for Soil Properties Data

==												
Soil Properties Import file												
Version 1.00												
08-09-2000												
==												
Medum Type	# of locations											
Vadose	1											
Set of soil data at location #1												
Location Name	x-coordinate	x units	y-coordinate	y units	z-coordinate	z units	# of soil parameters		Usage Location Type (Used by MEPAS)			
Site C Surface Soil Properties at Fort Campbell	50	m	50	m	0.02	m	3		Agricultural			
Property Name	Description	# of time-property pairs	Distribution	Date	Mean	Median	Min	Max	Standard Deviation	95th UCL	Sample Field ID	# of Samples comprising the Sample Field ID
CEC	Cation Exchange Capacity	4	Normal	(mm/dd/yy)	mol/Kg	mol/Kg	mol/Kg	mol/Kg	mol/Kg	mol/Kg		
				05/13/85	7.64	7.7	4.4	12	2.11		C-S0-85	24
				06/16/86	6.74	7.55	2.6	8.7	1.86		C-S0-86	19
				09/22/87	10.06	9.9	5.4	18	3.44		C-S0-87	11

Property Name	Description	# of time-property pairs	Distribution	Date	Mean	Median	Min	Max	Standard Deviation	95th UCL	Sample Field ID	# of Samples comprising the Sample Field ID
				10/30/90	8.44	8.3	6.5	10	1.02		C-S0-90	18
Property Name	Description	# of time-property pairs	Distribution	Date	Mean	Median	Min	Max	Standard Deviation	95th UCL	Sample Field ID	# of Samples comprising the Sample Field ID
TOC	Total Organic Compound	4	Normal	(mm/dd/yy)	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg		
				05/13/85	1.03	0.9	0.2	2	0.46		C-S0-85	24
				06/16/86	1.09	1	0.4	2	0.38		C-S0-86	19
				09/22/87	1.38	1.3	0.7	2.2	0.47		C-S0-87	11
				10/30/90	1.33	1.1	0.4	2.8	0.62		C-S0-90	18
Property Name	Description	# of time-property pairs	Distribution	Date	Mean	Median	Min	Max	Standard Deviation	95th UCL	Sample Field ID	# of Samples comprising the Sample Field ID
pH	Hydrogen Ion Level	4	Normal	(mm/dd/yy)	pH	pH	pH	pH	pH	pH		
				05/13/85	6.47	6.55	5.2	8.2	0.7		C-S0-85	24
				06/16/86	5.49	5.6	4.6	6.6	0.56		C-S0-86	19
				09/22/87	5.15	5.15	4.4	5.8	0.39		C-S0-87	11
				10/30/90	5.86	5.8	4.5	6.9	0.64		C-S0-90	18

3.5

4.0 Test Plan Approach and Internal Testing Results

4.1 Description and Rationale

This case will use measured soil concentrations at the source to calculate the human health effects of a receptor directly exposed to the source. The measured values will be entered into the FRAMES system using the Soil Concentration File SPREADSHEET Module. These soil concentrations will be used to estimate health impacts to humans on or near the site for pathways such as air inhalation, soil ingestion, and soil dermal contact. This case demonstrates the capability to enter SCF file values though a spreadsheet interface in FRAMES.

4.2 Input Data

Open the Multimedia Framework (fui.exe). Select New from the File menu. Enter a file name and select Open. Enter a site name and select Ok.

To insert icons, double click the icon on the toolbar, then drag the inserted icon to the desired location by left clicking and holding down the mouse button. Insert a contaminant, source, exposure, intake and health impacts icon. Connect the contaminant icon and source icons together. To do this, hold down the shift key, click on the contaminant icon, and drag the mouse to the source icon. Release mouse button and shift key. A line will connect the two icons with an arrow pointing from the air icon to the exposure icon. To remove this line, repeat the steps used to connect it. To remove an icon from the screen, right click and select delete from the menu.

Right click on the contaminant icon and choose General Info. When the General Info screen opens, select Label: Contaminants and Module: FRAMES Default Chemical Database Selection. Click on OK at the bottom of the screen; this returns you to the work area, and the signal light attached to the contaminant icon changes from black into red. Right click on the contaminant icon in the main screen and choose User Input on the menu that appears and the Contaminant Selection screen will open. Select from Possible Contaminants: All Contaminants. The contaminants used in this case are Chromium III, and Strontium-90.   Scroll to select the contaminants or use the Find option on this screen. Click OK to return to the work screen. The light will change from red into green.

Right click on the source module you placed on the main screen and choose General Info. Choose Module: WES SCF Spreadsheet Imports. Click OK. The signal light will turn from black into red.

Right click on the source module and choose User Input, and the WES SCF Spreadsheet Import screen will open. You will click on the browse button and look for the file name SpreadsheetUpdateRev6.xls; click okay and the rest of the screen will come up filled out. It should look like Figure 1. Now click on File Save and Exit. Now it will take back to the main menu and the light will turn yellow. Now you can either right click or double click to run the module.

