DOCUMENT RELEASE AND CHANGE FORM

Prepared For the U.S. Department of Energy, Assistant Secretary for Environmental Management
By Washington River Protection Solutions, LLC., PO Box 850, Richland, WA 99352
Contractor For U.S. Department of Energy, Office of River Protection, under Contract DE-AC27-08RV14800

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Release Stamp

DATE:
Aug 11,2020
HANFORD RELEASE

1. **Doc No:** RPP-CALC-63247 **Rev.** 00

2. **Title:**
WMA A-AX Performance Assessment Sensitivity Analysis

3. **Project Number:** T2C25 ☐N/A

4. **Design Verification Required:** ☐Yes ☒No

5. **USQ Number:** ☒ N/A RPP-27195

6. **PrHA Number** **Rev.** ☒ N/A

Clearance Review Restriction Type: public

7. **Approvals**

Title	Name	Signature	Date
Clearance Review	Harrison, Sarah E	*Harrison, Sarah E*	08/11/2020
Checker	Watson, David (Dj) J	*Watson, David (Dj) J*	06/09/2020
Document Control Approval	Meinecke, Kathryn R	*Meinecke, Kathryn R*	08/11/2020
Originator	Lee, Kearn (Pat)	*Lee, Kearn (Pat)*	06/17/2020
Quality Assurance	Lungu, Cris C	*Lungu, Cris C*	06/08/2020
Responsible Engineer	Lee, Kearn (Pat)	*Lee, Kearn (Pat)*	06/17/2020
Responsible Manager	Rutland, Paul L	*Rutland, Paul L*	07/08/2020

8. **Description of Change and Justification**

Rev. 0 - Initial issue.

9. **TBDs or Holds** ☒N/A

10. **Related Structures, Systems, and Components**

a. **Related Building/Facilities** ☒N/A	b. **Related Systems** ☒N/A	c. **Related Equipment ID Nos. (EIN)** ☒N/A

11. **Impacted Documents – Engineering** ☒N/A

Document Number	Rev.	Title

12. **Impacted Documents (Outside SPF):**

N/A

13. **Related Documents** ☐N/A

Document Number	Rev.	Title
RPP-CALC-62538	00	WMA A-AX Performance Assessment Groundwater Pathway Dose Calculation
RPP-CALC-62541	00	WMA A-AX Performance Assessment Uncertainty Calculation
RPP-ENV-61497	00	Preliminary Performance Assessment of Waste Management Area A-AX, Hanford Site, Washington
RPP-ENV-62206	00	Analysis of Post-Closure Groundwater Impacts from Hazardous Chemicals in Residual Wastes in Tanks and Ancillary Equipment at Waste Management Area A-AX at the Hanford Site, Southeast Washington
RPP-RPT-60885	00	Model Package Report System Model for the WMA A-AX Performance Assessment

14. **Distribution**

Name	Organization
Bergeron, Marcel P	CLOSURE & INTERIM MEASURES
Childress, Ryan D	CLOSURE & INTERIM MEASURES
Lee, Kearn (Pat)	CLOSURE & INTERIM MEASURES
Rutland, Paul L	CLOSURE & INTERIM MEASURES
Singleton, Kristin M	CLOSURE & INTERIM MEASURES
Watson, David (Dj) J	CLOSURE & INTERIM MEASURES

INFORMATION CLEARANCE REVIEW AND RELEASE APPROVAL

Part I: Background Information

Title: WMA A-AX Performance Assessment Sensitivity Analysis

Information Category:
- ☐ Abstract ☐ Journal Article ☐ Summary
- ☐ Internet ☐ Visual Aid ☐ Software
- ☐ Full Paper ☑ Report ☐ Other

Publish to OSTI? ☐ Yes ☑ No

Trademark/Copyright "Right to Use" Information or Permission Documentation	Yes	NA
	☐	☑

Document Number: RPP-CALC-63247 Revision 0 Date: June 2020

Author: Lee, Kearn (Pat)

Part II: External/Public Presentation Information

Conference Name: Not Applicable

Sponsoring Organization(s): DOE-ORP

Date of Conference: Not Applicable Conference Location: Not Applicable

Will Material be Handed Out? ☐ Yes ☑ No Will Information be Published? ☐ Yes ☑ No *(If Yes, attach copy of Conference format instructions/guidance.)*

Part III: WRPS Document Originator Checklist

Description	*Yes*	*N/A*	*Print/Sign/Date*
Information Product meets requirements in TFC-BSM-AD-C-01?	☑	☐	Lee, Kearn (Pat) Approved - IDMS data file att.
Document Release Criteria in TFC-ENG-DESIGN-C-25 completed? (Attach checklist)	☑	☐	Lee, Kearn (Pat) Approved - IDMS data file att.
If product contains pictures, safety review completed?	☐	☑	

Part IV: WRPS Internal Review

Function	*Organization*	*Date*	*Print Name/Signature/Date*
Subject Matter Expert	WRPS	06/23/2020	Lee, Kearn (Pat) Approved - IDMS data file att.
Responsible Manager	WRPS	06/18/2020	Rutland, Paul L Approved - IDMS data file att.
Other:			

Part V: IRM Clearance Services Review

Description	*Yes*	*No*	*Print Name/Signature*
Document Contains Classified Information?	☐	☒	If Answer is "Yes," ADC Approval Required Print Name/Signature/Date
Document Contains Information Restricted by DOE Operational Security Guidelines?	☐	☒	Reviewer Signature: Print Name/Signature/Date
Document is Subject to Release Restrictions? *If the answer is "Yes," please mark category at right and describe limitation or responsible organization below:*	☐	☒	Document contains: ☐ Applied Technology ☐ Protected CRADA ☐ Personal/Private ☐ Export Controlled ☐ Proprietary ☐ Procurement – Sensitive ☐ Patentable Info. ☐ OUO ☐ Predecisional Info. ☐ UCNI ☐ Restricted by Operational Security Guidelines ☐ Other (Specify)
Additional Comments from Information Clearance Specialist Review?	☐	☒	Information Clearance Specialist Approval APPROVED By Sarah Harrison at 9:02 am, Jul 16, 2020 Print Name/Signature/Date

When IRM Clearance Review is Complete – Return to WRPS Originator for Final Signature Routing (Part VI)

INFORMATION CLEARANCE REVIEW AND RELEASE APPROVAL

Part VI: Final Review and Approvals

Description	*Approved for Release*		*Print Name/Signature*
	Yes	*N/A*	
WRPS External Affairs	☒	☐	Mc Cune, Hal C Approved - IDMS data file att.
WRPS Office of Chief Counsel	☒	☐	Peters, Amber D Approved - IDMS data file att.
DOE – ORP Public Affairs/Communications	☒	☐	Tyree, Geoff T / Levardi, Yvonne M Approved - IDMS data file att.
Other: ORP-SME	☒	☐	Lobos, Rodrigo A Approved - IDMS data file att.
Other: ORP-OCC	☒	☐	Zelen, Benjamin J Approved - IDMS data file att.

Comments Required for WRPS-Indicate Purpose of Document:

This calculation report is being referenced by the preliminary Waste Management A-AX Performance Assessment (PA), which will be provided to Ecology later this year. In preparation for providing the preliminary PA to Ecology, the documents that support the PA are also be cleared for public release. The analysis was completed in June 2019, but finalization of the document was put on hold until DOE's Low-Level Waste Disposal Facility Federal Review Group (LFRG) reviewed the PA. That review completed in April so finalization of this report is now moving forward.

APPROVED
By Sarah Harrison at 9:02 am, Jul 16, 2020

Approved for Public Release; Further Dissemination Unlimited

Information Release Station

Was/Is Information Product Approved for Release? ☒ Yes ☐ No

If Yes, what is the Level of Releaser? ☑ Public/Unrestricted ☐ Other (Specify) _____

Date Information Product Stamped/Marked for Release: 07/16/2020

Was/Is Information Product Transferred to OSTI? ☐ Yes ☒ No

Forward Copies of Completed Form to WRPS Originator

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WMA A-AX Performance Assessment Sensitivity Analysis

Prepared by:
N. Hasan
W. Zhou
INTERA, Inc.

R. Childress
K. Singleton
Washington River Protection Solutions, LLC

Prepared for:
Washington River Protection Solutions, LLC

Date Published
September 2019

Prepared for the U.S. Department of Energy
Office of River Protection

Contract No. DE-AC27-08RV14800

Approved for Public Release;
Further Dissemination Unlimited

ENVIRONMENTAL MODEL CALCULATION COVER PAGE

Section 1: Completed by Responsible Manager

RELEASE/ISSUE

Project: Waste Management Area A-AX Performance Assessment

Date: 05/29/2019

Calculation Title & Description: WMA A-AX Performance Assessment Sensitivity Analysis

Section 2: Completed by Preparer

Calculation No.: RPP-CALC-63247 Revision No.: DrftA Rev. 0 KPL 6/24/2020

Revision History

Revision No.	Description	Date	Affected Pages

Section 3: Completed by Responsible Manager

Document Control

1. Is document intended to be controlled within SmartPlant? ☒ Yes ☐ No
2. Does document contain scientific and technical information intended for public use? ☒ Yes ☒ No KPL 6/24/2020
3. Does document contain controlled-use information? ☐ Yes ☒ No

Section 4: Training and Software Installation Approval (Completed Prior to Performing Calculation)

Modeler-Required Training Completed:

Ghada Saad/Training Coordinator (INTERA) — Training Coordinator (Name/Position) — Signature: Ghada Saad — Date: 5.30.19

Software Installation and Checkout Certified:

William Nichols/Principal Engineer (INTERA) — Integration Lead (Name/Position) — Signature — Date: 6 JUN 2019

Section 5: Document Review & Approval

Nazmul Hasan/Hydrologist (INTERA) — Preparer (Name/Position) — Signature — Date: 05/29/2019

DJ Watson/Scientist (WRPS) — Checker (Name/Position) — Signature — Date: 05/29/2019

Matt Kozak/Principal Engineer (INTERA) — Senior Reviewer (Name/Position) — Signature — Date: 6-3-2019

Bob Hiergesell/Sr.Scientist (WRPS) — Responsible Manager (Name/Position) — Signature — Date: 6/6/2019

Page 1 of 1 A-6006-716 (REV 0)

CHECKER LOG FOR SYSTEM MODELS

Project and Environmental Model Calculation Specific Information:

Project: Waste Management A-AX Performance Assessment

Responsible Manager or Designee, and Position: Bob Hiergesell, Senior Scientist

Originating Group or Department: Closure and Interim Measures | Date: 5/14/2019

Environmental Model Calculation File Report and Revision No.: RPP-CALC-63247 Draft A (GRT, TS, and BM)

Environmental Model Calculation File Title: WMA A-AX Performance Assessment Sensitivity Analysis

Check: Environmental Model Calculation File Document Elements

	List where Information is Described *(EMCF Section Number)*	Is the Description Correct and Sufficient? Yes	No	If No, describe deficiency:	Checker Signature
Purpose	1.0	◉	○		Ted J. Wh
Calculation Approach	4.3.1, 4.4.1, 4.5.1	◉	○		Ted J. Wh
Assumptions	4.0	◉	○		Ted J. Wh
Inputs *(reference detailed checklist below as well)*	4.3.3, 4.4.3, 4.5.3	◉	○		Ted J. Wh
Equations used	No equations outside those described in the MPR are used	◉	○		Ted J. Wh
Conclusions	4.3.4, 4.4.4, 4.5.4	◉	○		Ted J. Wh
References	7.0	◉	○		Ted J. Wh

Check: Controlled Software Use

	List where Information is Described *(EMCF Section Number)*	Is the Criteria Met? Yes	No	If No, describe deficiency:	Checker Signature
Software used in the calculation is appropriate for application	5.4	◉	○		Ted J. Wh
Software use is approved and properly validated in accordance with approved software management plan	5.1, 5.2, 5.3, 5.4	◉	○		Ted J. Wh
Software use is properly documented	4.3.2, 4.4.2, 4.5.2	◉	○		Ted J. Wh
Verify data was input correctly to approved software or spreadsheets	4.3.3, 4.4.3, 4.5.3	◉	○		Ted J. Wh
If a spreadsheet is used, verify inputs/outputs of calculation(s) to ensure accuracy	No spreadsheet is used	◉	○		Ted J. Wh

Check: Perform Calculation to Verify Free of Errors

	Describe how calculation was performed	List any discrepancies encountered *(If none, enter "None")*	Checker Signature
Perform the environmental model calculation as described to verify it is free of errors	Independent model was developed from the same	None	Ted J. Wh

CHECKER LOG FOR SYSTEM MODELS (Continued)

	Describe how calculation was performed	List any discrepancies encountered *(If none, enter "None")*	Checker Signature
	description. Results of this model were compared with the independently-produced model and the results matched		

Check: Process Model Parameterization ***(Specify Values and Units in Each Column)***

Model Parameter Type	(1) Input Documented in EMCF?	(2) Values checked against parameter source?	(3) Input in EMCF matches model input file(s)?
Simulation duration	4.0	yes	yes
Simulation time step control	4.0	yes	yes
Simulated chemical list	Table B-1	yes	yes
Simulated radionuclides list	Table B-1	yes	yes
External model components identified and documented or referenced	Not Applicable	Not Applicable	Not Applicable
External model linkages *(dynamic link libraries, etc.)* checked	Not Applicable	Not Applicable	Not Applicable
If model is probabilistic, stochastic distributions are defined and consistent	Not Applicable	Not Applicable	Not Applicable
Input units are declared and of correct dimensionality	Yes	Yes	Yes
Equations used in the model file are presented in EMCF and consistent	Not Applicable	Not Applicable	Not Applicable

Check: Further Checks ***(Record additional checks performed and results)***

Model Parameter Type	(1) Input Documented in EMCF?	(2) Values checked against parameter source?	(3) Input in EMCF matches model input file(s)?
Inventory: Radiological Decay Correction. Does the inventory *(source term)* include radionuclides, and if so, is it decay-corrected to the appropriate date for inclusion as a source?	The base case model (including inventory) is used for these sensitivities (Section 4.3.2).	Model values were compared against those in the source document (RPP-CALC-62319, Rev. 0), which are documented to be decay-corrected to the appropriate date (2050).	yes.

CHECKER LOG FOR SYSTEM MODELS (Continued)			
Model Parameter Type	(1) Input Documented in EMCF?	(2) Values checked against parameter source?	(3) Input in EMCF matches model input file(s)?
Inventory: Mass Balance. Is mass balance of inventory maintained in system model calculation(s)?	Mass balance is not an input. Mass Balance of inventory in the model was checked using the same elements as in the base case model and the mass balance is maintained in all scenarios.	N/A	N/A
Additional Model checks performed as documented in "Supplemental_Check_Log GRT TS TRA.docx"	N/A	N/A	N/A

Additional GRT/BM/TS Checks (2 sheets)

Check	Results	Resolution	Comments
Spreadsheet of STOMP results was input correctly into model	Pass.	N/A	GoldSim values were copied out of the model and pasted into the workbook "Sensitivity_Cases_Parameters_and_input_Data_Checking_GRT_TS_BM.xlsx" and boolean compared with values copied and pasted from the STOMP results spreadsheet.
Darcy Flux and Moisture Content data match between EMCF and GoldSim model	Pass.	N/A	The Darcy Flux and Moisture content values for A Farm and AX Farm were copied from RPP-CALC-63247 and pasted into the Excel workbook "GRT_EMCF_Input_Check.xlsx" and Boolean compared with those copied from the GoldSim file (a_ax v1.0_20190408_GRT_BM_TS.gsm)
Functions for Darcy flux and moisture content are indexed to degraded tank STOMP results correctly	Pass.	N/A	Checker visually verified each function was correctly indexed to the "DF_A_Tank_deg", "MC_A_Tank_deg", "DF_AX_Tank_deg", and "MC_AX_Tank_deg" data elements in the GoldSim file (a_ax v1.0_20190408_GRT_BM_TS.gsm)
Additional sensitivity-related parameters and values used match those of independently derived parameters and values	Pass.	N/A	Checker developed a list of additional parameters, and related values, needed to perform the sensitivity analyses as described prior to obtaining GoldSim model for checking. These independently developed parameters and values were checked against those in the GoldSim file in the "Sensitivity_Cases_Parameters_and_input_Data_Checking_GRT_TS_BM.xlsx" workbook.
Grout K_d values used in the various sensitivity runs are appropriate	Pass.	N/A	Values were copied from the "Kd_Grout_Best" data element for each scenario in the GoldSim model (a_ax v1.0_20190408_GRT_BM_TS.gsm) and pasted into the "Sensitivity_Cases_Parameters_and_input_Data_Checking_GRT_TS_BM.xlsx" workbook. The checker verified that the appropriate values were used for each scenario.
Sensitivity parameter selection logic in GoldSim scenario manager makes sense	Pass.	N/A	Checker developed a logic sequence based on the sensitivity related elements in the GoldSim file for each sensitivity case (model scenario). This sequence was checked against the model scenarios in the GoldSim file (a_ax v1.0_20190408_GRT_BM_TS.gsm).

Additional GRT/BM/TS Checks (2 sheets)

Check	Results	Resolution	Comments
Results are comparable with independently developed GoldSim model	Pass.	N/A	Checker independently developed a series of GoldSim models–one for each scenario (a_ax v1.0_20190408_GRT-1.gsm, a_ax v1.0_20190408_GRT-B1.gsm, a_ax v1.0_20190408_GRT-B2.gsm, a_ax v1.0_20190408_TS-1.gsm, and a_ax v1.0_20190408_BM-1.gsm)–prior to obtaining the model file to check (a_ax v1.0_20190408_GRT_BM_TS.gsm). The results of these files were checked against each other in the Excel workbook "Plot_Compare_GRT_TS_BM.xlsx". The results match except for GRT-1 and GRT-2, which have minor variations. These variations are a result of the flow field used by the checker in the model; The checker did not have access to the degraded tank flow field and had to approximate it. The results for these two cases are acceptably comparable.

CHECKER LOG FOR SYSTEM MODELS

Project and Environmental Model Calculation Specific Information:

Project: Waste Management A-AX Performance Assessment

Responsible Manager or Designee, and Position: Bob Hiergesell, Senior Scientist

Originating Group or Department: Closure and Interim Measures | Date: 5/15/2019

Environmental Model Calculation File Report and Revision No.: RPP-CALC-63247 Draft A (INF Cases)

Environmental Model Calculation File Title: WMA A-AX Performance Assessment Sensitivity Analysis

Check: Environmental Model Calculation File Document Elements

	List where Information is Described *(EMCF Section Number)*	Is the Description Correct and Sufficient?			Checker Signature
		Yes	No	If No, describe deficiency:	
Purpose	1.0	◉	○		
Calculation Approach	4.1.1	◉	○		
Assumptions	4.0	◉	○		
Inputs *(reference detailed checklist below as well)*	4.1.3, Attachment C	◉	○		
Equations used	No equations outside those described in the MPR are used	◉	○		
Conclusions	4.1.4	◉	○		
References	7.0	◉	○		

Check: Controlled Software Use

	List where Information is Described *(EMCF Section Number)*	Is the Criteria Met?			Checker Signature
		Yes	No	If No, describe deficiency:	
Software used in the calculation is appropriate for application	5.4	◉	○		
Software use is approved and properly validated in accordance with approved software management plan	5.1, 5.2, 5.3, 5.4	◉	○		
Software use is properly documented	4.1.2	◉	○		
Verify data was input correctly to approved software or spreadsheets	Attachment C	◉	○		
If a spreadsheet is used, verify inputs/outputs of calculation(s) to ensure accuracy	No spreadsheet is used	◉	○		

Check: Perform Calculation to Verify Free of Errors

	Describe how calculation was performed	List any discrepancies encountered *(If none, enter "None")*	Checker Signature
Perform the environmental model calculation as described to verify it is free of errors	Independent model was developed from the same	None	

CHECKER LOG FOR SYSTEM MODELS (Continued)

	Describe how calculation was performed	List any discrepancies encountered *(If none, enter "None")*	Checker Signature
	description. Results of this model were compared with the independently-produced model and the results matched		

Check: Process Model Parameterization *(Specify Values and Units in Each Column)*

Model Parameter Type	(1) Input Documented in EMCF?	(2) Values checked against parameter source?	(3) Input in EMCF matches model input file(s)?
Simulation duration	4.0	yes	yes
Simulation time step control	4.0	yes	yes
Simulated chemical list	Table B-1	yes	yes
Simulated radionuclides list	Table B-1	yes	yes
External model components identified and documented or referenced	Not Applicable	Not Applicable	Not Applicable
External model linkages *(dynamic link libraries, etc.)* checked	Not Applicable	Not Applicable	Not Applicable
If model is probabilistic, stochastic distributions are defined and consistent	Not Applicable	Not Applicable	Not Applicable
Input units are declared and of correct dimensionality	Appendix C	yes	yes
Equations used in the model file are presented in EMCF and consistent	Not Applicable	Not Applicable	Not Applicable

Check: Further Checks *(Record additional checks performed and results)*

Model Parameter Type	(1) Input Documented in EMCF?	(2) Values checked against parameter source?	(3) Input in EMCF matches model input file(s)?
Inventory: Radiological Decay Correction. Does the inventory *(source term)* include radionuclides, and if so, is it decay-corrected to the appropriate date for inclusion as a source?	The base case model (including inventory) is used for these sensitivities (Section 4.1.2).	Model values were compared against those in the source document (RPP-CALC-62319, Rev. 0), which are documented to be decay-corrected to the appropriate date (2050).	yes.

CHECKER LOG FOR SYSTEM MODELS (Continued)

Model Parameter Type	(1) Input Documented in EMCF?	(2) Values checked against parameter source?	(3) Input in EMCF matches model input file(s)?
Inventory: Mass Balance. Is mass balance of inventory maintained in system model calculation(s)?	Mass balance is not an input. Mass Balance of inventory in the model was checked using the same elements as in the base case model and the mass balance is maintained in all scenarios.	N/A	N/A
Additional Model checks performed as documented in "Supplemental_Check_Log INF.docx"	N/A	N/A	N/A

Additional INF Checks (2 sheets)

Check	Results	Resolution	Comments
Darcy Flux and Moisture content tables are modified to reflect the parameters of the sensitivity cases.	Pass	N/A	Checker independently developed a series of GoldSim models–one for each infiltration scenario (a_ax v1.0_20190408_INF-1.gsm, a_ax v1.0_20190408_INF-2.gsm and a_ax v1.0_20190408_INF-3.gsm)–prior to obtaining the model file to check (EMCF-62538_INF.gsm). The checker modified the darcy flux and moisture content tables for each tank farm for both tanks and non-tanks according to the scenario descriptions. The Darcy Flux and Moisture Content from the independently-developed model files and the sensitivity file (EMCF-62538_INF.gsm) are compared in "Sensitivity_Cases_Parameters_and_Input_Data_Checking_INF_Non_Tanks.xlsx" and "Sensitivity_Cases_Parameters_and_Input_Data_Checking_INF_Tanks.xlsx". The independently-developed model and the infiltration sensitivity model are in agreement.
GoldSim Darcy Flux and Moisture content data match those found in EMCF	Pass	N/A	The Darcy Flux and Moisture content values for A Farm and AX Farm were copied from RPP-CALC-63247 and pasted into the Excel workbooks "A_Farm_INF_Input_Check.xlsx" and "AX_Farm_INF_Input_Check.xlsx" and were Boolean compared with those copied from the GoldSim file (EMCF-62538_INF.gsm)
Inventory data matches that of Base Case model	Pass	N/A	Inventory data were copied from the Inventory EMCF (RPP-CALC-62319) and the GoldSim file (EMCF-62538_INF.gsm) and compared in "Inventory_Input_Check_INF.xlsx"
Script elements are logical	Pass	N/A	Checker reviewed the script elements and the logic is sound.
Script elements match each other	Pass	N/A	Since the script elements for each Hydrostratigraphic Unit perform the same function, they should match each other except for the node they refer to.
Script elements select the correct index from the Darcy Flux and Moisture Content tables	Pass	N/A	Script elements were visually checked against the values in the Model Package Report (RPP-CALC-60885, Rev. 0). The results of the check are documented in "Script_Element_Check_INF.xlsx"
Results are comparable with independently developed GoldSim model	Pass	N/A	Checker independently developed a series of GoldSim models–one for each infiltration scenario (a_ax v1.0_20190408_INF-1.gsm, a_ax v1.0_20190408_INF-2.gsm and a_ax v1.0_20190408_INF-3.gsm)–prior to obtaining the model file to check (EMCF-62538_INF.gsm). The results of these files were checked against

Additional INF Checks (2 sheets)

Check	Results	Resolution	Comments
			each other in the workbook “Plot_Compare_INF.xlsx”. The results match except for only a small few, which appear to have rounding differences between them.

CHECKER LOG FOR SYSTEM MODELS

Project and Environmental Model Calculation Specific Information:

Project: Waste Management A-AX Performance Assessment

Responsible Manager or Designee, and Position: Bob Hiergesell, Senior Scientist

Originating Group or Department: Closure and Interim Measures | Date: 5/20/2019

Environmental Model Calculation File Report and Revision No.: RPP-CALC-63247 Draft A (INV Cases)

Environmental Model Calculation File Title: WMA A-AX Performance Assessment Sensitivity Analysis

Check: Environmental Model Calculation File Document Elements

	List where Information is Described *(EMCF Section Number)*	Is the Description Correct and Sufficient? Yes	No	If No, describe deficiency:	Checker Signature
Purpose	1.0	◉	○		
Calculation Approach	4.2.1	◉	○		
Assumptions	4.0	◉	○		
Inputs *(reference detailed checklist below as well)*	4.2.3	◉	○		
Equations used	No equations outside those described in the MPR are used	◉	○		
Conclusions	4.2.4	◉	○		
References	7.0	◉	○		

Check: Controlled Software Use

	List where Information is Described *(EMCF Section Number)*	Is the Criteria Met? Yes	No	If No, describe deficiency:	Checker Signature
Software used in the calculation is appropriate for application	5.4	◉	○		
Software use is approved and properly validated in accordance with approved software management plan	5.1, 5.2, 5.3, 5.4	◉	○		
Software use is properly documented	4.2.2, 4.2.3	◉	○		
Verify data was input correctly to approved software or spreadsheets	Attachment B	◉	○		
If a spreadsheet is used, verify inputs/outputs of calculation(s) to ensure accuracy	"AAX_Inventory_Sensitivity.xlsx" was checked using "AAX_Inventory_Sensitivity_Calculation_Checklist.docx"	◉	○		

Check: Perform Calculation to Verify Free of Errors

	Describe how calculation was performed	List any discrepancies encountered *(If none, enter "None")*	Checker Signature
Perform the environmental	Independent model	None	

CHECKER LOG FOR SYSTEM MODELS (Continued)

	Describe how calculation was performed	List any discrepancies encountered *(If none, enter "None")*	Checker Signature
model calculation as described to verify it is free of errors	was developed from the same description. Results of this model were compared with the independently-produced model and the results matched		

Check: Process Model Parameterization ***(Specify Values and Units in Each Column)***

Model Parameter Type	(1) Input Documented in EMCF?	(2) Values checked against parameter source?	(3) Input in EMCF matches model input file(s)?
Simulation duration	4.0	yes	yes
Simulation time step control	4.0	yes	yes
Simulated chemical list	Attachment B	yes. Checked with spreadsheet "AAX_Inventory_Sensitivity_Check.xlsx"	yes. Checked with "Sensitivity_Cases_Parameters_and_Input_Data_Checking_INV.xlsx"
Simulated radionuclides list	Attachment B	yes. Checked with spreadsheet "AAX_Inventory_Sensitivity_Check.xlsx"	yes. Checked with "Sensitivity_Cases_Parameters_and_Input_Data_Checking_INV.xlsx"
External model components identified and documented or referenced	Not Applicable	Not Applicable	Not Applicable
External model linkages *(dynamic link libraries, etc.)* checked	Not Applicable	Not Applicable	Not Applicable
If model is probabilistic, stochastic distributions are defined and consistent	Not Applicable	Not Applicable	Not Applicable
Input units are declared and of correct dimensionality	Attachment B	yes	yes
Equations used in the model file are presented in EMCF and consistent	Not Applicable	Not Applicable	Not Applicable

Check: Further Checks ***(Record additional checks performed and results)***

Model Parameter Type	(1) Input Documented in EMCF?	(2) Values checked against parameter source?	(3) Input in EMCF matches model input file(s)?
Inventory: Radiological Decay Correction. Does the inventory *(source term)* include radionuclides, and if so, is it decay-corrected to the appropriate date for inclusion as a source?	4.2.1.1, 4.2.1.2	yes, using "Inventory_Input_Check_EMCF_and_Source_INV.xlsx"	yes, using "Inventory_Input_Check_EMCF_and_Model_INV.xlsx"

CHECKER LOG FOR SYSTEM MODELS (Continued)

Model Parameter Type	(1) Input Documented in EMCF?	(2) Values checked against parameter source?	(3) Input in EMCF matches model input file(s)?
Inventory: Mass Balance. Is mass balance of inventory maintained in system model calculation(s)?	Mass balance is not an input. Mass Balance of inventory in the model was checked using the same elements as in the base case model and the mass balance is maintained in all scenarios.	N/A	N/A
Additional Model checks performed as documented in "Supplemental_Check_Log INV.docx"	N/A	N/A	N/A

Additional INV Checks

Check	Results	Resolution	Comments
Spreadsheet of Inventory results was input correctly into model	Pass.	N/A	Inventory values were copied out of the model and pasted into the workbook "Sensitivity_Cases_Parameters_and_input_Data_Checking_INV.xlsx" and boolean compared with values copied and pasted from the STOMP results spreadsheet. Additionally, values were copied out of a GoldSim model independently developed by the checker prior to obtaining the Inventory Sensitivity Model and paste into the same workbook. These values were also boolean compared to the sensitivity model data.
Volumes were input correctly into model	Pass.	N/A	Volume values were copied out of the model and pasted into the workbook "Sensitivity_Cases_Parameters_and_input_Data_Checking_INV.xlsx" and boolean compared with values copied and pasted from the STOMP results spreadsheet. Additionally, values were copied out of a GoldSim model independently developed by the checker prior to obtaining the Inventory Sensitivity Model and paste into the same workbook. These values were also boolean compared to the sensitivity model data.
Results are comparable with independently developed GoldSim model	Pass.	N/A	Checker independently a GoldSim model containing scenarios for BaseCase, INV1 and INV2 prior to obtaining the model file to check. The results of these files were checked against each other in "Inv_check_w_mass_Balance_compared_with_INV_0_1_2(b).xlsx". The results match between the independently-developed GoldSim model and the Inventory Sensitivity model to check.

EXECUTIVE SUMMARY

This environmental model calculation file provides the basis for evaluation and review of the sensitivity analysis conducted as part of the Waste Management Area A-AX performance assessment modeling. The results of the sensitivity analysis support parts of the performance assessment focused on radiological impacts to meet the requirements for a closure authorization under DOE O 435.1, *Radioactive Waste Management* and are used to demonstrate compliance with performance measures. The model calculations are performed using GoldSim©[1] software.

The sensitivity analysis studies the impact of the potentially important components of the Waste Management Area A-AX system on the performance objectives. Several sensitivity cases are identified based on the safety functions of the disposal system. Sensitivity cases were simulated using the modified GoldSim© system model developed for the groundwater pathway Base Case. For each of the cases, this report documented the approach, necessary modifications to the system model, input parameters, and the analysis results. The following cases resulted in the peak annual doses that are at least 10 times the Base Case peak doses (0.3 mrem/yr for 241-A Tank Farm and 0.047 mrem/yr for 241-AX Tank Farm).

- No barrier and no vegetation (constant 100 mm/yr recharge rate throughout 10,000 years): the high recharge rate enhances release and transport of ^{233}U from the non-tank sources, giving rise to the peak doses that are about 40 to 80 times the Base Case doses. The peak times are within 1,000 years after closure.

- Inventory data derived using the current waste volumes from the Best-Basis Inventory data source: the peak dose in 241-AX Tank Farm is about 14 times the Base Case.

- Degraded grout with flow through the tanks or with no sorption would increase the peak doses by 10 to 17 times compared to the Base Case peak doses.

These analyses indicate that among all the cases, the peak doses are mostly sensitive to the recharge rate, advection through the grout, sorption in the grout, and inventory. Other cases have minor impacts on the peak doses. The peak dose analysis indicated that annual doses in both 241-A and 241-AX Tank Farms reach the peak values between 10,000 and 400,000 years primarily contributed by ^{233}U from the non-tank sources. The peak dose is 0.9 mrem/yr for 241-A Tank Farm and 0.08 mrem/yr for 241-AX Tank Farm, respectively.

[1] GoldSim© simulation software is copyrighted by GoldSim Technology Group LLC of Issaquah, Washington (see http://www.goldsim.com).

TABLE OF CONTENTS

1.0 PURPOSE 1-1

2.0 BACKGROUND 2-1

2.1 SUMMARY OF WASTE MANAGEMENT AREA A-AX PERFORMANCE ASSESSMENT GROUNDWATER PATHWAY BASE CASE 2-1

2.2 IDENTIFICATION OF SENSITIVITY ANALYSES 2-2

2.3 SUMMARY OF WASTE MANAGEMENT AREA A-AX PERFORMANCE ASSESSMENT SENSITIVITY ANALYSIS 2-10

3.0 METHODOLOGY 3-1

3.1 SELECTION OF TECHNICAL STAFF 3-1

3.2 ORIGINATORS 3-1

3.3 CHECKERS 3-3

3.4 SENIOR REVIEWERS 3-4

4.0 SENSITIVITY CASES IMPLEMENTATION AND RESULTS 4-1

4.1 SURFACE BARRIER SENSITIVITY CASES 4-1

4.1.1 Calculation Approach 4-1
4.1.2 Description of Model Changes 4-2
4.1.3 Inputs 4-4
4.1.4 Surface Barrier Sensitivity Results 4-4

4.2 INVENTORY SENSITIVITY CASES 4-7

4.2.1 Calculation Approach 4-7
4.2.2 Description of Model Changes 4-13
4.2.3 Inputs 4-13
4.2.4 Inventory Sensitivity Results 4-13

4.3 GROUT SENSITIVITY CASES 4-14

4.3.1 Calculation Approach 4-14
4.3.2 Description of Model Changes 4-25
4.3.3 Inputs 4-26

4.3.4 Grout Sensitivity Cases Results 4-26

4.4 TANK SHELL SENSITIVITY CASE 4-26

4.4.1 Calculation Approach 4-26
4.4.2 Description of Model Changes 4-30
4.4.3 Inputs 4-31
4.4.4 Tank Shell Sensitivity Case Results 4-31

4.5 BASE MAT SENSITIVITY CASE 4-32

4.5.1 Calculation Approach 4-32
4.5.2 Description of Model Changes 4-46
4.5.3 Inputs 4-47
4.5.4 Base Mat Sensitivity Case Results 4-47

4.6 VADOSE ZONE SENSITIVITY CASE 4-48

4.7 PEAK DOSE ANALYSIS 4-49

4.7.1 Calculation Approach 4-49
4.7.2 Description of the Model Changes 4-49
4.7.3 Inputs 4-52
4.7.4 Peak Dose Analysis Results 4-52

5.0 SOFTWARE APPLICATIONS 5-1

5.1 SOFTWARE IDENTIFICATION 5-1

5.2 SOFTWARE QUALITY ASSURANCE 5-1

5.3 SOFTWARE INSTALLATION AND CHECKOUT 5-1

5.4 STATEMENT OF VALID SOFTWARE APPLICATION 5-2

6.0 MODEL CONFIGURATION MANAGEMENT 6-1

7.0 REFERENCES 7-1

ATTACHMENT A – SOFTWARE INSTALLATION AND CHECKOUT FORMS A-1

ATTACHMENT B – INVENTORY AND VOLUME DATA FOR THE INVENTORY SENSITIVITY CASES B-1

ATTACHMENT C – FLOW FIELD DATA FOR THE INFILTRATION SENSITIVITY CASES C-1

LIST OF FIGURES

Figure 4-1. Flow_Field_Abstraction Container Structure. 4-3
Figure 4-2. GoldSim© Scenario Manager. 4-3
Figure 4-3. Scenario Data. 4-4
Figure 4-4. DF_A_Tank_H1_Top. 4-5
Figure 4-5. MC_A_Tank_H1_Top. 4-6
Figure 4-6. A_Tank_Flowfields. 4-7
Figure 4-7. Comparison between the Three Infiltration Cases and the Base Case. 4-9
Figure 4-8. Dose by Source (INF2). 4-9
Figure 4-9. Dose by Analyte (INF2). 4-10
Figure 4-10. Dose by Exposure Pathway (INF2). 4-10
Figure 4-11. Comparison between the Three Infiltration Cases and the Base Case. 4-11
Figure 4-12. Dose by Source (INF2). 4-11
Figure 4-13. Dose by Analyte (INF2). 4-12
Figure 4-14. Dose by Exposure Pathway (INF2). 4-12
Figure 4-15. GoldSim© Scenario Manager for Sensitivity Cases INV0, INV1, and INV2. 4-24
Figure 4-16. GoldSim© Scenario Manager Scenario Data for Sensitivity Cases INV0, INV1 and INV2. 4-24
Figure 4-17. Scenario Data Elements. 4-25
Figure 4-18. Total 241-A Tank Farm Dose at 100 meters by Source for the (a) Base Case INV0, (b) INV1, and (c) INV2. 4-27
Figure 4-19. Total 241-AX Tank Farm Dose at 100 meters by Source for the (a) Base Case INV0, (b) INV1, and (c) INV2. 4-28
Figure 4-20. 241-A Tank Farm Total Groundwater Dose. 4-29
Figure 4-21. 241-AX Tank Farm Total Groundwater Dose. 4-29
Figure 4-22. Grout Degradation Control by Tank_Degraded_Status and Tank_Deg_Time in the Base Case GoldSim© Model File (a_ax v1.0_20190408.gsm). 4-31
Figure 4-23. Grout Degradation Control by Tank_Degraded_Status and GRT_Time in the Sensitivity GoldSim© Model File (a_ax v1.0_20190408_GRT_BM_TS.gsm). 4-32
Figure 4-24. The GoldSim© Elements for Darcy Velocity and Moisture Contents for the Degraded Tank Condition in 241-A Tank Farm. 4-33
Figure 4-25. Example of Linkage between the Degraded Moisture Content to the Vadose Zone Unit (241-A Tank Farm H1_Top cell as an example) Property via a Selector Element. 4-46

Figure 4-26. Example of Linkage between the Degraded Darcy Velocity to the Vadose Zone Unit (241-A Tank Farm H1_Top cell, as an example) Property via a Selector Element. 4-47
Figure 4-27. GoldSim© Implementation of Darcy Velocity Flowing Through the Degraded Grout for the 241-A Farm Tank. 4-48
Figure 4-28. GoldSim© Implementation of Moisture Content in the Degraded Grout for the 241-A Farm Tank. 4-49
Figure 4-29. Comparison between the Grout Sensitivity Cases and the Base Case: 241-A Tank Farm Total Dose. 4-50
Figure 4-30. Comparison between the Grout Sensitivity Cases and the Base Case: 241-AX Tank Farm Total Dose. 4-51
Figure 4-31. The GoldSim© Elements Added to Control Diffusive Release from the Tanks. 4-53
Figure 4-32. Control of Diffusive Release from the Residual Waste for the Tank Integrity Sensitivity Case. 4-54
Figure 4-33. Comparison between the TS1 Case and the Base Case: 241-A Tank Farm Total Dose. 4-55
Figure 4-34. Comparison between the TS1 Case and the Base Case: 241-AX Tank Farm Total Dose. 4-56
Figure 4-35. The GoldSim© Scenario Parameter TRA is Added to Control Base Mat Advection Sensitivity Case. 4-57
Figure 4-36. GoldSim© Model Implementation of the Base Mat Sensitivity Case for 241-A Farm Tanks. 4-58
Figure 4-37. GoldSim© Model Implementation of the Base Mat Sensitivity Case for 241-AX Farm Tanks. 4-59
Figure 4-38. Comparison between the BM1 Case and the Base Case: 241-A Tank Farm Total Dose. 4-60
Figure 4-39. Comparison between the BM1 Case and the Base Case: 241-AX Tank Farm Total Dose. 4-60
Figure 4-40. Comparison between the TS1 Case and the Base Case: Technetium-99 Release to Vadose Zone from Tank 241-A-105. 4-61
Figure 4-41. 241-A Tank Farm Dose Results for the Peak Dose Analysis Case. 4-62
Figure 4-42. 241-AX Tank Farm Dose Results for the Peak Dose Analysis Case. 4-62
Figure 4-43. 241-A Tank Farm Pipeline Doses by Analytes for the Peak Dose Analysis Case. 4-63
Figure 4-44. 241-AX Tank Farm Pipeline Doses by Analytes for the Peak Dose Analysis Case. 4-63
Figure 4-45. Tank 241-A-105 Doses by Analytes for the Peak Dose Analysis Case. 4-64
Figure 4-46. Tank 241-AX-104 Doses by Analytes for the Peak Dose Analysis Case. 4-64

LIST OF TABLES

Table 2-1. List of Safety Functions, Associated Features, Events, and Processes, and Potentially Deleterious Features, Events, and Processes for the Waste Management Area A-AX Performance Assessment. 2-3

Table 2-2. Sensitivity Analysis Cases for the Waste Management Area A-AX Performance Assessment. 2-11

Table 4-1. List of Infiltration Sensitivity Cases. 4-1

Table 4-2. Summary of Inventory Development for Base Case and Sensitivity Cases. 4-13

Table 4-3. Radioactive Contaminant of Potential Concern Inventory (curies) at Calendar Year 2050 for INV1 Sensitivity Case. 4-15

Table 4-4. Chemical Contaminant of Potential Concern Inventory (kilograms) at Calendar Year 2050 for INV1 Sensitivity Case. 4-17

Table 4-5. The Current Tank Waste Volumes (kiloliters). 4-17

Table 4-6. Radioactive Contaminant of Potential Concern Best-Basis Inventory Tank Waste Concentrations and Average Farm Concentrations (curies/kiloliters) at 2050. 4-18

Table 4-7. Chemical Contaminant of Potential Concern Best-Basis Inventory Tank Waste Concentrations and Average Farm Concentrations (kilograms/kiloliter) at 2050. 4-19

Table 4-8. The Current and Residual Non-Tank Volumes (kiloliters). 4-19

Table 4-9. Non-Tank Radioactive Contaminant of Potential Concern Inventories (curies) for INV1. 4-20

Table 4-10. Non-Tank Chemical Contaminant of Potential Concern Inventories (kilograms) for INV1. 4-21

Table 4-11. Non-Tank Radioactive Contaminant of Potential Concern Inventories (curies) for INV2. 4-22

Table 4-12. Non-Tank Chemical Contaminant of Potential Concern Inventories (kilograms) for INV2. 4-23

Table 4-13. Peak Dose and Peak Times for Base Case (INV0), INV1, and INV2. 4-30

Table 4-14. Grout Sensitivity Case Parameters. 4-30

Table 4-15. Moisture Contents (dimensionless) versus Time (years after closure) for the Degraded Tank Condition in 241-A Tank Farm. 4-34

Table 4-16. Darcy Velocities (mm/yr) versus Time (years after closure) for the Degraded Tank Condition in 241-A Tank Farm. 4-36

Table 4-17. Moisture Contents (dimensionless) versus Time (years after closure) for the Degraded Tank Grout in 241-AX Tank Farm. 4-38

Table 4-18. Darcy Velocities (mm/yr) versus Time (years after closure) for the Degraded Tank Grout of 241-AX Tank Farm. 4-40

Table 4-19. Peak Dose and Peak Arrival Times for the Grout Sensitivity Cases and the Base Case. 4-52

Table 4-20. GoldSim© Element Values and Logic for the Tank Shell Sensitivity Case. 4-52

Table 4-21. Peak Dose and Peak Times for TS1 and the Base Case. 4-56

Table 4-22. Peak Dose and Peak Times for BM1 and Base Case. 4-61

Table 4-23. Timesteps Used in the Peak Dose Analysis Case. 4-61

LIST OF TERMS

AMS	American Meteorological Society
BBI	Best-basis inventory
BM	Base Mat
CHPRC	CH2M HILL Plateau Remediation Company
COPC	contaminant of potential concern
CY	calendar year
DOE	U.S. Department of Energy
EMCF	environmental model calculation file
EMMA	Environmental Model Management Archive
EPA	U.S. Environmental Protection Agency
FEPs	Features, Events, and Processes
GRT	grout
IAEA	International Atomic Energy Agency
IMBA	Integrated Modules for Bioassay Assessment
PA	performance assessment
RCRA	*Resource Conservation and Recovery Act of 1976*
RESRAD	RESidual RADioactive
SZ	saturated zone
VZ	vadose zone
WMA	Waste Management Area
WRPS	Washington River Protection Solutions, LLC

1.0 PURPOSE

The purpose of this environmental model calculation file (EMCF) is to document the sensitivity analysis calculations of deterministic groundwater concentrations and doses to support the performance assessment (PA) of the residual waste in the underground tanks and pipelines in Waste Management Area (WMA) A-AX. WMA A-AX comprises the 241-A and 241-AX Tank Farms and is located within the 200 East Area of the Central Plateau of the Hanford Site. Plans for the future closure of 241-A and 241-AX Tank Farms call for retrieval of wastes remaining in the tanks to the maximum extent practicable, grouting the residual wastes and interior volume of the tanks, and construction of a surficial barrier over the tank farms.