The User Input data for the other modules is below.

To view results, right click the source icon and select "View/Print Module Output" from the menu. Select the SCF Chart. One may look like Figure 2.

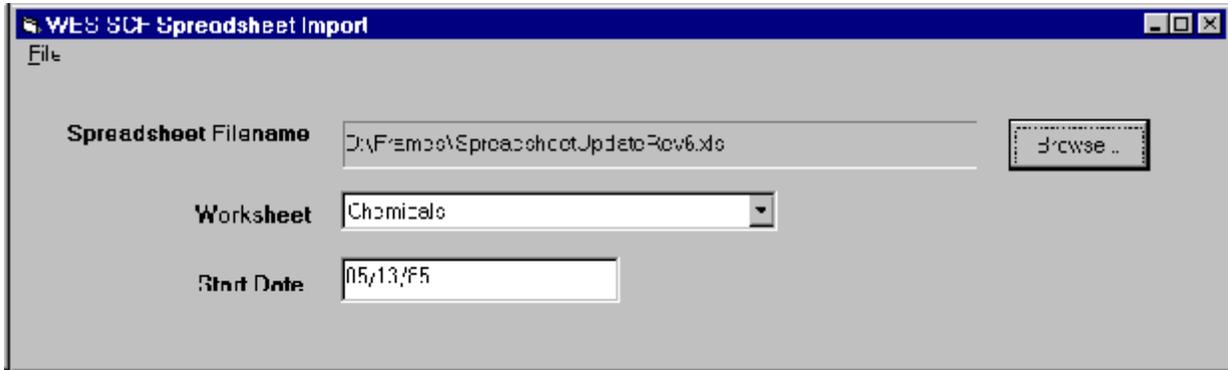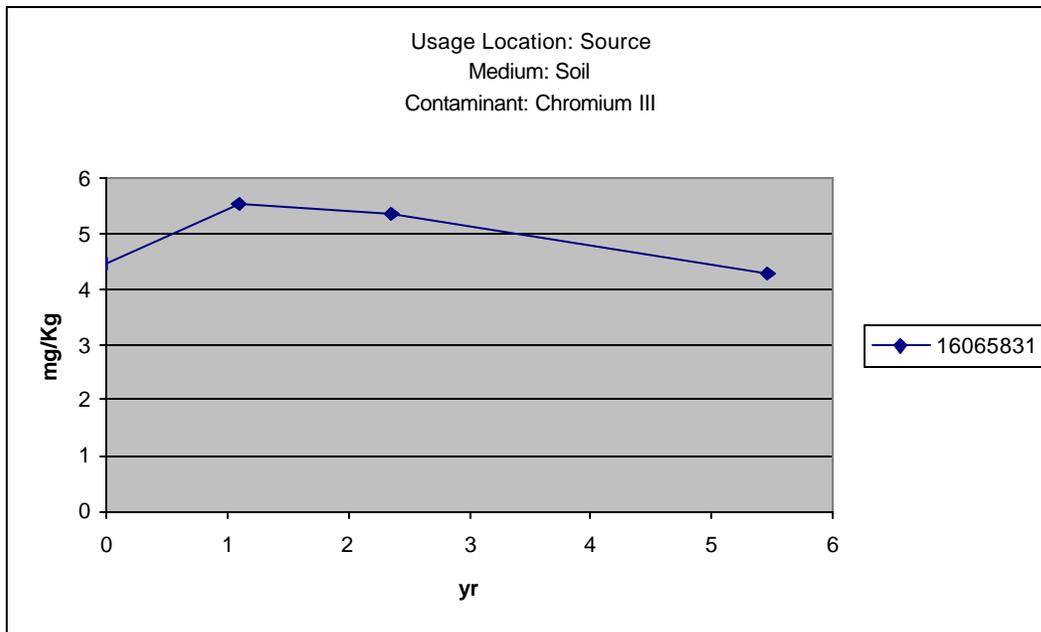**Figure 1.** WES SCF Spreadsheet Import Screen

Figure 2. Example Chart

Exposure Pathway

General Info

Label: Groundwater_Well

Applicable Model: MEPAS 4.1 Chronic Exposure Module

Exposure Controls

Time to start exposure computation – EC-TEXPOS	0.0	Yr.
Maximum time for reporting – EC-MAXTIM	10	Yr.
Number of time points for evaluation – EC-NTIMES	10	

Leach Rates

Leach rate selection option – EC-LEACHOPTION	User-provided leach rate constants	
Parent surface soil leach rate constant		
Antimony	1.0	1/Yr.
STRONTIUM-90	1.0	1/yr
Trichloroethylene	1.0	1/yr
Progeny surface soil leach rate constant		
YTTRIUM-90	1.0	1/yr.

Atmospheric/ Pathways

Exposure duration-EA-ATED	35.0 yr
Plant Product Ingestion	Other Pathways
x Leafy vegetables	x Soil-Ingestion
x Other vegetables	x Soil-Inhalation
Animal Product Ingestion	x Soil-Dermal
x Meat	x Soil- External
x Milk	o Air- External
	x Air-Inhalation

Receptor Intake

General Info

Label Receptor_Intake

Applicable Models: Mepas 4.1 Chronic Intake Module

Body weight of individual –IC-BODYWT	70.0	Kg.
Exposure duration - IC-EXPDUR	30.0	Yr.
Water dermal absorbtion model-IC-DERM		EPA Model

Ground water ingestion rate – IG-UDWGW	2.0	L/d
Surface water ingestion rate – IW-UDWSW	2.0	L/d
Domestic use population –IG-POPGW	1.0	
Age of receptor at start of exposure – IC-TAGE1	0.0	Yr.
Age of receptor at end of exposure – IC-TAGE2	70.0	Yr.

Human Health Impact

General Info

Label: Health_Impacts

Applicable Model: Mepas 4.1 Chronic Health Impacts Module

Chemical

X Calculate lifetime cancer incidence – CHEMRISK

X Calculate hazard index – CHEMH   0.0

Hazard quotient threshold limit – RFDLIM

Radionuclide

X Calculate lifetime cancer incidence – HE-INC		
Conversion factor – HE-CONINC	0.06	Risk/Sv
X Calculate cancer fatalities – HE-FAT		
Conversion factor – HE-CONFAT	0.05	Risk/Sv
X Calculate lifetime cancer & severe hereditary effects – HE-FSH		
Conversion factor – HE-CONFSH	0.073	Risk/Sv
X Calculate radiation dose commitment (CEDE) – HE-CEDE		
Cancer risk evaluation method – IHEAST	ICRP dose and risk factors	
Thickness of contaminated soil/sediment layer – TSOIL	0.04	M
Density of contaminated soil/sediment layer – DSOIL	1.5	g/cm^

5.0 Quality Assurance Program

Updates to the FRAMES technology software system will be developed under a quality assurance program documented in Gelston et al. (1998). Quality is defined as the capability of the software to meet client needs. Meeting client needs starts with a shared understanding of how the software must perform and continues throughout the software life cycle of design, development, testing, and implementation through attention to details.

Figure 3 outlines the software-development process that will be used for the FRAMES technology software system highlighting the quality check points. The FRAMES technology software system activities flow down the left side of Figure 3 because it is software developed for the first time as opposed to a modification to existing software. The process shown is designed for compatibility with similar processes used by other government agencies. For example, this quality process compares favorably with that in EPA Directive 2182, *System Design and Development Guidance* (EPA 1997). It also compares favorably with the Office of Civilian Radioactive Waste Management's *Quality Assurance Requirements and Description, Supplement I, Software* (OCRWM 1995). Activities roughly equivalent across these processes are shown in Table 2.

Development of the FRAMES technology software system includes the implementation of a quality assurance checklist (see Figure 4). All team members understand the component requirements and design necessary to ensure quality. Completion of this checklist verifies that all documentation will be complete for transfer of the software to client use.
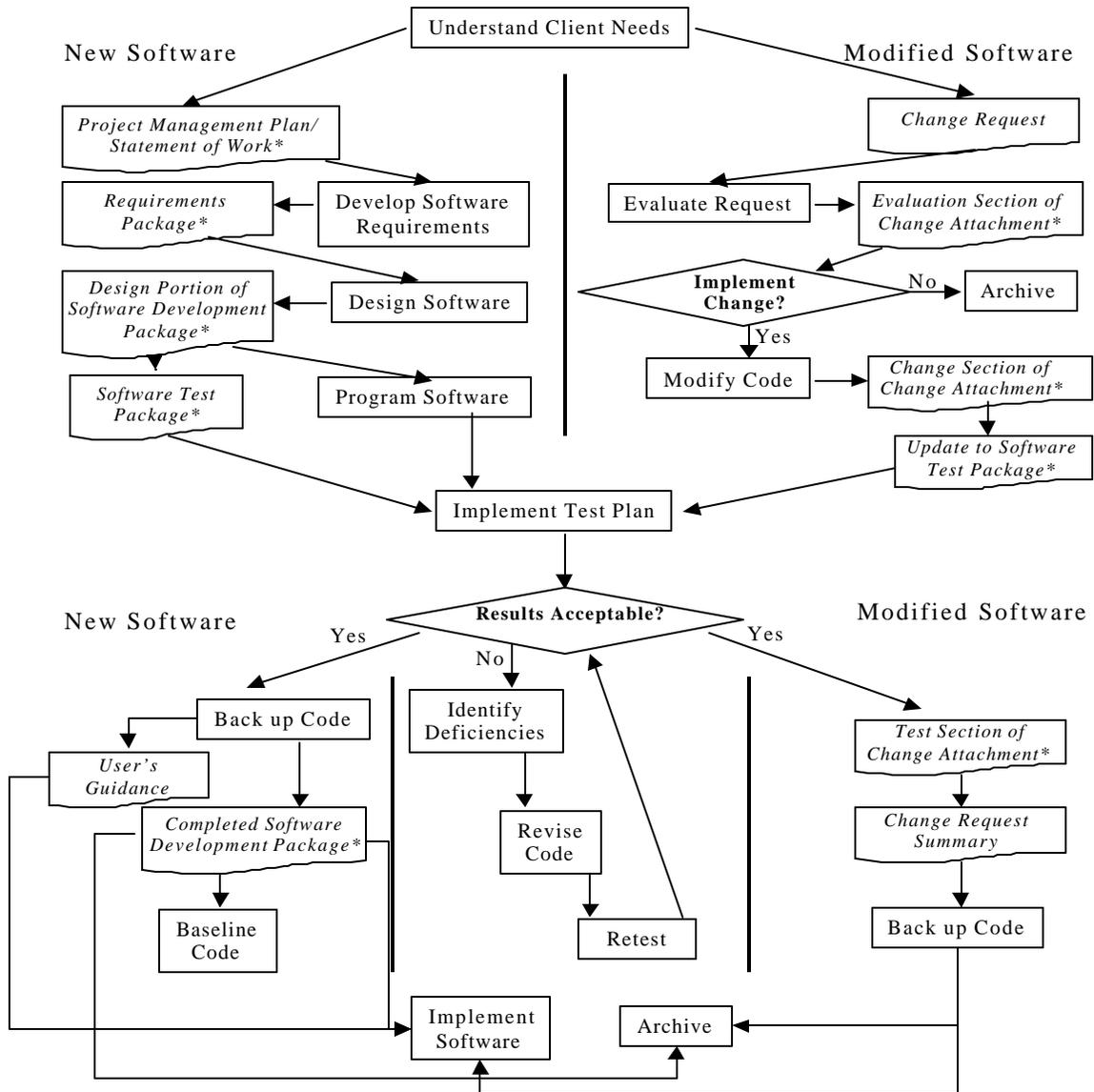
Understand Client Needs