In accordance with DOE O 435.1, *Radioactive Waste Management*, radioactive waste shall be managed and disposed in a manner that is protective of worker and public health and safety, and the environment. DOE O 435.1 requires a site-specific radiological PA that includes calculations of potential releases and subsequent doses to members of the public for a period of 1,000 years after closure of a low-level waste disposal facility. Washington River Protection Solutions, LLC (WRPS) and INTERA Inc., are performing the calculations supporting the PA for the WMA A-AX. As part of this PA evaluation, DOE M 435.1-1, *Radioactive Waste Management Manual* directs that the PA shall include a sensitivity analysis. Sensitivity analyses evaluate changes in calculated groundwater impacts that result from changes in input parameter estimates as a result of changing a broad set of input assumptions. Primary sources of alternative modeling assumptions are natural system heterogeneities, long-term engineered surface barrier performance, and human actions. Such assumptions can be categorized as scenario or model uncertainties, and as such are not readily amenable to the use of probabilistic methods (NCRP Report No. 152, *Performance Assessment of Near-Surface Facilities for Disposal of Low-Level Radioactive Waste*; "Decision analysis for low-level radioactive waste disposal safety assessments" [Kozak 1994]). Consequently, these analyses are run as deterministic sensitivity analyses, without assigning a likelihood of occurrence. The sensitivity analyses quantify the ranges of calculated groundwater concentration outcomes due to single-parameter or multiple-parameter changes that represent an underlying shift in the conceptual model. With respect to the defense-in-depth concept, the analyses quantify the impacts that alternative views of the natural and engineered barriers have on groundwater concentrations in the evaluation of total system performance. It is also emphasized that these sensitivity analyses have been augmented by probabilistic uncertainty analyses that specifically evaluate parameter uncertainties, which are addressed in RPP-CALC-62541, *WMA A-AX Performance Assessment Uncertainty Calculation*. This EMCF only presents the deterministic one-at-a-time analysis, where one aspect of the system is varied from the base case system model documented in RPP-CALC-62538, *WMA A-AX Performance Assessment Groundwater Pathway Dose Calculation*.

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2.0 BACKGROUND

2.1 SUMMARY OF WASTE MANAGEMENT AREA A-AX PERFORMANCE ASSESSMENT GROUNDWATER PATHWAY BASE CASE

Base Case is defined as the simulation of the WMA A-AX system model from closure to 10,000 years beyond using nominal or best-estimate parameters. The description of the system model and parameter values in the Base Case can be found in RPP-RPT-60885, *Model Package Report System Model for the WMA A-AX Performance Assessment*. The Base Case calculation and results are described in RPP-CALC-62538.

The primary factors controlling vadose zone (VZ) release rates are inventory, recharge rate and sorption in the near field. Tanks with higher inventories result in higher VZ release rates. During the first 500 years after closure, the surface barrier performs as designed and restricts the recharge rate to 0.5 mm/yr. After 500 years from closure, the surface barrier is assumed to be degraded and the natural background recharge rate of 3.5 mm/yr takes place. Recharge rate increase from 0.5 mm/yr to 3.5 mm/yr at 500 years gives rise to an increase in VZ release rates. The infill grout in the tank is assumed to be intact for the entire 10,000-year simulation period and diverts the flow around the tank through the backfill area. Release from the tanks only occurs by diffusion through the cementitious base mat. The pipeline sources have high release rates at early times because these sources do not have grout that prevents advective release and provides retardation by sorption. Nevertheless, the doses from the pipelines are much lower than from the tanks within 10,000 years because of lower inventories.

For ^{99}Tc, tanks 241-A-105 (A-105) and 241-A-104 (A-104) dominate VZ release rates in 241-A Tank Farm (A Farm). In 241-AX Tank Farm (AX Farm), tank 241-AX-104 (AX-104) dominates ^{99}Tc VZ release rates. For ^{129}I, tank 241-A-102 (A-102) and tank 241-AX-101 dominate VZ release rates from A Farm and AX Farm, respectively. For uranium, the pipeline sources provide significant higher VZ release rates at early times while the tank sources provide lower release rates that last throughout the 10,000-year period.

The concentrations at 100 m from the boundary are primarily controlled by VZ flow field, saturated zone (SZ) flow rate, sorption in VZ and SZ, as well as dispersion. For slightly- or moderately-sorbed radionuclides, the inventory differences from various sources explain the concentration differences. That is why ^{99}Tc and ^{129}I concentrations from the tank sources are much higher than the pipeline sources despite higher release rates at early times from the pipeline sources. For uranium, solubility and sorption are the key factors attributable to the concentration differences. Within 10,000 years, the pipeline sources have higher uranium concentrations than the tank sources.

For Base Case, doses were calculated for up to 10,000 years. For the A Farm total dose, the primary contributing sources are tanks A-105 and A-104. For the AX Farm, it is tank AX-104 that dominates the total dose. This is because ^{99}Tc is the primary dose contributor in all these tanks. ^{79}Se and ^{129}I are also primary dose contributors but at lower doses compared to ^{99}Tc. In all the cases, the primary dose-contributing exposure pathway is drinking water.

In summary, the results indicate that both A Farm and AX Farm meet the performance objectives with a substantial margin. There is essentially no dose within the 1,000-year performance period. Within 10,000 years, the peak annual doses at 100-m regulatory boundaries are 0.3 mrem/yr for A Farm and 0.05 mrem/yr for AX Farm, respectively.

2.2 IDENTIFICATION OF SENSITIVITY ANALYSES

For this PA, a suite of sensitivity analysis cases has been identified to evaluate alternative scenarios and conceptual models that may result in altered performance of the disposal system. The approach used to identify these sensitivity cases is the approach described in the WMA C PA (RPP-ENV-58782, *Performance Assessment of Waste Management Area C, Hanford Site, Washington*) and "A Hybrid Approach to the Use of Safety Functions with Features, Events, and Processes (FEPs) in Performance Assessment" (Kozak and Bergeron 2017). The approach begins with a top-down identification of safety functions, followed by a cross reference of the safety functions with a list of Features, Events, and Processes (FEPs) to identify potentially deleterious FEPs that may act to degrade a safety function. The sensitivity analysis cases have been identified specifically to evaluate conditions in which one or more safety functions has been changed relative to the Base Case assumptions.

It is noteworthy that this safety function approach intrinsically allows the identification of interdependencies between different safety functions. A FEP that is relevant to more than one safety function indicates an interdependency. A potentially deleterious FEP that applies to more than one safety function indicates a potential for a common failure mechanism. For instance, seismicity has the potential to affect both the grout hydraulic safety function, and also the tank structure hydraulic safety function. A sensitivity case intended to address this FEP needs to take account of the potential for this common failure.

The results of the FEP identification are shown in Table 2-1. For this preliminary PA, the FEP identification was conducted by beginning with the list developed for WMA C (RPP-ENV-58782), which was informed by a multi-organizational team of subject-matter experts (see RPP-ENV-58782, Appendix H). The WMA C list was modified by the project team to ensure that it reflects conditions at WMA A-AX.

Table 2-1. List of Safety Functions, Associated Features, Events, and Processes, and Potentially Deleterious Features, Events, and Processes for the Waste Management Area A-AX Performance Assessment. (6 sheets)

Designation		Description	Associated FEPs	Potentially Deleterious FEPs	Comments
I1	Institutional Control	By U.S. Department of Energy (DOE) O 435.1, *Radioactive Waste Management*, we assume that control of the site will be retained for 100 years. A strong potential exists that the U.S. government will retain control of the site for a much more extended period of time. DOE O 458.1, *Radiation Protection of the Public and the Environment* requires that plans for management and disposal of wastes provide for institutional controls and long-term stewardship. DOE P 454.1, *Use of Institutional Controls* identifies how that stewardship is to be carried out.	1.1.06 1.1.09 1.1.10 1.4 (all)	—	—
I2	Societal memory	Societal memory is represented by records, deed restrictions, and other passive controls that would warn someone that additional care should be taken in the area. For a member of the public to come onsite to experience exposures to contamination from Waste Management Area (WMA) A-AX, records that the Hanford Site existed would need to be forgotten or ignored. DOE O 458.1 requires record keeping that would lessen the likelihood of this occurrence. DOE P 454.1 identifies how that stewardship is to be carried out.	1.1.06 1.1.09 1.1.10 1.4 (all)	—	—
I3	Exposure	By DOE O 435.1, we assume that a post-closure well is established 100 m downgradient at the point of highest exposure. It is highly unlikely that this situation will occur, and potential wells in other locations would produce much lower impacts to a member of the public. Furthermore, even if control of the site is lost, the 100 m boundary for WMA A-AX lies under a series of tank complexes, and does not represent a realistic exposure point. Exposures would be more likely to occur further downgradient.	1.1 (all) 1.4 (all) 3.3 (all) 2.2.13(intruder) 2.3.03 2.3.08 2.3.09 2.3.13 2.4 (all)	—	—

Table 2-1. List of Safety Functions, Associated Features, Events, and Processes, and Potentially Deleterious Features, Events, and Processes for the Waste Management Area A-AX Performance Assessment. (6 sheets)

Designation		Description	Associated FEPs	Potentially Deleterious FEPs	Comments
S1	Site characteristics	WMA C is a semi-arid site with low precipitation. The Central Plateau is remote from members of the public, with a substantial buffer area under DOE control. The vadose zone is thick, with long travel times in the vadose zone.	2.3.01 2.3.02 2.3.03 2.3.07 2.3.07 2.3.09 2.3.10 2.3.11 2.3.12 2.3.13	—	—
EB1	*Resource Conservation and Recovery Act of 1976* Cover (infiltration reduction)	The final design cover has not yet been established, but is believed to be able to produce very low initial flow rates. Over some period of time this function may deteriorate, with the rate of deterioration associated with a variety of processes.	1.1.02 1.1.08 1.1.12 1.2.04 1.3.01 1.3.02 1.3.04 1.3.06 1.3.07 1.3.08 1.4 (all) 2.1.05 2.3.01 2.3.02 2.3.07 2.3.08 2.3.10 2.3.11 2.3.12 2.3.13	1.1.08 1.1.12 1.2.04 2.3.08 2.3.12 2.3.13	—
EB2	Cover	Limitation of types of potential inadvertent human intrusion by depth of disposal.	1.1.02 1.1.05 1.4 (all)	—	—

Table 2-1. List of Safety Functions, Associated Features, Events, and Processes, and Potentially Deleterious Features, Events, and Processes for the Waste Management Area A-AX Performance Assessment. (6 sheets)

Designation		Description	Associated FEPs	Potentially Deleterious FEPs	Comments
EB3	Steel Shell (permeability)	The function of the carbon steel shell to limit flow through the tank is not currently explicitly accounted for in the performance assessment. The shell is part of the overall assessment of low flow through the tank for long periods of time. Its potential eventual failure is considered as part of the generic barrier failure cases.	1.1.02 2.1.05 2.1.08	—	No credit taken for this safety function. Sensitivity case included to evaluate the potential for ingrowth of progeny if the shell remains intact.
EB4	Steel Shell (chemical)	The carbon steel shell will corrode over a period of time, leaving behind corrosion products of (primarily) iron oxides. These corrosion products are highly sorptive and tend to produce reducing conditions that are highly advantageous for limiting solubilities of key radionuclides, particularly technetium.	2.1.05 2.1.09	—	No credit taken for this safety function.
EB5	Tank structure (structural)	The dome and walls provide structural support preventing subsidence of the closed facility.	1.1.02 1.2.03 2.1.05	—	—
EB6	Tank structure (intrusion)	The tank structure provides a barrier to intrusion.	1.1.02 1.4.03 2.1.05	—	—
EB7	Tank structure (chemical)	The concrete of the tank acts to condition the chemistry of the waste residuals, with sorption characteristic of high pH environments.	1.1.02 2.1.05 2.1.09	—	—
EB8	Tank structure (permeability)	The concrete of the tank structure is substantially intact and provides a barrier to flow into the tank.	1.1.02 1.2.03 2.1.05	1.2.03	—

Table 2-1. List of Safety Functions, Associated Features, Events, and Processes, and Potentially Deleterious Features, Events, and Processes for the Waste Management Area A-AX Performance Assessment. (6 sheets)

Designation		Description	Associated FEPs	Potentially Deleterious FEPs	Comments
EB9	Grout in tank (permeability)	The grout acts to limit water flow through the facility, making releases dominated by diffusion from the waste.	1.1.02 1.1.03 1.1.04 1.1.05 1.1.08 1.2.03 2.1.04	1.1.08 1.2.03	—
EB10	Grout in Tank (chemical)	The grout acts to condition the chemistry of the waste residuals, with sorption characteristic of high pH environments.	1.1.02 2.1.04 2.1.09	—	—
EB11	Grout in tank (structural)	The grout provides structural support preventing subsidence of the closed facility.	1.1.02 2.1.04	—	—
EB12	Grout (intrusion)	The structural strength of the grout provides a barrier to intrusion.	1.1.02 1.4 (all) 2.1.04 2.2.13	—	—
EB13	Tank Base Mat (permeability)	The tank base mat, if intact, will provide a barrier that will limit flow and contaminant transport from the tank residual wastes situated at the tank bottom into the underlying vadose zone sediments.	1.1.02 2.1.05	2.1.05	—
EB14	Tank Base Mat (chemical)	The concrete pad is anticipated to continue to provide a high pH environment, with associated sorption, for an extended time in the future.	1.1.02 2.1.05 2.1.09	—	—
EB15	Ancillary equipment (permeability)	The pipes and ancillary equipment, if intact, provide a delay to releases of waste in ancillary equipment.	2.1.06	—	No credit taken for this safety function.
AP1	Grout (air pathway)	Limitation of releases to air owing to low air permeability and long pathway to the surface.	2.3.07 3.1.04 3.2.09 3.2.10	—	—

Table 2-1. List of Safety Functions, Associated Features, Events, and Processes, and Potentially Deleterious Features, Events, and Processes for the Waste Management Area A-AX Performance Assessment. (6 sheets)

Designation		Description	Associated FEPs	Potentially Deleterious FEPs	Comments
WF1	Residual Waste (chemical)	The residual waste is recalcitrant by nature, providing limitations to the amount and rate of release of contamination from it upon contact with water.	2.1.01 2.1.02 3.1 (all) (except 3.1.06) 3.2 (all) (except 3.2.08)	2.1.1	No credit taken for this safety function.
VZ1	Vadose zone thickness	The vadose zone is thick with slow rates of water flow, leading to long delay times in the vadose zone.	2.2.7 2.3.3 2.2.01 2.2.02 2.2.03 2.2.05 2.2.07 2.2.08 2.2.09 2.2.12 2.3.02 3.1.01 3.2.07	1.1.01 2.2.12	—
VZ2	Sorption on vadose zone soils	Vadose zone soils sorb some of the contaminants of potential concern, delaying their arrival at the water table. A number of key contaminants are not believed to sorb significantly.	1.4.07 2.2.08 2.2.09 2.3.02 3.2.03 3.2.04 3.2.05 3.2.06 3.2.07	1.4.07 2.2.08 3.2.03	—
VZ3	Dispersion in vadose zone	Spreading of contaminants in the vadose zone, dispersing them and decreasing concentrations.	2.2.01 2.2.02 2.2.03 2.2.05 2.2.07 2.3.02	2.2.12	—

Table 2-1. List of Safety Functions, Associated Features, Events, and Processes, and Potentially Deleterious Features, Events, and Processes for the Waste Management Area A-AX Performance Assessment. (6 sheets)

Designation		Description	Associated FEPs	Potentially Deleterious FEPs	Comments
SZ1	Water flow in saturated zone	Advective flow in the saturated zone leading to dilution of the contaminants.	1.3.01 1.3.02 1.3.03 1.3.07 1.4.10 2.2.03 2.2.05 2.2.07 2.3.03 2.3.04 3.1.01 3.2.07	1.3.01 1.3.02 1.3.03 1.3.07 2.3.03	Addressed as parameter uncertainty in probabilistic analysis.
SZ2	Sorption on saturated zone soils	Saturated zone soils sorb some of the contaminants of potential concern, delaying their arrival at the point of compliance. A number of key contaminants are not believed to sorb significantly.	2.2.08 2.2.09 3.2.03 3.2.04 3.2.07	—	Addressed as parameter uncertainty in probabilistic analysis.
SZ3	Dispersion in saturated zone	Spreading of the plume in the saturated zone, adding dilution to the contaminant plume and lowering concentrations.	2.2.03 2.2.05 2.2.07	—	—
SZ4	Dilution in well	Dilution caused by pumping a groundwater well to the surface where it is useable and accessible by a member of the public.	1.4.10 3.2.07 3.2.12 3.3.01 3.3.02 3.3.04	—	No credit taken for this safety function.

FEPs = Features, Events, and Processes

The next step in the methodology was to develop sensitivity analysis cases to reflect alternative conditions, in which the potentially deleterious FEPs are assumed to have acted on the safety functions to alter their behavior from the base case. There are different approaches that can be taken for this step. One could specifically identify the magnitude of a FEP acting in the future and its likely action on the safety function, to establish a credible estimate of the likely degradation of the safety function. In this approach, considerable effort may be needed to investigate the FEP and its effect on the safety function, and to express it in a credible model that will withstand regulatory scrutiny. Alternatively, one can make assumptions about the amount of degradation that may occur in the future that are unambiguously conservative compared to the effects any FEPs may have on the safety function. The result will be an analysis case that clearly bounds the potential effect of any deleterious FEPs on the safety function. When this latter approach is taken, the sensitivity analysis case supports the decision about post-closure safety but is not generally accurately linked to potential future behavior of the system.

The selection between these approaches is a risk-informed programmatic decision. For some disposal facilities and site conditions, it may be worth the time and effort to fully develop a good understanding of potentially deleterious FEPs to develop a credible, plausible representation of the timing, manner, and degree of degradation of the safety function. This would lead to an alternative scenario or conceptual model that is a credible representation of the behavior of the system under different conditions than the base case. For other disposal facilities and site conditions, a conservative approach can be taken without expending the time and effort to justify the more reasonable representation. This may lead to an unrealistic representation of the disposal system, but one which demonstrates the robustness of the system performance in the absence of the safety function.

For WMA A-AX, all of the sensitivity cases have been identified by the latter approach. Prior understanding developed from the WMA C PA and from scoping analyses has shown that closed tanks in Hanford's Central Plateau are extremely robust with respect to performance relative to regulatory performance measures. For WMA C, it was found possible to treat safety functions very conservatively and still meet all performance objectives under all evaluated future conditions and combinations of parameters. Initial scoping analyses of WMA A-AX indicate that this approach is also appropriate for this WMA.

Several notes are necessary regarding differences between the sensitivity analysis cases selected for WMA A-AX and those documented for WMA C (RPP-ENV-58782).

- At the outset of the development of the WMA C PA, an extensive set of scoping meetings was held with stakeholders (RPP-ENV-58782, Section 1.1.1). These scoping meetings predated the development of the safety-function methodology. At the meetings, a number of commitments were made by DOE to run specific sensitivity analysis cases, which did not necessarily correspond to the sensitivity cases identified from the safety-function methodology. These stakeholder-identified sensitivity cases were retained in the PA so that DOE could honor its commitment to evaluate them.

- As a result of this project history, several of the WMA C sensitivity analysis cases involved simple parameter variations, which were duplicative of analyses included in the probabilistic uncertainty analysis.

- The remaining WMA A-AX sensitivity analysis cases are focused on evaluation of the influence of specific safety functions. Extraneous analysis cases have been dropped.

- In the WMA C PA (RPP-ENV-58782) and Past Leaks analysis (RPP-RPT-59197, *Analysis of Past Tank Waste Leaks and Losses in the Vicinity of Waste Management Area C at the Hanford Site, Southeast Washington*) substantial effort was expended in evaluating potential fast pathways in the vadose zone. The effect of those pathways on performance in the post-closure period was found to be minimal. Specifically, the inclusion of a hypothetical (unobserved) clastic dike below the WMA was evaluated, and it was shown to be unimportant to performance in the post-closure period. Therefore, for the WMA A-AX PA, the possible presence of a clastic dike has been retained as a potentially deleterious FEP with an associated sensitivity case. However, for this preliminary PA, no results have been calculated for this case.

2.3 SUMMARY OF WASTE MANAGEMENT AREA A-AX PERFORMANCE ASSESSMENT SENSITIVITY ANALYSIS

A summary of sensitivity analysis cases derived from the process described in Section 2.2 is presented in Table **2-2**. Each sensitivity analysis is assigned a shorthand designator so it can be easily referenced. A brief explanation of each sensitivity analysis is also provided in the table, to provide insight into the alternative assumptions it is intended to evaluate.

Table 2-2. Sensitivity Analysis Cases for the Waste Management Area A-AX Performance Assessment. (2 sheets)

Sensitivity Case	Description
Surface Barrier Sensitivity Cases	
INF0	Base case, 0-500 year 0.5 mm/yr, after 500 year 3.5 mm/yr.
INF1	This is a case in which the surface barrier continues to provide limitation to flow beyond its design life. Recharge rate 0.5 mm/yr in entire 10,000-year time period reflecting intact surface barrier condition.
INF2	This is a case which assumes absence of surface barrier, and gravel surface on the tank farm. Recharge rate 100 mm/yr in entire 10,000-year time period which reflects recharge rate for Hanford operation period for gravel-dominated surface cover.
INF3	This is a case which assumes absence of surface barrier, and natural vegetation on the tank farms. Recharge rate 3.5 mm/yr in entire 10,000-year time period reflecting recharge rate for natural vegetation-covered surface.
Inventory Sensitivity Cases	
INV0	Base case, based on projected inventory after retrieval except tanks 241-A-104 and 241-A-105 which are assumed not to be retrieved.
INV1	Based on current inventory. This is an exploration of alternative inventory assuming no retrieval for the tanks.
INV2	All parameters same as base case, except that the estimated inventory for ancillary equipment is based on average Best-Basis Inventory concentration of the tanks. This is an exploration of alternative inventory for the ancillary equipment.
Grout Sensitivity Cases	
GRT0	Base case, grout intact for evaluation period (10,000 years).
GRT1	All parameters same as base case, except that after 500 years following closure, the grout degrades and the flow properties change to Hanford H2 sand values, with a step function change in the flow rate occurring at this time. This is a loss of the flow safety function of the grout. This represents an alternative in which the grout degradation is more rapid than the base case through degradation processes such as unanticipated seismic activity.
GRT2	All parameters same as base case, except that beginning from closure (time zero), the grout is assumed to be degraded and the flow properties are represented by Hanford H2 sand values. This represents a complete loss of the flow safety function at the time of closure.
GRT3	K_d values on grout are set equal to zero for all radionuclides. This case evaluates the effect from loss of the chemical safety function of the grout material. There is no known feature, event, or process to produce this condition. It has been included to evaluate the robustness of the system.

Table 2-2. Sensitivity Analysis Cases for the Waste Management Area A-AX Performance Assessment. (2 sheets)

Sensitivity Case	Description
Tank Shell Sensitivity Cases	
TS0	Base case, tank shell provides no containment.
TS1	Tank shell prevents release from waste zone for 5,000 years, then diffusive release to the vadose zone. The function of the carbon steel shell to limit release through the tank is not currently explicitly accounted for in the base case and this case evaluates the effect of containing the waste by carbon steel shell, possibly allowing ingrowth of decay chain progeny.
Base Mat Sensitivity Cases	
BM0	Base case, assumes diffusion through base mat for 10,000 years all tanks.
BM1	Assumes advection through base mat at all times for all tanks (note: intact grout over failed base mat). This case is designed to study the effect of a degraded base mat on transport of residual waste constituents. It represents a loss of the flow safety function of the base mat.
Vadose Zone Sensitivity Cases	
VZP0	Base case, no preferential pathway exists at the site.
VZP1	All parameters same as base case, except that the geologic conceptualization includes preferential pathways. This is an alternative conceptual model representing an unknown feature at the site.
Peak Dose Analysis	
Long term (300k-400k) simulation for calculating peak dose beyond 10,000 years.	

3.0 METHODOLOGY

The system-level model has been implemented using GoldSim©[2] software. The detailed methodology for various calculations performed with the system-level model is discussed in RPP-RPT-60885.

3.1 SELECTION OF TECHNICAL STAFF

The responsible manager or a selected delegate is responsible for selecting the technical staff that develops the conceptual and mathematical approach, performs and documents the calculations, checks the work, and reviews the calculation for technical accuracy and completeness.

- For the calculations described in this environmental calculation report, the WRPS technical lead, as delegated by the responsible manager, has selected the technical staff.

- Additionally, for the calculations described in this environmental calculation report, the INTERA, Inc. modeling team lead, as delegated by the responsible manager, has selected additional technical staff.

3.2 ORIGINATORS

The originators or preparers of the environmental model calculation develops the methodology, gains early concurrence with the senior reviewers, identifies project conditions, assumptions, and inputs, and prepares the calculation and associated calculation report.

Nazmul Hasan, INTERA, Inc.
Hydrologist, PE
M.S., 2008, Environmental Engineering, Washington State University
B.S., 2007, Civil Engineering, Bangladesh University of Engineering & Technology

Mr. Hasan is a hydrologist with 11 years of experience in numerical modeling of contaminant fate and transport in the saturated and unsaturated zones, model calibration, geostatistical analysis, and programming in and application of multiple languages and codes including

[2] GoldSim© simulation software is copyrighted by GoldSim Technology Group LLC of Issaquah, Washington (see http://www.goldsim.com).

FORTRAN, MODFLOW[3], MT3DMS©[4], MODPATH[5], PEST[6], STOMP[7], T-PROGS[8], ArcGIS®[9], GoldSim©, Groundwater Vistas[10], RETC[11], R[12], JMP[13], MATLAB®[14] and Tecplot®[15]. He has more than 8 years of experience in PAs and was a major contributor to the recent Hanford PAs (Environmental Restoration Disposal Facility PA, WMA C PA, Integrated Disposal Facility PA and WMA A-AX PA).

Wei Zhou, INTERA, Inc.
Senior Engineer
Ph.D., 1992, Nuclear Engineering, University of California at Berkeley
M.S., 1986, Mechanical Engineering, San Jose State University
B.S., 1982, Mechanical Engineering, Beijing University of Technology

Wei Zhou has 31 years of experience in the areas of performance and safety assessment of near-surface and deep geological radioactive waste repositories; risk assessments for organic wastes including dense and light non-aqueous phase liquids and volatile organic compounds; and the geological sequestration of carbon dioxide (CO_2). She has provided technical support in these areas to industrial, governmental, and international organizations such as the Electric Power Research Institute, International Atomic Energy Agency (IAEA), Nuclear Energy Institute, Korean Hydro and Nuclear Power, Canadian Petroleum Technology Research Institute, U.S. Environmental Protection Agency (EPA), U.S. Department of Energy (DOE), Swedish Nuclear Inspectorate, Japan Atomic Energy Agency, Taiwan Institute of Nuclear Energy Research, International Energy Agency, Nuclear Energy Agency, and the Commission for European Communities. She specializes in modeling and simulation of radionuclide transport, coupled heat and mass transfer in fractured media, as well as multiphase and multi-component

[3] MODFLOW software has been developed and distributed by the U.S. Geological Survey, Washington, D.C.
[4] MT3DMS© model software is copyrighted by The University of Alabama, Tuscaloosa, Alabama.
[5] MODPATH software has been developed and distributed by the U.S. Geological Survey, Washington, D.C.
[6] PEST (Parameter ESTimation) is an open-source, freely-available software tool currently distributed by S. S. Papadopoulos & Associates, Inc., Bethesda, Maryland.
[7] Subsurface Transport Over Multiple Phases (STOMP)© is copyrighted by Battelle Memorial Institute, 1996.
[8] T-PROGS (Transition Probability Geostatistical Software) was originally developed by Graham Fogg and Steven Carle at the University of California, Davis in Davis, California.
[9] ArcGIS® is a registered trademark of Environmental Systems Research Institute, Inc., Redlands, California.
[10] Groundwater Vistas is a product of Environmental Simulations, Inc., Leesport, Pennsylvania.
[11] RETC (RETention Curve) was developed by the U.S. Department of Agriculture, Agricultural Research Service for the U.S. Environmental Protection Agency Office of Research and Development, Washington, D.C.
[12] R is a programming language and free software environment created by Ross Ihaka and Robert Gentleman at the University of Auckland, New Zealand.
[13] JMP is a product of SAS Institute Inc., SAS Campus Drive, Cary, North Carolina.
[14] MATLAB® (matrix laboratory) is a registered trademark of The MathWorks, Inc., Natick, Massachusetts.
[15] Tecplot® is a registered trademark of Tecplot, Inc., 3535 Factoria Blvd. SE, Bellevue, Washington.

transport systems using public or commercial codes including TOUGH2[16], TOUGHREACT[17], STOMP, ECLIPSE[18] suite codes, MATLAB, and GoldSim©.

Ryan Childress, Washington River Protection Solutions, Scientist
M.S., 2019, Environmental Science, Washington State University
B.S., 2015, Environmental Science, Washington State University

Ryan Childress has six years of experience working at the Hanford Site for DOE as well as their contractors. Ryan has worked on developing many regulatory documents including Data Quality Objectives, Sampling and Analysis Plans, *Resource Conservation and Recovery Act of 1976* (RCRA) Facility Investigations, EMCFs, Model Package Reports, and 435.1 PAs.

Kristin M. Singleton, Washington River Protection Solutions, Scientist
B.S., Cellular and Molecular Biology, University of Nevada, Reno

Ms. Singleton has nine years of experience performing extensive risk assessments across the Hanford Site Tank Farms and River Corridor. She has experience developing risk-based remediation goals in compliance with Federal and State regulations and interpreting modeling results for hazardous waste facilities and contaminated sites.

3.3 CHECKERS

The checker reviews the environmental model calculation to verify that it is clearly developed, and that the calculation was performed as described and without error. Checking includes ensuring that all the inputs are consistent with the original referenced material. The checker documents the review of the calculation on an appropriate Checker Log.

David J. (DJ) Watson, Washington River Protection Solutions, Scientist
M.S. 2009, Environmental Science, Washington State University
B.S. 1996, Geology, Washington State University

DJ Watson has over 16 years of human health risk assessment and PA experience. He has over 13 years of environmental modeling experience, including: subsurface contaminant transport

[16] TOUGH2 software was developed by Lawrence Berkeley National Laboratory, University of California, Berkeley, California with support from the Office of Science, Office of Basic Energy Sciences, Materials Sciences and Engineering Division of the U.S. Department of Energy.

[17] TOUGHREACT software was developed by Lawrence Berkeley National Laboratory, University of California, Berkeley, California with support from the Office of Science, Office of Geothermal Technologies of the U.S. Department of Energy.

[18] ECLIPSE is a suite of reservoir simulator software developed by GeoQuest, an operating unit of Schlumberger Oilfield Services, Houston, Texas.

using STOMP, pflotran[19], and TOUGH2; air dispersion with AERMOD[20]; internal and external radiological dosimetry using IMBA®[21], DCAL[22], OLINDA[23], and RESRAD[24]; and system modeling using GoldSim©. He has worked in the areas of underground tank waste retrieval and tank closure, radiation dosimetry of both internally-deposited radionuclides and external exposure, nuclear fuel fabrication and transport, and geologic carbon dioxide (CO_2) sequestration. His work has supported DOE, U.S. Nuclear Regulatory Commission, IAEA, Joint Global Change Research Institute and other industrial and research organizations.

3.4 SENIOR REVIEWERS

Matthew W. Kozak, INTERA, Inc.
Ph.D., 1988, Chemical Engineering, University of Washington
B.S., 1981, Chemical Engineering, Cleveland State University

Dr. Kozak has more than 30 years of experience in the areas of performance assessment of near-surface and geological radioactive waste repositories, regulatory development, dose assessment for residual contamination of soils and buildings, toxic materials risk assessment, and mixed waste issues. He is the author of over 100 publications on these topics. He has supported national programs in the U.S. and countries in Europe, Asia, and Africa to site, develop, construct, and analyze facilities for disposal of radioactive waste.

He has participated in a number of international research programs, including the IAEA's Coordinated Research Program on Improvement of Safety Assessment Methodologies, and its successor programs: Application of Safety Assessment Methodologies, Practical Illustration and Use of the Safety Case Concept in the Management of Near-Surface Disposal, and most recently Modelling and Data for Radiological Impact Assessments.

He is a principle investigator for the WMA A-AX PA.

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[19] PFLOTRAN is open-source software and can be redistributed and/or modified under the terms of the GNU Lesser General Public License as published by the Free Software Foundation.

[20] AERMOD atmospheric dispersion modeling system was developed by the AERMIC (American Meteorological Society [AMS]/U.S. Environmental Protection Agency [EPA] Regulatory Model Improvement Committee), a collaborative working group of scientists from the AMS and the EPA.

[21] Integrated Modules for Bioassay Assessment (IMBA)® is a registered trademark of Public Health England, London, United Kingdom; IMBA Expert™ DOE-Edition is a trademark of ACJ & Associates, Richland, Washington and U.K. Health Protection Agency, Oxfordshire, United Kingdom.

[22] DCAL (Dose and Risk Calculation) software was developed by the Dosimetry Research Group (now the Biosystems Modeling Team in the Advanced Biomedical Science and Technology Group) at Oak Ridge National Laboratory under the sponsorship of the U.S. Environmental Protection Agency.

[23] OLINDA code was written by Michael Stabin, PhD, CHP, Department of Radiology and Radiological Sciences, Vanderbilt University, Nashville, Tennessee.

[24] The RESRAD (RESidual RADioactive) family of codes is developed at Argonne National Laboratory, Lemont, Illinois, managed by UChicago Argonne, LLC, for the U.S. Department of Energy's Office of Science.

4.0 SENSITIVITY CASES IMPLEMENTATION AND RESULTS

This section describes how the sensitivity cases are implemented and presents their results. All assumptions are the same as for RPP-RPT-60885; any new assumptions made for an individual sensitivity case are discussed in the respective section for that sensitivity case. The simulation duration for all the sensitivity cases is 10,000 years except for the peak dose analysis case which was simulated up to 400,000 years. The time step in all sensitivity cases was kept the same as the time step of "a_ax v1.0_20190408.gsm" model (RPP-RPT-60885) except the peak dose analysis case. The time step adopted for the peak dose analysis case is presented in Section 4.7.2.3.

4.1 SURFACE BARRIER SENSITIVITY CASES

4.1.1 Calculation Approach

The sensitivity cases described in this section investigate the impacts a surface barrier and surface vegetation have on groundwater pathway doses. The list of infiltration sensitivity cases is presented in Table 4-1.

Table 4-1. List of Infiltration Sensitivity Cases.

Case ID	Description	Recharge Rate
INF0 (Base Case)	Barrier degrades after first 500 years, and is replaced by native vegetation.	0.5 mm/yr from year 0 to 500, 3.5 mm/yr for remaining 9,500 years.
INF1	Barrier remains intact for all 10,000 years.	0.5 mm/yr for 10,000 years
INF2	No barrier is constructed, and no vegetation grows for all 10,000 years.	100 mm/yr for 10,000 years
INF3	No barrier is constructed and native vegetation is reintroduced at time 0, and remains for all 10,000 years.	3.5 mm/yr for 10,000 years

In the Base Case (INF0) during the first 500 years after closure, the surface barrier performs as designed and restricts the recharge rate to 0.5 mm/yr. After 500 years from closure, the surface barrier is assumed to be degraded and natural background recharge rate of 3.5 mm/yr takes place. The base case flow fields (Darcy flux and moisture content) were abstracted from the base case STOMP model (RPP-RPT-60101, *Model Package Report Flow and Contaminant Transport Numerical Model Used in WMA A-AX Performance Assessment and RCRA Closure Analysis*) and applied in the system model ("a_ax_v1.0_20190408.gsm" file). Flow field abstraction methodology is presented in detail in RPP-RPT-60885. At the beginning of the post-closure time period (calendar year 2050 and time zero in the system model), the flow fields are a reflection of the recharge rate of 100 mm/yr applied during the tank farm operation time period. For the first 500 years after closure, flow fields are affected by a recharge rate of 0.5 mm/yr reflective of intact surface cover. After 500 years, flow fields are affected by a recharge rate of 3.5 mm/yr reflective of the degraded surface cover, which is equivalent to natural background rate for native vegetative cover. In the infiltration sensitivity cases, different recharge rate

variation was explored. Instead of simulating STOMP model for each of the recharge cases and abstracting flow field from STOMP simulations, a simplified approach was adopted for the flow fields necessary for the system model.

For INF1, the Barrier remains intact for all 10,000 years. It takes some time for the flow field to dry out after the Barrier is placed, so the Darcy flux and moisture content values were the same as the Base Case for the first 500 years, and then were held constant at the value of 500 years for the remaining 9,500 years.

INF2 is a very unrealistic and pessimistic scenario that includes no placement of a surface barrier, and no vegetation growing on top of the tank farms. The existing gravel-dominated surface cover over the tank farm persists for the entire 10,000 years. Since the flow field at time zero in the Base Case is reflective of 100 mm/yr recharge rate, the flow field at time zero was held constant for the entire 10,000-year time period to establish the flow field for 100 mm/yr recharge. It was assumed that at time zero, flow fields became steady state corresponding to a 100 mm/yr recharge rate applied in the operational time period.

INF3 also assumes no Barrier, but reintroduces native vegetation on top of the tank farms. This results in a natural 3.5 mm/yr recharge for the duration of the simulation. The Darcy flux and moisture content values were taken from 2,000 years post-closure in the base case, because at this point the system has reached a steady state condition for a 3.5 mm/yr recharge rate. The flow fields are held constant for the entire 10,000-year time period.

4.1.2 Description of Model Changes

The only changes made in the model were made in the **Flow_Field_Abstraction** container shown below in Figure 4-1, and in the Scenario Manager shown in Figure 4-2.

The GoldSim© Scenario Manager allows a user to run multiple scenarios at the same time that have different values for data elements. For the Surface Barrier Sensitivity Case, the **FlowField_Scenario** data element shown in Figure 4-1 is the only data element that changes in between scenarios. The different values for each scenario are shown in Figure 4-3.

In the base case model, the **Flow_Field_A100_Tanks**, **Flow_Field_Pipeline_A**, **Flow_Field_AX100_Tanks**, and **Flow_Field_Pipeline_AX** expression elements used index function to obtain the correct values from lookup tables containing the Darcy flux and moisture content values abstracted from STOMP. These expressions would obtain a value for each time step, and interpolate linearly between values if there was not one defined for that time step.

Those expression elements have been replaced by a script element (Figure 4-4 and Figure 4-5) that will query values from the two-dimensional lookup table corresponding to the selected Infiltration Case (INF0, INF1, INF2, or INF3) based on the value of the **FlowField_Scenario** data element. These tables are stored in **A_Tank_Flowfields**, **AX_Tank_Flowfields**, **A_Pipeline_Flowfields**, and **AX_Pipeline_Flowfields** (Figure 4-6).

Figure 4-1. Flow_Field_Abstraction Container Structure.

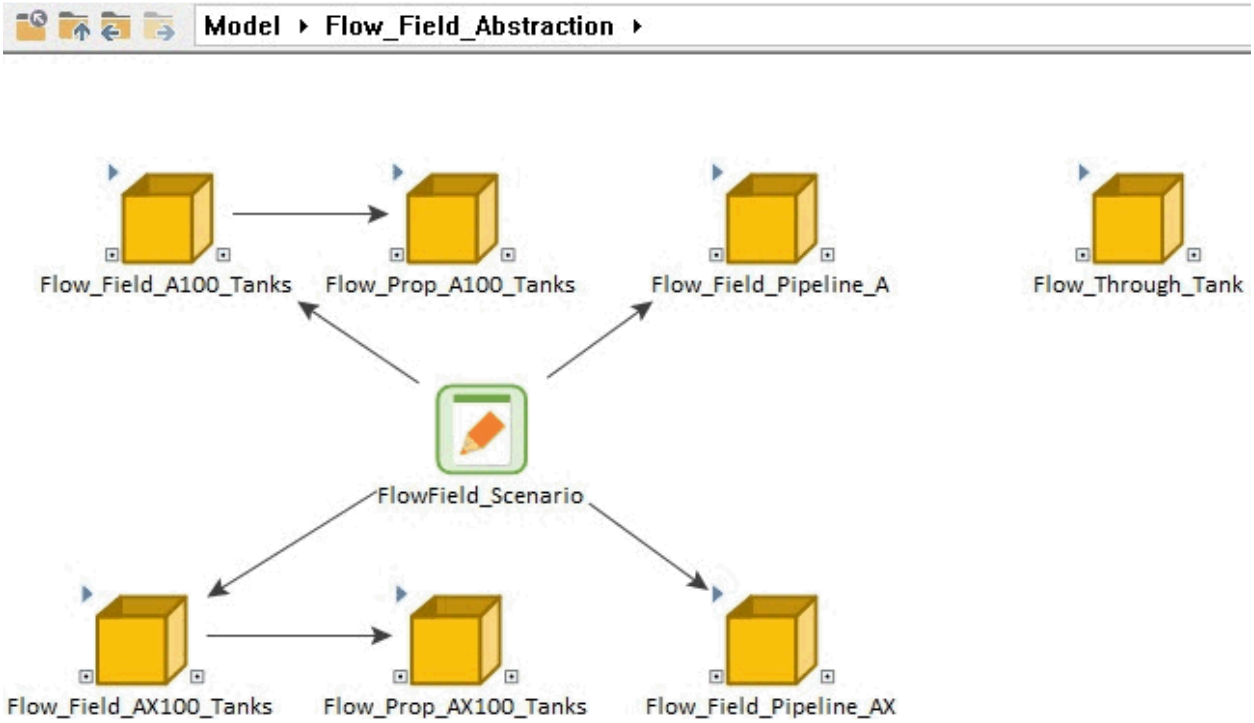
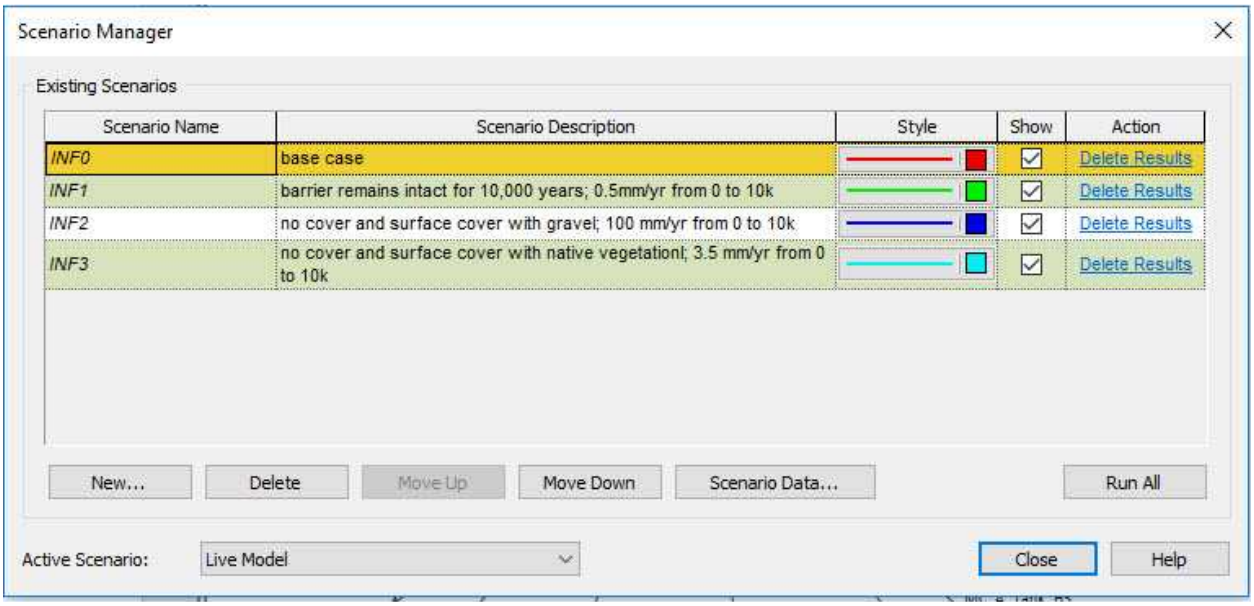
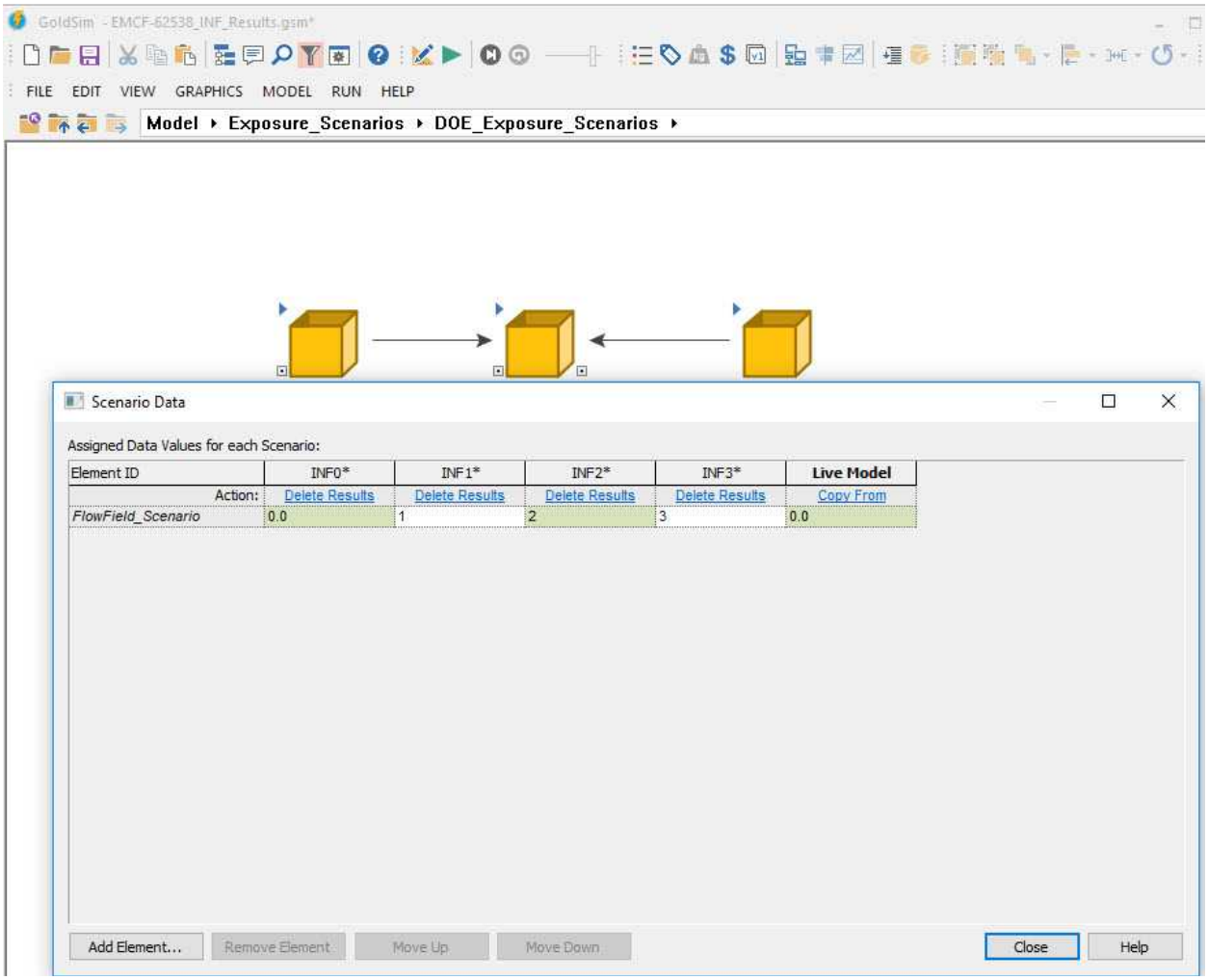


Figure 4-2. GoldSim© Scenario Manager.



GoldSim© simulation software is copyrighted by GoldSim Technology Group LLC of Issaquah, Washington (see http://www.goldsim.com).

Figure 4-3. Scenario Data.



4.1.3 Inputs

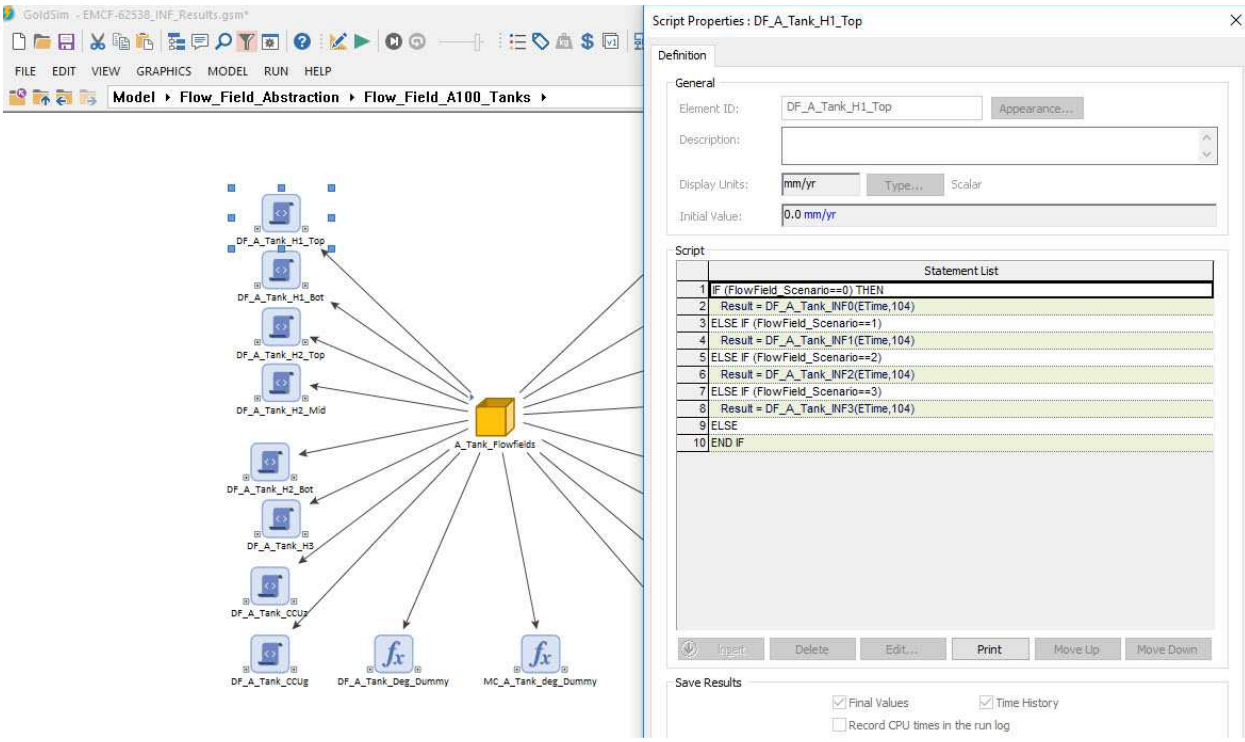
The inputs to these sensitivity cases include 48 tables for the Darcy flux and moisture content abstracted from STOMP simulations (RPP-CALC-63248, *WMA A-AX Performance Assessment Flow and Transport Process Model Support of the Sensitivity Analysis*) of the different cases described in Table **2-2** for **Flow_Field_A100_Tanks**, **Flow_Field_Pipeline_A**, **Flow_Field_AX_100Tanks**, and **Flow_Field_Pipeline_AX**. These tables are attached in Appendix C of this EMCF.

4.1.4 Surface Barrier Sensitivity Results

4.1.4.1 241-A Tank Farm. The results for INF1 and INF3 were very similar to that of the base case, so those results are not heavily interpreted in this EMCF. INF3 dose breaks through earlier during the compliance period than that of the base case, while INF1's breakthrough and peak dose occur later outside the compliance period. INF2's dose has a distinctly different curve

from the base case, reflecting the behavior of contaminants from the pipelines in the high-recharge flow field.

Figure 4-4. DF_A_Tank_H1_Top.



The total annual dose in the INF2 case comes very close to the performance objective of 25 mrem/yr at 749 years post-closure, with a value of 24.46 mrem/yr (Figure 4-7). The spike in dose at approximately 800 years post-closure is due to the arrival of uranium isotopes to the groundwater from the pipeline and ancillary equipment sources. The uranium released from the pipelines and ancillary equipment arrives at the water table after ^{99}Tc and ^{129}I because it has a slightly higher distribution coefficient.

Figure 4-8 displays the same total annual dose from A Farm in the INF2 case, along with the doses associated with individual A Farm sources. A Farm non-tank sources dominate this increased recharge case because their release to the environment is not controlled by diffusion through grout.

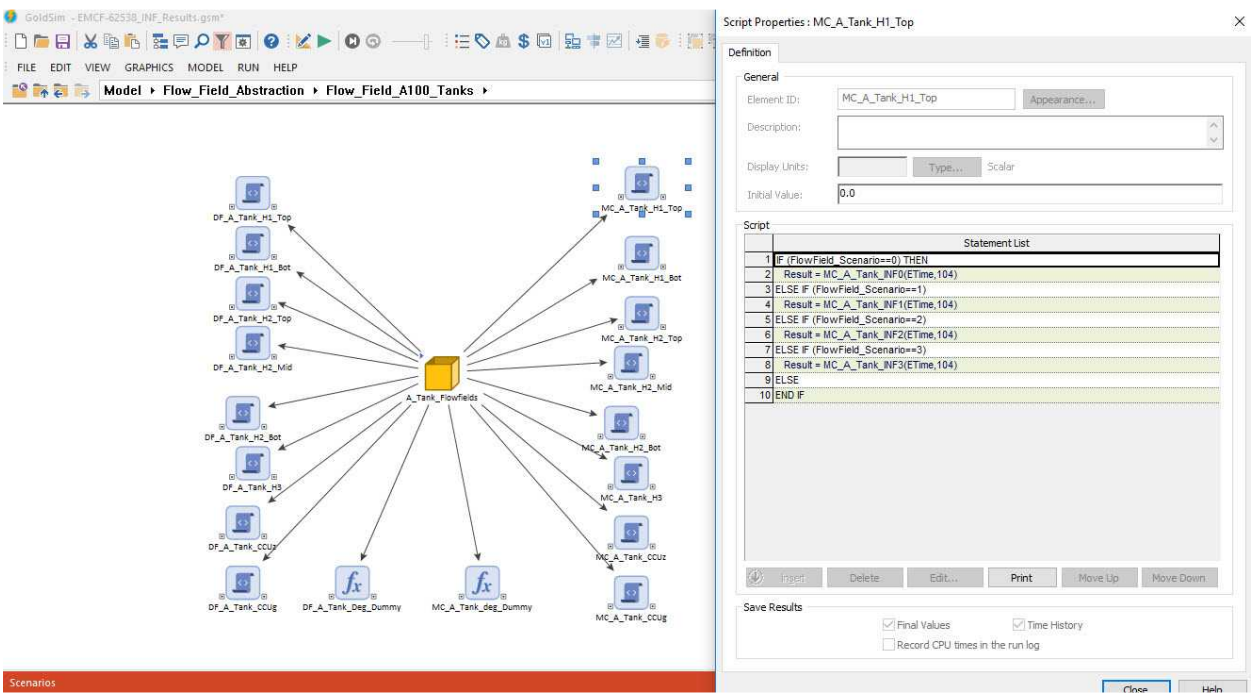
Figure 4-9 displays the total annual dose from A Farm non-tank sources in the INF2 case, along with the doses associated with key contributing radionuclides. At the time of peak dose, 17.38 mrem/yr is from ^{233}U, 3.225 mrem/yr is from ^{234}U, and 2.881 mrem/yr is from ^{238}U, which together account for 96% of the 24.46 mrem/yr total annual dose. In contrast to the base case, uranium from the pipelines is transported to the receptor during the compliance period from the pipelines because INF2's increased recharge of 100 mm/yr transports uranium more quickly through the vadose zone despite uranium's K_d value of 0.6 mL/g. The dose contributions from uranium isotopes occur later than other frequent dose contributors (^{99}Tc and ^{129}I) because uranium isotopes travel through the Hanford formation sands with greater sorption. Despite the

high flow rate through the vadose zone in INF2, uranium isotopes (K_d = 0.6 ml/g) travel slower than ^{129}I (K_d = 0.2 ml/g), which travels slower than ^{99}Tc (K_d = 0.0 ml/g). The dose contributions from these radionuclides are offset in time in Figure 4-9 because of the differences in K_ds.

An observation in Figure 4-9 is that $^{93}Nb^m$ is the predominant dose driver at early times. Historically $^{93}Nb^m$ has not been a radionuclide of concern. The dose consequence from $^{93}Nb^m$ is higher than expected because of the increased recharge rates in INF2. $^{93}Nb^m$ has a short half-life, ~16 years, and would not be expected to reach groundwater under the expected recharge conditions. However, when recharged is increased by 30 times, transport of $^{93}Nb^m$ from the perpetual decay of ^{93}Zr is enhanced. Consequently, $^{93}Nb^m$, which travels at the same rate as nitrate and ^{99}Tc, does reach the groundwater. $^{93}Nb^m$ has a high specific activity (238.6 Ci/g) which means a small mass reaching the groundwater results in a high activity concentration in the groundwater. When this is coupled with a total dose conversion factor that is only about 5 times lower than ^{99}Tc, $^{93}Nb^m$ has a dose impact when is able to reach the groundwater.

Figure 4-10 displays the total annual dose from A Farm Pipelines, along with contributions of each exposure pathway to the dose. The primary pathway at the time of peak dose is groundwater consumption, which contributes 19.86 mrem/yr. The consumption of poultry is the second highest contributor at 2.635 mrem/yr at its peak.

Figure 4-5. MC_A_Tank_H1_Top.



4.1.4.2 241-AX Tank Farm. The peak total annual dose for AX Farm does not exceed 2 mrem/yr for any of the Surface Barrier Infiltration sensitivity cases. Results for AX Farm are similar to A Farm, but the lower inventory in AX Farm non-tank sources scale all of the doses down. These results are displayed in Figure 4-11 through Figure 4-14.

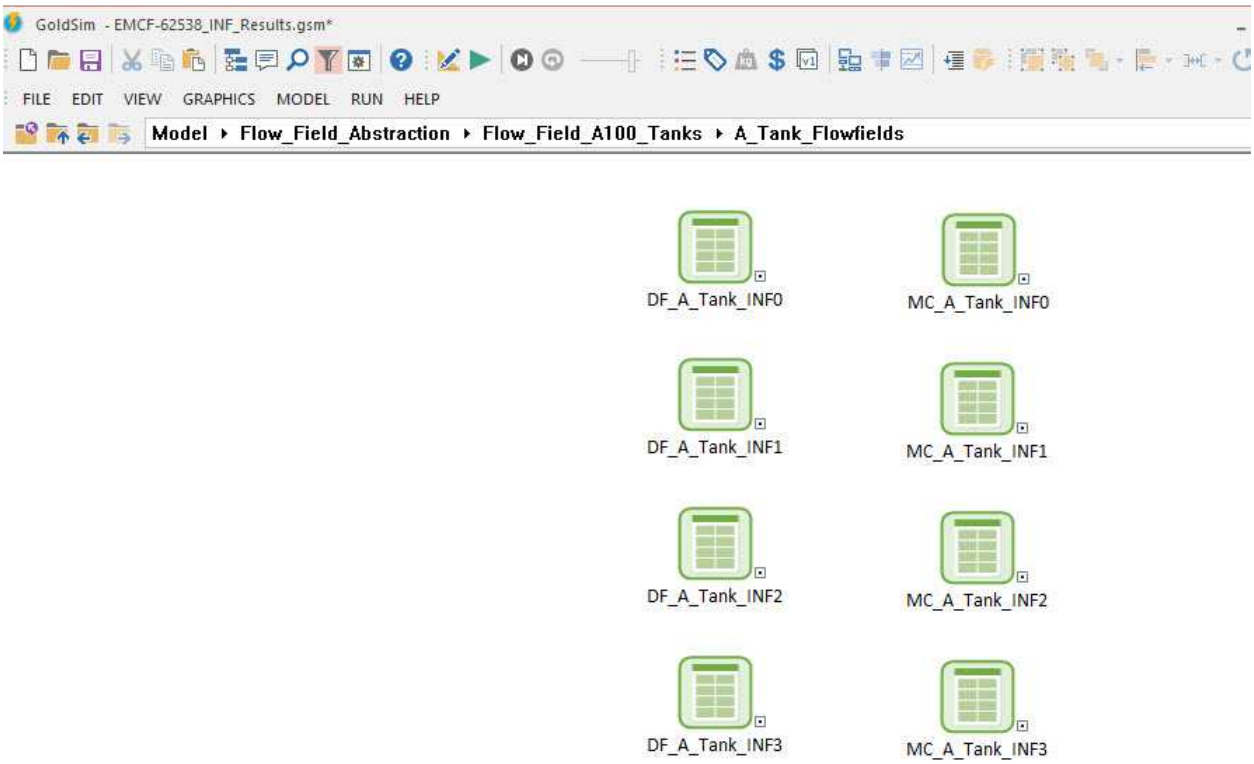
4.2 INVENTORY SENSITIVITY CASES

Inventory sensitivity cases were performed to evaluate upper bound inventories in the tanks and ancillary equipment. Sensitivity case INV1 upper bound residual waste volumes are based on current unretrieved Best-Basis Inventory (BBI) volumes for tanks and ancillary equipment. Sensitivity case INV2 is an evaluation of ancillary equipment residual estimates at post-retrieval estimated volumes. INV2 inventories are based on the average BBI composition of residual tank waste. Residual volumes and inventory for tanks A-104 and A-105 remain the same for the base case and the two inventory sensitivity cases.

4.2.1 Calculation Approach

The Base Case calculation employed the inventories that are developed using BBI current tank waste concentrations and the residual waste volumes for the tank inventories and Hanford Tank Waste Operations Simulator (HTWOS) tank concentrations and residual non-tank volumes for the non-tank sources. The details are given in RPP-CALC-62319, *Residual Waste Source Inventory Term for Waste Management Area A-AX Performance Assessment Inventory Case 1*. Two sensitivity cases on inventory, INV1 and INV2, are identified. The development of these inventories is summarized in Table 4-2 along with Base Case for comparison.

Figure 4-6. A_Tank_Flowfields.



4.2.1.1 INV1 Inventory. In this case, the radioactive inventory for tanks is the same as the BBI current tank waste inventory decayed/ingrown to 2050. The decay and ingrowth were calculated in the GoldSim© model file reported in RPP-CALC-62319. The GoldSim© file is AAX_initial_inventory.gsm. The output element is Trans_BBI_Activity_2050, listed in Table 4-3 for the radionuclides on the WMA A-AX system model species list. The chemical inventory is taken from the spreadsheet file "A and AX Resid Inv_SM_04-24-2018_WZ_06-15-2018.xlsx" associated with RPP-CALC-62319 and RPP-RPT-58293, *Hanford 241-A and 241-AX-Farm Tank and Ancillary Equipment Residual Waste Inventory Estimates*. The chemical BBI current tank waste inventory is listed in Table 4-4 for the chemicals on the WMA A-AX system model species list. Table 4-3 and Table 4-4 are actually the initial inventory of the tank sources for INV1 case.

For the ancillary and pipeline sources, the average BBI tank inventory concentrations at 2050 and the current non-tank waste volumes are needed. The steps are given below.

(1) Calculate the BBI tank waste concentrations at 2050: dividing the BBI tank waste inventory at 2050 shown in Table 4-3 and Table 4-4 by the current tank waste volumes. The current tank waste volumes are given in Table 4-5.

(2) Obtain average concentrations for A Farm and AX Farm. The calculated tank concentrations and the average tank concentrations for A Farm and AX Farm are shown in Table 4-6 and Table 4-7 for radioactive and chemical contaminants of potential concern (COPCs), respectively.

(3) The farm average concentrations are then multiplied by the non-tank (ancillary and pipeline) current waste volumes to give the ancillary and pipeline inventories. The non-tank waste volumes are given in Table 4-8. The current waste volumes are obtained from RPP-RPT-58293 Table 5-1 and Table 5-2 and the assumption that the catch tank residual volumes are 10% of the current volumes. The other assumption inherited from RPP-RPT-58293 is that the diversion box and pipeline waste volumes are the same before and after retrieval.

The calculated non-tank inventories for INV1 are given in Table 4-9 and Table 4-10 for the radioactive and chemical COPCs, respectively.

4.2.1.2 INV2 Inventory. As shown in Table 4-2, this case is different from the Base Case in the non-tank inventories only. It is different from INV1 in the aspect that the inventory is obtained by using the BBI tank average concentrations (Table 4-6 and Table 4-7) multiplied by the projected residual waste volumes (Table 4-8). The calculated non-tank inventories for this case are given in Table 4-11 and Table 4-12 for radioactive and chemical COPCs, respectively.

Figure 4-7. Comparison between the Three Infiltration Cases and the Base Case.

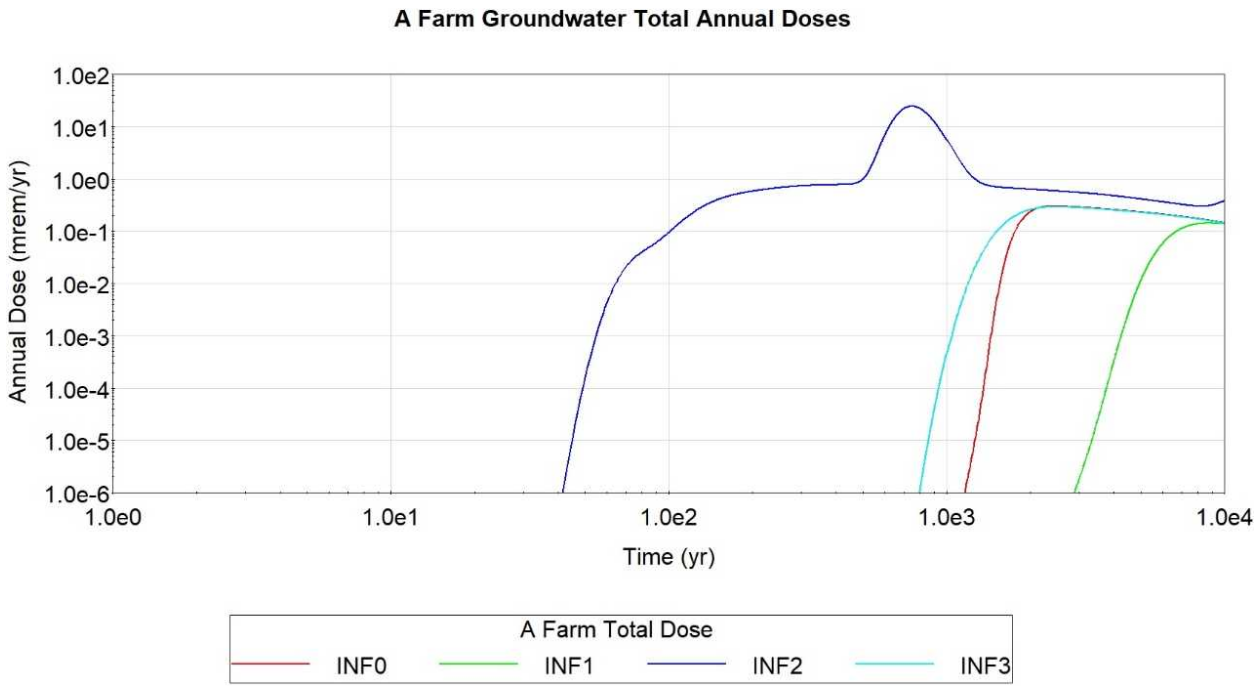


Figure 4-8. Dose by Source (INF2).

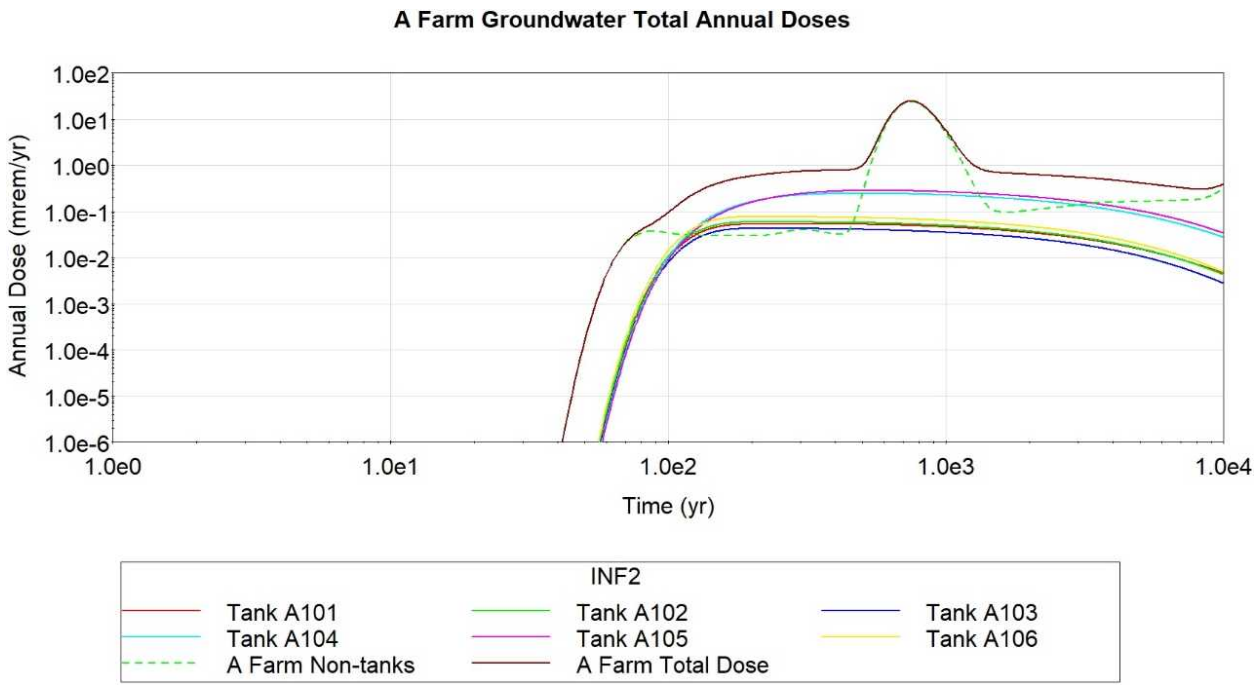


Figure 4-9. Dose by Analyte (INF2).

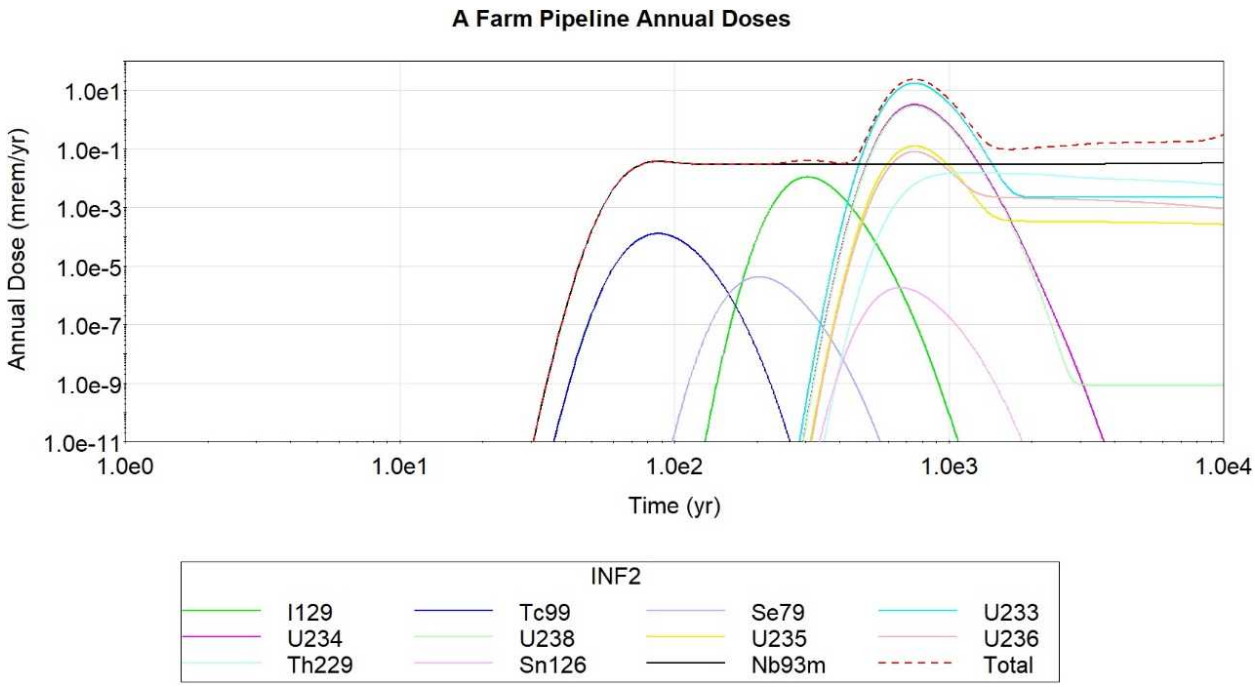


Figure 4-10. Dose by Exposure Pathway (INF2).

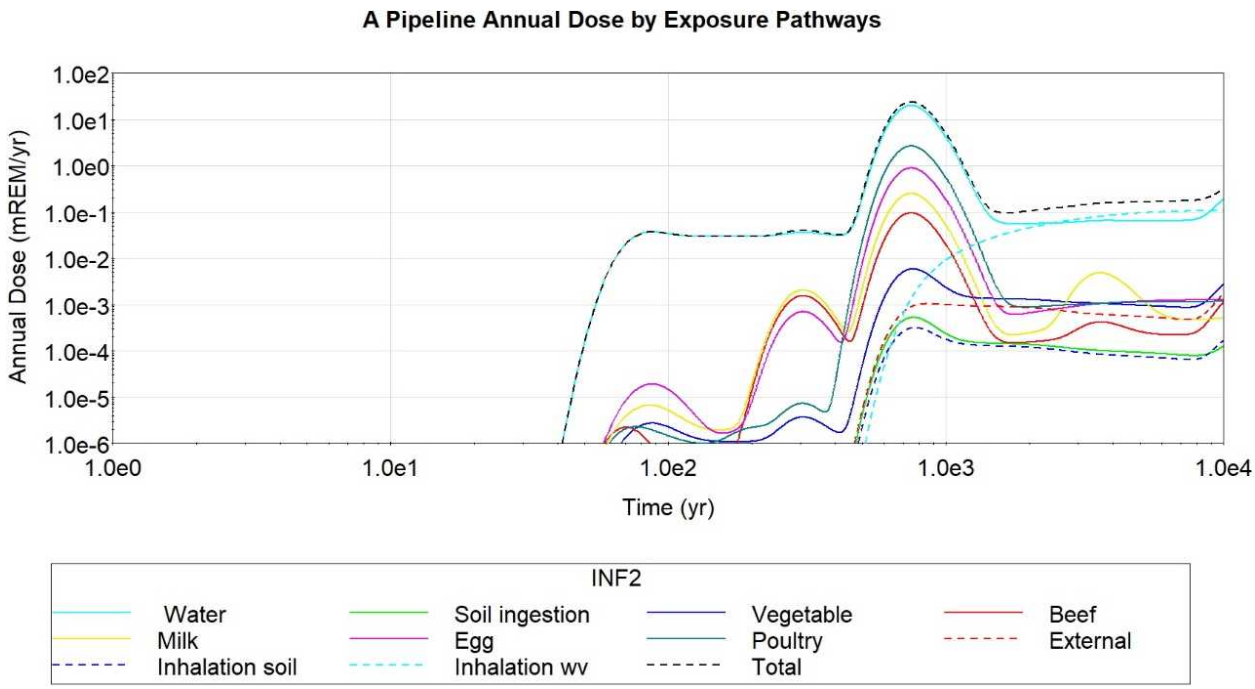


Figure 4-11. Comparison between the Three Infiltration Cases and the Base Case.

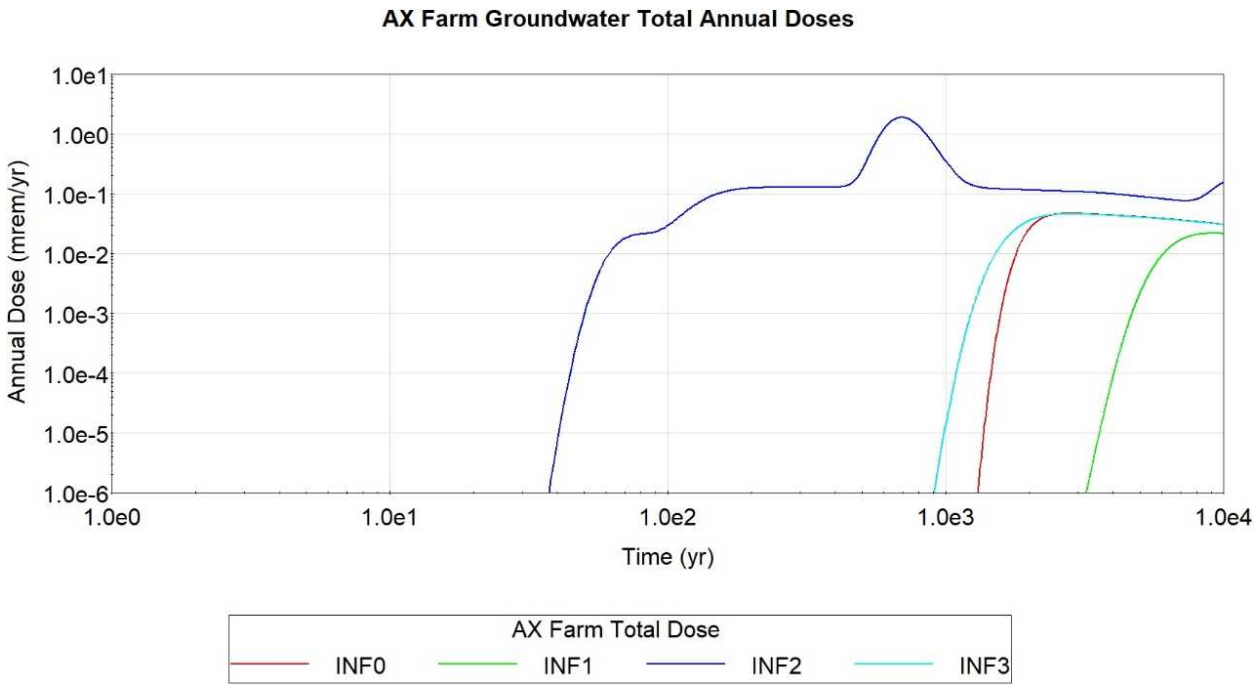


Figure 4-12. Dose by Source (INF2).

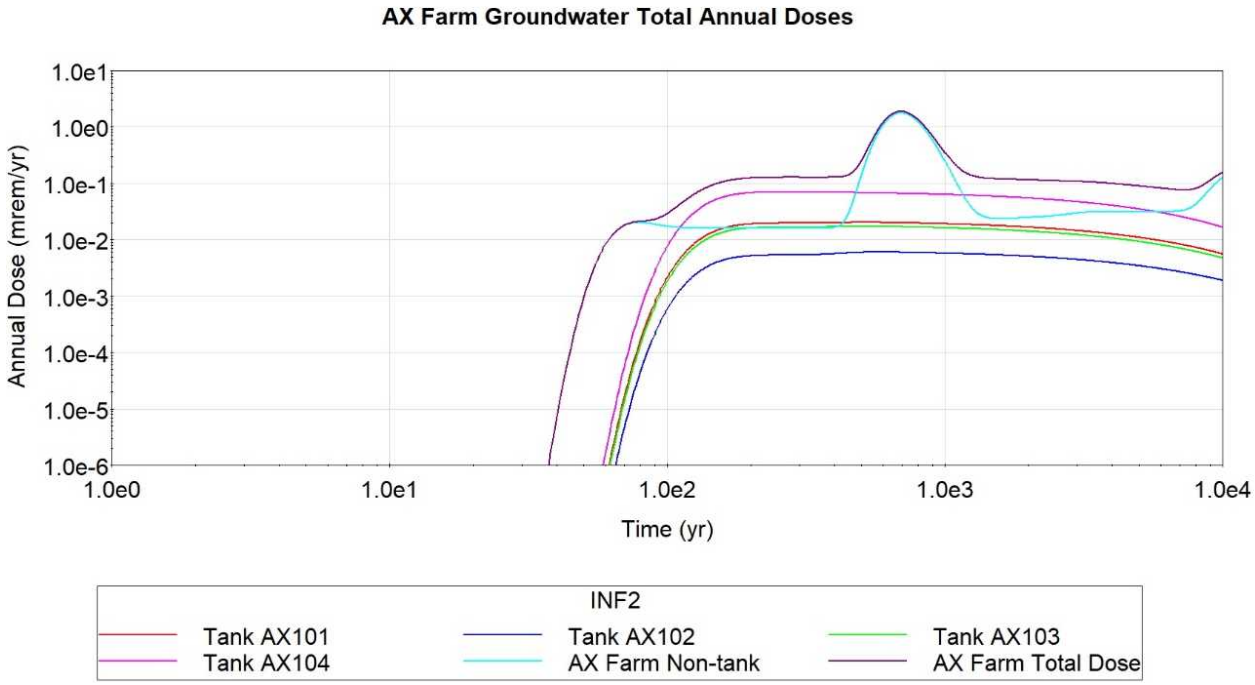


Figure 4-13. Dose by Analyte (INF2).

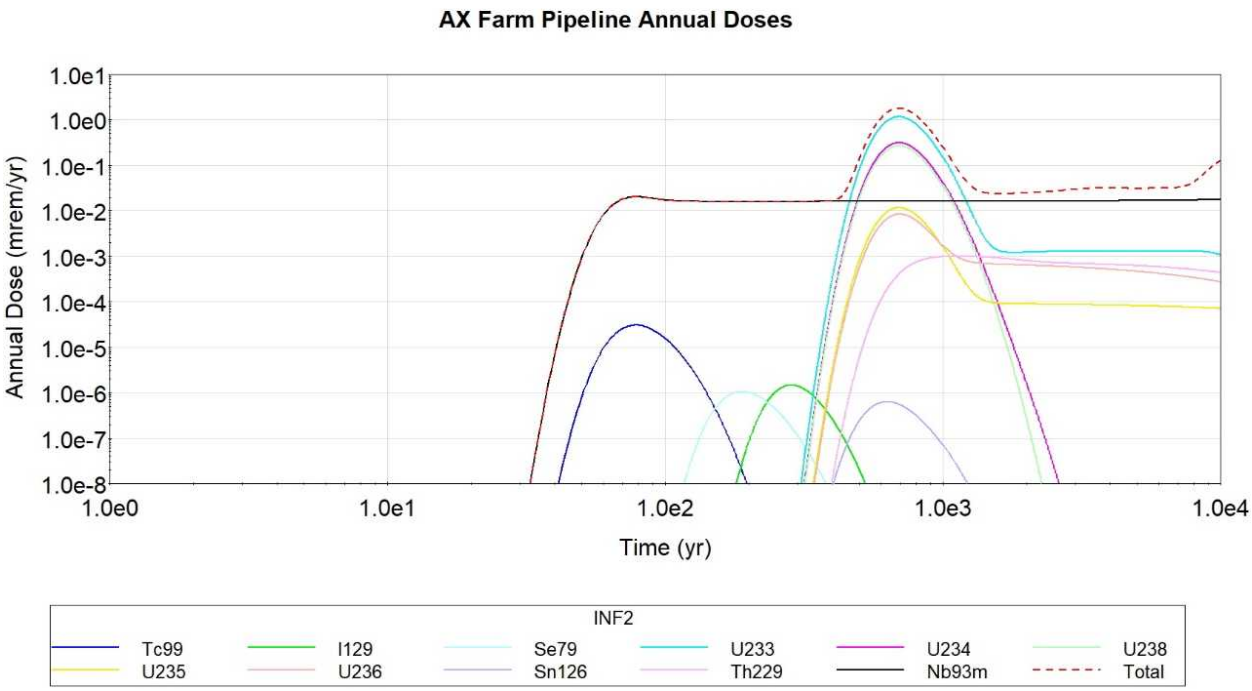


Figure 4-14. Dose by Exposure Pathway (INF2).

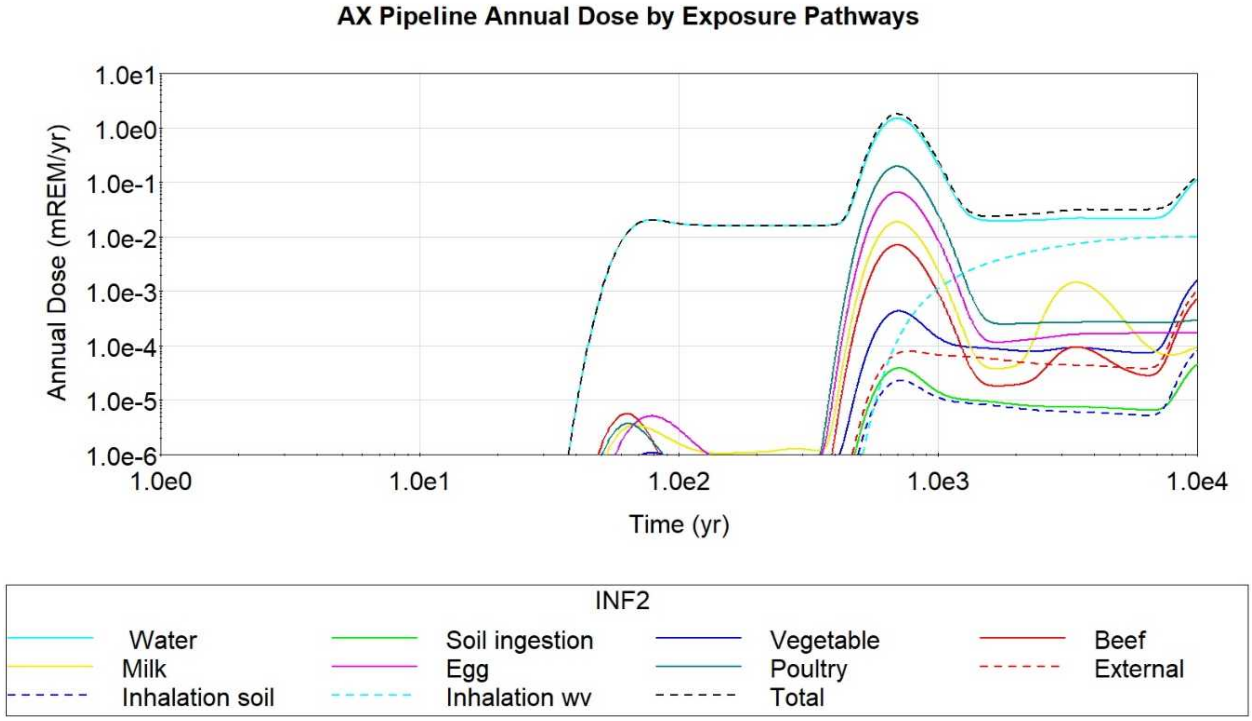


Table 4-2. Summary of Inventory Development for Base Case and Sensitivity Cases.