New Software

Modified Software

Project Management Plan/ Statement of Work*

Change Request

Requirements Package* ← Develop Software Requirements

Evaluate Request → *Evaluation Section of Change Attachment**

Design Portion of Software Development Package* ← Design Software

Implement Change? No → Archive

Yes

Software Test Package* Program Software

Modify Code → *Change Section of Change Attachment**

Update to Software Test Package*

Implement Test Plan

Results Acceptable?

New Software

Modified Software

Yes

No

Yes

Back up Code

Identify Deficiencies

Test Section of Change Attachment*

User's Guidance

Revise Code

Change Request Summary

Completed Software Development Package*

Retest

Back up Code

Baseline Code

Implement Software

Archive

Figure 3. Ensuring Quality in the Environmental Software Development Process (* indicates quality review stage; box with wavy bottom line and italics font indicates a document rather than an activity)

Table 3. Relationship of PNNL Environmental Software Development Process to Quality Assurance Requirements (OCRWM 1995, EPA 1997)

OCRWM Quality Assurance Requirement[a]	EPA Essential Element of Information[b]	Environmental Software Process Equivalent (Section)
	4—System Implementation Plan	Project Management Plan or Statement of Work
I.2.5A Functional Requirements Information Documentation; I.2.5C Requirements and Design Documentation	5—System Detailed Requirements Document	Requirements Package
I.2.1 Software Life Cycles, Baselines (see their Appendix C), and Controls	6—Software Management Plan	Project Management Plan or Statement of Work and Gelston et al. (1998)
I.2.2 Software Verification[c] and Software Validation; I.2.4 Software Validation[d]	7—Software Test and Acceptance Plan	Software Test Package
I.2.3 Software Verification; I.2.5C Requirements and Design Information Documentation	8—Software Design Document	Design Portion of Software Development Package
I.2.6A Configuration Identification		Completed Software
I.2.6B Configuration Control; I.2.6C Configuration Status; I.2.7 Defect Reporting and Resolution[e]	9—Software Maintenance Document	Modification Documentation
	10—Software Operations Document	User's Guidance and Training
I.2.5B User Information Documentation	11—Software User's Reference Guide	User's Guidance and Training
	12—System Integration Test Reports	Software Test Package

(a) Note that OCRWM requirement I.2.8, Control of the Use of Software, is the responsibility of the OCRWM-related client.

(b) Elements 1 through 3 are generally completed by clients in the U.S. Environmental Protection Agency before contract initiation with the project team.

(c) Verification includes informal code testing by software engineers to ensure that code functions as required.

(d) Validation includes testing by those other than the software engineers who developed the code to provide an independent confirmation that software functions as required.

(e) Note that some changes requested by clients may not be made in the software unless funding has been allocated for such modifications.

```
A. General Requirements Analysis
        --Documented in
        _____Statement of Work
        --Contains information on (all of the following)
        _____problem description
        _____deliverables
        _____project team
        _____capabilities to be used
        _____restrictions
        _____difficulties envisioned
        _____compatibilities with existing software/hardware
        _____scope of the project
B. Specific Requirements Analysis
        --Documented in
        _____requirements section of documentation.
        --Contains information on (all of the following)
        _____purpose of the software
        _____structure of the software
        _____hardware and software requirements
        _____input and output requirements
        _____scientific basis
        _____assumptions
        _____limitations
C. Design Documentation
        --Documented in
        _____design portion of documentation.
        _____team task plans/Project Management Plan
        --Contains information on (all of the following)
        _____code type and description
        _____development team members
        _____specifications
        _____logic diagrams
        _____"help" descriptions
        _____methods to ensure consistency in components
        _____mathematical formulations
        _____need for pre/post-processors
D. Development Documentation
        --Documented in
        _____Specifications Document
        _____Quality Assurance Archive
        --Contains information on (all of the following)
        _____baseline hard copy of the source code
        _____diskette copy
        _____name of computer language(s) used
E. Testing Documentation
        --Documented in
        _____test plan that meets quality assurance requirements
        --Contains information on (all of the following)
        _____description of software
        _____testing scope
```

Figure 4. Quality Assurance Implementation Checklist for the FRAMES Technology Software System

F. User's Guidance
       --Documented in
       _____hardcopy printout of user's guidance for system
       --Contains information on (all of the following)
       _____description of software
       _____description of use of user interface
       _____mathematical formulations
       _____example problems
       _____explanation of modules included

G. General Quality Assurance Documentation
       --Documented in
       _____Quality Assurance Program Document
       _____Quality Assurance Software-Specific Checklist
       --Contains information on (all of the following)
       _____purpose of quality assurance program
       _____client-specified activities
       _____activities required to ensure quality in software

H. Quality Assurance Archive
       --Documented in
       _____hard-copy files
       _____back up disk files in multiple storage locations
       --Contains information on (all of the following)
       _____all quality assurance documentation
       _____client correspondence regarding software
       _____modifications made to baselined software
       _____disk copy back ups
       _____reproducibility of code (check code for comments)

Completed by _____   Date _____

Approved by
System/Module Manager _____   Date _____

Figure 4. Quality Assurance Implementation Checklist for FRAMES Technology Software System
(contd)

6.0 Example of Human Health Impact Assessment, Based on Imported Spreadsheet Data

Spreadsheet ⮕ Intake ⮕ Exposure ⮕ Risk
This example demonstrates spreadsheet access and access at a specified location.

6.1 Introduction

The U.S. Army Research and Development Center, Waterways Experiment Station (WES), U.S. Corps of Engineers develops tools to help analysts assess the impacts of anthropogenic activities in the environment. As such, WES is developing the Army Risk Assessment Modeling System (ARAMS) to provide the Army with the capability to perform human and ecologically based risk/hazard assessments associated with past-practice and current activities at military installations. The intent of the system is to provide a platform from which a variety of assessments can be performed, using screening-level tools, science-support tools, site-specific databases, physicochemical databases, visualization, and Conceptual Site Model (CSM) guidance. The system is envisioned to help a risk analyst visualize an assessment from source, through multiple environmental media (e.g., groundwater, surface water, air, and land), to sensitive receptors of concern (e.g., humans and wildlife). Concurrently, WES is also sponsoring the development of the science-support-based Land-based Management System (LMS), which has many of the same goals of ARAMS, yet is taking a more detailed approach to each of the components of an integrated system. The linkage of ARAMS and LMS is an ultimate goal of WES, such that utilization of the components in each system can be used by the other system to support assessment activities.

To help use current and existing state-of-the-art multimedia tools and to gain an appreciation for current technological advances, the Pacific Northwest National Laboratory (PNNL) is supporting WES and ARAMS by modifying and updating the Framework for Risk Analysis in Multimedia Environmental Systems (FRAMES) for inclusion as a component in ARAMS. FRAMES is a Windows-based software platform that provides an interactive user interface and, more importantly, specifications to allow a variety of DOS and Windows-based environmental codes to be integrated within a single framework.   As new components in ARAMS and FRAMES, PNNL developed a protocol for reading data stored in a specially formatted EXCEL spreadsheet containing data documenting contaminated surface soil. FRAMES accesses and reads to spreadsheet and creates a Soil Concentration File (SCF). This information is used to calculate the human health effects of a receptor directly exposed to the contaminated soil from exposure through pathways such as air inhalation, soil ingestion, and soil dermal contact.

6.2 Description and Rationale

This case will use measured soil concentrations at the source to calculate the human health effects of a receptor directly exposed to the source. The measured values will be entered into the Framework for Analysis of Risk in Multimedia Environmental Systems (FRAMES) system using the Soil Concentration File SPREADSHEET Module. These soil concentrations will be used to estimate health impacts to humans on or near the site for pathways such as air inhalation, soil ingestion, and soil dermal contact. This case demonstrates the capability to enter SCF file values though a spreadsheet interface in FRAMES.