	Base Case	INV1	INV2
Tank data source	BBI current tank wastes	BBI current tank wastes	BBI current tank wastes
Volumes for tank concentrations	Current tank waste volumes	Current tank waste volumes	Current tank waste volumes
Volumes for residual waste	Projected tank residual volumes	Current tank waste volumes	Projected tank residual volumes
Non-tank data source	HTWOS for 300 m^3 residual tank wastes	BBI current tank wastes	BBI current tank wastes
Volumes for average tank concentrations	HTWOS tank residual waste volume 300 m^3	Current tank waste volumes	Current tank waste volumes
Non-tank residual volumes	Projected non-tank residual volumes	Current non-tank waste volume	Projected non-tank residual volumes

BBI = Best-Basis Inventory HTWOS = Hanford Tank Waste Operations Simulator

4.2.2 Description of Model Changes

This model uses the model described in RPP-RPT-60885 as its basis. This model file was created from the version-controlled "a_ax v1.0_20190228.gsm" model file by utilizing the "scenario" feature in GoldSim© to add different tank and ancillary equipment inventories and evaluate their impacts on groundwater concentrations. Changes to the model were made using the GoldSim© Scenario Manager for INV0, INV1, and INV2. Figure 4-15 and Figure 4-16 show the changes made in the Scenario Manager.

Data element **Res_Waste_Vol_Source** was modified for the three volume data sets used. **Initial_Chem_Inventory** and **Initial_Rad_Inventory** data elements were modified for three inventory data sets for chemicals and radionuclides.

Figure 4-17 presents the data elements that were modified using the Scenario Manager for INV0, INV1, and INV2.

4.2.3 Inputs

The inputs used in the GoldSim© elements **Res_Waste_Vol_Source, Initial_Chem_Inventory,** and **Initial_Rad_Inventory** for sensitivity cases INV0 (base case), INV1, and INV2 are included in Attachment B.

4.2.4 Inventory Sensitivity Results

Figure 4-18 and Figure 4-19 compare total groundwater dose for INV0, INV1, and INV2 by source for A Farm and AX Farm, respectively. Figure 4-20 presents total A Farm groundwater dose; Figure 4-21 presents total AX Farm groundwater dose.

Peak groundwater dose and peak times for A Farm and AX Farm are reported in Table 4-13 for each of the Base Case and the two sensitivity cases (INV1 and INV2).

4.3 GROUT SENSITIVITY CASES

4.3.1 Calculation Approach

The sensitivity cases described in this section investigate the effect of grout safety functions on the groundwater pathway doses. Three sensitivity cases have been identified as shown in Table 4-14. The physical degradation in the table means that the tank concrete shell, including the base mat, and the grout infill above the waste zone lose their flow safety function. Consequently, water is able to flow through the grout, giving rise to advective release of radionuclides from the residual waste zone. Both the Base Case and GRT3 involve no physical degradation of the grout. Where grout degradation is assumed to occur, the physical and water flow properties of the material change to those of sand, while the geochemical characteristics remain as those of grout. In one case, GRT3, the geochemical adsorption property of the grout materials is assumed to lose its safety function to sorb radionuclides in the residual waste. As a result, radionuclides diffuse through the tank base mat without sorption. Note that to test each of the physical and chemical safety functions, only one function is tested in each case.

Table 4-3. Radioactive Contaminant of Potential Concern Inventory (curies) at Calendar Year 2050 for INV1 Sensitivity Case. (2 sheets)

Species	Tank									
	241-A-101	241-A-102	241-A-103	241-A-104	241-A-105	241-A-106	241-AX-101	241-AX-102	241-AX-103	241-AX-104
Ac227	6.54E-02	8.89E-03	6.75E-02	2.68E-05	1.46E-05	4.29E-03	7.03E-02	4.87E-03	1.85E-02	4.07E-06
Am241	3.56E+02	3.47E+02	3.85E+02	6.82E+02	2.95E+03	1.31E+03	3.35E+02	2.02E+03	6.81E+02	5.75E+02
Am243	2.11E-01	1.99E-01	2.25E-01	3.57E-01	1.67E+00	3.08E+00	2.17E-01	1.95E+00	3.89E-01	3.23E-01
C14	6.54E+00	2.48E-01	4.59E+00	3.24E-01	2.75E-01	3.72E-01	6.77E+00	6.61E-02	1.72E+00	6.83E-02
Cd113m	8.00E+00	9.68E-01	7.30E+00	2.18E-01	3.12E-01	8.62E-01	8.40E+00	6.74E-01	2.20E+00	7.76E-02
Cm243	5.77E-03	4.53E-03	5.54E-03	7.21E-03	5.28E-02	9.85E-02	6.55E-03	1.04E-01	1.21E-02	1.02E-02
Cm244	6.75E-02	5.36E-02	6.48E-02	8.40E-02	6.06E-01	1.17E+00	7.82E-02	1.25E+00	1.40E-01	1.18E-01
Co60	1.01E-01	5.64E-02	6.02E-02	2.75E-01	4.03E-01	1.88E-01	9.08E-02	2.39E-01	1.66E-01	2.25E-01
Cs137	1.05E+05	1.47E+04	9.91E+04	1.89E+04	3.73E+04	2.83E+04	1.36E+05	8.53E+03	4.00E+04	1.11E+04
Eu152	7.54E-01	1.20E-01	5.78E-01	7.71E-01	6.63E+00	6.39E+00	5.11E-01	1.99E+00	1.55E+00	1.65E+00
Eu154	1.40E+01	2.25E+00	1.08E+01	2.78E+01	7.05E+01	1.18E+02	9.15E+00	1.90E+01	4.70E+01	1.38E+01
Eu155	3.07E-01	4.97E-02	2.32E-01	3.10E-01	5.97E-01	2.55E+00	1.81E-01	4.18E-01	6.63E-01	3.51E-01
H3	1.48E+00	1.64E-01	1.23E+00	1.13E-01	6.96E-02	2.31E-01	1.54E+00	1.39E-01	3.90E-01	1.74E-02
I129	2.33E-01	1.93E-02	4.83E-02	6.36E-03	9.47E-04	3.55E-02	2.52E-01	1.68E-02	6.77E-02	2.36E-04
Nb93m	3.87E+01	5.33E+00	3.99E+01	2.25E+00	2.87E+00	5.10E+00	4.14E+01	3.02E+00	1.16E+01	7.13E-01
Ni59	1.41E+01	1.76E+00	1.18E+01	8.62E+00	7.20E+00	6.96E+00	1.40E+01	1.71E+00	5.06E+00	1.79E+00
Ni63	9.57E+02	1.20E+02	8.03E+02	5.83E+02	4.93E+02	4.73E+02	9.53E+02	1.17E+02	3.45E+02	1.23E+02
Np237	1.36E+00	1.52E-01	1.12E+00	5.82E-02	7.62E-02	1.64E-01	1.39E+00	2.99E-01	5.75E-02	1.72E-02
Pa231	8.25E-02	1.13E-02	8.53E-02	3.89E-05	1.57E-05	5.42E-03	8.89E-02	6.15E-03	2.34E-02	5.03E-06
Pb210	5.42E-05	1.25E-05	4.89E-05	2.46E-06	1.45E-06	5.04E-06	5.17E-05	4.87E-06	1.52E-05	4.56E-07
Pu238	2.56E+00	9.35E+00	6.78E+00	1.39E+01	1.88E+01	4.21E+01	3.07E+00	1.06E+01	3.18E+00	5.77E+00
Pu239	7.98E+01	3.21E+02	2.28E+02	5.96E+02	5.56E+02	1.42E+03	1.05E+02	1.52E+02	9.25E+01	1.73E+02

Table 4-3. Radioactive Contaminant of Potential Concern Inventory (curies) at Calendar Year 2050 for INV1 Sensitivity Case. (2 sheets)

Species	Tank									
	241-A-101	241-A-102	241-A-103	241-A-104	241-A-105	241-A-106	241-AX-101	241-AX-102	241-AX-103	241-AX-104
Pu240	1.91E+01	7.43E+01	5.33E+01	1.31E+02	1.36E+02	3.30E+02	2.42E+01	4.85E+01	2.33E+01	4.23E+01
Pu241	1.60E+01	6.31E+01	4.51E+01	7.93E+01	1.14E+02	2.63E+02	1.96E+01	7.82E+01	1.89E+01	3.55E+01
Pu242	1.42E-03	5.57E-03	3.98E-03	6.55E-03	9.91E-03	2.29E-02	1.72E-03	7.50E-03	1.65E-03	3.09E-03
Ra226	7.55E-05	2.73E-05	7.69E-05	5.49E-06	2.19E-06	8.16E-06	7.97E-05	7.42E-06	2.10E-05	8.14E-07
Ra228	1.10E-04	1.49E-05	1.13E-04	1.63E-06	1.90E-11	7.76E-06	1.18E-04	1.19E-03	1.22E-04	5.95E-12
Rn222	7.55E-05	2.73E-05	7.69E-05	5.49E-06	2.19E-06	8.16E-06	7.97E-05	7.42E-06	2.10E-05	8.14E-07
Se79	1.48E+00	1.96E-01	1.48E+00	8.89E-02	1.13E-01	1.82E-01	1.58E+00	3.55E-02	4.37E-01	2.82E-02
Sm151	1.33E+04	3.14E+03	1.12E+04	2.70E+04	5.60E+04	1.69E+05	1.92E+04	2.67E+04	1.49E+04	1.40E+04
Sn126	3.79E+00	6.40E-01	4.82E+00	1.79E-01	2.29E-01	4.01E-01	4.23E+00	1.08E+00	1.26E+00	5.69E-02
Sr90	4.00E+04	2.50E+04	4.58E+04	6.67E+05	9.54E+05	7.80E+05	6.49E+04	7.60E+04	1.47E+05	4.36E+05
Tc99	2.29E+02	3.62E+01	2.62E+02	1.24E+01	1.58E+01	8.76E+01	2.48E+02	6.30E+00	7.03E+01	1.32E+01
Th229	1.04E-02	4.49E-02	1.72E-02	6.32E-04	2.70E-08	7.44E-04	5.66E-03	4.24E-03	3.71E-04	2.32E-08
Th230	3.14E-04	1.60E-03	6.18E-04	3.38E-04	9.21E-07	1.06E-04	3.21E-04	1.35E-04	6.89E-05	2.41E-05
Th232	1.10E-04	1.49E-05	1.13E-04	1.63E-06	1.91E-11	7.76E-06	1.18E-04	1.19E-03	1.22E-04	6.34E-12
U232	2.67E-02	1.40E-01	5.36E-02	1.94E-03	4.19E-08	2.33E-03	1.77E-02	1.09E-02	6.75E-03	1.73E-06
U233	2.63E+00	1.38E+01	5.27E+00	1.94E-01	9.05E-06	2.28E-01	1.73E+00	1.07E+00	9.15E-02	7.22E-06
U234	4.75E-01	2.41E+00	9.34E-01	5.12E-01	2.95E-03	1.64E-01	4.84E-01	2.04E-01	1.04E-01	3.69E-02
U235	1.93E-02	9.78E-02	3.78E-02	2.15E-02	5.56E-05	6.68E-03	1.99E-02	8.26E-03	2.75E-03	1.53E-03
U236	1.24E-02	6.34E-02	2.46E-02	1.23E-02	1.61E-04	4.45E-03	1.27E-02	5.73E-03	3.70E-03	9.77E-04
U238	4.27E-01	2.17E+00	8.39E-01	5.07E-01	8.57E-04	1.53E-01	4.48E-01	1.80E-01	6.45E-02	3.55E-02
Zr93	4.05E+01	5.57E+00	4.17E+01	2.35E+00	3.00E+00	5.33E+00	4.33E+01	3.16E+00	1.21E+01	7.46E-01

Table 4-4. Chemical Contaminant of Potential Concern Inventory (kilograms) at Calendar Year 2050 for INV1 Sensitivity Case.

Species	Tank									
	241-A-101	241-A-102	241-A-103	241-A-104	241-A-105	241-A-106	241-AX-101	241-AX-102	241-AX-103	241-AX-104
Al	4.50E+04	7.73E+03	3.46E+04	7.08E+03	8.28E+03	1.02E+04	4.96E+04	2.37E+03	1.51E+04	1.71E+03
B	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CN	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cr	6.58E+03	1.63E+03	2.71E+03	1.58E+02	3.56E+02	1.93E+03	4.21E+03	1.02E+02	2.13E+03	1.87E+01
F	9.85E+02	5.36E+01	1.18E+03	1.92E+00	1.68E+01	1.04E+02	1.20E+03	5.92E+01	5.39E+02	3.27E+00
Fe	7.34E+02	4.65E+03	1.73E+03	2.59E+04	1.92E+04	1.83E+04	1.25E+03	6.40E+03	4.54E+03	8.77E+03
Hg	3.40E+00	9.92E-01	2.69E+00	3.20E+01	2.14E+01	1.80E+02	1.32E+01	7.59E+00	5.24E+00	5.32E+00
Mn	2.06E+02	9.12E+02	2.97E+02	3.63E+03	6.49E+02	8.85E+02	4.67E+01	5.22E+02	6.15E+02	1.52E+02
Ni	3.27E+02	1.36E+02	2.69E+02	1.68E+03	1.55E+03	7.03E+02	1.43E+02	1.49E+02	2.70E+02	4.72E+02
NO2	1.33E+05	2.25E+04	1.63E+05	5.88E+03	3.73E+02	1.15E+04	1.64E+05	5.07E+03	5.39E+04	7.27E+01
NO3	2.44E+05	2.49E+04	2.29E+05	3.02E+02	9.53E+03	3.10E+04	3.04E+05	2.58E+04	6.83E+04	1.48E+03
Pb	3.28E+02	3.20E+02	3.21E+02	5.65E+01	1.54E+03	8.50E+02	1.74E+02	4.43E+02	3.88E+02	3.00E+02
Sr	1.83E+01	1.34E+01	1.32E+01	4.21E+01	5.34E+01	8.07E+01	3.81E+00	1.16E+02	4.58E+01	3.09E+01
Se	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sn	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TBP	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 4-5. The Current Tank Waste Volumes (kiloliters).

Tank	241-A-101	241-A-102	241-A-103	241-A-104	241-A-105	241-A-106	241-AX-101	241-AX-102	241-AX-103	241-AX-104
Volume	1,037	147	1,471	93	139	273	1,210	113	403	18

Table 4-6. Radioactive Contaminant of Potential Concern Best-Basis Inventory Tank Waste Concentrations and Average Farm Concentrations (curies/kiloliters) at 2050.

Species	Tank						241-A Farm Average	Tank				241-AX Farm Average
	241-A-101	241-A-102	241-A-103	241-A-104	241-A-105	241-A-106		241-AX-101	241-AX-102	241-AX-103	241-AX-104	
Ac227	6.30E-05	6.05E-05	4.59E-05	2.88E-07	1.05E-07	1.57E-05	3.09E-05	5.81E-05	4.31E-05	4.59E-05	2.26E-07	3.68E-05
Am241	3.43E-01	2.36E+00	2.62E-01	7.33E+00	2.12E+01	4.81E+00	6.05E+00	2.77E-01	1.78E+01	1.69E+00	3.20E+01	1.29E+01
Am243	2.04E-04	1.36E-03	1.53E-04	3.84E-03	1.20E-02	1.13E-02	4.80E-03	1.80E-04	1.73E-02	9.64E-04	1.79E-02	9.09E-03
C14	9.57E+01	9.45E+01	6.36E+01	1.92E+02	2.54E+02	9.78E+01	1.33E+02	1.06E+02	7.13E+01	9.37E+01	5.82E+02	2.13E+02
Cd113m	6.30E-03	1.69E-03	3.12E-03	3.48E-03	1.98E-03	1.36E-03	2.99E-03	5.60E-03	5.85E-04	4.27E-03	3.80E-03	3.56E-03
Cm243	5.57E-06	3.08E-05	3.77E-06	7.75E-05	3.79E-04	3.61E-04	1.43E-04	5.41E-06	9.21E-04	3.00E-05	5.67E-04	3.81E-04
Cm244	6.51E-05	3.65E-04	4.41E-05	9.04E-04	4.36E-03	4.29E-03	1.67E-03	6.46E-05	1.11E-02	3.47E-04	6.53E-03	4.50E-03
Co60	9.75E-05	3.84E-04	4.09E-05	2.96E-03	2.90E-03	6.90E-04	1.18E-03	7.50E-05	2.11E-03	4.12E-04	1.25E-02	3.77E-03
Cs137	1.01E+02	1.00E+02	6.74E+01	2.03E+02	2.69E+02	1.04E+02	1.41E+02	1.12E+02	7.55E+01	9.93E+01	6.16E+02	2.26E+02
Eu152	7.27E-04	8.18E-04	3.93E-04	8.29E-03	4.77E-02	2.34E-02	1.36E-02	4.22E-04	1.76E-02	3.84E-03	9.15E-02	2.83E-02
Eu154	1.35E-02	1.53E-02	7.31E-03	2.98E-01	5.07E-01	4.30E-01	2.12E-01	7.56E-03	1.68E-01	1.17E-01	7.66E-01	2.64E-01
Eu155	2.96E-04	3.38E-04	1.58E-04	3.33E-03	4.30E-03	9.36E-03	2.96E-03	1.50E-04	3.70E-03	1.65E-03	1.95E-02	6.25E-03
H3	1.43E-03	1.11E-03	8.36E-04	1.21E-03	5.01E-04	8.47E-04	9.89E-04	1.27E-03	1.23E-03	9.67E-04	9.65E-04	1.11E-03
I129	2.25E-04	1.31E-04	3.28E-05	6.84E-05	6.81E-06	1.30E-04	9.90E-05	2.08E-04	1.49E-04	1.68E-04	1.31E-05	1.35E-04
Nb93m	3.73E-02	3.63E-02	2.71E-02	2.42E-02	2.06E-02	1.87E-02	2.74E-02	3.42E-02	2.67E-02	2.87E-02	3.96E-02	3.23E-02
Ni59	1.36E-02	1.20E-02	8.02E-03	9.27E-02	5.18E-02	2.55E-02	3.39E-02	1.16E-02	1.51E-02	1.26E-02	9.94E-02	3.47E-02
Ni63	9.23E-01	8.14E-01	5.46E-01	6.27E+00	3.55E+00	1.73E+00	2.30E+00	7.87E-01	1.03E+00	8.55E-01	6.82E+00	2.37E+00
Np237	1.31E-03	1.03E-03	7.64E-04	6.25E-04	5.48E-04	6.00E-04	8.13E-04	1.15E-03	2.65E-03	1.43E-04	9.54E-04	1.22E-03
Pa231	7.96E-05	7.66E-05	5.80E-05	4.18E-07	1.13E-07	1.99E-05	3.91E-05	7.34E-05	5.44E-05	5.80E-05	2.79E-07	4.65E-05
Pb210	5.22E-08	8.52E-08	3.32E-08	2.65E-08	1.04E-08	1.85E-08	3.77E-08	4.28E-08	4.31E-08	3.76E-08	2.53E-08	3.72E-08
Pu238	2.47E-03	6.36E-02	4.61E-03	1.49E-01	1.35E-01	1.54E-01	8.49E-02	2.54E-03	9.42E-02	7.88E-03	3.21E-01	1.06E-01
Pu239	7.70E-02	2.18E+00	1.55E-01	6.41E+00	4.00E+00	5.20E+00	3.00E+00	8.67E-02	1.34E+00	2.30E-01	9.60E+00	2.81E+00
Pu240	1.84E-02	5.06E-01	3.62E-02	1.40E+00	9.75E-01	1.21E+00	6.91E-01	2.00E-02	4.29E-01	5.78E-02	2.35E+00	7.14E-01
Pu241	1.55E-02	4.29E-01	3.07E-02	8.53E-01	8.22E-01	9.62E-01	5.19E-01	1.62E-02	6.92E-01	4.70E-02	1.97E+00	6.82E-01
Pu242	1.36E-06	3.79E-05	2.71E-06	7.04E-05	7.13E-05	8.37E-05	4.46E-05	1.42E-06	6.63E-05	4.09E-06	1.71E-04	6.08E-05
Ra226	7.28E-08	1.86E-07	5.23E-08	5.90E-08	1.57E-08	2.99E-08	6.92E-08	6.58E-08	6.56E-08	5.21E-08	4.52E-08	5.72E-08
Ra228	1.06E-07	1.01E-07	7.68E-08	1.75E-08	1.37E-13	2.84E-08	5.50E-08	9.75E-08	1.05E-05	3.03E-07	3.30E-13	2.73E-06
Rn222	7.28E-08	1.86E-07	5.23E-08	5.90E-08	1.57E-08	2.99E-08	6.92E-08	6.58E-08	6.56E-08	5.21E-08	4.52E-08	5.72E-08
Se79	3.18E-19	2.24E-18	2.24E-19	3.55E-18	2.37E-18	1.21E-18	1.65E-18	2.73E-19	2.92E-18	8.18E-19	1.83E-17	5.58E-18
Sm151	3.73E-08	9.33E-08	2.49E-08	3.56E-06	2.01E-06	1.93E-06	1.28E-06	3.66E-08	3.17E-05	5.68E-07	8.14E-06	1.01E-05
Sn126	1.43E-03	1.33E-03	1.01E-03	9.56E-04	8.13E-04	6.67E-04	1.03E-03	1.31E-03	3.14E-04	1.08E-03	1.57E-03	1.07E-03
Sr90	1.28E+01	2.14E+01	7.61E+00	2.90E+02	4.03E+02	6.18E+02	2.25E+02	1.58E+01	2.36E+02	3.70E+01	7.75E+02	2.66E+02
Tc99	3.65E-03	4.35E-03	3.28E-03	1.92E-03	1.65E-03	1.47E-03	2.72E-03	3.50E-03	9.56E-03	3.13E-03	3.16E-03	4.84E-03
Th229	3.86E+01	1.70E+02	3.11E+01	7.17E+03	6.87E+03	2.86E+03	2.85E+03	5.37E+01	6.73E+02	3.65E+02	2.42E+04	6.32E+03
Th230	2.21E-01	2.46E-01	1.78E-01	1.33E-01	1.14E-01	3.21E-01	2.02E-01	2.05E-01	5.57E-02	1.74E-01	7.33E-01	2.92E-01
Th232	1.01E-05	3.05E-04	1.17E-05	6.79E-06	1.94E-10	2.72E-06	5.61E-05	4.68E-06	3.75E-05	9.20E-07	1.29E-09	1.08E-05
U232	3.03E-07	1.09E-05	4.20E-07	3.63E-06	6.63E-09	3.88E-07	2.60E-06	2.65E-07	1.19E-06	1.71E-07	1.34E-06	7.42E-07
U233	1.06E-07	1.01E-07	7.68E-08	1.75E-08	1.37E-13	2.84E-08	5.50E-08	9.75E-08	1.05E-05	3.03E-07	3.52E-13	2.73E-06
U234	2.57E-05	9.52E-04	3.65E-05	2.08E-05	3.02E-10	8.52E-06	1.74E-04	1.46E-05	9.63E-05	1.67E-05	9.62E-08	3.19E-05
U235	2.54E-03	9.39E-02	3.58E-03	2.09E-03	6.51E-08	8.35E-04	1.72E-02	1.43E-03	9.47E-03	2.27E-04	4.01E-07	2.78E-03
U236	4.58E-04	1.64E-02	6.35E-04	5.50E-03	2.12E-05	6.00E-04	3.94E-03	4.00E-04	1.81E-03	2.59E-04	2.05E-03	1.13E-03
U238	1.86E-05	6.65E-04	2.57E-05	2.31E-04	4.00E-07	2.45E-05	1.61E-04	1.64E-05	7.31E-05	6.83E-06	8.48E-05	4.53E-05
Zr93	3.91E-02	3.79E-02	2.83E-02	2.53E-02	2.16E-02	1.95E-02	2.86E-02	3.58E-02	2.80E-02	3.00E-02	4.14E-02	3.38E-02

Table 4-7. Chemical Contaminant of Potential Concern Best-Basis Inventory Tank Waste Concentrations and Average Farm Concentrations (kilograms/kiloliter) at 2050.

Species	241-A-101	241-A-102	241-A-103	241-A-104	241-A-105	241-A-106	241-A Farm Average	241-AX-101	241-AX-102	241-AX-103	241-AX-104	241-AX Farm Average
Al	4.34E+01	5.26E+01	2.35E+01	7.61E+01	5.96E+01	3.74E+01	4.88E+01	4.10E+01	2.10E+01	3.75E+01	9.50E+01	4.86E+01
B	0	0	0	0	0	0	0	0	0	0	0	0
CN	0	0	0	0	0	0	0	0	0	0	0	0
Co	0	0	0	0	0	0	0	0	0	0	0	0
Cr	6.35E+00	1.11E+01	1.84E+00	1.70E+00	2.56E+00	7.07E+00	5.10E+00	3.48E+00	9.03E-01	5.29E+00	1.04E+00	2.68E+00
F	9.50E-01	3.65E-01	8.02E-01	2.06E-02	1.21E-01	3.81E-01	4.40E-01	9.92E-01	5.24E-01	1.34E+00	1.82E-01	7.59E-01
Fe	7.08E-01	3.16E+01	1.18E+00	2.78E+02	1.38E+02	6.70E+01	8.62E+01	1.03E+00	5.66E+01	1.13E+01	4.87E+02	1.39E+02
Hg	3.28E-03	6.75E-03	1.83E-03	3.44E-01	1.54E-01	6.59E-01	1.95E-01	1.09E-02	6.72E-02	1.30E-02	2.96E-01	9.67E-02
Mn	1.99E-01	6.20E+00	2.02E-01	3.90E+01	4.67E+00	3.24E+00	8.92E+00	3.86E-02	4.62E+00	1.53E+00	8.44E+00	3.66E+00
Ni	3.15E-01	9.25E-01	1.83E-01	1.81E+01	1.12E+01	2.58E+00	5.54E+00	1.18E-01	1.32E+00	6.70E-01	2.62E+01	7.08E+00
NO2	1.28E+02	1.53E+02	1.11E+02	6.32E+01	2.68E+00	4.21E+01	8.34E+01	1.36E+02	4.49E+01	1.34E+02	4.04E+00	7.95E+01
NO3	2.35E+02	1.69E+02	1.56E+02	3.25E+00	6.86E+01	1.14E+02	1.24E+02	2.51E+02	2.28E+02	1.69E+02	8.22E+01	1.83E+02
Pb	3.16E-01	2.18E+00	2.18E-01	6.08E-01	1.11E+01	3.11E+00	2.92E+00	1.44E-01	3.92E+00	9.63E-01	1.67E+01	5.42E+00
Sr	1.76E-02	9.12E-02	8.97E-03	4.53E-01	3.84E-01	2.96E-01	2.08E-01	3.15E-03	1.03E+00	1.14E-01	1.72E+00	7.15E-01
Se	0	0	0	0	0	0	0	0	0	0	0	0
Sn	0	0	0	0	0	0	0	0	0	0	0	0
TBP	0	0	0	0	0	0	0	0	0	0	0	0

Table 4-8. The Current and Residual Non-Tank Volumes (kiloliters).

	A-350	A-417	A-302A	A-302B	204-AR	244-A	244-AR	Diversion Box/Pits	Pipelines	Total 241-A Tank Farm Non-Tank, Non-Pipeline	AX-151	AX-152	AX-152-DS	Diversion Box/Pits	Pipelines	Total 241-AX Tank Farm Non-Tank, Non-Pipeline
Current*	0.42	4.16	2.31	23.1	2.69	19.7	10.78	0.039	3.3	63.199	10.6	0.38	0.757	0.029	2.9	11.766
Residual	0.042	0.416	0.231	2.309	0.269	1.968	1.083	0.039	3.3	6.356	1.06	0.038	0.076	0.029	2.9	1.203

*RPP-RPT-58293, *Hanford 241-A and 241-AX-Farm Tank and Ancillary Equipment Residual Waste Inventory Estimates*, Table 5-1 and Table 5-2.

Table 4-9. Non-Tank Radioactive Contaminant of Potential Concern Inventories (curies) for INV1. (2 sheets)

Species	A_Ancillary	AX_Ancillary	A_Pipelines	AX_Pipelines
Ac227	1.95E-03	4.33E-04	1.02E-04	1.07E-04
Am241	3.83E+02	1.52E+02	2.00E+01	3.75E+01
Am243	3.03E-01	1.07E-01	1.58E-02	2.64E-02
C14	1.89E-01	4.19E-02	9.86E-03	1.03E-02
Cd113m	2.85E-01	6.66E-02	1.49E-02	1.64E-02
Cm243	9.04E-03	4.48E-03	4.72E-04	1.10E-03
Cm244	1.06E-01	5.30E-02	5.51E-03	1.31E-02
Co60	7.44E-02	4.44E-02	3.89E-03	1.09E-02
Cs137	8.89E+03	2.66E+03	4.64E+02	6.55E+02
Eu152	8.57E-01	3.34E-01	4.47E-02	8.22E-02
Eu154	1.34E+01	3.11E+00	7.00E-01	7.67E-01
Eu155	1.87E-01	7.35E-02	9.78E-03	1.81E-02
H3	6.25E-02	1.30E-02	3.26E-03	3.21E-03
I129	6.26E-03	1.58E-03	3.27E-04	3.90E-04
Nb93m	1.73E+00	3.80E-01	9.03E-02	9.37E-02
Ni59	2.14E+00	4.08E-01	1.12E-01	1.01E-01
Ni63	1.46E+02	2.79E+01	7.60E+00	6.89E+00
Np237	5.14E-02	1.44E-02	2.68E-03	3.55E-03
Pa231	2.47E-03	5.48E-04	1.29E-04	1.35E-04
Pb210	2.38E-06	4.38E-07	1.24E-07	1.08E-07
Pu238	5.36E+00	1.25E+00	2.80E-01	3.08E-01
Pu239	1.90E+02	3.31E+01	9.91E+00	8.16E+00
Pu240	4.37E+01	8.40E+00	2.28E+00	2.07E+00
Pu241	3.28E+01	8.03E+00	1.71E+00	1.98E+00
Pu242	2.82E-03	7.16E-04	1.47E-04	1.76E-04
Ra226	4.38E-06	6.73E-07	2.28E-07	1.66E-07
Ra228	3.48E-06	3.22E-05	1.82E-07	7.93E-06
Rn222	4.37E-06	6.73E-07	2.28E-07	1.66E-07
Se79	6.53E-02	1.26E-02	3.41E-03	3.10E-03
Sm151	1.42E+04	3.13E+03	7.44E+02	7.72E+02
Sn126	1.72E-01	5.69E-02	8.98E-03	1.40E-02
Sr90	1.80E+05	7.44E+04	9.42E+03	1.83E+04
Tc99	1.28E+01	3.44E+00	6.67E-01	8.47E-01

Table 4-9. Non-Tank Radioactive Contaminant of Potential Concern Inventories (curies) for INV1. (2 sheets)

Species	A_Ancillary	AX_Ancillary	A_Pipelines	AX_Pipelines
Th229	3.55E-03	1.27E-04	1.85E-04	3.12E-05
Th230	1.64E-04	8.73E-06	8.58E-06	2.15E-06
Th232	3.48E-06	3.22E-05	1.82E-07	7.93E-06
U232	1.10E-02	3.76E-04	5.74E-04	9.26E-05
U233	1.08E+00	3.27E-02	5.66E-02	8.07E-03
U234	2.49E-01	1.33E-02	1.30E-02	3.28E-03
U235	1.02E-02	5.33E-04	5.31E-04	1.31E-04
U236	6.42E-03	3.67E-04	3.35E-04	9.04E-05
U238	2.29E-01	1.20E-02	1.20E-02	2.97E-03
Zr93	1.81E+00	3.98E-01	9.44E-02	9.80E-02

Table 4-10. Non-Tank Chemical Contaminant of Potential Concern Inventories (kilograms) for INV1.

Species	A_Ancillary	AX_Ancillary	A_Pipelines	AX_Pipelines
Al	3.08E+03	5.72E+02	1.61E+02	1.41E+02
B	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CN	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cr	3.22E+02	3.15E+01	1.68E+01	7.76E+00
F	2.78E+01	8.93E+00	1.45E+00	2.20E+00
Fe	5.45E+03	1.64E+03	2.84E+02	4.03E+02
Hg	1.23E+01	1.14E+00	6.43E-01	2.80E-01
Mn	5.64E+02	4.30E+01	2.95E+01	1.06E+01
Ni	3.50E+02	8.33E+01	1.83E+01	2.05E+01
NO2	5.27E+03	9.36E+02	2.75E+02	2.31E+02
NO3	7.85E+03	2.15E+03	4.10E+02	5.30E+02
Pb	1.84E+02	6.38E+01	9.63E+00	1.57E+01
Sr	1.32E+01	8.41E+00	6.88E-01	2.07E+00
Se	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sn	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TBP	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 4-11. Non-Tank Radioactive Contaminant of Potential Concern Inventories (curies) for INV2. (2 sheets)

Species	A_Ancillary	AX_Ancillary	A_Pipelines	AX_Pipelines
Ac227	1.97E-04	4.43E-05	1.02E-04	1.07E-04
Am241	3.85E+01	1.56E+01	2.00E+01	3.75E+01
Am243	3.05E-02	1.09E-02	1.58E-02	2.64E-02
C14	1.90E-02	4.28E-03	9.86E-03	1.03E-02
Cd113m	2.86E-02	6.81E-03	1.49E-02	1.64E-02
Cm243	9.09E-04	4.58E-04	4.72E-04	1.10E-03
Cm244	1.06E-02	5.42E-03	5.51E-03	1.31E-02
Co60	7.49E-03	4.54E-03	3.89E-03	1.09E-02
Cs137	8.94E+02	2.72E+02	4.64E+02	6.55E+02
Eu152	8.62E-02	3.41E-02	4.47E-02	8.22E-02
Eu154	1.35E+00	3.18E-01	7.00E-01	7.67E-01
Eu155	1.88E-02	7.51E-03	9.78E-03	1.81E-02
H3	6.29E-03	1.33E-03	3.26E-03	3.21E-03
I129	6.29E-04	1.62E-04	3.27E-04	3.90E-04
Nb93m	1.74E-01	3.89E-02	9.03E-02	9.37E-02
Ni59	2.16E-01	4.17E-02	1.12E-01	1.01E-01
Ni63	1.46E+01	2.86E+00	7.60E+00	6.89E+00
Np237	5.17E-03	1.47E-03	2.68E-03	3.55E-03
Pa231	2.48E-04	5.60E-05	1.29E-04	1.35E-04
Pb210	2.39E-07	4.47E-08	1.24E-07	1.08E-07
Pu238	5.39E-01	1.28E-01	2.80E-01	3.08E-01
Pu239	1.91E+01	3.39E+00	9.91E+00	8.16E+00
Pu240	4.39E+00	8.58E-01	2.28E+00	2.07E+00
Pu241	3.30E+00	8.20E-01	1.71E+00	1.98E+00
Pu242	2.83E-04	7.32E-05	1.47E-04	1.76E-04
Ra226	4.40E-07	6.88E-08	2.28E-07	1.66E-07
Ra228	3.50E-07	3.29E-06	1.82E-07	7.93E-06
Rn222	4.40E-07	6.88E-08	2.28E-07	1.66E-07
Se79	6.57E-03	1.28E-03	3.41E-03	3.10E-03
Sm151	1.43E+03	3.20E+02	7.44E+02	7.72E+02
Sn126	1.73E-02	5.82E-03	8.98E-03	1.40E-02
Sr90	1.81E+04	7.61E+03	9.42E+03	1.83E+04
Tc99	1.29E+00	3.51E-01	6.67E-01	8.47E-01

Table 4-11. Non-Tank Radioactive Contaminant of Potential Concern Inventories (curies) for INV2. (2 sheets)

Species	A_Ancillary	AX_Ancillary	A_Pipelines	AX_Pipelines
Th229	3.57E-04	1.30E-05	1.85E-04	3.12E-05
Th230	1.65E-05	8.92E-07	8.58E-06	2.15E-06
Th232	3.50E-07	3.29E-06	1.82E-07	7.93E-06
U232	1.11E-03	3.84E-05	5.74E-04	9.26E-05
U233	1.09E-01	3.35E-03	5.66E-02	8.07E-03
U234	2.50E-02	1.36E-03	1.30E-02	3.28E-03
U235	1.02E-03	5.45E-05	5.31E-04	1.31E-04
U236	6.46E-04	3.75E-05	3.35E-04	9.04E-05
U238	2.31E-02	1.23E-03	1.20E-02	2.97E-03
Zr93	1.82E-01	4.07E-02	9.44E-02	9.80E-02

Table 4-12. Non-Tank Chemical Contaminant of Potential Concern Inventories (kilograms) for INV2.

Species	A_Ancillary	AX_Ancillary	A_Pipelines	AX_Pipelines
Al	3.10E+02	5.85E+01	1.61E+02	1.41E+02
B	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CN	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cr	3.24E+01	3.22E+00	1.68E+01	7.76E+00
F	2.80E+00	9.12E-01	1.45E+00	2.20E+00
Fe	5.48E+02	1.67E+02	2.84E+02	4.03E+02
Hg	1.24E+00	1.16E-01	6.43E-01	2.80E-01
Mn	5.67E+01	4.40E+00	2.95E+01	1.06E+01
Ni	3.52E+01	8.52E+00	1.83E+01	2.05E+01
NO2	5.30E+02	9.57E+01	2.75E+02	2.31E+02
NO3	7.90E+02	2.20E+02	4.10E+02	5.30E+02
Pb	1.86E+01	6.52E+00	9.63E+00	1.57E+01
Sr	1.32E+00	8.60E-01	6.88E-01	2.07E+00
Se	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sn	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TBP	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Figure 4-15. GoldSim© Scenario Manager for Sensitivity Cases INV0, INV1, and INV2.

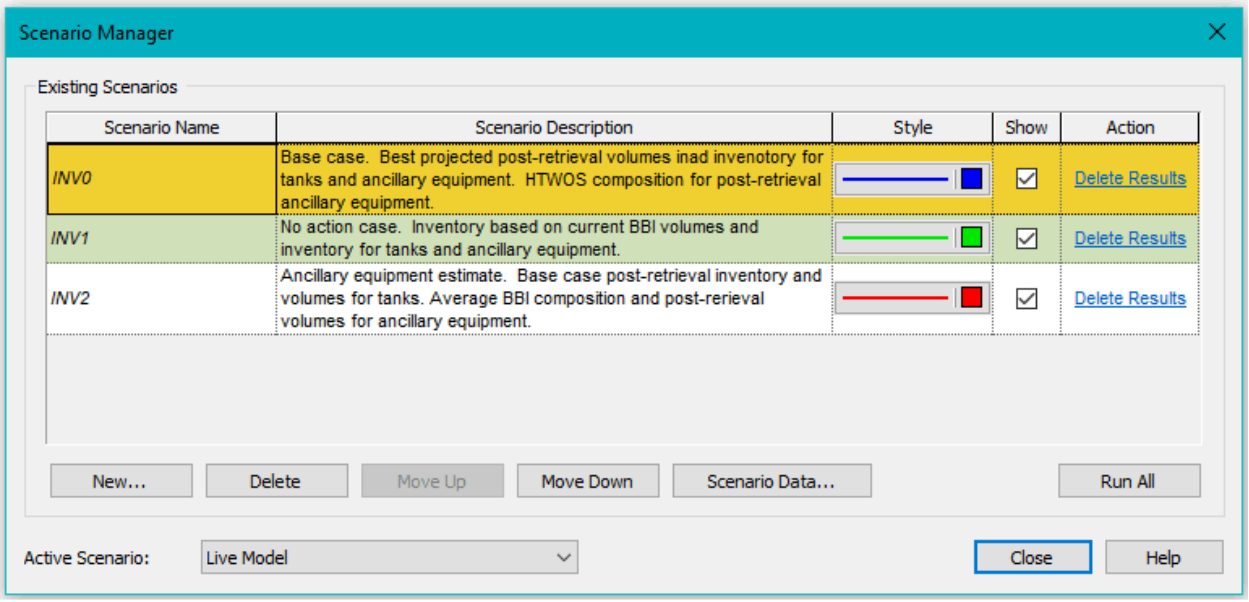


Figure 4-16. GoldSim© Scenario Manager Scenario Data for Sensitivity Cases INV0, INV1 and INV2.

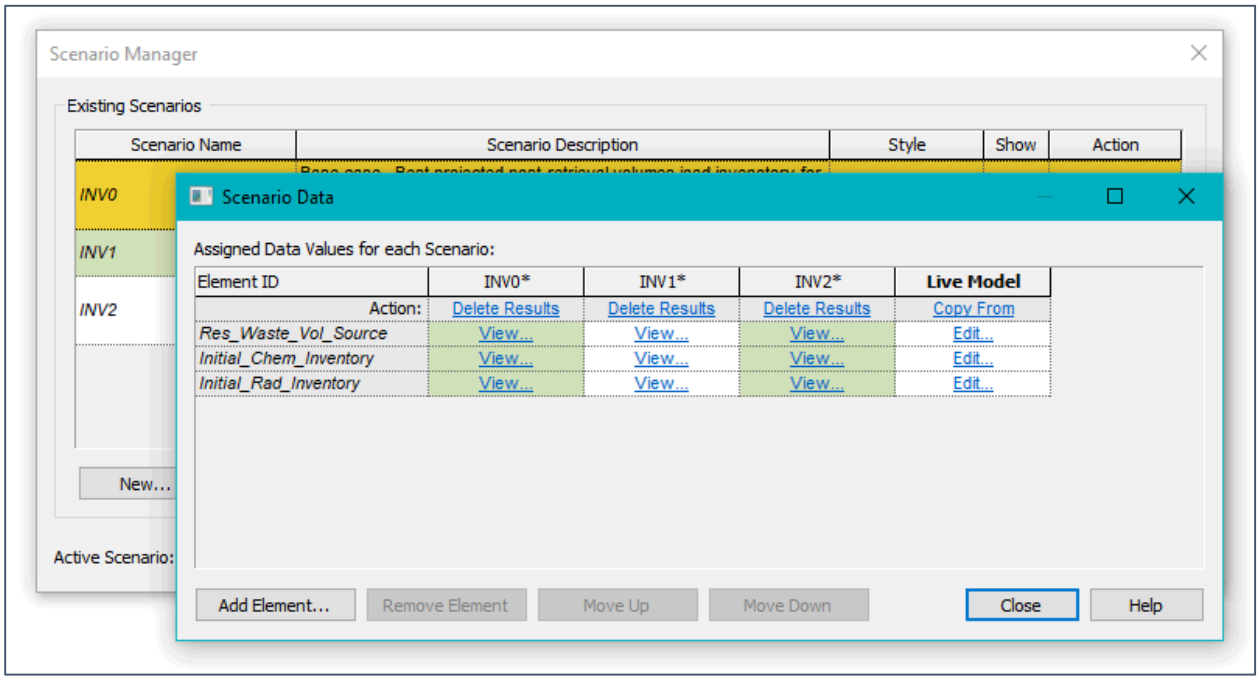
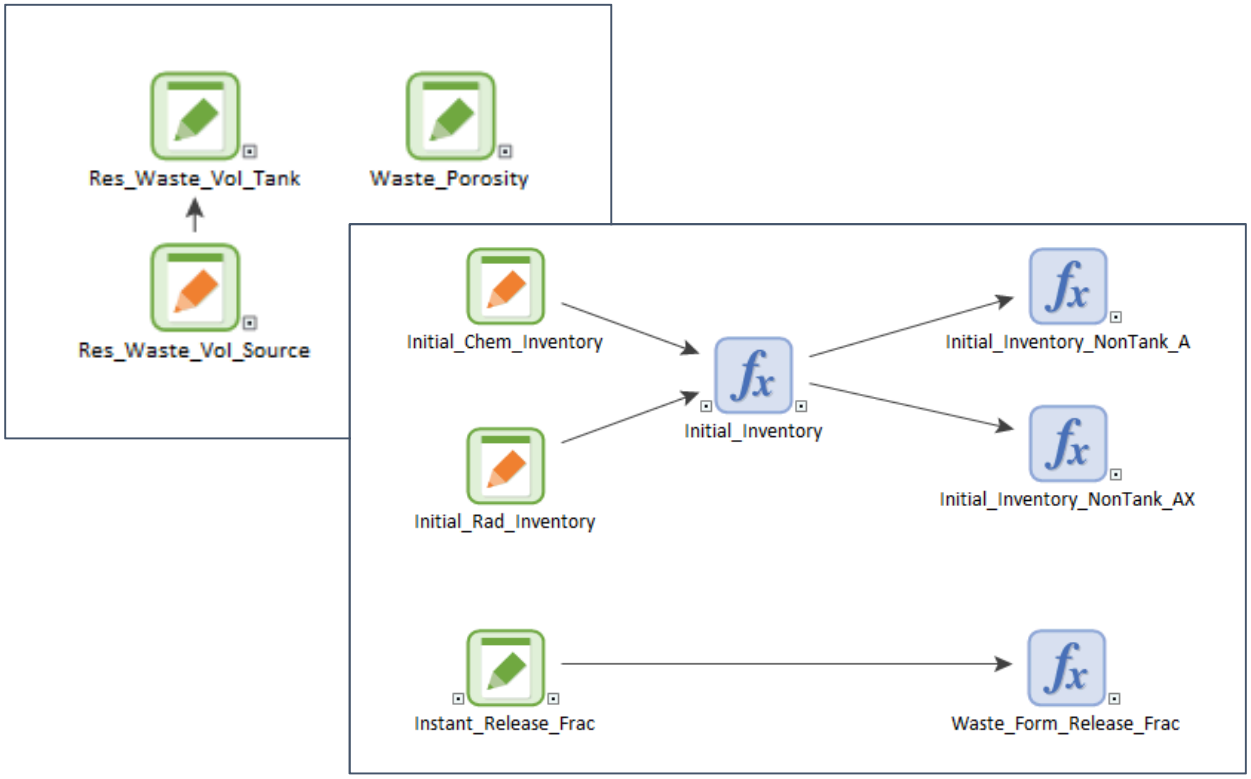


Figure 4-17. Scenario Data Elements.