6.3 Input Data

Open the Multimedia Framework (fui.exe). Select New from the File menu. Enter a file name and select Open. Enter a site name and select Ok.

   To insert icons, double click the icon on the toolbar, then drag the inserted icon to the desired location by left clicking and holding down the mouse button.
   Insert the following icons to the case:

>   *1 "Contaminants"*
>   *1 "Source"*
>   *1 "Exposure Pathways"*
>   *1 "Receptor Intake"*
>   *1 "Health Impacts"*

   Connect the Contaminant icon and Source icons together by holding down SHIFT, clicking on the Contaminant Icon, dragging the cursor to the Source icon, and releasing the mouse button (Note: To remove this line, repeat the steps used to connect it. To remove an icon from the screen, right click and a menu will appear with different options. Click "Delete," and the icon will be taken out.).

   In the same fashion, connect the following pairs of icons:

Contaminants	*Û*	*Source (already done)*
Contaminants	*Û*	*Exposure Pathways*
Contaminanst	*Û*	*Receptor Intake*
Contaminants	*Û*	*Health Impacts*
Source	*Û*	*Exposure Pathways*
Exposure Pathways	*Û*	*Receptor Intake*
Receptor Intake	*Û*	*Health Impacts*

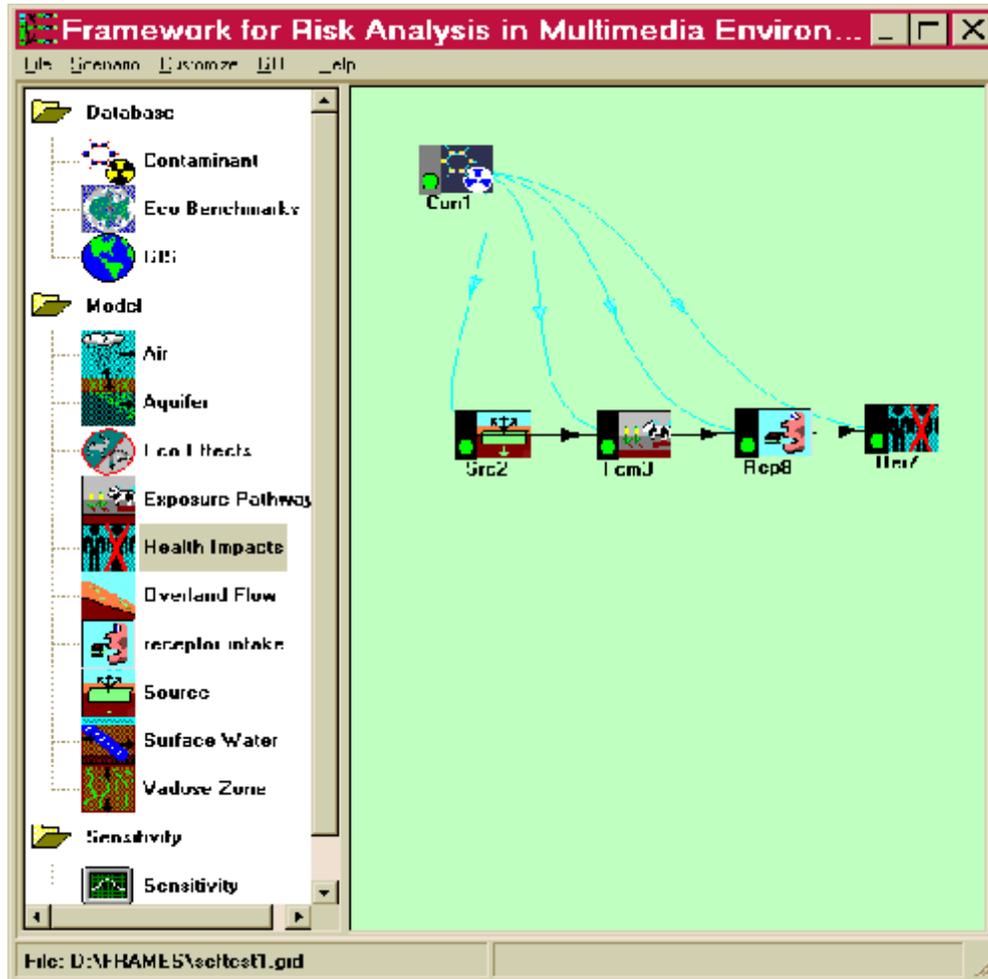FRAMES should now be arranged similar to Figure 5

Figure 5. Multimedia Framework Screen

6.3.1 Contaminant Database Module

Right click the Contaminant icon and choose General Info. When the General Info screen opens, enter "Contaminants" in the Label text box and select "FRAMES Default Chemical Database Selection" in the "Select from applicable models" text box. Click OK at the bottom of the screen to return to the work area. The signal light attached to the contaminant icon will change from black into red. Right click on the contaminant icon in the main screen and choose User Input on the menu that appears. The Contaminant Selection screen will open (see Figure 2). Select "All Contaminants" from the "Possible Contaminants" dropdown box. The contaminants used in this case are Chromium III and STRONTIUM-90. Scroll to select the contaminants from the contaminants list or use the Find option to search for them. Go to File and click "Exit - Save Changes" to return to the work screen. The Contaminant icon's status light will change from red to green.
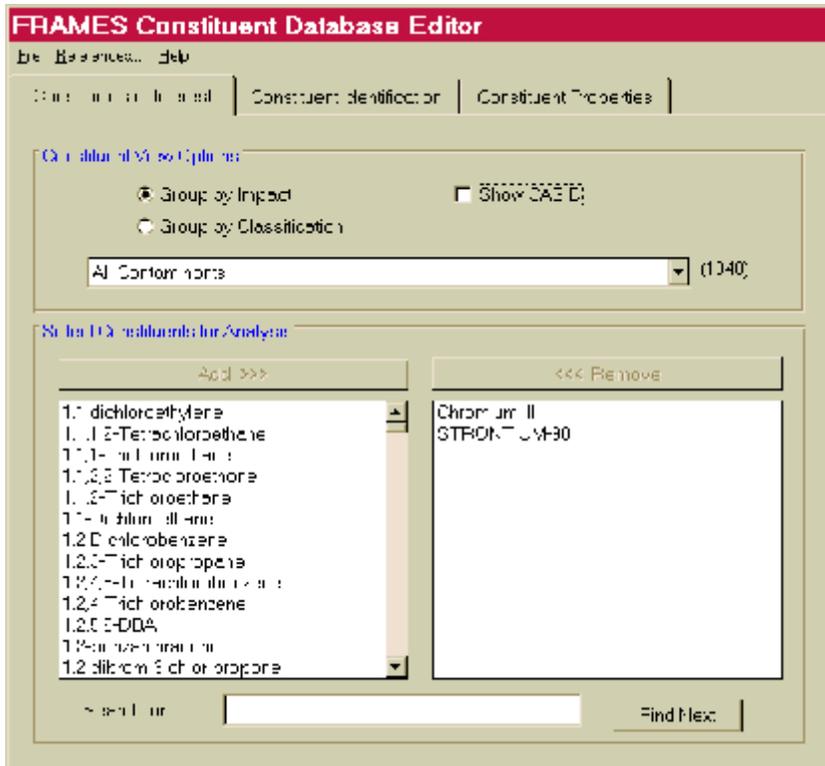
Figure 6. Contaminant Selection Screen

Following is a listing of all data input required by the remaining modules used in this case. *Names of module icons* are in bold Italics. *Menu items* (displayed by right clicking on the icon) are shown below and indented to the right the icon names. *Explanations* of data required by each menu item are indented further to the right.

6.3.2 Source Term Icon

General Info

A window titled "Object General Information" will appear. In "Select from Applicable Models," choose "SCF Spreadsheet Imports" and click "Ok." The traffic light next to the Source Term icon should turn red.

User Input

A window titled "SCF Spreadsheet Import will appear. Click "Browse…"
Select "SpreadsheetUpdateRev6.xls" (see Figure 3) from its location on the disk. This should be given to you. Click "File - Save and Exit." The traffic light next to the Source Term icon should turn yellow.

Figure 7. Spreadsheet Import Screen

Run Model

    The model should run in the background. The traffic light next to the Source Term icon should turn green.

View/Print Module Output

    A second menu will appear, select the "SCF Text View - Soil Concentrations."   The view should output a screen like Figure 8.

Figure 8. Viewing File Screen

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6.3.3 Exposure Pathways

General Info
>A window titled "Object General Information" will appear. In "Select from Applicable Models," choose "Mepas 4.1 Chronic Exposure Module" and click "Ok." The traffic light next to the Exposure icon should turn red.

User Input
>A window titled "MEPAS Chronic Exposure Module" will appear. Click the "Measured Soil tab" and ensure that the following are true:
>
>- Exposure duration – EM-SMED = 35.0 yr
>- Leafy vegetables, Other vegetables, Meat, Milk, Soil – Ingestion, Soil – Inhalation, Soil – Dermal, Soil – External are checked.

>Click the "Exposure Controls" tab and set the following values:
>
>- *Time to start exposure computation –EC-TEXPOS   = 0.0 yr*
>- *Maximum time for reporting – EC-MAXTIM   = 10.0 yr*
>- *Number of time points for evaluation – EC-NTIMES   = 10*
>
>Click the "Leach Rates" tab and set the following values:
>
>- *Leachrate selection option = EC-LEACHOPTION   = "User provided leach rate constants"*
>- Parent surface soil leach rate constant = "Chromium III" in top dropdown box and 1.0 1/yr in bottom boxes.
>- Parent surface soil leach rate constant = "Strontium - 90" in bottom dropdown box and 1.0 1/yr in bottom boxes.
>- Progeny suface soil leach rate constant = "YTTRIUM - 90" and 1.0 1/yr in bottom boxes.
>
>Click "File ⇔ Save and Exit." The traffic light next to the Exposure icon should turn yellow.