4.3.2 Description of Model Changes

The sensitivity analysis requires several modifications to the Base Case GoldSim© model file, a_ax v1.0_20190408.gsm. These changes are described below.

(1) Tank degradation status: Figure 4-22 shows the GoldSim© element Tank_degraded_Status in a_ax v1.0_20190408.gsm. This element is controlled by Tank_Deg_Time. Once the simulation time is greater than Tank_Deg_Time, the grout is degraded. Because Tank_Deg_Time is connected to a random sampling element designed for uncertainty analysis, a new element GRT_Time was added and used to trigger the grout degradation for the grout sensitivity model file (named a_ax v1.0_20190408_GRT_BM_TS.gsm) as shown in Figure 4-23.

(2) Once the grout is degraded, water is assumed to flow through the tank, altering the VZ flow field. To implement this flow field, a new set of Darcy velocities and moisture contents were added, as shown in Figure 4-24. The data for the degraded-grout Darcy velocity and moisture content are given in Table 4-15 through Table 4-18 where the number in each column head is the STOMP model (RPP-RPT-60101) grid number assigned to a specific VZ cell (see RPP-RPT-60885 for mapping between STOMP model cells and GoldSim© cells). These data are abstracted from STOMP simulation (RPP-CALC-63248), where the tank infill grout material was simulated as sand to reflect the assumed degraded state of grout material. The flow field data are linked to the VZ cells

through a series of selectors shown in Figure 4-25 for moisture content and in Figure 4-26 for Darcy velocity for a VZ cell H1_Top as an example. Other changes made to A Farm and AX Farm VZ cells are similar and can be easily identified within the a_ax v1.0_20190408_GRT_BM_TS.gsm \ Flow_Field_Abstraction subfolder.

(3) The rate at which water flowing through the degraded grout is assumed to be the same as the top VZ layer. The GoldSim© implementation for the flow rate through the degraded grout is shown in Figure 4-27 for the A Farm tank example. The implementation of the moisture content in the degraded grout inside an A Farm tank is shown in Figure 4-28. The implementation for AX Farm tanks is similar to A Farm as shown in Figure 4-27 and Figure 4-28.

(4) Three scenarios were added for the three grout sensitivity cases. The scenario data settings for these cases are given in Table 4-14.

4.3.3 Inputs

The flow fields values for degraded tank condition are presented in Table 4-15 through 4-18.

4.3.4 Grout Sensitivity Cases Results

The total groundwater pathway doses associated with grout sensitivity cases GRT1, GRT2, GRT3 and the Base Case are compared against one another for A Farm in Figure 4-29. The results of each of the cases for AX Farm are similarly displayed in Figure 4-30 for AX Farm. The peak doses and peak times for these cases are summarized in Table 4-19. From these result plots, the following can be observed:

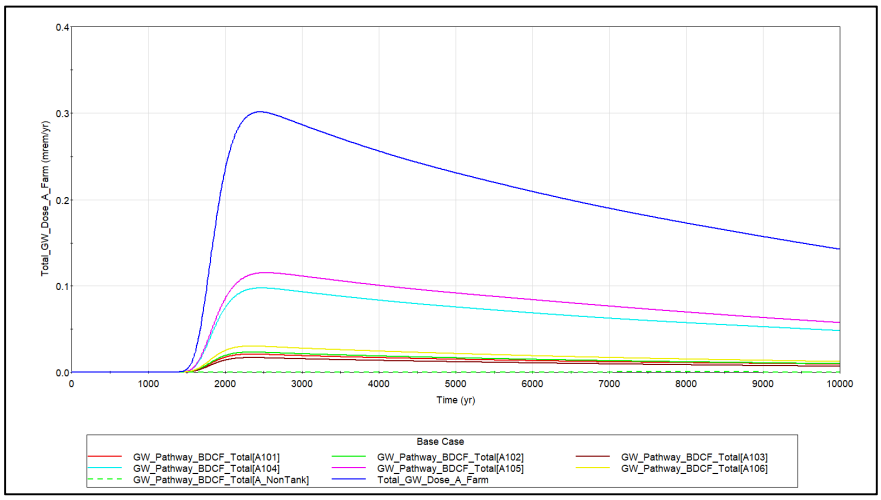
(1) The degraded grout increases the peak dose by 10 to 20 times approximately;
(2) Losing sorption in grout increases the peak dose by 5 to 10 times approximately;
(3) Peak arrival time is less than the Base Case in all grout sensitivity cases.

4.4 TANK SHELL SENSITIVITY CASE

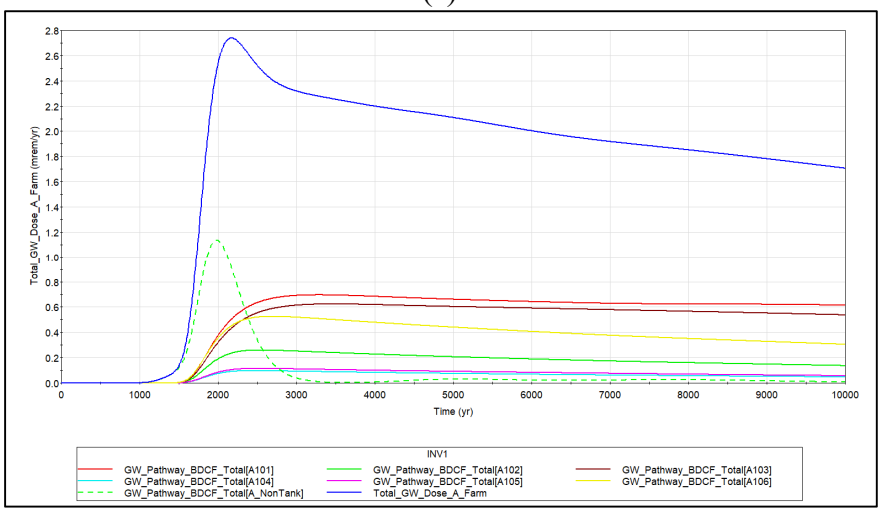
4.4.1 Calculation Approach

The concrete tanks in A Farm and AX Farm are constructed with an inner steel liner. The Base Case analysis takes no credit for this tank liner in preventing or delaying the release of waste constituents to the vadose zone. With this assumption, the contaminants are released from the time of closure. The tank-shell sensitivity case (TS1) is designed to investigate the tank integrity safety function. The approach taken in this study is to delay release of waste constituents for a certain time period. Specifically, it is assumed that each tank's steel liner lifetime is 5,000 years, during which no releases occur. After 5,000 years, the releases by diffusion are enabled.

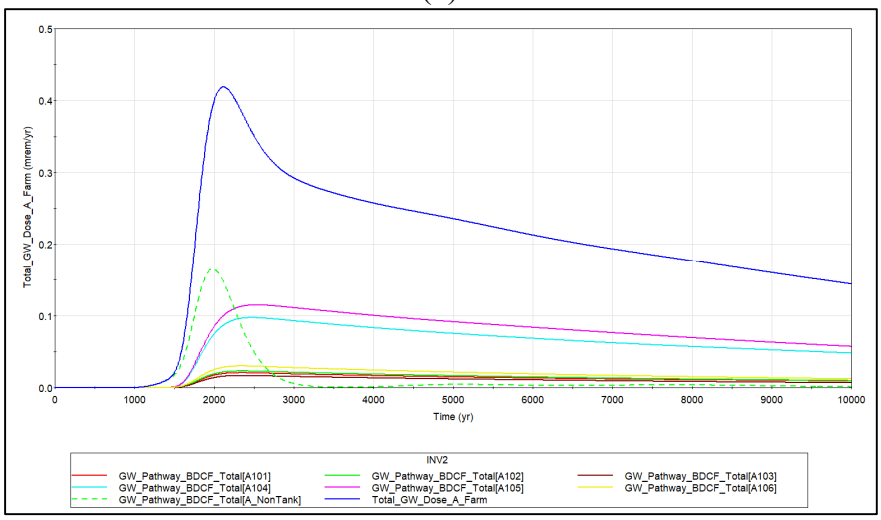
Figure 4-18. Total 241-A Tank Farm Dose at 100 meters by Source for the (a) Base Case INV0, (b) INV1, and (c) INV2.



(a)

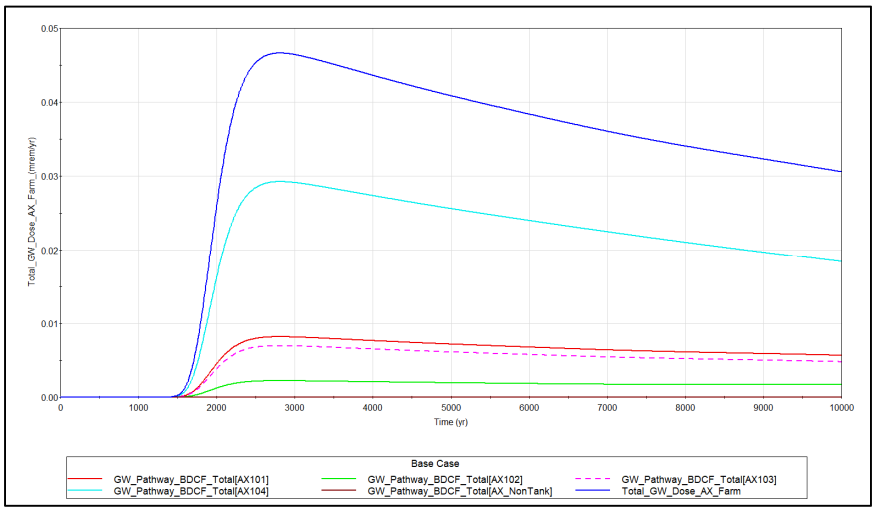


(b)

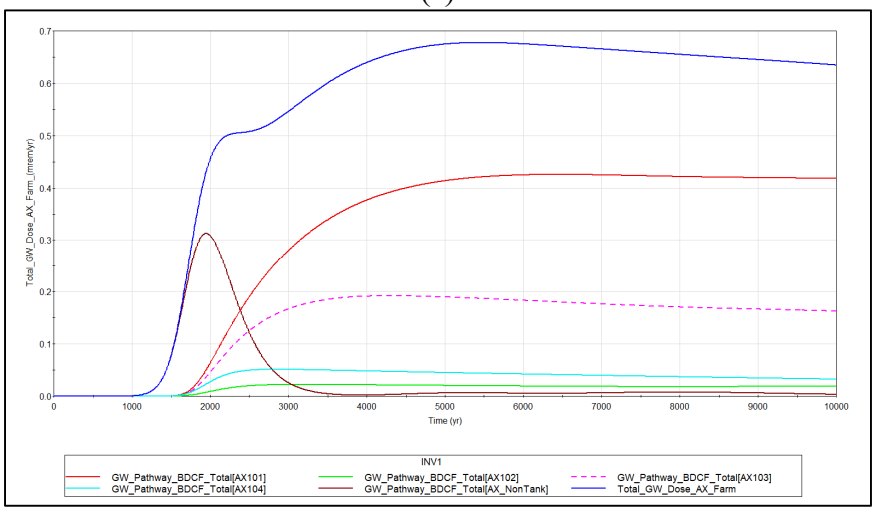


(c)

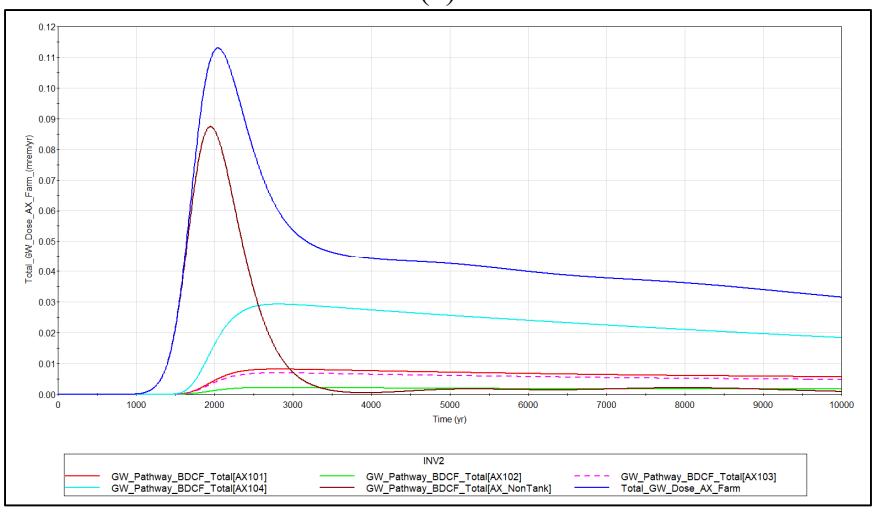
Figure 4-19. Total 241-AX Tank Farm Dose at 100 meters by Source for the (a) Base Case INV0, (b) INV1, and (c) INV2.



(a)



(b)



(c)

Figure 4-20. 241-A Tank Farm Total Groundwater Dose.

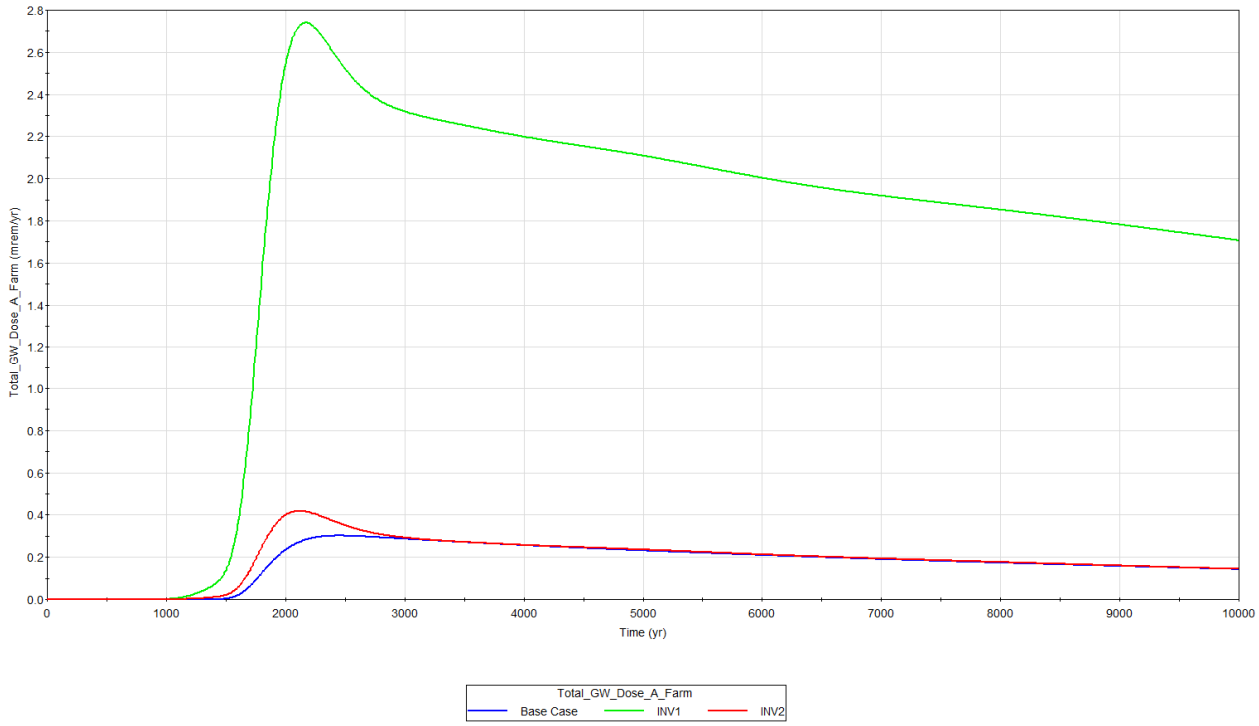


Figure 4-21. 241-AX Tank Farm Total Groundwater Dose.

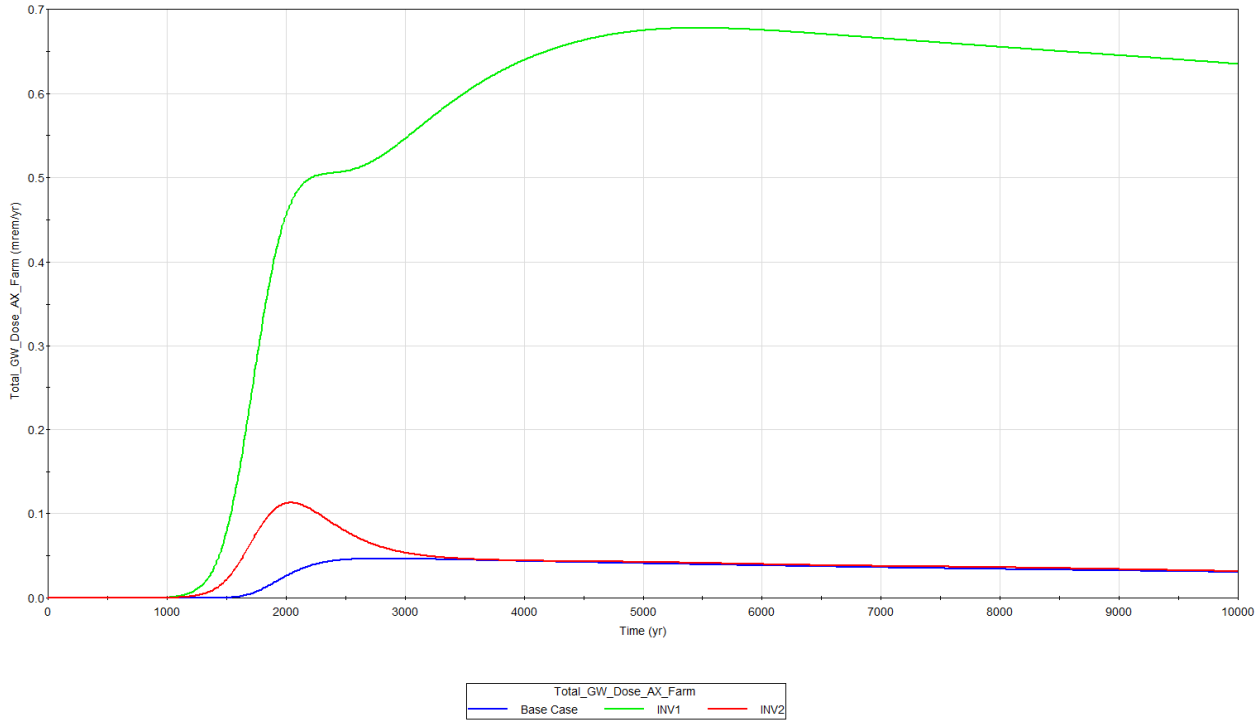


Table 4-13. Peak Dose and Peak Times for Base Case (INV0), INV1, and INV2.

Farm Name	Case Name	Peak Dose (mrem/yr)	Peak Time (years)
241-A Tank Farm	Base Case (INV0)	0.3015	2,450
	INV1	2.74	2,170
	INV2	0.419	2,115
241-AX Tank Farm	Base Case (INV0)	0.04664	2,805
	INV1	0.6775	5,465
	INV2	0.113	2,045

Table 4-14. Grout Sensitivity Case Parameters.

Case ID	Time of Physical Degradation	GoldSim© Scenario Data Setting: GRT_Time (years)	Chemical Degradation Status (GoldSim© scenario data setting for Kd_Grout_Best)
GRT0 (Base Case)	No degradation	1E6	Best estimate Grout K_ds
GRT1	0-500 years (intact), 500-10,000 years (degraded)	500	Best estimate Grout K_ds
GRT2	Degraded at all times	0	Best estimate Grout K_ds
GRT3	No degradation	1E6	Grout K_ds set to 0 mL/g for all radionuclides

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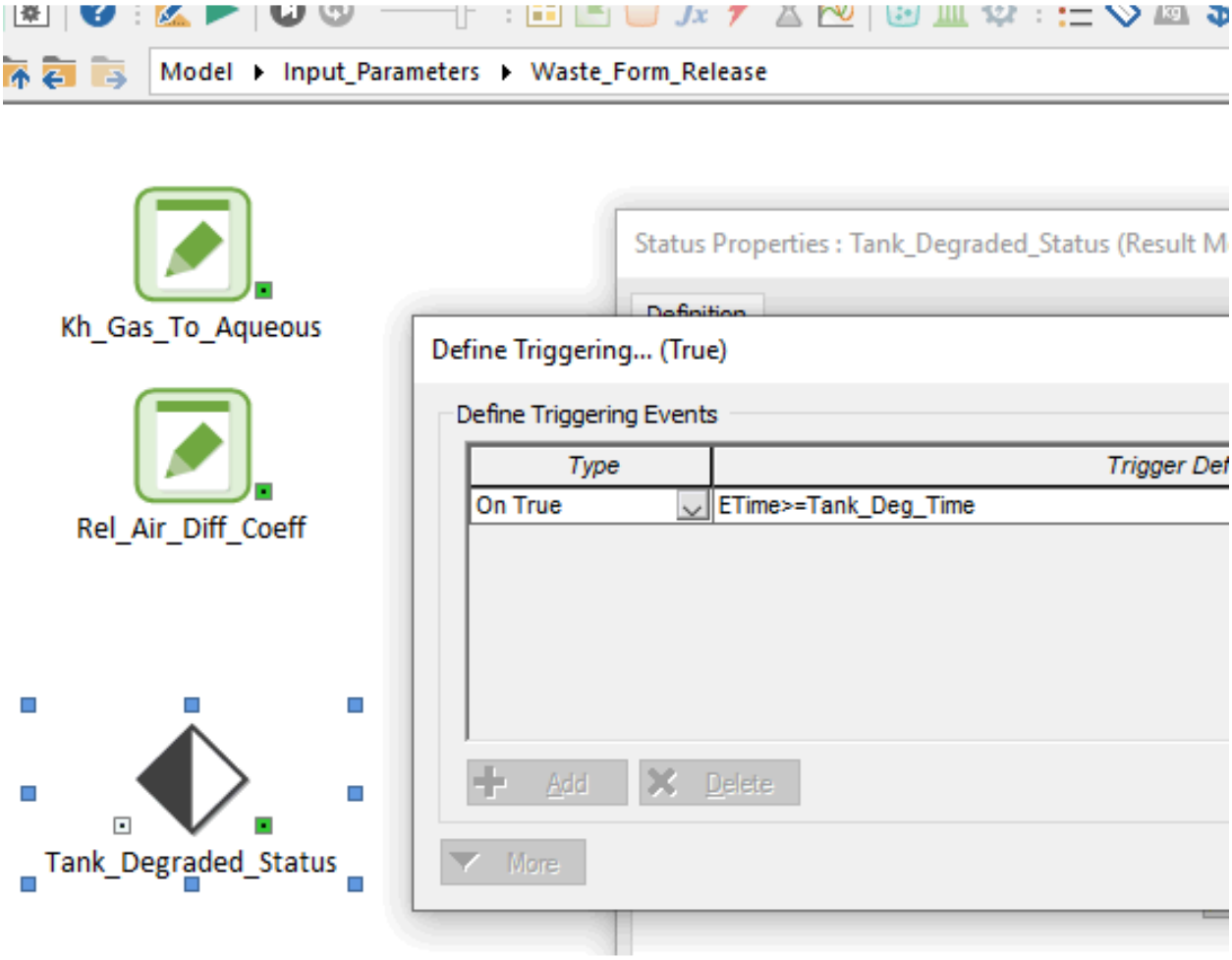
4.4.2 Description of Model Changes

Necessary modifications to the GoldSim© base case model include shutting off diffusional release from the tank residual waste prior to 5,000 years elapsed time after closure. Two changes were made to implement TS1 in a_ax v1.0_20190408.gsm. Firstly, the elements were included to trigger the diffusive release from the tanks as shown in Figure 4-31. Shell_Time is used to trigger Tank_Shell_Status that is then used to alter the value of the time-dependent parameter named Factor. The parameter Factor acts as a binary switch; when Factor is zero it makes the transport area zero and turns off diffusive release from the residual waste, and when Factor is 1 it allows diffusion from the residual wastes (Figure 4-32). The working logic of these elements is given in Table 4-20. Because both Tank_Shell_Status and Factor depend on Shell_Time, Shell_Time is the only GoldSim© scenario parameter needed for this case.

This case only changes diffusive release starting time, leaving all other parameters unchanged. The modified file is named a_ax v1.0_20190408_GRT_BM_TS.gsm, and includes the grout sensitivity cases reported in Section 4.3 and base mat sensitivity cases to be reported in Section 4.5.

Figure 4-22. Grout Degradation Control by Tank_Degraded_Status and Tank_Deg_Time in the Base Case GoldSim© Model File (a_ax v1.0_20190408.gsm).



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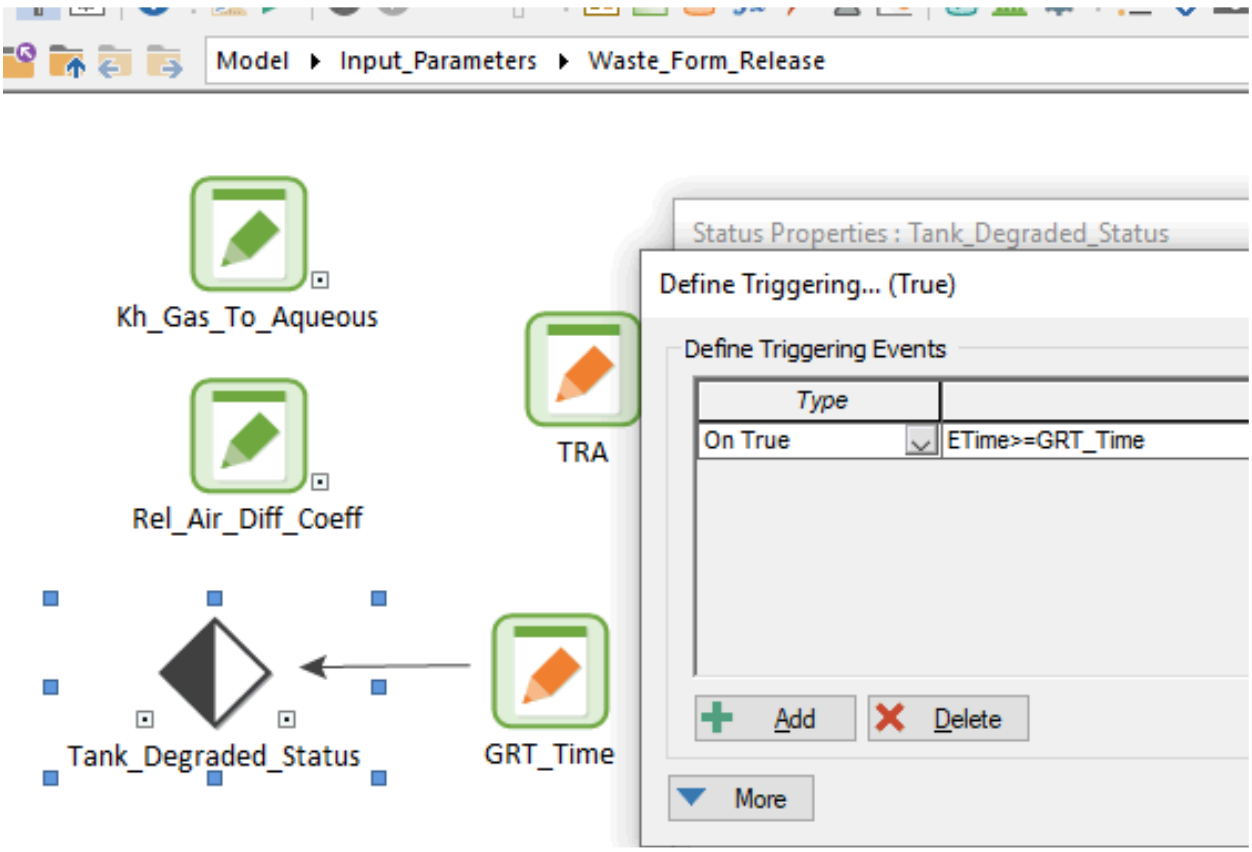
4.4.3 Inputs

The inputs specific to this sensitivity case are already presented in Table 4-20 (Section 4.4.1).

4.4.4 Tank Shell Sensitivity Case Results

The total dose resulting from implementing TS1 and the comparison to the Base Case are presented for A Farm in Figure 4-33. Similarly, TS1 results are displayed in Figure 4-34 for AX Farm. It can be seen from these figures that the total dose curves for the TS1 case are delayed for about 5,000 years compared to the Base Case. The peak doses and peak times for this sensitivity case are summarized in Table 4-21 along with the Base Case results. Based on the information presented in Table 4-21 it can be said that the tank shell lifetime can delay the peak dose and peak dose is about the same as the Base Case.

Figure 4-23. Grout Degradation Control by Tank_Degraded_Status and GRT_Time in the Sensitivity GoldSim© Model File (a_ax v1.0_20190408_GRT_BM_TS.gsm).



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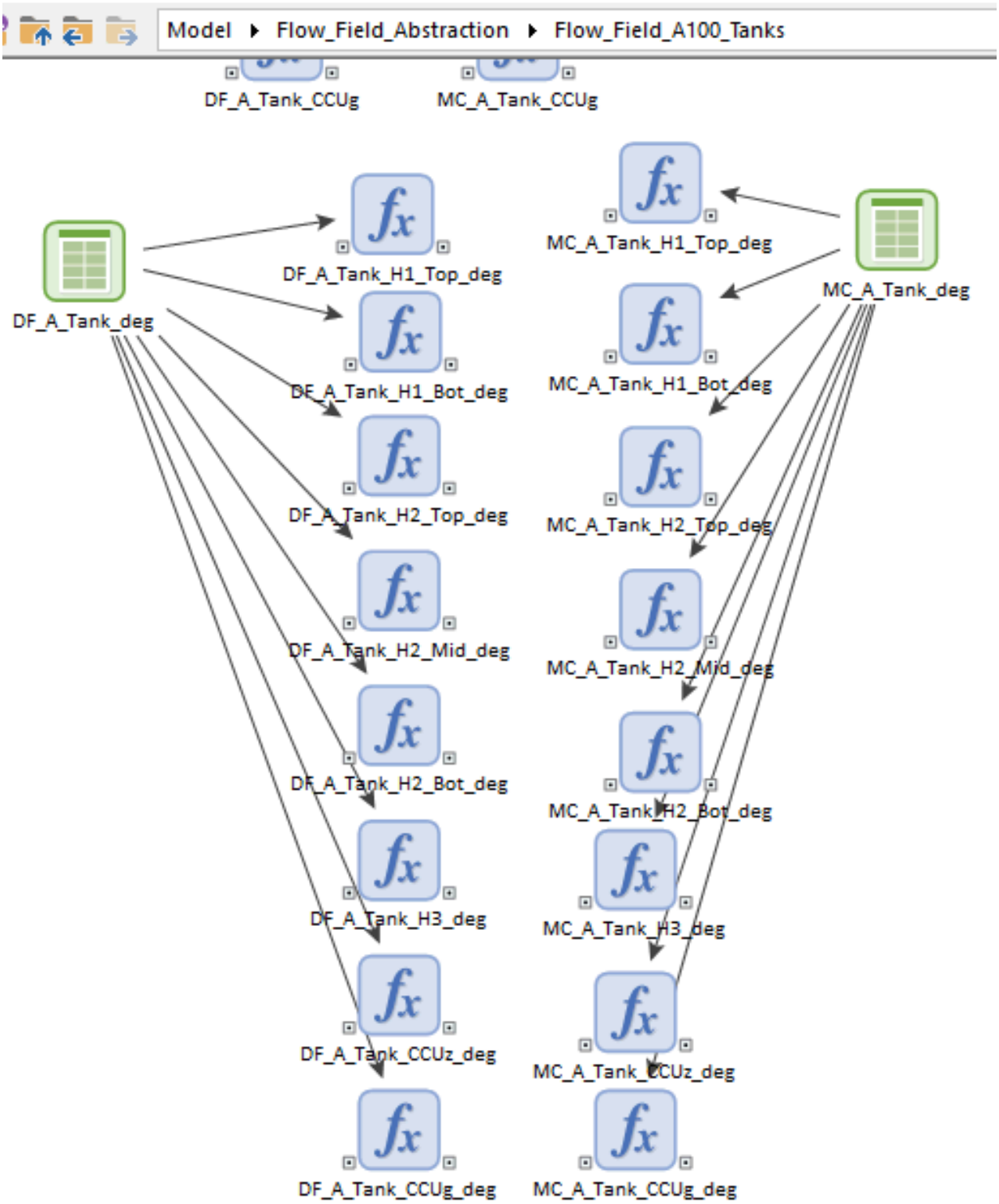
4.5 BASE MAT SENSITIVITY CASE

4.5.1 Calculation Approach

Base Case assumes that there is no advective transport in the concrete tank base mat over the 10,000-year period of simulation, leaving diffusion as the only mechanism by which residual waste constituents are able to be released. This assumption is consistent with the related assumption that concrete remains intact over this period of time. If, however, the concrete is degraded such that its permeability increases, it is possible that the surrounding unsaturated flow may find a pathway through the base mat. The base mat sensitivity case (designated as BM1) is designed to study the effect of degraded base mats (by allowing advection through the base mat) on the release and transport of residual waste constituents.

Figure 4-24. The GoldSim© Elements for Darcy Velocity and Moisture Contents for the Degraded Tank Condition in 241-A Tank Farm.



GoldSim© simulation software is copyrighted by GoldSim Technology Group LLC of Issaquah, Washington (see http://www.goldsim.com).

Table 4-15. Moisture Contents (dimensionless) versus Time (years after closure) for the Degraded Tank Condition in 241-A Tank Farm. (2 sheets)

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
0	0.0854	0.2561	0.0951	0.1052	0.1056	0.1051	0.1049	0.1046
0.1	0.0854	0.2561	0.0951	0.1052	0.1056	0.1051	0.1049	0.1046
0.5	0.0854	0.2561	0.0951	0.1052	0.1056	0.1051	0.1049	0.1045
1	0.0854	0.2561	0.0951	0.1052	0.1056	0.1046	0.1042	0.1038
2	0.0854	0.2561	0.0951	0.1052	0.1056	0.1016	0.1009	0.1001
3	0.0854	0.2561	0.0951	0.1052	0.1055	0.0979	0.0971	0.0962
5	0.0854	0.2560	0.0950	0.1051	0.1042	0.0919	0.0910	0.0901
7	0.0853	0.2555	0.0948	0.1045	0.1016	0.0877	0.0869	0.0859
10	0.0848	0.2524	0.0937	0.1023	0.0976	0.0833	0.0825	0.0816
15	0.0833	0.2441	0.0911	0.0978	0.0922	0.0787	0.0779	0.0771
20	0.0819	0.2362	0.0887	0.0940	0.0884	0.0756	0.0749	0.0741
25	0.0808	0.2297	0.0866	0.0910	0.0855	0.0734	0.0728	0.0720
30	0.0800	0.2244	0.0849	0.0885	0.0832	0.0717	0.0711	0.0704
40	0.0789	0.2161	0.0822	0.0848	0.0798	0.0691	0.0686	0.0680
50	0.0781	0.2101	0.0801	0.0820	0.0772	0.0673	0.0668	0.0662
70	0.0772	0.2019	0.0770	0.0780	0.0737	0.0648	0.0644	0.0639
100	0.0766	0.1946	0.0739	0.0740	0.0702	0.0625	0.0622	0.0618
130	0.0762	0.1902	0.0717	0.0713	0.0678	0.0611	0.0608	0.0605
160	0.0760	0.1873	0.0701	0.0693	0.0661	0.0602	0.0600	0.0597
200	0.0758	0.1847	0.0685	0.0673	0.0643	0.0594	0.0593	0.0591
250	0.0757	0.1825	0.0670	0.0654	0.0627	0.0589	0.0588	0.0586
300	0.0756	0.1811	0.0658	0.0639	0.0615	0.0586	0.0585	0.0584
400	0.0755	0.1794	0.0642	0.0617	0.0599	0.0583	0.0583	0.0582
500	0.0755	0.1784	0.0631	0.0603	0.0589	0.0582	0.0582	0.0581
500.5	0.0755	0.1784	0.0631	0.0603	0.0589	0.0582	0.0582	0.0581
501	0.0755	0.1784	0.0631	0.0602	0.0589	0.0582	0.0582	0.0581
502	0.0755	0.1783	0.0631	0.0602	0.0589	0.0582	0.0582	0.0581
503	0.0755	0.1783	0.0631	0.0602	0.0588	0.0582	0.0582	0.0581
505	0.0755	0.1783	0.0631	0.0602	0.0588	0.0582	0.0582	0.0581
507	0.0755	0.1783	0.0630	0.0602	0.0588	0.0582	0.0582	0.0581
510	0.0755	0.1783	0.0630	0.0601	0.0588	0.0582	0.0582	0.0581

Table 4-15. Moisture Contents (dimensionless) versus Time (years after closure) for the Degraded Tank Condition in 241-A Tank Farm. (2 sheets)

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
515	0.0755	0.1782	0.0630	0.0601	0.0588	0.0582	0.0582	0.0582
520	0.0755	0.1782	0.0629	0.0600	0.0587	0.0583	0.0584	0.0584
525	0.0755	0.1782	0.0629	0.0600	0.0587	0.0585	0.0587	0.0590
530	0.0754	0.1781	0.0628	0.0599	0.0587	0.0590	0.0595	0.0599
540	0.0754	0.1781	0.0628	0.0598	0.0586	0.0610	0.0618	0.0624
550	0.0754	0.1780	0.0627	0.0597	0.0585	0.0637	0.0644	0.0649
570	0.0754	0.1779	0.0625	0.0595	0.0584	0.0677	0.0679	0.0678
600	0.0754	0.1777	0.0623	0.0592	0.0583	0.0695	0.0694	0.0691
630	0.0754	0.1776	0.0622	0.0590	0.0583	0.0699	0.0697	0.0694
660	0.0754	0.1775	0.0620	0.0588	0.0605	0.0699	0.0697	0.0694
700	0.0754	0.1774	0.0618	0.0585	0.0681	0.0699	0.0697	0.0694
800	0.0756	0.1819	0.0677	0.0682	0.0698	0.0699	0.0697	0.0694
900	0.0759	0.1862	0.0698	0.0695	0.0698	0.0699	0.0697	0.0694
1,000	0.0759	0.1862	0.0698	0.0695	0.0698	0.0699	0.0697	0.0694
1,200	0.0759	0.1862	0.0698	0.0695	0.0698	0.0699	0.0697	0.0694
1,400	0.0759	0.1862	0.0698	0.0695	0.0698	0.0699	0.0697	0.0694
1,600	0.0759	0.1862	0.0698	0.0695	0.0698	0.0699	0.0697	0.0694
1,800	0.0759	0.1862	0.0698	0.0695	0.0698	0.0699	0.0697	0.0694
2,000	0.0759	0.1862	0.0698	0.0695	0.0698	0.0699	0.0697	0.0694
2,200	0.0759	0.1862	0.0698	0.0695	0.0698	0.0699	0.0697	0.0694
2,400	0.0759	0.1862	0.0698	0.0695	0.0698	0.0699	0.0697	0.0694
2,600	0.0759	0.1862	0.0698	0.0695	0.0698	0.0699	0.0697	0.0694
2,800	0.0759	0.1862	0.0698	0.0695	0.0698	0.0699	0.0697	0.0694
3,000	0.0759	0.1862	0.0698	0.0695	0.0698	0.0699	0.0697	0.0694
10,000	0.0759	0.1862	0.0698	0.0695	0.0698	0.0699	0.0697	0.0694

Table 4-16. Darcy Velocities (mm/yr) versus Time (years after closure) for the Degraded Tank Condition in 241-A Tank Farm. (2 sheets)

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
0	102.6181	102.4126	103.8248	104.7201	107.5327	102.8177	100.6020	97.4752
0.1	102.6181	102.4126	103.8248	104.7201	107.5327	102.8177	100.6020	97.4752
0.5	102.6176	102.4125	103.8248	104.7201	107.5327	102.5949	100.2583	96.9709
1	102.6179	102.4125	103.8248	104.7201	107.5327	98.3963	95.1819	91.0051
2	102.6181	102.4125	103.8248	104.7201	107.5049	77.7671	73.3706	68.2279
3	102.6179	102.4120	103.8237	104.7168	106.7962	58.2580	54.1562	49.5166
5	102.5253	102.2095	103.5185	104.1406	97.0978	35.5615	32.6507	29.3840
7	101.1247	99.8975	100.4979	99.7682	80.3528	24.5079	22.3893	19.9895
10	92.5752	88.9650	87.9575	85.0837	58.9610	16.2079	14.7548	13.0799
15	70.7918	65.9357	63.9958	60.6115	38.3028	10.0571	9.1361	8.0471
20	53.6951	49.4292	47.6096	44.7972	27.5217	7.1770	6.5184	5.7230
25	42.1609	38.6528	37.0938	34.8230	21.1590	5.5400	5.0349	4.4139
30	34.2446	31.3593	30.0329	28.1725	17.0326	4.4965	4.0910	3.5846
40	24.3082	22.2949	21.3101	19.9860	12.0398	3.2480	2.9635	2.5983
50	18.4860	17.0132	16.2514	15.2489	9.1837	2.5401	2.3254	2.0427
70	12.1380	11.2600	10.7601	10.1123	6.1069	1.7857	1.6465	1.4543
100	7.7298	7.2486	6.9404	6.5404	3.9770	1.2765	1.1896	1.0602
130	5.5423	5.2423	5.0305	4.7536	2.9144	1.0348	0.9737	0.8750
160	4.2634	4.0600	3.9039	3.6987	2.2887	0.9021	0.8558	0.7744
200	3.2220	3.0896	2.9778	2.8308	1.7762	0.8038	0.7690	0.7009
250	2.4418	2.3566	2.2767	2.1732	1.3915	0.7409	0.7140	0.6546
300	1.9526	1.8934	1.8328	1.7567	1.1519	0.7092	0.6866	0.6317
400	1.3848	1.3520	1.3128	1.2687	0.8823	0.6834	0.6645	0.6134
500	1.0772	1.0567	1.0287	1.0031	0.7488	0.6757	0.6580	0.6081
500.5	1.0760	1.0555	1.0276	1.0020	0.7483	0.6757	0.6579	0.6081
501	1.0749	1.0544	1.0265	1.0010	0.7478	0.6756	0.6579	0.6081
502	1.0726	1.0522	1.0244	0.9991	0.7469	0.6756	0.6579	0.6080
503	1.0703	1.0500	1.0223	0.9971	0.7460	0.6756	0.6579	0.6080
505	1.0657	1.0456	1.0180	0.9931	0.7441	0.6755	0.6578	0.6080
507	1.0612	1.0413	1.0139	0.9892	0.7423	0.6754	0.6578	0.6081
510	1.0545	1.0348	1.0077	0.9835	0.7397	0.6757	0.6587	0.6101

Table 4-16. Darcy Velocities (mm/yr) versus Time (years after closure) for the Degraded Tank Condition in 241-A Tank Farm. (2 sheets)

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
515	1.0436	1.0243	0.9976	0.9741	0.7354	0.6808	0.6693	0.6282
520	1.0330	1.0141	0.9877	0.9649	0.7312	0.7045	0.7089	0.6838
525	1.0227	1.0041	0.9781	0.9560	0.7272	0.7674	0.8000	0.7946
530	1.0126	0.9944	0.9688	0.9473	0.7233	0.8915	0.9595	0.9675
540	0.9932	0.9757	0.9508	0.9306	0.7160	1.3592	1.4736	1.4568
550	0.9747	0.9579	0.9337	0.9147	0.7091	2.0223	2.1015	1.9972
570	0.9404	0.9248	0.9018	0.8853	0.6968	3.1215	3.0484	2.7875
600	0.8948	0.8809	0.8596	0.8463	0.6818	3.7259	3.5595	3.2233
630	0.8554	0.8429	0.8231	0.8128	0.6943	3.8360	3.6516	3.3013
660	0.8214	0.8100	0.7915	0.7841	1.2436	3.8521	3.6648	3.3123
700	0.7831	0.7732	0.7563	0.7540	3.3917	3.8545	3.6668	3.3139
800	2.0920	2.4574	2.7816	3.4415	3.9375	3.8546	3.6669	3.3141
900	3.7582	3.7532	3.7501	3.8458	3.9386	3.8546	3.6669	3.3141
1,000	3.7641	3.7568	3.7522	3.8466	3.9386	3.8546	3.6669	3.3141
1,200	3.7641	3.7568	3.7522	3.8466	3.9386	3.8546	3.6669	3.3141
1,400	3.7641	3.7568	3.7522	3.8466	3.9386	3.8546	3.6669	3.3141
1,600	3.7641	3.7568	3.7522	3.8466	3.9386	3.8546	3.6669	3.3141
1,800	3.7641	3.7568	3.7522	3.8466	3.9386	3.8546	3.6669	3.3141
2,000	3.7641	3.7568	3.7522	3.8466	3.9386	3.8546	3.6669	3.3141
2,200	3.7641	3.7568	3.7522	3.8466	3.9386	3.8546	3.6669	3.3141
2,400	3.7641	3.7568	3.7522	3.8466	3.9386	3.8546	3.6669	3.3141
2,600	3.7641	3.7568	3.7522	3.8466	3.9386	3.8546	3.6669	3.3141
2,800	3.7641	3.7568	3.7522	3.8466	3.9386	3.8546	3.6669	3.3141
3,000	3.7641	3.7568	3.7522	3.8466	3.9386	3.8546	3.6669	3.3141
10,000	3.7641	3.7568	3.7522	3.8466	3.9386	3.8546	3.6669	3.3141

Table 4-17. Moisture Contents (dimensionless) versus Time (years after closure) for the Degraded Tank Grout in 241-AX Tank Farm. (1 of 2 sheets)

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
0	0.0871	0.2588	0.0831	0.0895	0.0978	0.1053	0.1059	0.1061	0.1062	0.1063	0.1063	0.1063	0.1063	0.1062
0.1	0.0871	0.2588	0.0831	0.0895	0.0978	0.1053	0.1059	0.1061	0.1062	0.1063	0.1063	0.1063	0.1063	0.1062
0.5	0.0871	0.2588	0.0831	0.0895	0.0978	0.1053	0.1059	0.1061	0.1062	0.1063	0.1063	0.1063	0.1063	0.1062
1	0.0871	0.2588	0.0831	0.0895	0.0978	0.1053	0.1059	0.1061	0.1062	0.1062	0.1062	0.1062	0.1061	0.1061
2	0.0871	0.2588	0.0831	0.0895	0.0978	0.1053	0.1058	0.1056	0.1054	0.1050	0.1048	0.1046	0.1042	0.1038
3	0.0871	0.2588	0.0831	0.0895	0.0978	0.1053	0.1047	0.1037	0.1031	0.1024	0.1020	0.1015	0.1010	0.1004
5	0.0871	0.2588	0.0830	0.0894	0.0977	0.1045	0.1006	0.0987	0.0978	0.0968	0.0963	0.0957	0.0951	0.0945
7	0.0870	0.2583	0.0828	0.0889	0.0970	0.1025	0.0966	0.0945	0.0935	0.0925	0.0920	0.0914	0.0908	0.0902
10	0.0866	0.2558	0.0816	0.0871	0.0946	0.0988	0.0919	0.0897	0.0888	0.0878	0.0873	0.0868	0.0863	0.0857
15	0.0853	0.2485	0.0790	0.0833	0.0899	0.0934	0.0865	0.0844	0.0836	0.0827	0.0822	0.0817	0.0813	0.0808
20	0.0841	0.2417	0.0766	0.0802	0.0861	0.0895	0.0828	0.0809	0.0801	0.0792	0.0788	0.0784	0.0779	0.0775
25	0.0833	0.2362	0.0748	0.0777	0.0830	0.0865	0.0801	0.0782	0.0775	0.0767	0.0763	0.0759	0.0755	0.0751
30	0.0826	0.2319	0.0733	0.0756	0.0805	0.0842	0.0779	0.0762	0.0754	0.0747	0.0743	0.0739	0.0736	0.0732
40	0.0818	0.2257	0.0710	0.0725	0.0768	0.0806	0.0747	0.0731	0.0724	0.0717	0.0714	0.0710	0.0707	0.0703
50	0.0812	0.2214	0.0692	0.0702	0.0740	0.0780	0.0724	0.0708	0.0702	0.0695	0.0692	0.0689	0.0686	0.0683
70	0.0806	0.2161	0.0668	0.0669	0.0701	0.0744	0.0692	0.0677	0.0671	0.0665	0.0663	0.0660	0.0657	0.0655
100	0.0801	0.2118	0.0645	0.0637	0.0663	0.0709	0.0661	0.0647	0.0642	0.0637	0.0635	0.0632	0.0630	0.0628
130	0.0799	0.2093	0.0629	0.0615	0.0637	0.0685	0.0639	0.0627	0.0623	0.0618	0.0616	0.0614	0.0613	0.0611
160	0.0797	0.2078	0.0617	0.0598	0.0617	0.0666	0.0624	0.0613	0.0609	0.0605	0.0603	0.0602	0.0600	0.0599
200	0.0796	0.2064	0.0604	0.0581	0.0597	0.0647	0.0609	0.0599	0.0596	0.0593	0.0592	0.0591	0.0590	0.0589
250	0.0795	0.2053	0.0593	0.0565	0.0578	0.0630	0.0596	0.0588	0.0585	0.0583	0.0583	0.0582	0.0582	0.0582
300	0.0794	0.2046	0.0584	0.0553	0.0564	0.0617	0.0587	0.0581	0.0579	0.0578	0.0577	0.0577	0.0578	0.0578
400	0.0794	0.2039	0.0573	0.0537	0.0546	0.0601	0.0578	0.0574	0.0573	0.0573	0.0573	0.0573	0.0574	0.0575
500	0.0793	0.2035	0.0566	0.0528	0.0535	0.0592	0.0575	0.0572	0.0571	0.0571	0.0572	0.0572	0.0573	0.0574
500.5	0.0793	0.2035	0.0566	0.0528	0.0535	0.0592	0.0575	0.0572	0.0571	0.0571	0.0572	0.0572	0.0573	0.0574
501	0.0793	0.2035	0.0566	0.0528	0.0535	0.0592	0.0575	0.0572	0.0571	0.0571	0.0572	0.0572	0.0573	0.0574
502	0.0793	0.2035	0.0566	0.0528	0.0535	0.0592	0.0575	0.0572	0.0571	0.0571	0.0572	0.0572	0.0573	0.0574
503	0.0793	0.2035	0.0566	0.0528	0.0535	0.0592	0.0574	0.0572	0.0571	0.0571	0.0572	0.0572	0.0573	0.0574
505	0.0793	0.2035	0.0566	0.0528	0.0535	0.0592	0.0574	0.0572	0.0571	0.0571	0.0572	0.0572	0.0573	0.0574
507	0.0793	0.2035	0.0566	0.0528	0.0535	0.0592	0.0574	0.0572	0.0571	0.0571	0.0572	0.0572	0.0573	0.0574

Table 4-17. Moisture Contents (dimensionless) versus Time (years after closure) for the Degraded Tank Grout in 241-AX Tank Farm. (2 of 2 sheets)

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
510	0.0793	0.2034	0.0566	0.0527	0.0534	0.0592	0.0574	0.0572	0.0571	0.0571	0.0572	0.0572	0.0573	0.0574
515	0.0793	0.2034	0.0565	0.0527	0.0534	0.0591	0.0574	0.0572	0.0571	0.0571	0.0572	0.0572	0.0573	0.0574
520	0.0793	0.2034	0.0565	0.0527	0.0534	0.0591	0.0574	0.0572	0.0571	0.0571	0.0572	0.0572	0.0573	0.0574
525	0.0793	0.2034	0.0565	0.0526	0.0533	0.0591	0.0574	0.0572	0.0571	0.0571	0.0572	0.0572	0.0573	0.0574
530	0.0793	0.2034	0.0565	0.0526	0.0533	0.0591	0.0574	0.0572	0.0571	0.0571	0.0572	0.0572	0.0573	0.0574
540	0.0793	0.2034	0.0564	0.0526	0.0532	0.0590	0.0574	0.0572	0.0571	0.0572	0.0572	0.0574	0.0575	0.0578
550	0.0793	0.2034	0.0564	0.0525	0.0531	0.0590	0.0574	0.0572	0.0572	0.0574	0.0577	0.0581	0.0587	0.0595
570	0.0793	0.2033	0.0563	0.0524	0.0530	0.0589	0.0574	0.0579	0.0590	0.0610	0.0623	0.0637	0.0650	0.0661
600	0.0793	0.2033	0.0562	0.0523	0.0529	0.0588	0.0600	0.0652	0.0670	0.0682	0.0687	0.0691	0.0695	0.0698
630	0.0793	0.2032	0.0561	0.0521	0.0527	0.0587	0.0667	0.0688	0.0692	0.0695	0.0697	0.0698	0.0700	0.0701
660	0.0793	0.2032	0.0561	0.0520	0.0526	0.0591	0.0687	0.0693	0.0695	0.0697	0.0698	0.0699	0.0700	0.0702
700	0.0793	0.2031	0.0560	0.0520	0.0526	0.0640	0.0690	0.0693	0.0695	0.0697	0.0698	0.0699	0.0700	0.0702
800	0.0795	0.2052	0.0600	0.0587	0.0607	0.0687	0.0691	0.0693	0.0695	0.0697	0.0698	0.0699	0.0700	0.0702
900	0.0796	0.2066	0.0610	0.0593	0.0613	0.0687	0.0691	0.0693	0.0695	0.0697	0.0698	0.0699	0.0700	0.0702
1,000	0.0796	0.2067	0.0610	0.0593	0.0613	0.0687	0.0691	0.0693	0.0695	0.0697	0.0698	0.0699	0.0700	0.0702
1,200	0.0796	0.2067	0.0610	0.0593	0.0613	0.0687	0.0691	0.0693	0.0695	0.0697	0.0698	0.0699	0.0700	0.0702
1,400	0.0796	0.2067	0.0610	0.0593	0.0613	0.0687	0.0691	0.0693	0.0695	0.0697	0.0698	0.0699	0.0700	0.0702
1,600	0.0796	0.2067	0.0610	0.0593	0.0613	0.0687	0.0691	0.0693	0.0695	0.0697	0.0698	0.0699	0.0700	0.0702
1,800	0.0796	0.2067	0.0610	0.0593	0.0613	0.0687	0.0691	0.0693	0.0695	0.0697	0.0698	0.0699	0.0700	0.0702
2,000	0.0796	0.2067	0.0610	0.0593	0.0613	0.0687	0.0691	0.0693	0.0695	0.0697	0.0698	0.0699	0.0700	0.0702
2,200	0.0796	0.2067	0.0610	0.0593	0.0613	0.0687	0.0691	0.0693	0.0695	0.0697	0.0698	0.0699	0.0700	0.0702
2,400	0.0796	0.2067	0.0610	0.0593	0.0613	0.0687	0.0691	0.0693	0.0695	0.0697	0.0698	0.0699	0.0700	0.0702
2,600	0.0796	0.2067	0.0610	0.0593	0.0613	0.0687	0.0691	0.0693	0.0695	0.0697	0.0698	0.0699	0.0700	0.0702
2,800	0.0796	0.2067	0.0610	0.0593	0.0613	0.0687	0.0691	0.0693	0.0695	0.0697	0.0698	0.0699	0.0700	0.0702
3,000	0.0796	0.2067	0.0610	0.0593	0.0613	0.0687	0.0691	0.0693	0.0695	0.0697	0.0698	0.0699	0.0700	0.0702
10,000	0.0796	0.2067	0.0610	0.0593	0.0613	0.0687	0.0691	0.0693	0.0695	0.0697	0.0698	0.0699	0.0700	0.0702

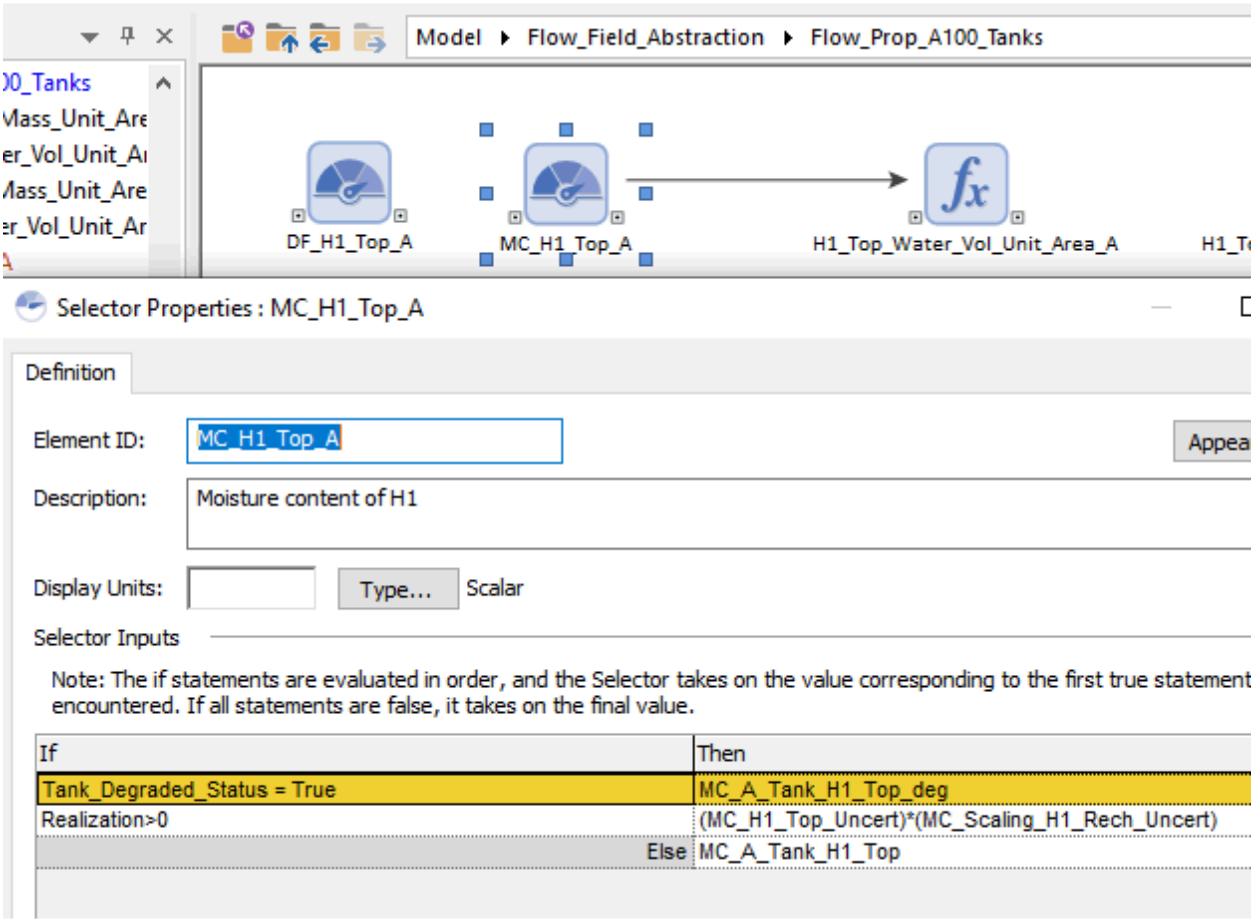
Table 4-18. Darcy Velocities (mm/yr) versus Time (years after closure) for the Degraded Tank Grout of 241-AX Tank Farm. (1 of 2 sheets)

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
0	102.6966	102.2017	102.8496	103.0401	103.2019	105.7000	110.5905	111.9893	112.4895	112.8327	112.8858	112.8076	112.5364	111.9666
0.1	102.6966	102.2017	102.8496	103.0401	103.2019	105.7000	110.5905	111.9893	112.4895	112.8327	112.8858	112.8076	112.5364	111.9666
0.5	102.6945	102.2013	102.8496	103.0401	103.2019	105.7000	110.5905	111.9891	112.4889	112.8306	112.8819	112.8002	112.5229	111.9418
1	102.6955	102.2014	102.8496	103.0401	103.2019	105.7000	110.5784	111.8925	112.2785	112.3890	112.2513	111.9085	111.2739	110.2098
2	102.6963	102.2016	102.8496	103.0400	103.2018	105.6953	108.8077	106.8741	105.0348	102.2747	100.4603	98.2932	95.7089	92.6089
3	102.6964	102.2014	102.8478	103.0351	103.1957	105.4747	100.1337	92.6682	88.5488	83.7244	81.0260	78.1118	74.9457	71.4626
5	102.6162	102.0585	102.4434	102.3038	102.3684	99.8018	73.9802	63.6428	59.1962	54.6078	52.2568	49.8536	47.3708	44.7553
7	101.3242	100.1869	98.8673	97.2763	96.9829	85.9330	54.2106	45.4380	41.9097	38.3931	36.6362	34.8693	33.0697	31.1917
10	93.0332	90.2581	85.4030	81.7334	81.0146	64.6904	36.8090	30.4499	27.9781	25.5616	24.3729	23.1901	21.9965	20.7552
15	71.1952	67.6118	61.3788	57.2870	56.5432	42.3427	22.8420	18.7847	17.2387	15.7472	15.0226	14.3086	13.5945	12.8529
20	53.8477	50.8093	45.4530	41.9395	41.3418	30.3592	16.0859	13.2070	12.1209	11.0813	10.5803	10.0901	9.6033	9.0986
25	42.1422	39.7318	35.3484	32.3872	31.9113	23.2551	12.2131	10.0212	9.2001	8.4191	8.0452	7.6816	7.3229	6.9518
30	34.1414	32.2242	28.6067	26.0748	25.6874	18.6546	9.7434	7.9925	7.3405	6.7237	6.4302	6.1463	5.8681	5.5809
40	24.1743	22.9132	20.3338	18.3871	18.1133	13.1215	6.8055	5.5810	5.1296	4.7069	4.5079	4.3175	4.1332	3.9441
50	18.4132	17.5314	15.5807	14.0030	13.7962	9.9927	5.1582	4.2294	3.8902	3.5753	3.4287	3.2898	3.1570	3.0217
70	12.2395	11.7402	10.4766	9.3301	9.1965	6.6711	3.4213	2.8058	2.5845	2.3828	2.2908	2.2054	2.1259	2.0462
100	7.9597	7.6918	6.9052	6.0922	6.0087	4.3689	2.2336	1.8376	1.6986	1.5754	1.5212	1.4725	1.4292	1.3873
130	5.7644	5.5983	5.0520	4.4258	4.3663	3.1835	1.6369	1.3571	1.2616	1.1798	1.1453	1.1159	1.0915	1.0691
160	4.4407	4.3288	3.9238	3.4176	3.3721	2.4692	1.2876	1.0801	1.0116	0.9555	0.9334	0.9159	0.9032	0.8926
200	3.3464	3.2740	2.9830	2.5826	2.5486	1.8824	1.0109	0.8650	0.8196	0.7855	0.7739	0.7666	0.7637	0.7630
250	2.5284	2.4818	2.2739	1.9585	1.9336	1.4502	0.8180	0.7197	0.6923	0.6751	0.6716	0.6720	0.6765	0.6831
300	2.0258	1.9931	1.8353	1.5762	1.5574	1.1911	0.7108	0.6427	0.6263	0.6197	0.6210	0.6260	0.6349	0.6457
400	1.4710	1.4516	1.3479	1.1566	1.1458	0.9174	0.6124	0.5772	0.5726	0.5764	0.5825	0.5919	0.6048	0.6192
500	1.1957	1.1818	1.1049	0.9508	0.9448	0.7928	0.5783	0.5573	0.5572	0.5648	0.5725	0.5834	0.5975	0.6130
500.5	1.1947	1.1809	1.1040	0.9501	0.9441	0.7924	0.5782	0.5573	0.5572	0.5648	0.5725	0.5834	0.5975	0.6130
501	1.1937	1.1799	1.1031	0.9493	0.9434	0.7920	0.5781	0.5572	0.5571	0.5648	0.5725	0.5833	0.5975	0.6130
502	1.1917	1.1780	1.1014	0.9479	0.9419	0.7911	0.5779	0.5571	0.5570	0.5647	0.5724	0.5833	0.5974	0.6129
503	1.1898	1.1760	1.0997	0.9464	0.9405	0.7903	0.5778	0.5570	0.5570	0.5647	0.5724	0.5833	0.5974	0.6129
505	1.1859	1.1722	1.0962	0.9436	0.9377	0.7887	0.5774	0.5568	0.5568	0.5646	0.5723	0.5832	0.5973	0.6129
507	1.1821	1.1685	1.0929	0.9407	0.9350	0.7870	0.5770	0.5566	0.5567	0.5645	0.5722	0.5831	0.5973	0.6128

Table 4-18. Darcy Velocities (mm/yr) versus Time (years after closure) for the Degraded Tank Grout of 241-AX Tank Farm. (2 of 2 sheets)

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
510	1.1764	1.1629	1.0879	0.9366	0.9309	0.7847	0.5765	0.5563	0.5565	0.5643	0.5721	0.5830	0.5972	0.6127
515	1.1673	1.1539	1.0798	0.9298	0.9243	0.7809	0.5757	0.5559	0.5561	0.5641	0.5719	0.5828	0.5971	0.6127
520	1.1584	1.1452	1.0719	0.9232	0.9179	0.7772	0.5749	0.5555	0.5558	0.5639	0.5717	0.5828	0.5971	0.6130
525	1.1497	1.1368	1.0643	0.9169	0.9118	0.7736	0.5741	0.5551	0.5556	0.5638	0.5719	0.5833	0.5984	0.6157
530	1.1414	1.1285	1.0569	0.9107	0.9058	0.7702	0.5735	0.5548	0.5555	0.5644	0.5732	0.5861	0.6039	0.6262
540	1.1254	1.1128	1.0429	0.8990	0.8944	0.7638	0.5722	0.5550	0.5580	0.5742	0.5915	0.6195	0.6637	0.7300
550	1.1103	1.0981	1.0296	0.8879	0.8836	0.7578	0.5715	0.5611	0.5780	0.6360	0.6977	0.7966	0.9467	1.1562
570	1.0827	1.0710	1.0053	0.8678	0.8641	0.7472	0.5846	0.7386	1.0207	1.5538	1.9036	2.2811	2.6580	3.0031
600	1.0469	1.0358	0.9739	0.8419	0.8391	0.7343	1.1948	2.6134	3.1374	3.5436	3.7088	3.8543	3.9812	4.0812
630	1.0169	1.0064	0.9478	0.8206	0.8185	0.7298	2.9600	3.5935	3.7543	3.9012	3.9750	4.0503	4.1243	4.1850
660	0.9921	0.9821	0.9265	0.8039	0.8027	0.8093	3.5071	3.7313	3.8275	3.9386	4.0014	4.0688	4.1373	4.1940
700	0.9709	0.9617	0.9141	0.8075	0.8133	2.0475	3.5899	3.7483	3.8360	3.9428	4.0043	4.0708	4.1386	4.1949
800	2.3829	2.4694	2.9508	3.0579	3.1083	3.3855	3.5953	3.7494	3.8365	3.9430	4.0045	4.0709	4.1387	4.1949
900	3.5278	3.5096	3.4704	3.2630	3.2739	3.3885	3.5953	3.7494	3.8365	3.9430	4.0045	4.0709	4.1387	4.1949
1,000	3.5316	3.5128	3.4716	3.2634	3.2742	3.3885	3.5953	3.7494	3.8365	3.9430	4.0045	4.0709	4.1387	4.1949
1,200	3.5317	3.5128	3.4716	3.2634	3.2742	3.3885	3.5953	3.7494	3.8365	3.9430	4.0045	4.0709	4.1387	4.1949
1,400	3.5317	3.5128	3.4716	3.2634	3.2742	3.3885	3.5953	3.7494	3.8365	3.9430	4.0045	4.0709	4.1387	4.1949
1,600	3.5317	3.5128	3.4716	3.2634	3.2742	3.3885	3.5953	3.7494	3.8365	3.9430	4.0045	4.0709	4.1387	4.1949
1,800	3.5317	3.5128	3.4716	3.2634	3.2742	3.3885	3.5953	3.7494	3.8365	3.9430	4.0045	4.0709	4.1387	4.1949
2,000	3.5317	3.5128	3.4716	3.2634	3.2742	3.3885	3.5953	3.7494	3.8365	3.9430	4.0045	4.0709	4.1387	4.1949
2,200	3.5317	3.5128	3.4716	3.2634	3.2742	3.3885	3.5953	3.7494	3.8365	3.9430	4.0045	4.0709	4.1387	4.1949
2,400	3.5317	3.5128	3.4716	3.2634	3.2742	3.3885	3.5953	3.7494	3.8365	3.9430	4.0045	4.0709	4.1387	4.1949
2,600	3.5317	3.5128	3.4716	3.2634	3.2742	3.3885	3.5953	3.7494	3.8365	3.9430	4.0045	4.0709	4.1387	4.1949
2,800	3.5317	3.5128	3.4716	3.2634	3.2742	3.3885	3.5953	3.7494	3.8365	3.9430	4.0045	4.0709	4.1387	4.1949
3,000	3.5317	3.5128	3.4716	3.2634	3.2742	3.3885	3.5953	3.7494	3.8365	3.9430	4.0045	4.0709	4.1387	4.1949
10,000	3.5317	3.5128	3.4716	3.2634	3.2742	3.3885	3.5953	3.7494	3.8365	3.9430	4.0045	4.0709	4.1387	4.1949

Figure 4-25. Example of Linkage between the Degraded Moisture Content to the Vadose Zone Unit (241-A Tank Farm H1_Top cell as an example) Property via a Selector Element.

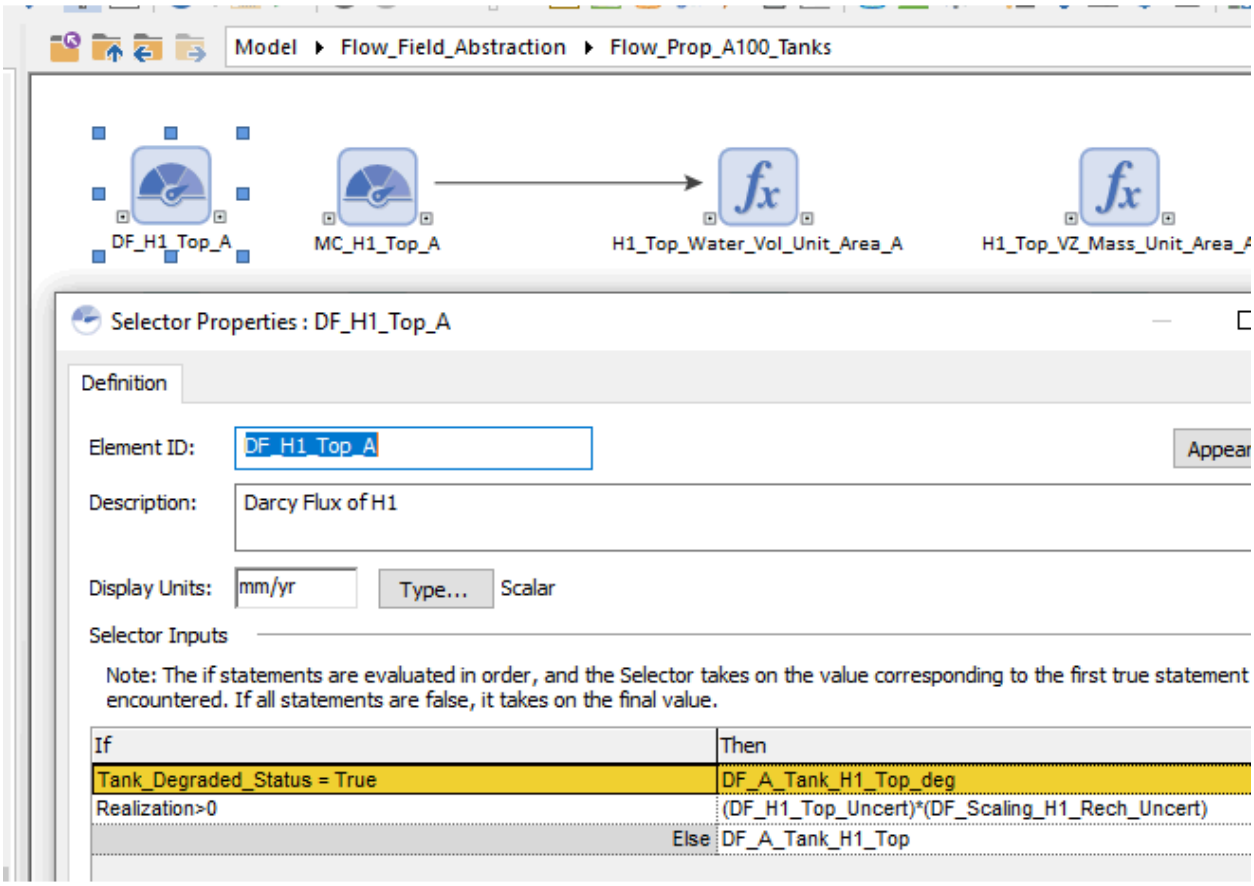


4.5.2 Description of Model Changes

While keeping all other parameters and model parts unchanged, the one change implemented in BM1 is to introduce a GoldSim© scenario parameter TRA as shown in Figure 4-35. If TRA = 1, the base mat advection is added through the changes in the transport part of the model as shown in Figure 4-36. Taking tank A-102 as an example, a selector TRA_flowrate is added in the model file a_ax v1.0_20190408_GRT_BM_TS.gsm in the folder of \Transport_Abstraction_Model\Transport_A_Series_Tanks\Transport_Model_A102 \Transport_A\A_Waste_Source.

Figure 4-36 shows that if TRA = 1, the flow rate of Grout_Base and Thin_VZ cells are set equal to the Darcy velocity of the top A Farm VZ cell H1_Top. Otherwise, the flow rate is equal to the infiltration rate of the tank grout that is controlled by the tank degradation status parameters. In this case, it is assumed that the infill grout in the tank is intact. In this way, the concrete base mat performance can be exclusively studied. Similarly, in AX Farm, the Grout_Base and Thin_VZ cell flow rate is set the same as the Darcy velocity of top AX Farm VZ cell H2_a (see Figure 4-37). Obviously, changes for this case do not impact non-tank sources.

Figure 4-26. Example of Linkage between the Degraded Darcy Velocity to the Vadose Zone Unit (241-A Tank Farm H1_Top cell, as an example) Property via a Selector Element.



4.5.3 Inputs

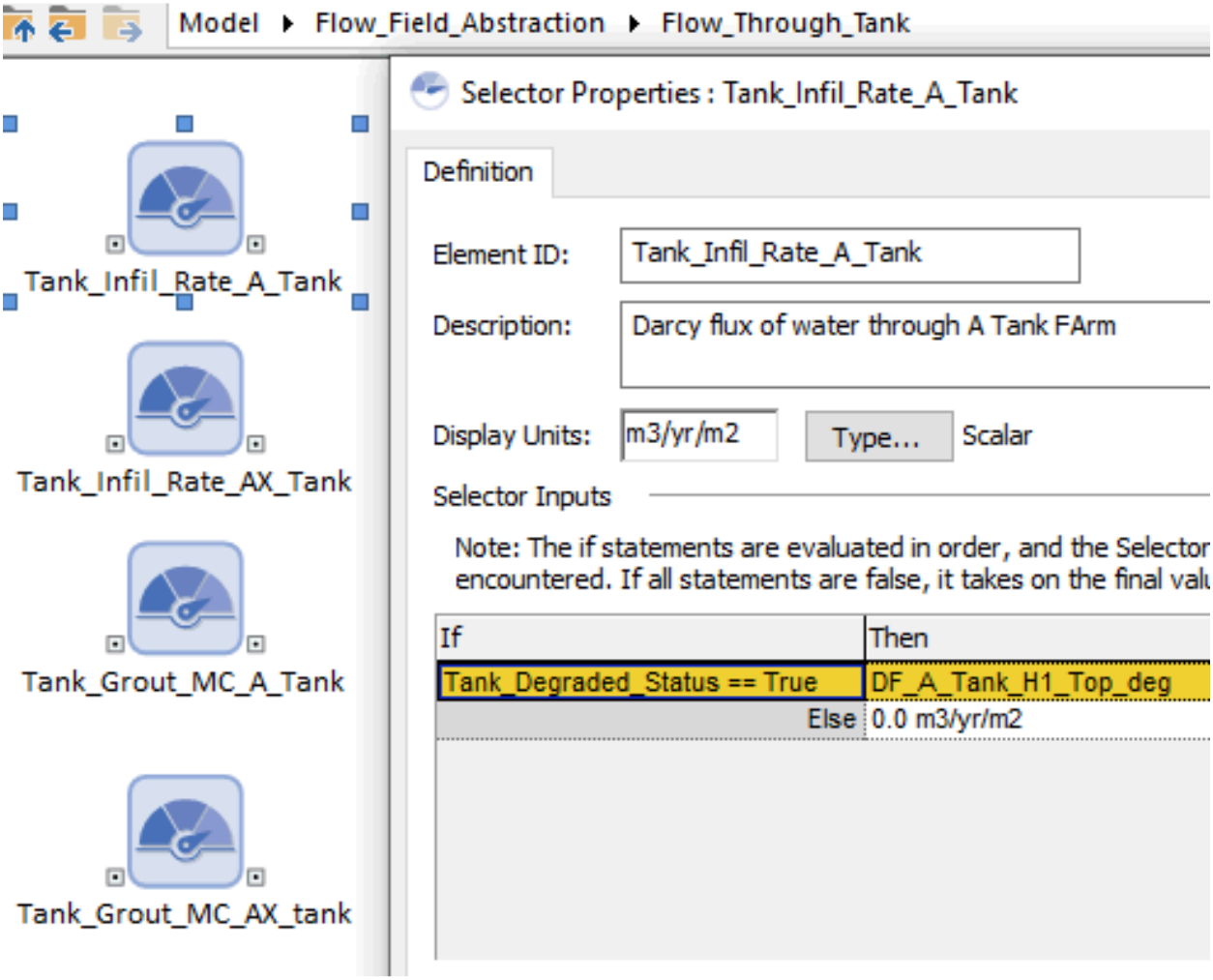
In the GoldSim© scenario data, the value for parameter TRA is set to 1.

4.5.4 Base Mat Sensitivity Case Results

To illustrate the impact of advection in the base mat, the total doses are compared with their Base Case counterparts for A Farm and AX Farm in Figure 4-38 and Figure 4-39, respectively. It can be seen that in both farms, the total doses with advective base mat are higher than Base Case at early times and lower than Base Case at later times.

To further understand the impact of the BM1 sensitivity case, comparison for the ^{99}Tc release rate from tank A-105 (dominant dose-contributing source) is shown in Figure 4-40. Because of advective transport through the base mat in addition to the diffusive release, the total release rate is higher for BM1 than in the Base Case. Faster release and transport of ^{99}Tc increases its dose at early times but decreases its dose at later times due to rapidly depleting its inventory in the residual waste.

Figure 4-27. GoldSim© Implementation of Darcy Velocity Flowing Through the Degraded Grout for the 241-A Farm Tank.



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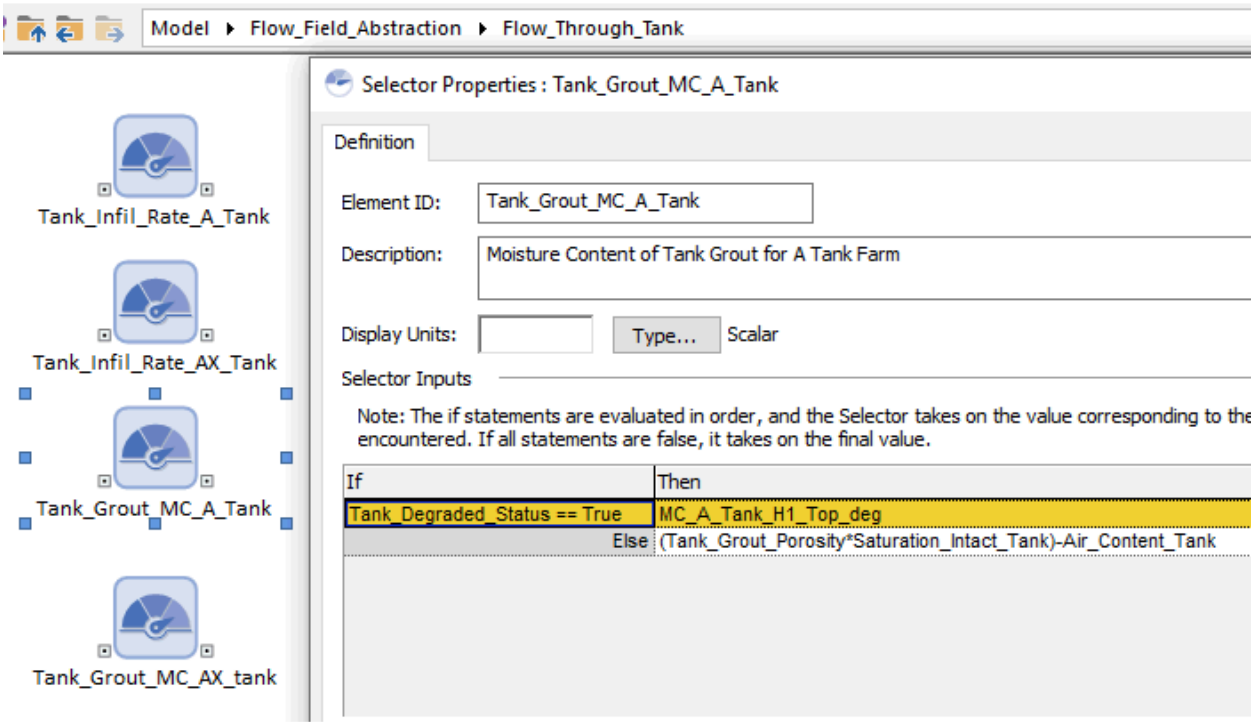
Peak doses of BM1 are compared with the Base Case along with peak times in Table 4-22. The table shows that the peak doses with advection in the base mat are 6 times higher than the Base Case, occurring more than 100 years earlier than the Base Case.

4.6 VADOSE ZONE SENSITIVITY CASE

This sensitivity case includes evaluation of an alternative geologic model that is identical to the Base Case model except that it includes the representation of a hypothetical preferential pathway, such as a clastic dike or unsealed borehole, as present in the vadose zone. Based on the analysis presented in the WMA C PA (RPP-ENV-58782), these heterogeneous features only very minimally affect the results of the PA. For this reason, in this preliminary PA, no further analysis was conducted to evaluate this sensitivity case.

Figure 4-28. GoldSim© Implementation of Moisture Content in the Degraded Grout for the 241-A Farm Tank.



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4.7 PEAK DOSE ANALYSIS

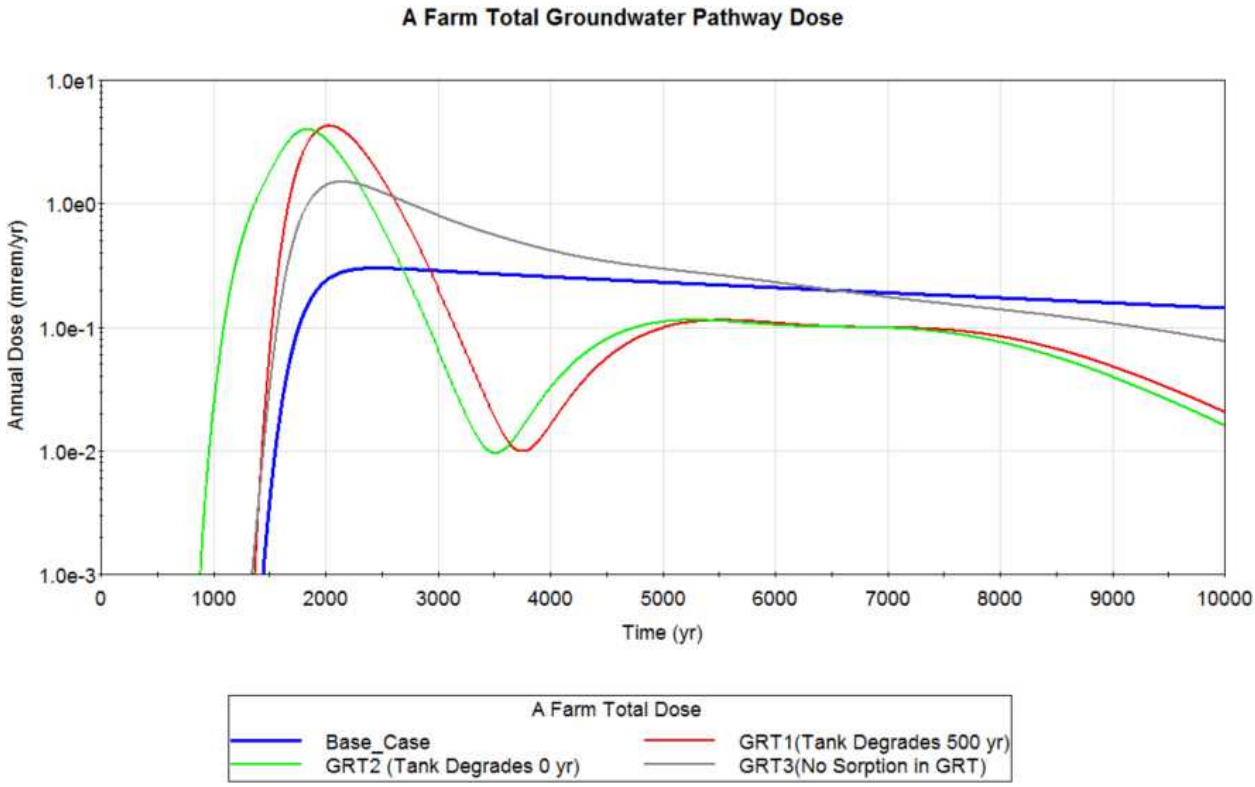
4.7.1 Calculation Approach

To analyze peak doses that are likely to occur after 10,000 years, this case simulates the Base Case for up to 400,000 years after closure. It is assumed that the tank grout is degraded at 30,000 years based on the WMA C PA (RPP-ENV-58782). To do this, some elements in the Base Case GoldSim© model file, a_ax v1.0_20190408.gsm, must be modified. The modification involves elements related to grout degradation, time series, and timesteps. The modification related to grout degradation is the same as the grout degradation cases described in Section 4.3. The modifications are made on the GoldSim© model file, a_ax v1.0_20190408_GRT_BM_TS.gsm, because this model file contains grout degradation elements (see Section 4.3). The resulted GoldSim© file is named a_ax v1.0_20190408_Peakdose.gsm.