Run Model
>A DOS batch file will execute in a command prompt window, completing the operation. The traffic light next to the Exposure icon should turn green.

View/Print Module Output
>A second menu will appear, select the "EPF Text View."   The view should output a screen like Figure 9a.

6.3.4 Receptor Intake

General Info

A window titled "Object General Information" will appear. From "Select from Applicable Models," select "Mepas 4.1 Intake Module" and click "Ok." The traffic light next to the Receptor Intake icon should turn red.

User Input

A window titled "MEPAS Intake Module" will appear. Set the following values:
- *Body weight of individual – IC-BODYWT= 70.0 kg*
- *Exposure duration – IC-EXPDUR = 30.0 yr*
  - *Water dermal absorbtion model – IC-DERM = "EPA model"*
  - *Age of receptor at start of exposure – IC-TAGE1 = 0.0 yr*
  - *Age of receptor at end of exposure – IC-TAGE3 = 70.0yr*
  - *Method for inhalation impact analysis - HE - INHAL = "Air concentration"*

Click "File ↻ Save and Exit." The traffic light next to the Receptor Intake icon should turn yellow.

Run Model

The model should run in the background. The traffic light next to the Receptor Intake icon should turn green.

View/Print Module Output

A second menu will appear, select the "RIF Text View." The view should output a screen like Figure 9b.

6.3.5 Health Impacts

General Info

A window titled "Object General Information" will appear. Under "Select from Applicable Models," choose "Mepas 4.1 Human Health Impact Module" and click "Ok." The traffic light next to the Health Impacts icon should turn red.

User Input

A window titled "MEPAS Human Health Impact Module" should appear. Click the "Chemical" tab and set the following conditions:
- *"Calculate lifetime cancer incidence – CHEMRISK" is checked*
- *"Calculate hazard index – CHEMHI" is checked*
- *"Hazard quotient threshold limit – RFDLIM" = 0.0*
- *Method for inhalation impact analysis - HE - INHAL = "Air concentration"*

Click the 'Radionuclide' tab and set the following conditions:
- *"Calculate lifetime cancer incidence – HE-INC" is checked*
  Conversion factor – HE-CONINC = 0.06 risk/Sv
- *All additional checkboxes are NOT checked.*
- *'Cancer risk evaluation method – IHEAST' = "ICRP dose and risk factors"*
- *"Thickness of contaminated soil/sediment layer – TSOIL"= 0.04 m*

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- "Density of contaminated soil/sediment layer – DSOIL"   = 1.5 g/cm^3

Click "File Û Save and Exit." The traffic light next to the Health Impacts icon should turn yellow.

Run Model

The model should run in the background. The traffic light next to the Health
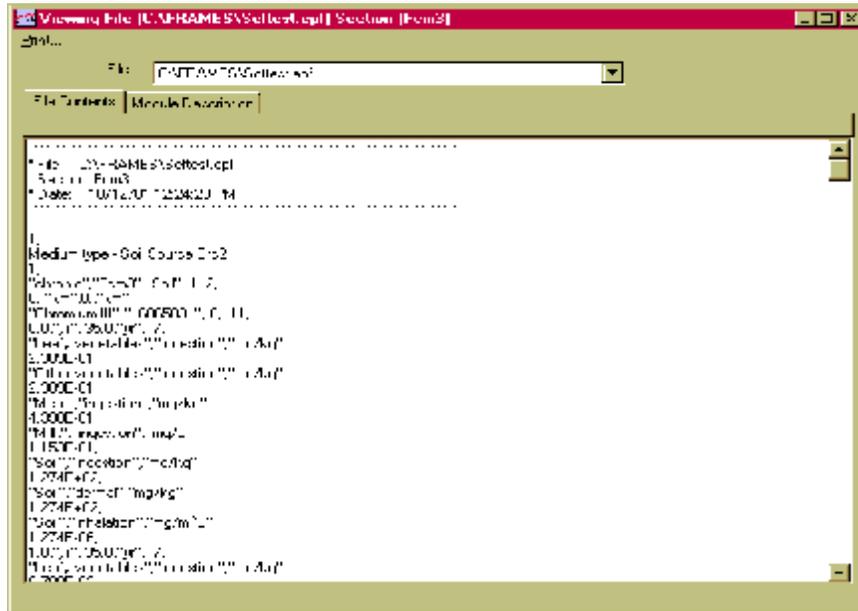
Impacts icon should turn green.

View/Print Module Output

A second menu will appear, select the "HIF Text View."   The view should output a screen like Figure 9c.

6.4 Expected Results

Viewer outputs should look like the three viewers of Figure 9.

Figure 9a. Viewer for Exposure Pathways

Figure 9b. Viewer for Receptor Intake

Figure 9c. Viewer for Human Impacts

6.5 Testing Results

Testing Restults were indentical to the Expected Results.

7.0 References

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