4.7.2 Description of the Model Changes

The modifications made in the model are presented in Sections 4.7.1 through 4.7.3.

Figure 4-29. Comparison between the Grout Sensitivity Cases and the Base Case: 241-A Tank Farm Total Dose.



GRT = grout

4.7.2.1 Time Series. The modified time series elements include the following.

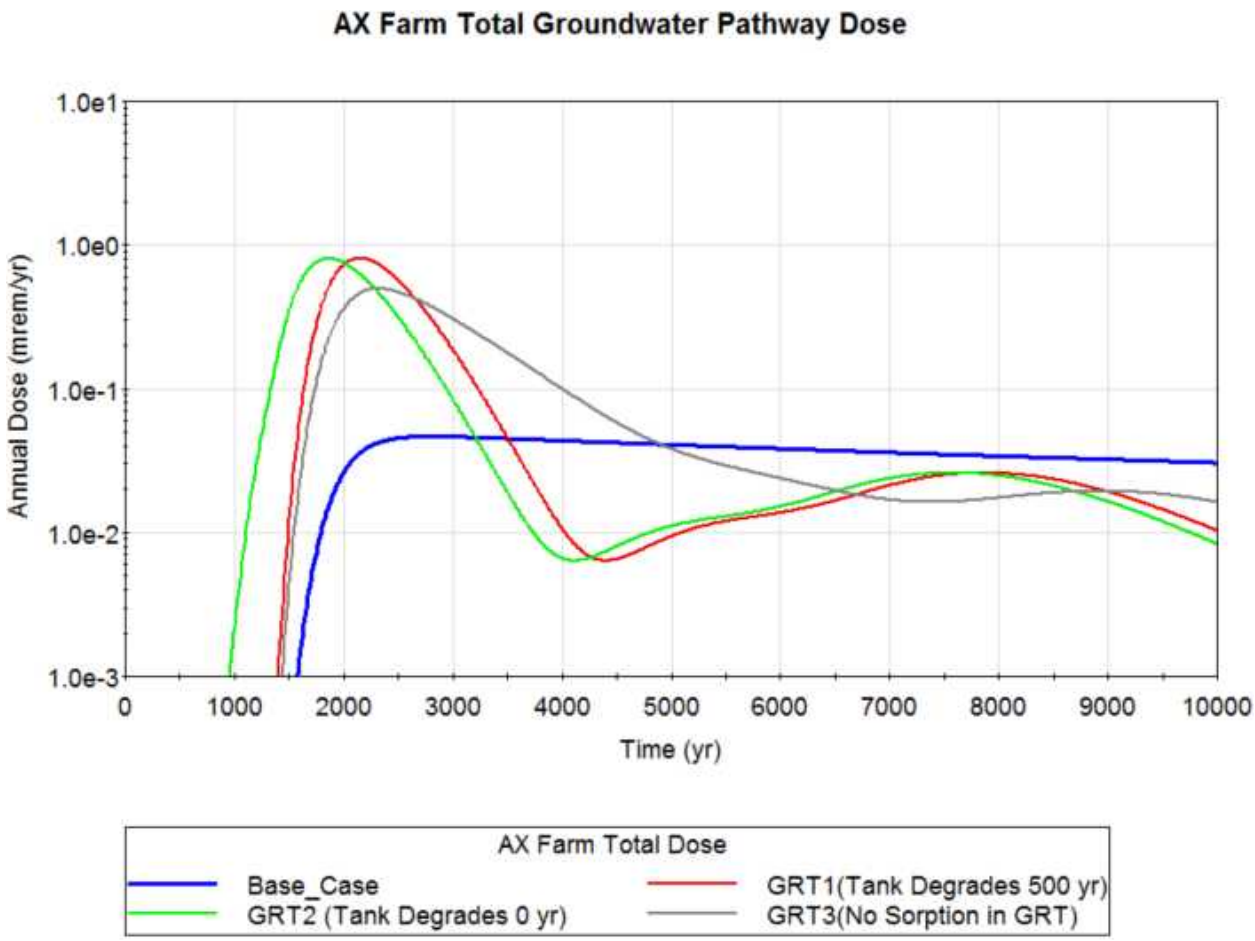
(1) In \Flow_Field_Abstraction\Flow_Field_A100_Tanks:
   a. DF_A_Tank
   b. MC_A_Tank
   c. DF_A_Tank_deg
   d. MC_A_Tank_deg.

(2) In \Flow_Field_Abstraction\Flow_Field_AX100_Tanks:
   a. DF_AX_Tank
   b. MC_AX_Tank
   c. DF_AX_Tank_deg
   d. MC_AX_Tank_deg.

(3) In \Flow_Field_Abstraction\Flow_Field_Pipeline_A:
   a. DF_A_Pipeline
   b. MC_A_Pipeline
   c. DF_Soil_Backfill_A
   d. MC_Soil_Backfill_A.

(4) In \Flow_Field_Abstraction\Flow_Field_Pipeline_AX:
   a. DF_AX_Pipeline
   b. MC_AX_Pipeline
   c. DF_Soil_Backfill_AX
   d. MC_Soil_Backfill_AX.

Figure 4-30. Comparison between the Grout Sensitivity Cases and the Base Case: 241-AX Tank Farm Total Dose.



GRT = grout

All the above time series are flow field parameters that end at 10,000 years in Base Case model file and need to be extended to 400,000 years. Because the flow field reaches steady state long before 10,000 years, the extension was made by adding 400,000 years at the end of the series and duplicating the inputs at 10,000 years for the new ending time.

In addition, all unused time series elements, remnants of flow field abstraction and earlier version development, were deleted. Although unused, GoldSim© would stop simulation and generate error messages once the ends of time series are reached before simulation is completed.

Table 4-19. Peak Dose and Peak Arrival Times for the Grout Sensitivity Cases and the Base Case.

Farm Name	Case Name	Peak Dose (mrem/yr)	Peak Time (year after closure)
241-A Tank Farm	Base Case	0.3015	2,450
	GRT1	4.262	2,030
	GRT2	3.987	1,830
	GRT3	1.506	2,140
241-AX Tank Farm	Base Case	0.0466	2,810
	GRT1	0.8058	2,150
	GRT2	0.8028	1,860
	GRT3	0.4961	2,320

Table 4-20. GoldSim© Element Values and Logic for the Tank Shell Sensitivity Case.

Case	Shell_Time (year)	Factor (-)	Effect
Base Case and other cases in the model file	0	1	Diffusive release starts at beginning (0 years)
TS1 (tank shell sensitivity case)	5,000	0	Diffusive release starts 5,000 years

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4.7.2.2 Grout Degradation Time. The element GRT_Time was added for grout sensitivity cases (Section 4.3). In this case, GRT_Time = 30,000 years.

4.7.2.3 Timesteps. Considerations of timestep changes include accommodating long simulation time period (400,000 years) and computational efficiency. Table 4-23 lists the timesteps changed especially for this case.

4.7.3 Inputs

GoldSim© scenario data the value for parameter GRT_Time is set to 30,000.

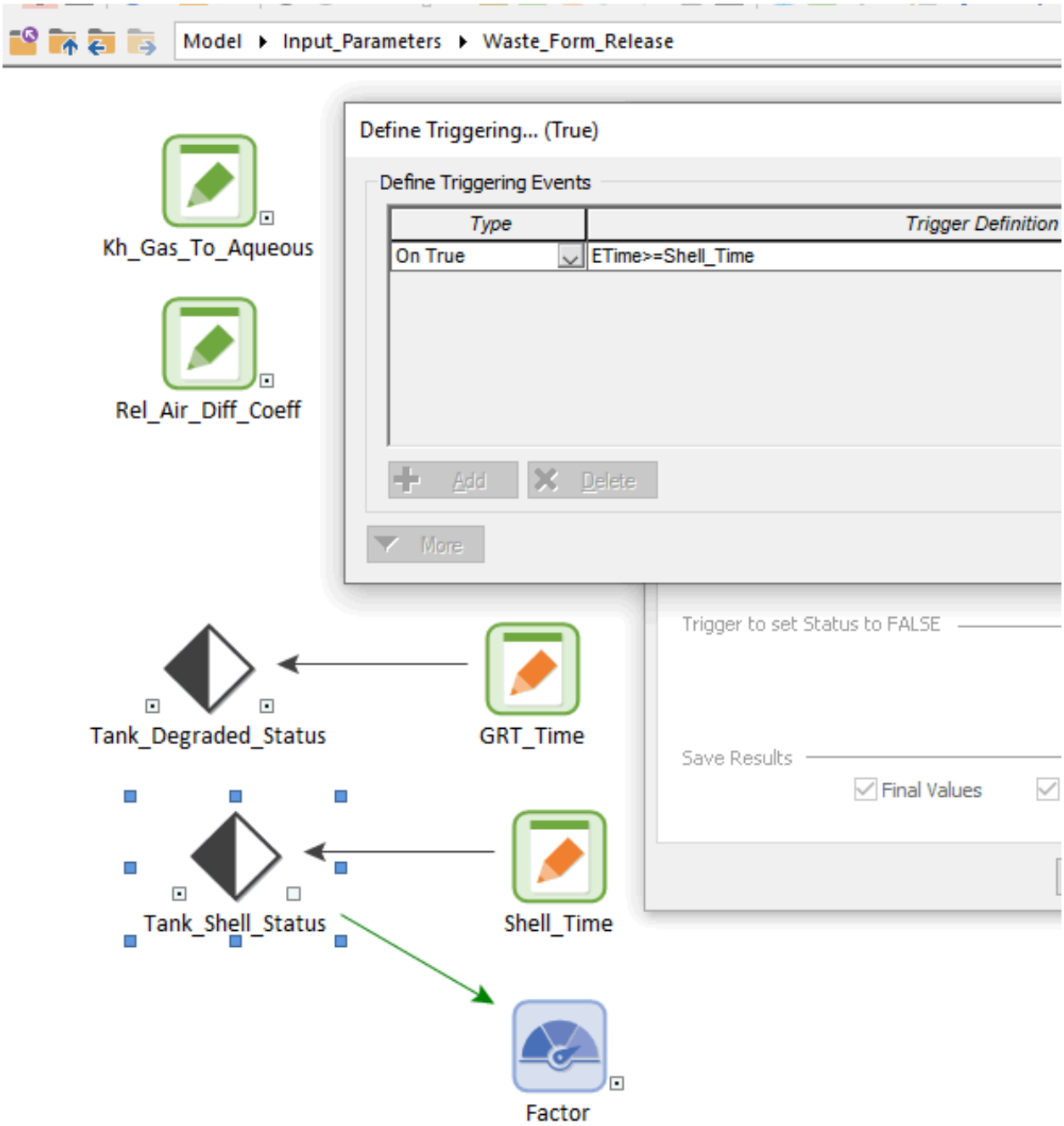
4.7.4 Peak Dose Analysis Results

The results from peak dose analysis is presented in section 4.7.4.1 through 4.7.4.3

4.7.4.1 Dose Results by Farms and Sources. Figure 4-41 shows A Farm tank and total dose histories. The first 10,000-year histories are the same as Base Case, during which period the pipeline doses are insignificant compared to the tank doses. Figure 4-41 shows that after 10,000 years, the dose from pipeline increases and peaks around 20,000 years. There are

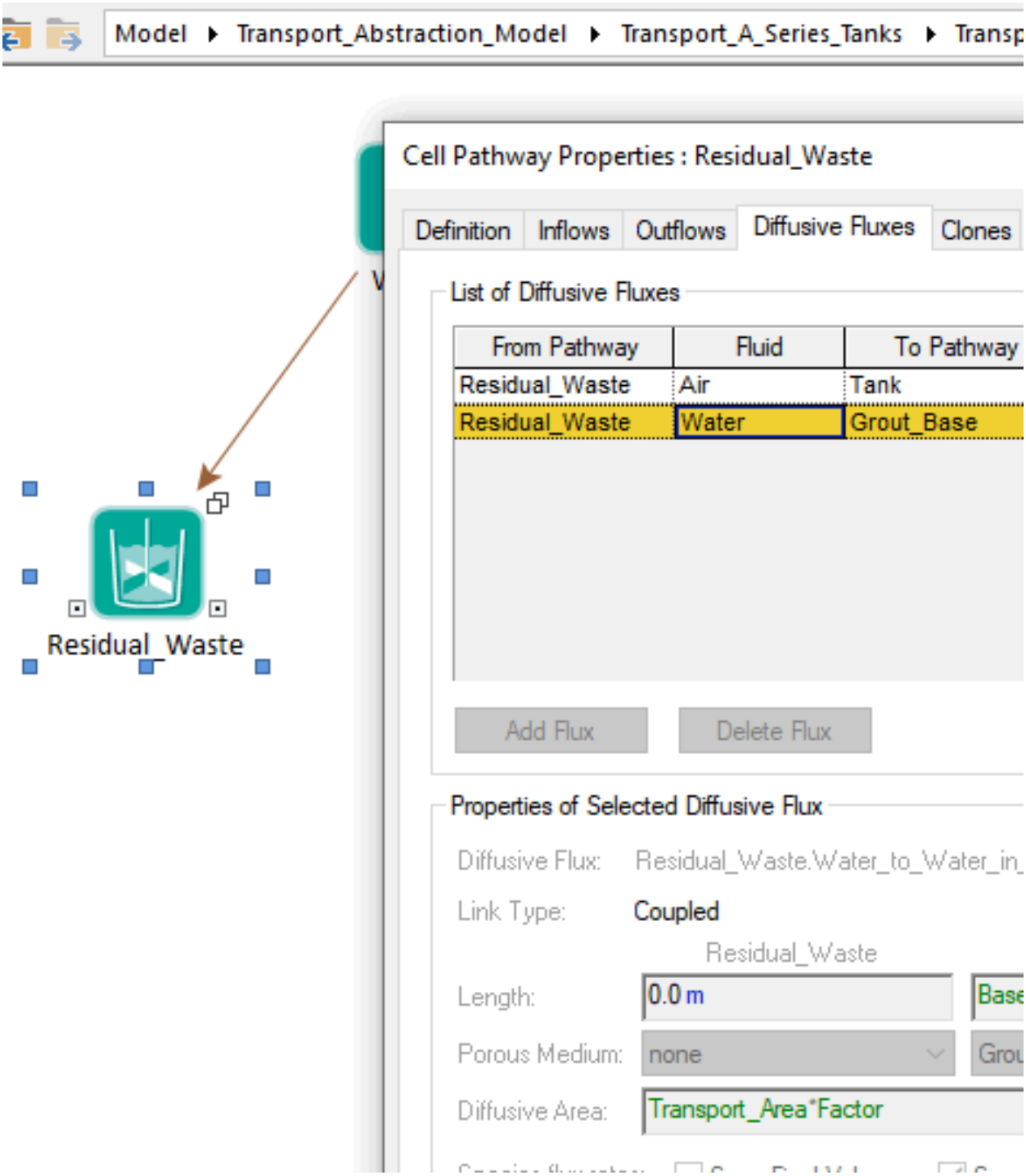
two smaller peaks around 30,000 years when the tank grout is assumed to degrade, and water is allowed to flow through the tanks. These smaller peaks are primarily associated with tanks A-105 and A-104. Doses from the tanks continue to rise until around 300,000 years. The AX Farm results shown in Figure 4-42 demonstrate the similar patterns as the A Farm results.

Figure 4-31. The GoldSim© Elements Added to Control Diffusive Release from the Tanks.



GoldSim© simulation software is copyrighted by GoldSim Technology Group LLC of Issaquah, Washington (see http://www.goldsim.com).

Figure 4-32. Control of Diffusive Release from the Residual Waste for the Tank Integrity Sensitivity Case.



4.7.4.2 Dose Result by Analytes. Figure 4-43 shows A Farm pipeline doses by analytes. It shows that after 10,000 years, uranium isotopes, moderately sorbed in soils, take the lead in contributing the total dose, with ^{233}U as the key dose contributor. The pipeline sources have higher pore water solubilities for uranium in comparison to the grouted tanks and experience

higher flow rates before 500 years than the tank sources, resulting in faster uranium transport than the tank sources. As uranium doses decrease, doses from ^{226}Ra and ^{210}Pb, the decay products of ^{238}U chain, rise to dominate the total dose. The last peak before 400,000 years is contributed by ^{237}Np. The AX Farm pipeline doses have the similar patterns as A Farm pipelines, as shown in Figure 4-44.

Figure 4-33. Comparison between the TS1 Case and the Base Case: 241-A Tank Farm Total Dose.

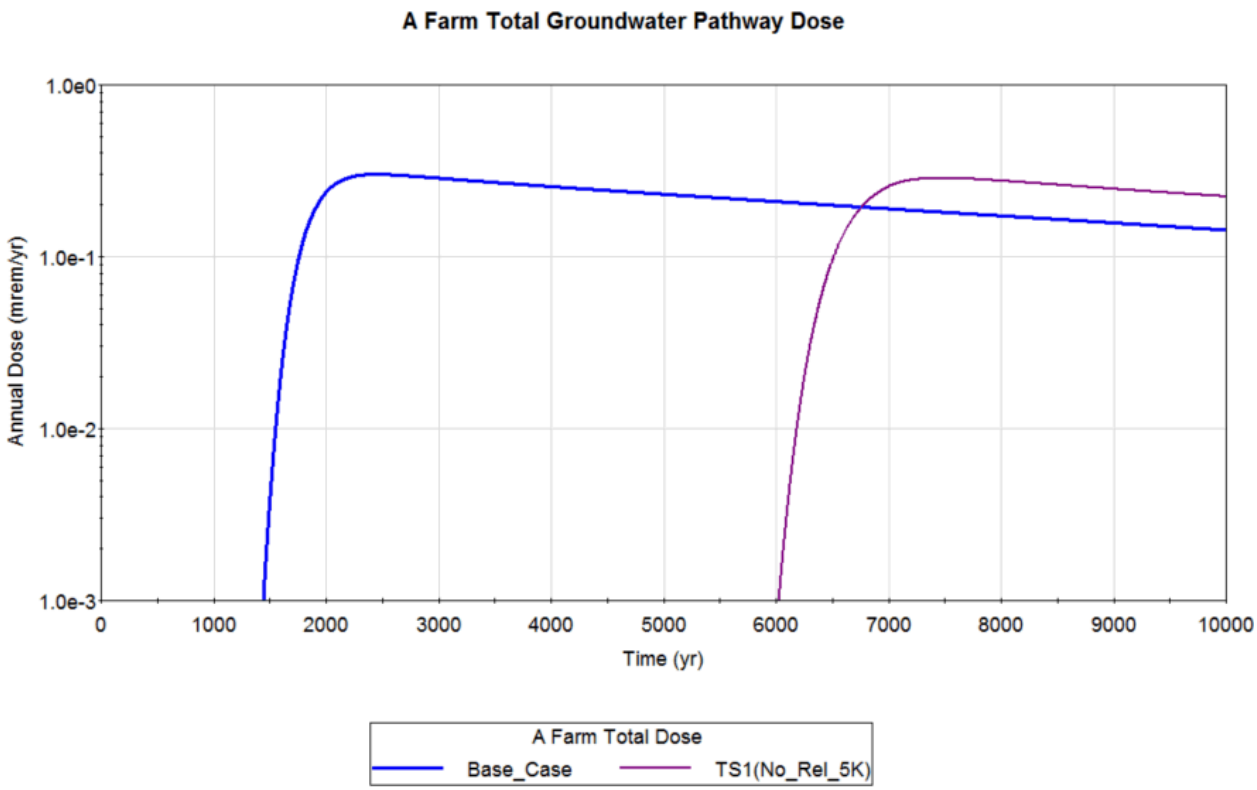


Figure 4-45 shows tank A-105 doses by analytes. It can be seen that most mobile nuclides, ^{99}Tc, ^{79}Se, and ^{129}I, show two peaks. The early peaks are the result of diffusive release and occur before 10,000 years as observed in Base Case results. The secondary peaks, which occur after 30,000 years, are attributed to the enhancement of release and transport by advection that is caused by grout failure. For less mobile nuclides, such as ^{14}C, the peaks happen at later times. Similar to the pipeline doses, ^{233}U dominates the total dose between 50,000 to 300,000 years. Thereafter, ^{237}Np arrives and contributes to the total dose. Figure 4-46 shows tank AX-104 doses by analytes. The patterns of dose histories for this tank are more or less the same as those displayed by tank A-105. For tank AX-104, ^{226}Ra dose is comparable to ^{233}U dose.

Figure 4-34. Comparison between the TS1 Case and the Base Case: 241-AX Tank Farm Total Dose.

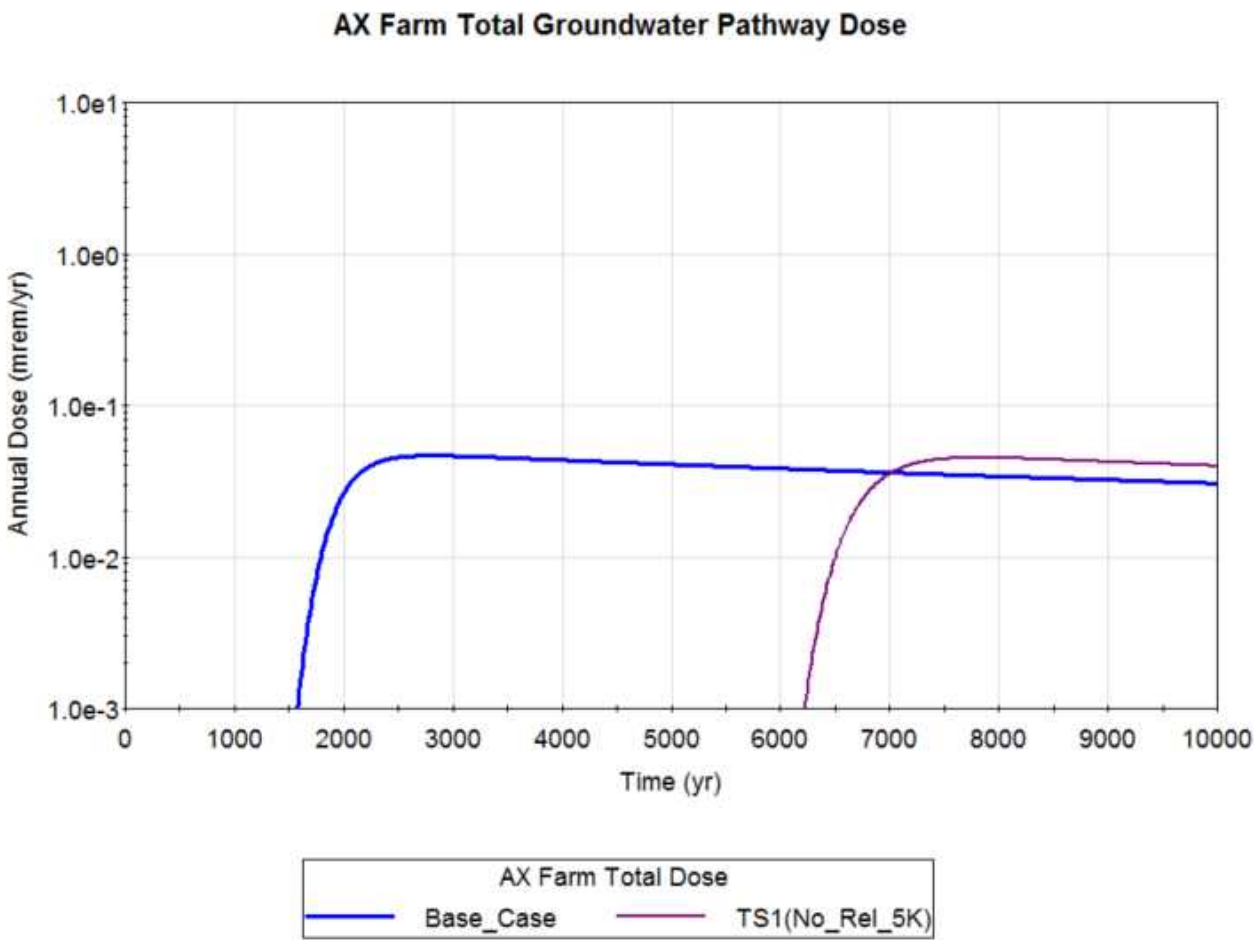


Table 4-21. Peak Dose and Peak Times for TS1 and the Base Case.

Farm	Case Name	Peak Dose (mrem/yr)	Peak Time (years)
241-A Tank Farm	Base Case	0.3015	2,450
	TS1	0.2864	7,450
241-AX Tank Farm	Base Case	0.0466	2,810
	TS1	0.0450	7,810

4.7.4.3 Summary of Results. From the calculation results, the following conclusions can be made:

(1) Doses of all sources reach peak values within 400,000 years;

(2) The total doses for both farms peak after 10,000 years;

(3) The highest total dose is 0.9 mrem/yr occurring at 21,000 years and is from A Farm driven by ^{233}U in the non-tank source;

(4) Peak doses and peak times from tanks 241-A-101, 241-A-103, A-104, A-105, and 241-A-106 are the same as the Base Case;

(5) Peak doses of tank A-102, A Farm non-tanks, and all AX Farm sources occur after 10,000 years;

(6) Grout degradation at 30,000 years increases doses, in particular, of the mobile radionuclides ^{99}Tc, ^{79}Se, and ^{129}I;

(7) Moderately retarded ^{233}U and ^{237}Np are among the primary dose contributors after 10,000 years;

(8) ^{226}Ra with relatively mobile predecessors also contributes to the total dose in the long term.

Figure 4-35. The GoldSim© Scenario Parameter TRA is Added to Control Base Mat Advection Sensitivity Case.

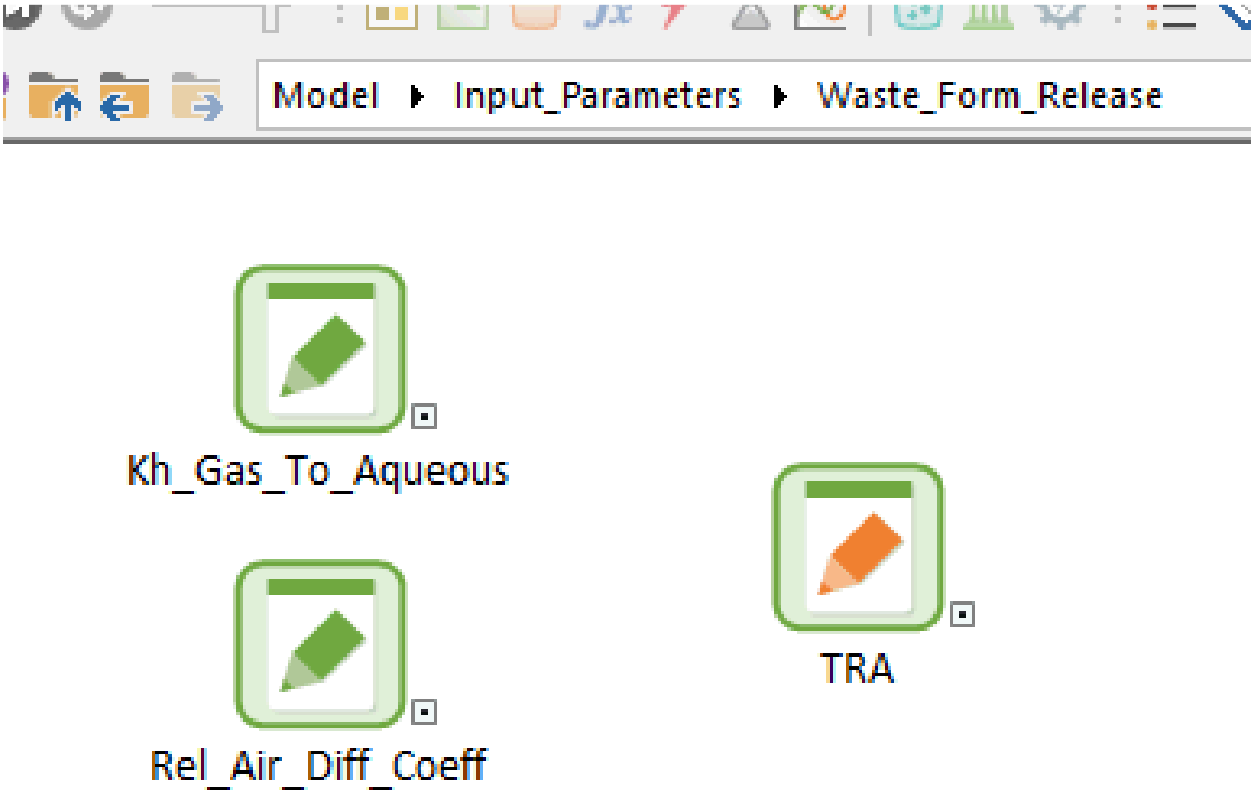


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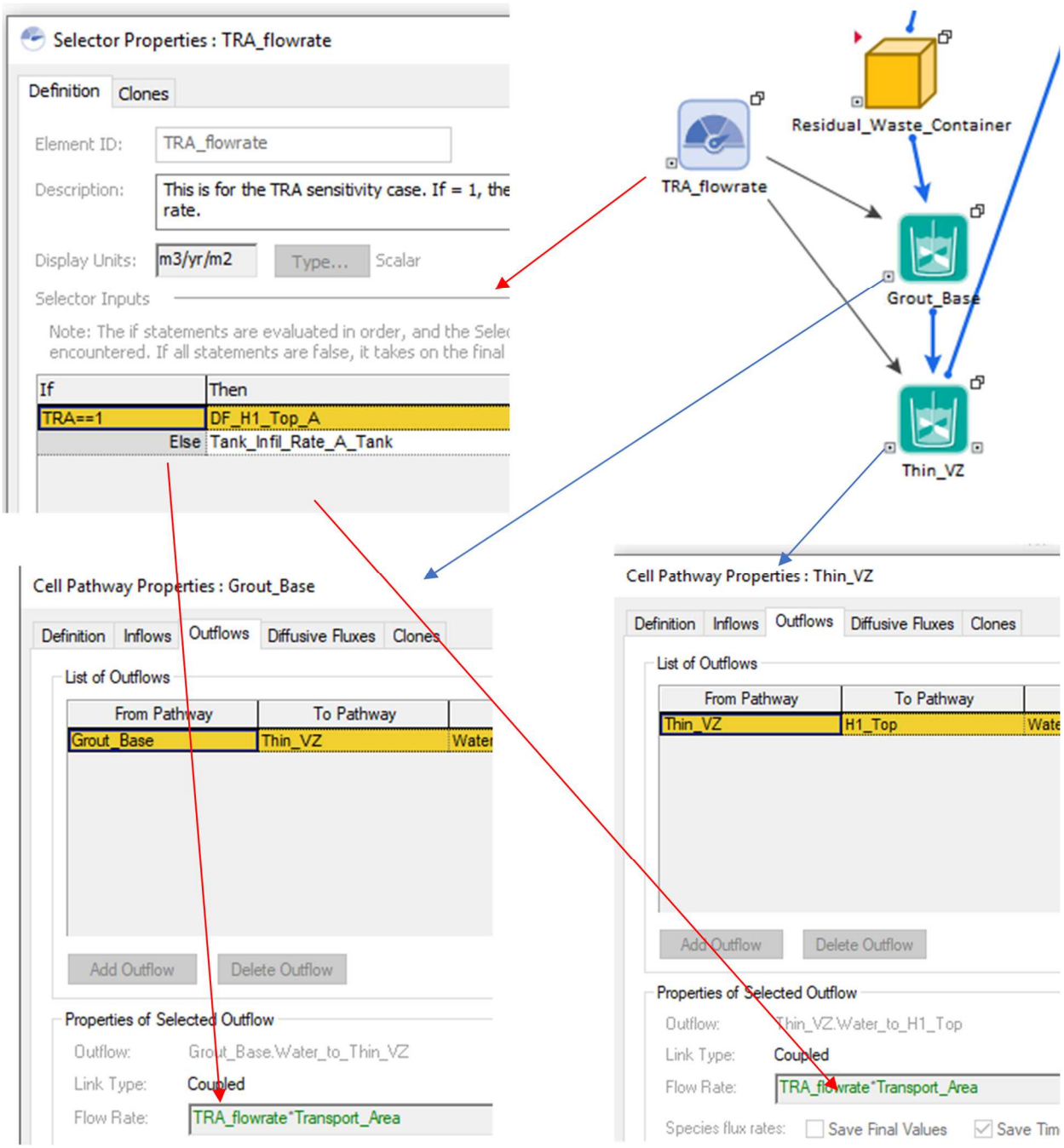
Figure 4-36. GoldSim© Model Implementation of the Base Mat Sensitivity Case for 241-A Farm Tanks.



GoldSim© simulation software is copyrighted by GoldSim Technology Group LLC of Issaquah, Washington (see http://www.goldsim.com).

Figure 4-37. GoldSim© Model Implementation of the Base Mat Sensitivity Case for 241-AX Farm Tanks.

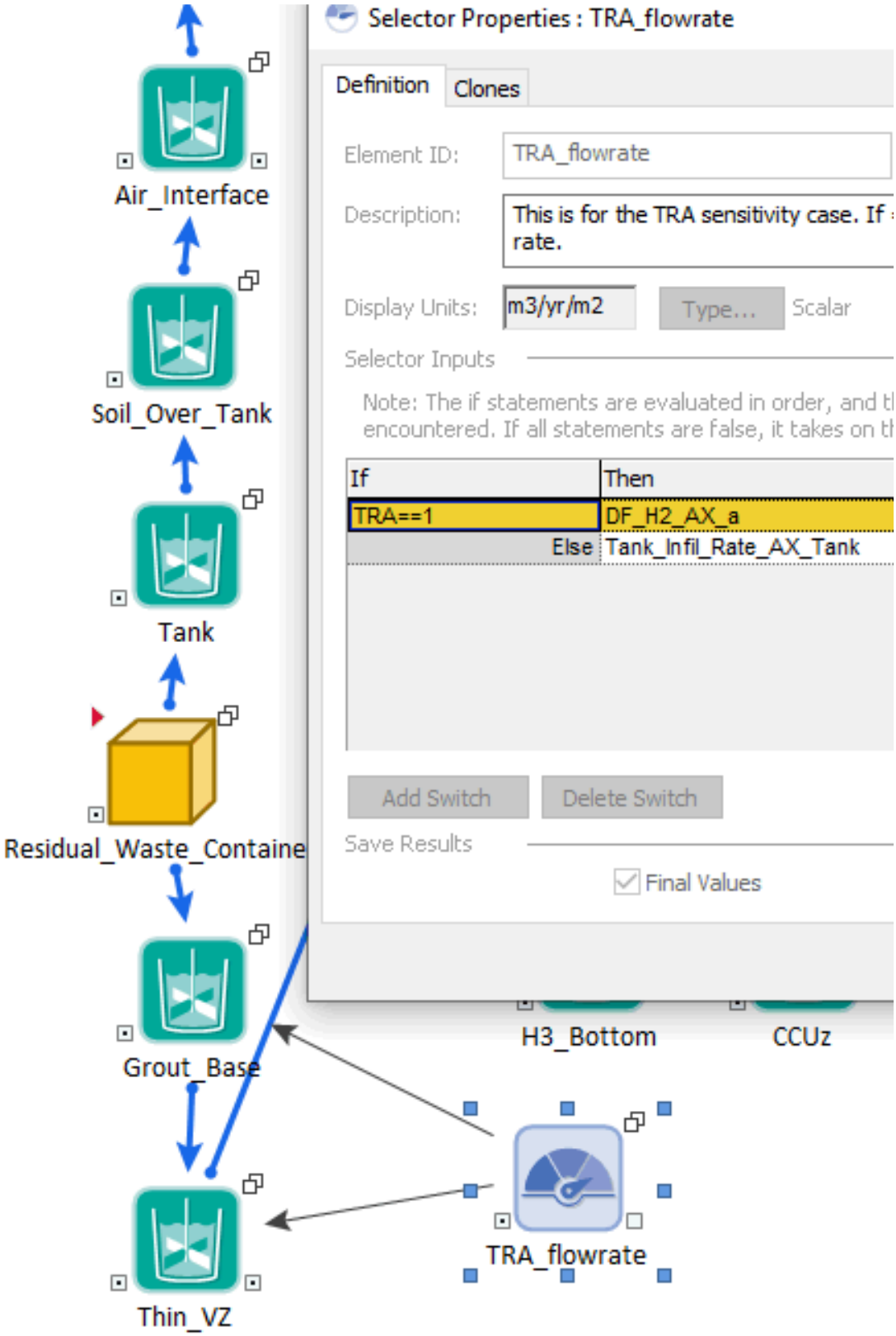
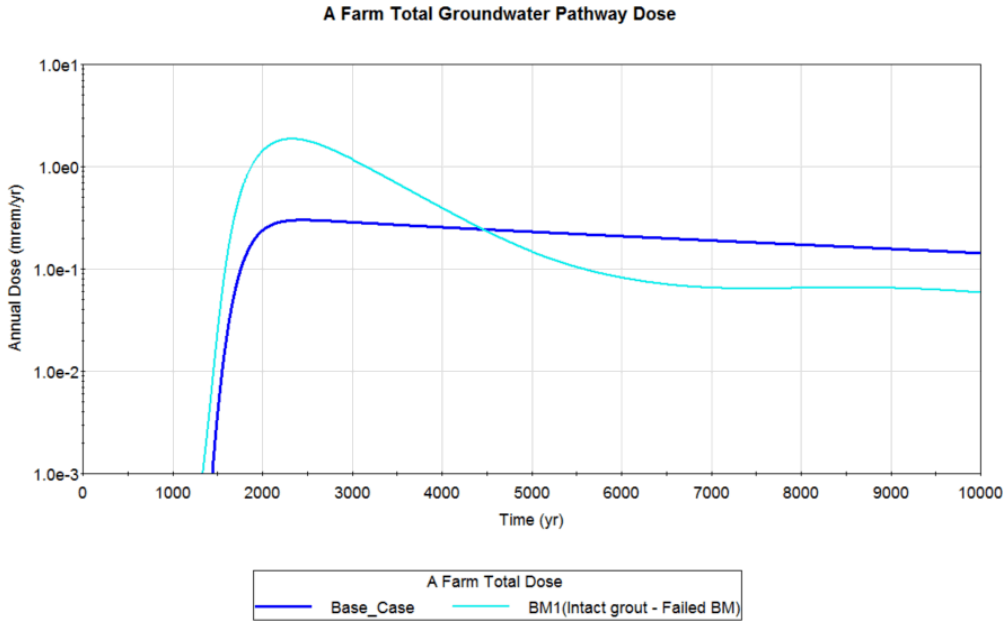
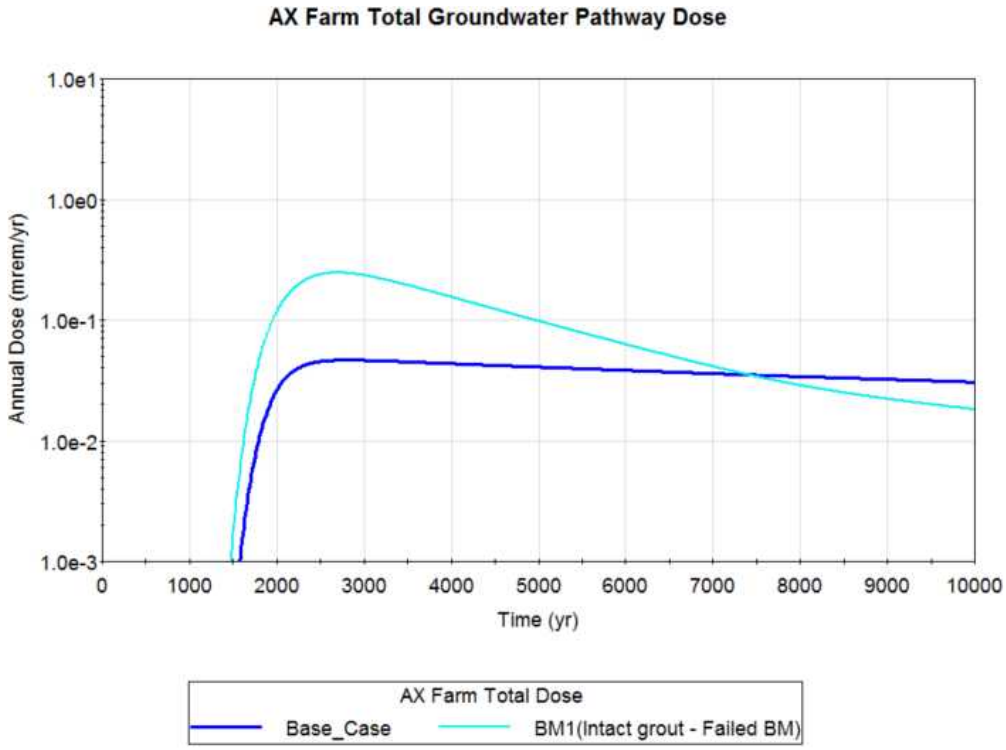


Figure 4-38. Comparison between the BM1 Case and the Base Case: 241-A Tank Farm Total Dose.



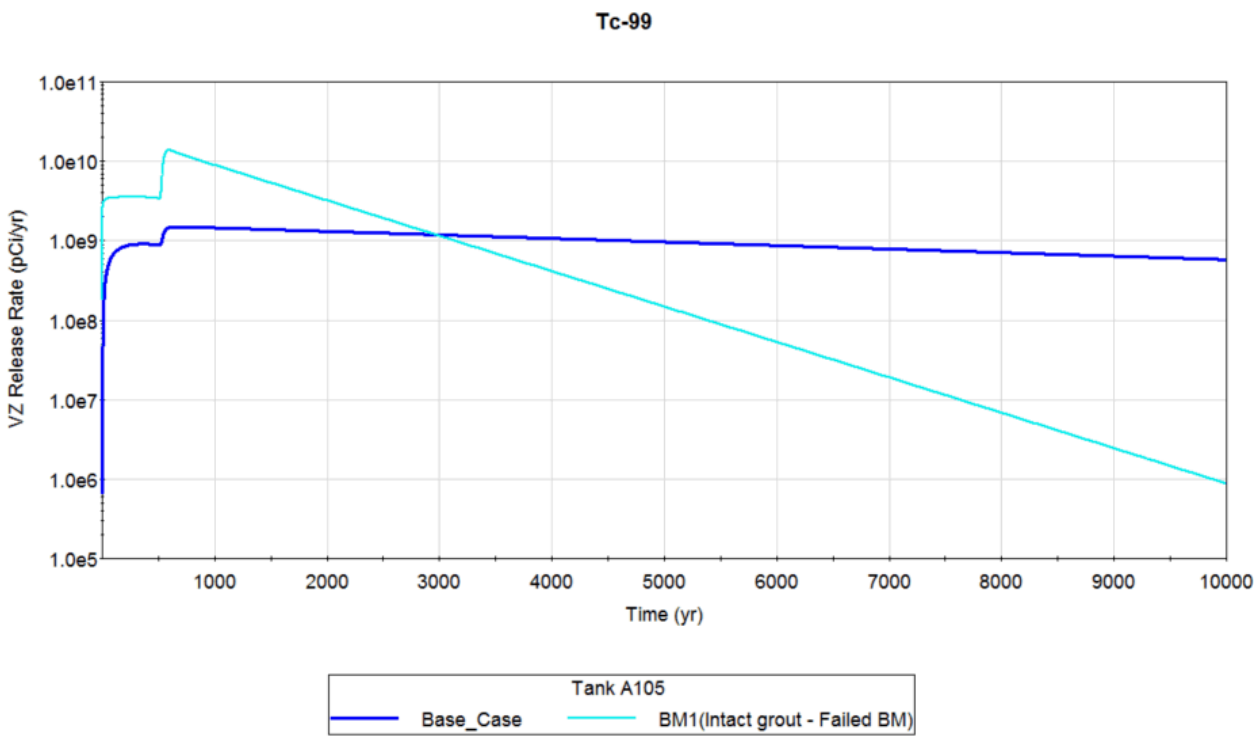
BM = Base Mat

Figure 4-39. Comparison between the BM1 Case and the Base Case: 241-AX Tank Farm Total Dose.



BM = Base Mat

Figure 4-40. Comparison between the TS1 Case and the Base Case: Technetium-99 Release to Vadose Zone from Tank 241-A-105.



BM = Base Mat VZ = vadose zone

Table 4-22. Peak Dose and Peak Times for BM1 and Base Case.

Farm Name	Case Name	Peak Dose (mrem/yr)	Peak Time (years)
241-A Tank Farm	Base Case	0.3015	2,450
	BM1	1.8650	2,320
241-AX Tank Farm	Base Case	0.0466	2,810
	BM1	0.2466	2,690

Table 4-23. Timesteps Used in the Peak Dose Analysis Case.

Time Period (years)	Simulation Timestep (year)	Output Timestep (year)
1 – 1,000	1.0	1.0
1,000 – 10,000	10.0	10.0
10,000 – 400,000	500.0	1,000.0

Figure 4-41. 241-A Tank Farm Dose Results for the Peak Dose Analysis Case.

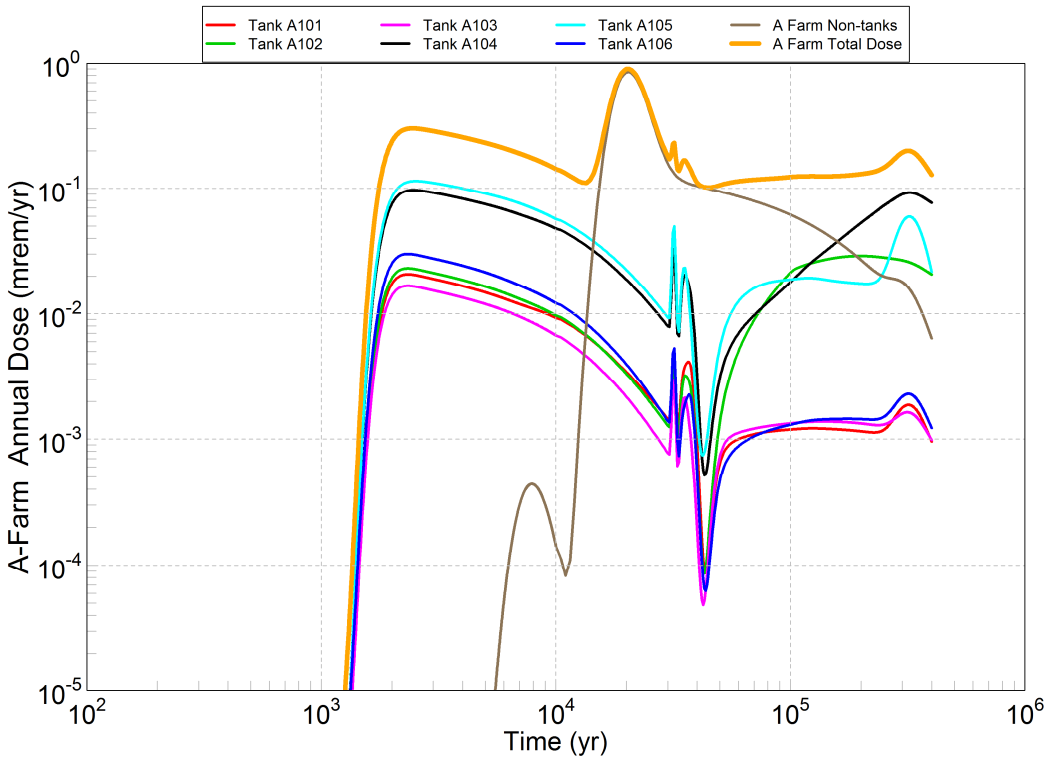


Figure 4-42. 241-AX Tank Farm Dose Results for the Peak Dose Analysis Case.

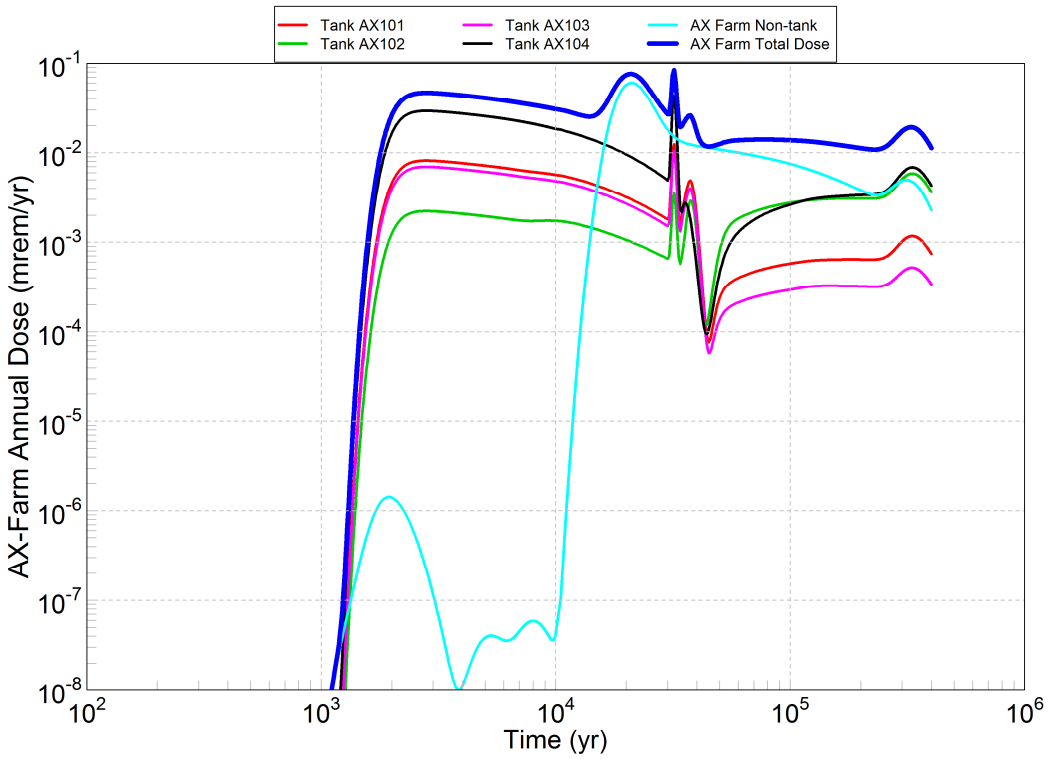


Figure 4-43. 241-A Tank Farm Pipeline Doses by Analytes for the Peak Dose Analysis Case.

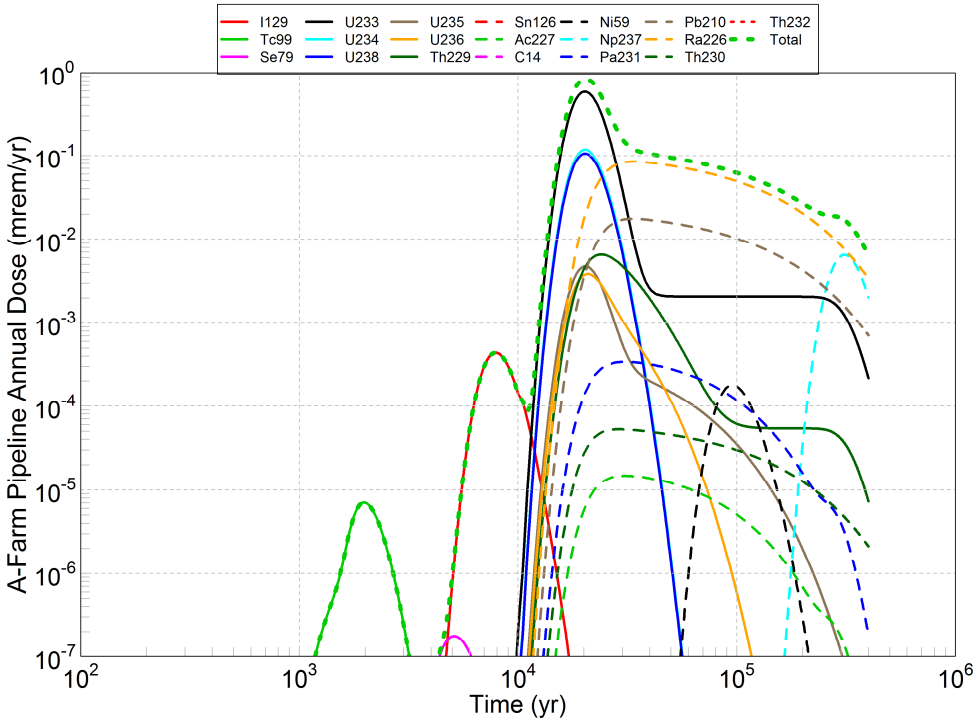


Figure 4-44. 241-AX Tank Farm Pipeline Doses by Analytes for the Peak Dose Analysis Case.

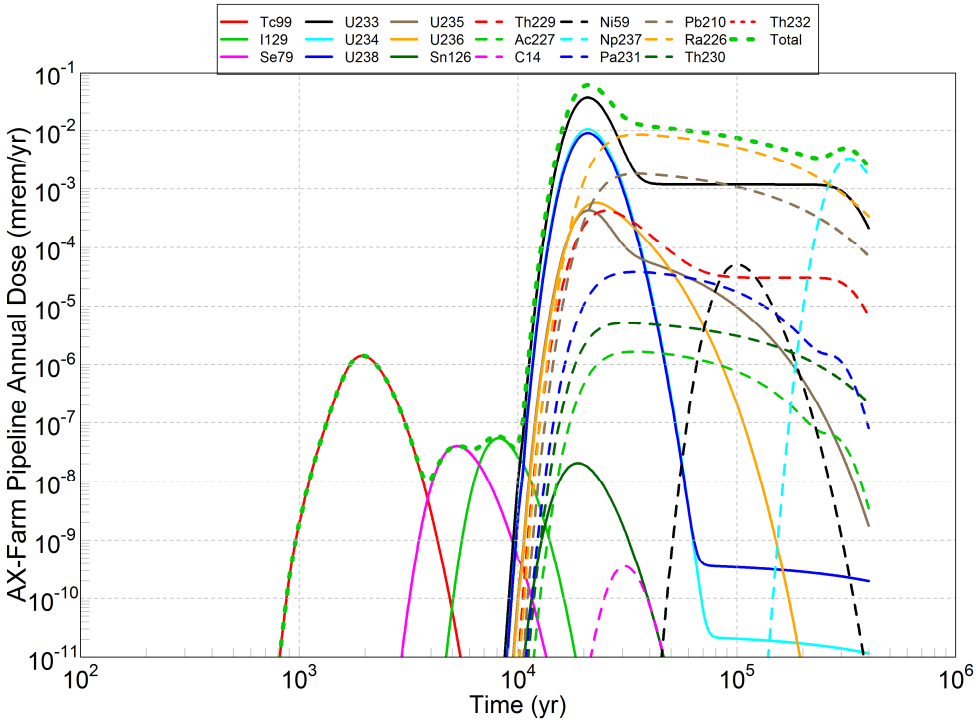


Figure 4-45. Tank 241-A-105 Doses by Analytes for the Peak Dose Analysis Case.

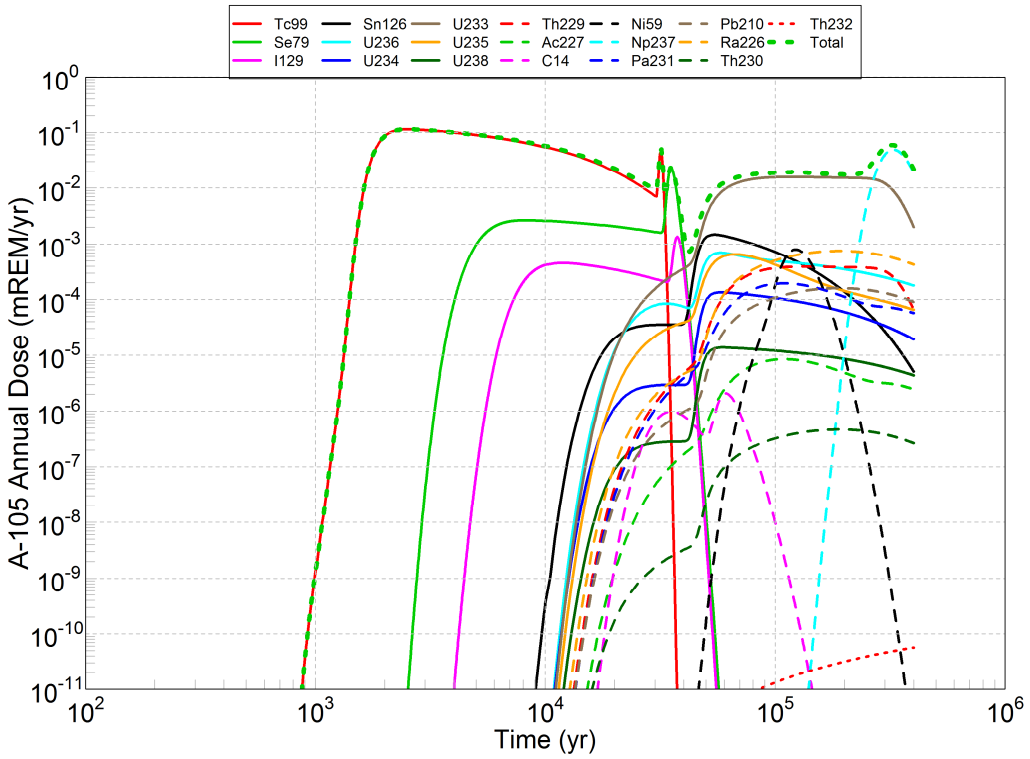
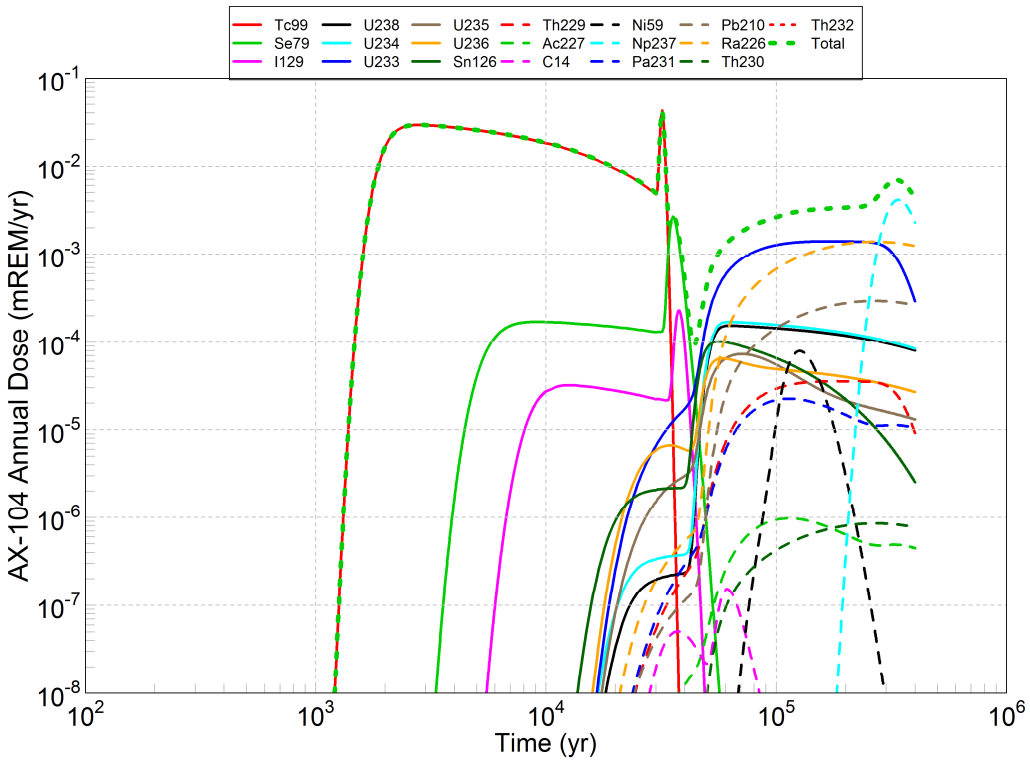


Figure 4-46. Tank 241-AX-104 Doses by Analytes for the Peak Dose Analysis Case.



5.0 SOFTWARE APPLICATIONS

The software used to perform this calculation is approved, managed, and used in compliance with the CH2M HILL Plateau Remediation Company (CHPRC) requirements of PRC-PRO-IRM-309, "Controlled Software Management."

5.1 SOFTWARE IDENTIFICATION

Software is registered on the Hanford Information System Inventory and is identified as approved for use. The identification for the software package used in the calculation is as follows:

- GoldSim© Pro
- Version 12.0
- Hanford Information System Inventory Identification Number: 2461
- Workstation type and property number: Lenovo Yoga 900-131SK2 Signature Edition, SN PFOGS02H.

5.2 SOFTWARE QUALITY ASSURANCE

All calculations are performed using GoldSim© Pro simulator software, version 12.0. GoldSim© Pro simulator is approved for use by CHPRC at the Hanford Site in accordance with the requirements of PRC-PRO-IRM-309. WRPS recognizes CHPRC's role as Hanford Site environmental modeling integrator (TFC-PLN-155, "General Project Plan for Environmental Modeling") and accepts CHPRC's qualification of GoldSim© Pro. The installed GoldSim© Pro simulator software was tested in accordance with the procedure per CHPRC-00175, *GoldSim Pro Software Management Plan*, Revision 3, using CHPRC-00224, *GoldSim Pro Software Test Plan*, Revision 2.

5.3 SOFTWARE INSTALLATION AND CHECKOUT

The software installation and checkout form for GoldSim© is provided in Attachment 1 to this EMCF.

5.4 STATEMENT OF VALID SOFTWARE APPLICATION

The following validates that GoldSim© is a valid software application and was applied in this EMCF within its range of intended uses for which it was tested and approved.

- GoldSim© Pro was utilized for DOE to assist in performing simulation of radioactive mass conservation including decay and ingrowth as well as contamination mass transport in subsurface environment, and to perform human health dose and risk assessment for the Hanford Site.

- GoldSim© Pro as it is used in this EMCF has been implemented within the range of its limitations.

6.0 MODEL CONFIGURATION MANAGEMENT

All inputs and outputs for the development of the WMA A-AX PA GoldSim©-based system model are archived to the CHPRC Environmental Model Management Archive (EMMA) to maintain and preserve models, input and select output files under configuration management. Inputs include the input files used in the GoldSim© simulations and the input parameters. Basis information (that information collected to form the basis for model input parameterization) is also stored in the EMMA for traceability purposes.

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7.0 REFERENCES

CHPRC-00175, 2018, *GoldSim Pro Software Management Plan*, Rev. 3, CH2M HILL Plateau Remediation Company, Richland, Washington.

CHPRC-00224, 2018, *GoldSim Pro Software Test Plan*, Rev. 2, CH2M HILL Plateau Remediation Company, Richland, Washington.

DOE M 435.1-1, 2007, *Radioactive Waste Management Manual*, U.S. Department of Energy, Washington, D.C.

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Kozak, M. W., 1994, "Decision analysis for low-level radioactive waste disposal safety assessments," *Radioactive Waste Management and Environmental Restoration*, Vol. 18, pp. 209–223.

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RPP-CALC-62319, in process, *Residual Waste Source Inventory Term for Waste Management Area A-AX Performance Assessment Inventory Case 1*, Rev. 0, Washington River Protection Solutions, LLC, Richland, Washington.

RPP-CALC-62538, in process, *WMA A-AX Performance Assessment Groundwater Pathway Dose Calculation*, Rev. 0, Washington River Protection Solutions, LLC, Richland, Washington.

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RPP-RPT-58293, 2017, *Hanford 241-A and 241-AX-Farm Tank and Ancillary Equipment Residual Waste Inventory Estimates*, Rev. 1, Washington River Protection Solutions, LLC, Richland, Washington.

RPP-RPT-59197, 2016, *Analysis of Past Tank Waste Leaks and Losses in the Vicinity of Waste Management Area C at the Hanford Site, Southeast Washington*, Rev. 1, INTERA, Inc./ CH2M HILL Plateau Remediation Company/Washington River Protection Solutions, LLC/TecGeo, Inc., Richland, Washington.

RPP-RPT-60101, in process, *Model Package Report Flow and Contaminant Transport Numerical Model Used in WMA A-AX Performance Assessment and RCRA Closure Analysis*, Rev. 0, Washington River Protection Solutions, LLC, Richland, Washington.

RPP-RPT-60885, in process, *Model Package Report System Model for the WMA A-AX Performance Assessment*, Rev. 0, Washington River Protection Solutions, LLC, Richland, Washington.

TFC-PLN-155, "General Project Plan for Environmental Modeling," Washington River Protection Solutions, LLC, Richland, Washington.

ATTACHMENT A

SOFTWARE INSTALLATION AND CHECKOUT FORMS

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CHPRC SOFTWARE INSTALLATION AND CHECKOUT FORM

Software Owner Instructions:
Complete Fields 1-13, then run test cases in Field 14. Compare test case results listed in Field 15 to corresponding Test Report outputs. If results are the same, sign and date Field 19. If not, resolve differences and repeat above steps.

Software Subject Matter Expert Instructions:
Assign test personnel. Approve the installation of the code by signing and dating Field 21, then maintain form as part of the software support documentation.

GENERAL INFORMATION:

1. Software Name: GoldSim Pro Software Version No.: 12.0

EXECUTABLE INFORMATION:

2. Executable Name [redacted] GoldSim.exe
3. Executable Size (bytes): 2,836 kB

COMPILATION INFORMATION:

4. Hardware System (i.e., property number or ID):
   Compiled by vendor
5. Operating System (include version number):
   Windows 10

INSTALLATION AND CHECKOUT INFORMATION:

6. Hardware System (i.e., property number or ID):
   Lenovo YOGA 900-131SK2 Signature Edition SN: PFOGS02H
7. Operating System (include version number):
   Window 10
8. Open Problem Report? (●) No ( ) Yes PR/CR No.

TEST CASE INFORMATION:

[redacted]

10. Procedure(s):
    per CHPRC-00224 Rev 1, GoldSim Pro Software Test Plan
11. Libraries:
    N/A
12. Input Files:
    FirstModel.gsm
13. Output Files:
    FirstModel.gsm
14. Test Cases:
    GS-ITC-1
15. Test Case Results:
    Match expected results as presented in CHPRC-00224, GoldSim Pro Software Test Plan
16. Test Performed By: Wei Zhou
17. Test Results: (●) Satisfactory, Accepted for Use ( ) Unsatisfactory
18. Disposition (include HISI update): ADDED TO HISI ENTRY [signature]

Page 1 of 2 A-6005-149 (REV 0)

CHPRC SOFTWARE INSTALLATION AND CHECKOUT FORM (continued)

1. Software Name: GoldSim Pro Software Version No.: 12.0

Prepared By:

19. _____ Software Owner (Signature) | WE Nichols Print | 12 APR 2018 Date

20. Test Personnel:

_____ Sign | Wei Zhou Print | 4/12/2018 Date

_____ Sign | _____ Print | _____ Date

_____ Sign | _____ Print | _____ Date

Approved By:

21. _____ Software SME (Signature) | N/R per SMP Print | _____ Date

Page 2 of 2 A-6005-149 (REV 0)

ATTACHMENT B

INVENTORY AND VOLUME DATA FOR THE INVENTORY SENSITIVITY CASES

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Table B-1. Base Case Inventory and Residual Waste Volumes – INV0. (sheet 1 of 2)

Analyte	Units	A101	A102	A103	A104	A105	A106	AX101	AX102	AX103	AX104	A_Ancillary	AX_Ancillary	A_Pipelines	AX_Pipelines
Tanks Volume	kL	10.19	10.19	10.19	93	139	10.19	10.19	10.19	10.19	10.19	6.36	1.20	3.3	2.9
Ac227	Ci	6.42E-04	6.17E-04	4.68E-04	2.68E-05	1.46E-05	1.60E-04	5.92E-04	4.39E-04	4.68E-04	2.30E-06	2.42E-03	4.30E-04	1.26E-03	1.02E-03
Am241	Ci	3.50E+00	2.41E+01	2.67E+00	6.82E+02	2.95E+03	4.91E+01	2.82E+00	1.82E+02	1.72E+01	3.26E+02	1.34E+02	4.70E+01	6.96E+01	1.13E+02
Am243	Ci	2.08E-03	1.38E-02	1.56E-03	3.57E-01	1.67E+00	1.15E-01	1.83E-03	1.76E-01	9.83E-03	1.83E-01	7.49E-02	3.78E-02	3.91E-02	9.02E-02
C14	Ci	6.43E-02	1.72E-02	3.18E-02	3.24E-01	2.75E-01	1.39E-02	5.71E-02	5.96E-03	4.35E-02	3.87E-02	7.96E-07	1.18E-07	4.14E-07	2.82E-07
Cd113m	Ci	7.87E-02	6.71E-02	5.06E-02	2.18E-01	3.12E-01	3.22E-02	7.08E-02	6.08E-02	5.55E-02	4.39E-02	2.31E-01	3.02E-02	1.20E-01	7.18E-02
Cm243	Ci	5.68E-05	3.14E-04	3.84E-05	7.21E-03	5.28E-02	3.68E-03	5.52E-05	9.39E-03	3.06E-04	5.78E-03	8.41E-09	5.20E-09	4.39E-09	1.26E-08
Cm244	Ci	6.63E-04	3.72E-03	4.49E-04	8.40E-02	6.06E-01	4.37E-02	6.59E-04	1.13E-01	3.54E-03	6.66E-02	9.87E-08	6.20E-08	5.13E-08	1.50E-07
Co60	Ci	9.94E-04	3.91E-03	4.17E-04	2.75E-01	4.03E-01	7.04E-03	7.65E-04	2.16E-02	4.20E-03	1.27E-01	2.51E-02	1.02E-02	1.30E-02	2.45E-02
Cs137	Ci	1.03E+03	1.02E+03	6.87E+02	1.89E+04	3.73E+04	1.06E+03	1.14E+03	7.70E+02	1.01E+03	6.28E+03	2.55E-02	3.62E-03	1.33E-02	8.68E-03
Eu152	Ci	7.42E-03	8.34E-03	4.00E-03	7.71E-01	6.63E+00	2.39E-01	4.31E-03	1.80E-01	3.92E-02	9.33E-01	3.37E-01	8.00E-02	1.75E-01	1.91E-01
Eu154	Ci	1.38E-01	1.56E-01	7.46E-02	2.78E+01	7.05E+01	4.39E+00	7.71E-02	1.71E+00	1.19E+00	7.81E+00	4.09E+00	9.50E-01	2.13E+00	2.31E+00
Eu155	Ci	3.02E-03	3.45E-03	1.61E-03	3.10E-01	5.97E-01	9.54E-02	1.53E-03	3.77E-02	1.68E-02	1.99E-01	6.22E-02	1.92E-02	3.22E-02	4.61E-02
H3	Ci	1.45E-02	1.14E-02	8.52E-03	1.13E-01	6.96E-02	8.63E-03	1.29E-02	1.26E-02	9.86E-03	9.84E-03	2.63E-07	3.08E-08	1.37E-07	7.52E-08
I129	Ci	2.29E-03	1.34E-03	3.35E-04	6.36E-03	9.47E-04	1.33E-03	2.12E-03	1.52E-03	1.71E-03	1.34E-04	7.90E-05	4.50E-09	4.10E-05	1.11E-08
Nb93m	Ci	3.80E-01	3.70E-01	2.77E-01	2.25E+00	2.87E+00	1.90E-01	3.49E-01	2.72E-01	2.92E-01	4.04E-01	1.99E+00	3.32E-01	1.03E+00	8.08E-01
Ni59	Ci	1.39E-01	1.22E-01	8.18E-02	8.62E+00	7.20E+00	2.60E-01	1.18E-01	1.54E-01	1.28E-01	1.01E+00	1.13E+00	1.66E-01	5.89E-01	3.99E-01
Ni63	Ci	9.41E+00	8.30E+00	5.57E+00	5.83E+02	4.93E+02	1.76E+01	8.03E+00	1.05E+01	8.72E+00	6.96E+01	7.70E+01	1.13E+01	4.00E+01	2.72E+01
Np237	Ci	1.33E-02	1.05E-02	7.79E-03	5.82E-02	7.62E-02	6.12E-03	1.17E-02	2.70E-02	1.46E-03	9.73E-03	5.48E-02	1.03E-02	2.84E-02	2.48E-02
Pa231	Ci	8.11E-04	7.81E-04	5.91E-04	3.89E-05	1.57E-05	2.02E-04	7.49E-04	5.55E-04	5.92E-04	2.85E-06	3.67E-03	6.40E-04	1.90E-03	1.55E-03
Pb210	Ci	5.33E-07	8.69E-07	3.39E-07	2.46E-06	1.45E-06	1.88E-07	4.36E-07	4.39E-07	3.83E-07	2.58E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pu238	Ci	2.52E-02	6.49E-01	4.70E-02	1.39E+01	1.88E+01	1.57E+00	2.59E-02	9.60E-01	8.03E-02	3.27E+00	1.72E+00	2.95E-01	8.91E-01	7.15E-01
Pu239	Ci	7.85E-01	2.22E+01	1.58E+00	5.96E+02	5.56E+02	5.30E+01	8.84E-01	1.37E+01	2.34E+00	9.79E+01	6.25E+01	7.20E+00	3.24E+01	1.72E+01
Pu240	Ci	1.88E-01	5.16E+00	3.69E-01	1.31E+02	1.36E+02	1.23E+01	2.04E-01	4.38E+00	5.89E-01	2.39E+01	1.43E+01	1.90E+00	7.43E+00	4.58E+00
Pu241	Ci	1.58E-01	4.38E+00	3.13E-01	7.93E+01	1.14E+02	9.80E+00	1.66E-01	7.06E+00	4.79E-01	2.01E+01	1.11E+01	2.10E+00	5.75E+00	5.08E+00
Pu242	Ci	1.39E-05	3.87E-04	2.76E-05	6.55E-03	9.91E-03	8.53E-04	1.45E-05	6.76E-04	4.17E-05	1.75E-03	9.47E-04	1.90E-04	4.93E-04	4.57E-04
Ra226	Ci	7.42E-07	1.89E-06	5.33E-07	5.49E-06	2.19E-06	3.05E-07	6.71E-07	6.69E-07	5.32E-07	4.61E-07	1.07E-11	1.47E-12	5.53E-12	3.53E-12
Ra228	Ci	1.08E-06	1.03E-06	7.83E-07	1.63E-06	1.90E-11	2.90E-07	9.94E-07	1.07E-04	3.09E-06	3.37E-12	4.85E-06	1.69E-05	2.52E-06	4.08E-05
Rn222	Ci	7.42E-07	1.89E-06	5.33E-07	5.49E-06	2.19E-06	3.05E-07	6.71E-07	6.69E-07	5.32E-07	4.61E-07	1.07E-11	1.47E-12	5.53E-12	3.53E-12
Se79	Ci	1.46E-02	1.36E-02	1.03E-02	8.89E-02	1.13E-01	6.80E-03	1.33E-02	3.20E-03	1.11E-02	1.60E-02	2.64E-07	2.94E-08	1.37E-07	7.16E-08
Sm151	Ci	1.31E+02	2.18E+02	7.76E+01	2.70E+04	5.60E+04	6.30E+03	1.62E+02	2.41E+03	3.77E+02	7.90E+03	6.50E+03	8.80E+02	3.37E+03	2.11E+03

Table B-2. Base Case Inventory and Residual Waste Volumes – INV0. (sheet 2 of 2)

Analyte	Units	A101	A102	A103	A104	A105	A106	AX101	AX102	AX103	AX104	A_Ancillary	AX_Ancillary	A_Pipelines	AX_Pipelines
Sn126	Ci	3.73E-02	4.44E-02	3.34E-02	1.79E-01	2.29E-01	1.50E-02	3.56E-02	9.74E-02	3.19E-02	3.22E-02	7.03E-07	1.13E-07	3.67E-07	2.71E-07
Sr90	Ci	3.93E+02	1.73E+03	3.17E+02	6.67E+05	9.54E+05	2.91E+04	5.47E+02	6.86E+03	3.72E+03	2.47E+05	3.77E+04	1.24E+04	1.95E+04	2.97E+04
Tc99	Ci	2.25E+00	2.51E+00	1.82E+00	1.24E+01	1.58E+01	3.27E+00	2.09E+00	5.68E-01	1.78E+00	7.48E+00	5.50E-05	5.70E-06	2.86E-05	1.37E-05
Th229	Ci	1.03E-04	3.11E-03	1.19E-04	6.32E-04	2.70E-08	2.78E-05	4.77E-05	3.82E-04	9.38E-06	1.31E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Th230	Ci	3.09E-06	1.11E-04	4.28E-06	3.38E-04	9.21E-07	3.96E-06	2.70E-06	1.22E-05	1.74E-06	1.37E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Th232	Ci	1.08E-06	1.03E-06	7.83E-07	1.63E-06	1.91E-11	2.90E-07	9.94E-07	1.07E-04	3.09E-06	3.59E-12	4.94E-06	1.72E-05	2.56E-06	4.15E-05
U232	Ci	2.62E-04	9.70E-03	3.72E-04	1.94E-03	4.19E-08	8.68E-05	1.49E-04	9.82E-04	1.71E-04	9.81E-07	8.57E-03	2.86E-04	4.43E-03	6.89E-04
U233	Ci	2.59E-02	9.57E-01	3.65E-02	1.94E-01	9.05E-06	8.51E-03	1.46E-02	9.65E-02	2.31E-03	4.09E-06	8.37E-01	2.39E-02	4.33E-01	5.75E-02
U234	Ci	4.67E-03	1.67E-01	6.47E-03	5.12E-01	2.95E-03	6.11E-03	4.08E-03	1.84E-02	2.64E-03	2.09E-02	1.60E-01	6.60E-03	8.31E-02	1.58E-02
U235	Ci	1.90E-04	6.78E-03	2.62E-04	2.15E-02	5.56E-05	2.49E-04	1.68E-04	7.45E-04	6.97E-05	8.64E-04	6.52E-03	2.58E-04	3.38E-03	6.23E-04
U236	Ci	1.22E-04	4.40E-03	1.70E-04	1.23E-02	1.61E-04	1.66E-04	1.07E-04	5.17E-04	9.36E-05	5.53E-04	4.17E-03	1.83E-04	2.16E-03	4.40E-04
U238	Ci	4.20E-03	1.51E-01	5.81E-03	5.07E-01	8.57E-04	5.71E-03	3.77E-03	1.62E-02	1.63E-03	2.01E-02	1.46E-01	5.80E-03	7.54E-02	1.39E-02
Zr93	Ci	3.98E-01	3.86E-01	2.89E-01	2.35E+00	3.00E+00	1.99E-01	3.65E-01	2.85E-01	3.06E-01	4.23E-01	2.00E+00	3.36E-01	1.04E+00	8.14E-01
Al	kg	4.42E+02	5.36E+02	2.40E+02	7.08E+03	8.28E+03	3.81E+02	4.18E+02	2.14E+02	3.82E+02	9.68E+02	2.05E+03	3.26E+02	1.06E+03	7.84E+02
B	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CN	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cr	kg	6.47E+01	1.13E+02	1.88E+01	1.58E+02	3.56E+02	7.21E+01	3.55E+01	9.20E+00	5.39E+01	1.06E+01	2.74E+02	3.69E+01	1.43E+02	8.81E+01
F	kg	9.68E+00	3.72E+00	8.18E+00	1.92E+00	1.68E+01	3.88E+00	1.01E+01	5.34E+00	1.36E+01	1.85E+00	1.15E-04	2.71E-05	5.94E-05	6.55E-05
Fe	kg	7.22E+00	3.22E+02	1.20E+01	2.59E+04	1.92E+04	6.83E+02	1.05E+01	5.77E+02	1.15E+02	4.97E+03	1.45E+03	3.28E+02	7.53E+02	8.02E+02
Hg	kg	3.34E-02	6.88E-02	1.86E-02	3.20E+01	2.14E+01	6.72E+00	1.11E-01	6.85E-01	1.33E-01	3.01E+00	4.92E-05	1.10E-06	2.55E-05	2.67E-06
Mn	kg	2.03E+00	6.32E+01	2.06E+00	3.63E+03	6.49E+02	3.30E+01	3.93E-01	4.71E+01	1.56E+01	8.61E+01	1.56E+02	1.53E+01	8.05E+01	3.67E+01
Ni	kg	3.21E+00	9.43E+00	1.86E+00	1.68E+03	1.55E+03	2.63E+01	1.20E+00	1.34E+01	6.83E+00	2.67E+02	1.08E+02	1.61E+01	5.62E+01	3.86E+01
NO2	kg	1.31E+03	1.56E+03	1.13E+03	5.88E+03	3.73E+02	4.29E+02	1.38E+03	4.57E+02	1.36E+03	4.12E+01	2.69E-02	2.72E-03	1.39E-02	6.55E-03
NO3	kg	2.40E+03	1.73E+03	1.59E+03	3.02E+02	9.53E+03	1.16E+03	2.56E+03	2.33E+03	1.73E+03	8.38E+02	3.32E-02	5.40E-03	1.72E-02	1.31E-02
Pb	kg	3.22E+00	2.22E+01	2.22E+00	5.65E+01	1.54E+03	3.17E+01	1.47E+00	4.00E+01	9.81E+00	1.70E+02	2.80E-04	5.90E-05	1.46E-04	1.43E-04
Sr	kg	1.80E-01	9.29E-01	9.15E-02	4.21E+01	5.34E+01	3.01E+00	3.21E-02	1.05E+01	1.16E+00	1.75E+01	2.69E+00	1.61E+00	1.39E+00	3.89E+00
Se	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sn	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TBP	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table B-3. Sensitivity Case INV1 Tank Inventory and Volume. (sheet 1 of 2)

Analytes	Units	A101	A102	A103	A104	A105	A106	AX101	AX102	AX103	AX104	A_Ancillary	AX_Ancillary	A_Pipelines	AX_Pipelines
Tanks Volume	kL	1037	147	1471	93	139	273	1210	113	403	18	63.2	11.77	3.3	2.9
Ac227	Ci	6.54E-02	8.89E-03	6.75E-02	2.68E-05	1.46E-05	4.29E-03	7.03E-02	4.87E-03	1.85E-02	4.07E-06	1.95E-03	4.33E-04	1.02E-04	1.07E-04
Am241	Ci	3.56E+02	3.47E+02	3.85E+02	6.82E+02	2.95E+03	1.31E+03	3.35E+02	2.02E+03	6.81E+02	5.75E+02	3.83E+02	1.52E+02	2.00E+01	3.75E+01
Am243	Ci	2.11E-01	1.99E-01	2.25E-01	3.57E-01	1.67E+00	3.08E+00	2.17E-01	1.95E+00	3.89E-01	3.23E-01	3.03E-01	1.07E-01	1.58E-02	2.64E-02
C14	Ci	6.54E+00	2.48E-01	4.59E+00	3.24E-01	2.75E-01	3.72E-01	6.77E+00	6.61E-02	1.72E+00	6.83E-02	1.89E-01	4.19E-02	9.86E-03	1.03E-02
Cd113m	Ci	8.00E+00	9.68E-01	7.30E+00	2.18E-01	3.12E-01	8.62E-01	8.40E+00	6.74E-01	2.20E+00	7.76E-02	2.85E-01	6.66E-02	1.49E-02	1.64E-02
Cm243	Ci	5.77E-03	4.53E-03	5.54E-03	7.21E-03	5.28E-02	9.85E-02	6.55E-03	1.04E-01	1.21E-02	1.02E-02	9.04E-03	4.48E-03	4.72E-04	1.10E-03
Cm244	Ci	6.75E-02	5.36E-02	6.48E-02	8.40E-02	6.06E-01	1.17E+00	7.82E-02	1.25E+00	1.40E-01	1.18E-01	1.06E-01	5.30E-02	5.51E-03	1.31E-02
Co60	Ci	1.01E-01	5.64E-02	6.02E-02	2.75E-01	4.03E-01	1.88E-01	9.08E-02	2.39E-01	1.66E-01	2.25E-01	7.44E-02	4.44E-02	3.89E-03	1.09E-02
Cs137	Ci	1.05E+05	1.47E+04	9.91E+04	1.89E+04	3.73E+04	2.83E+04	1.36E+05	8.53E+03	4.00E+04	1.11E+04	8.89E+03	2.66E+03	4.64E+02	6.55E+02
Eu152	Ci	7.54E-01	1.20E-01	5.78E-01	7.71E-01	6.63E+00	6.39E+00	5.11E-01	1.99E+00	1.55E+00	1.65E+00	8.57E-01	3.34E-01	4.47E-02	8.22E-02
Eu154	Ci	1.40E+01	2.25E+00	1.08E+01	2.78E+01	7.05E+01	1.18E+02	9.15E+00	1.90E+01	4.70E+01	1.38E+01	1.34E+01	3.11E+00	7.00E-01	7.67E-01
Eu155	Ci	3.07E-01	4.97E-02	2.32E-01	3.10E-01	5.97E-01	2.55E+00	1.81E-01	4.18E-01	6.63E-01	3.51E-01	1.87E-01	7.35E-02	9.78E-03	1.81E-02
H3	Ci	1.48E+00	1.64E-01	1.23E+00	1.13E-01	6.96E-02	2.31E-01	1.54E+00	1.39E-01	3.90E-01	1.74E-02	6.25E-02	1.30E-02	3.26E-03	3.21E-03
I129	Ci	2.33E-01	1.93E-02	4.83E-02	6.36E-03	9.47E-04	3.55E-02	2.52E-01	1.68E-02	6.77E-02	2.36E-04	6.26E-03	1.58E-03	3.27E-04	3.90E-04
Nb93m	Ci	3.87E+01	5.33E+00	3.99E+01	2.25E+00	2.87E+00	5.10E+00	4.14E+01	3.02E+00	1.16E+01	7.13E-01	1.73E+00	3.80E-01	9.03E-02	9.37E-02
Ni59	Ci	1.41E+01	1.76E+00	1.18E+01	8.62E+00	7.20E+00	6.96E+00	1.40E+01	1.71E+00	5.06E+00	1.79E+00	2.14E+00	4.08E-01	1.12E-01	1.01E-01
Ni63	Ci	9.57E+02	1.20E+02	8.03E+02	5.83E+02	4.93E+02	4.73E+02	9.53E+02	1.17E+02	3.45E+02	1.23E+02	1.46E+02	2.79E+01	7.60E+00	6.89E+00
Np237	Ci	1.36E+00	1.52E-01	1.12E+00	5.82E-02	7.62E-02	1.64E-01	1.39E+00	2.99E-01	5.75E-02	1.72E-02	5.14E-02	1.44E-02	2.68E-03	3.55E-03
Pa231	Ci	8.25E-02	1.13E-02	8.53E-02	3.89E-05	1.57E-05	5.42E-03	8.89E-02	6.15E-03	2.34E-02	5.03E-06	2.47E-03	5.48E-04	1.29E-04	1.35E-04
Pb210	Ci	5.42E-05	1.25E-05	4.89E-05	2.46E-06	1.45E-06	5.04E-06	5.17E-05	4.87E-06	1.52E-05	4.56E-07	2.38E-06	4.38E-07	1.24E-07	1.08E-07
Pu238	Ci	2.56E+00	9.35E+00	6.78E+00	1.39E+01	1.88E+01	4.21E+01	3.07E+00	1.06E+01	3.18E+00	5.77E+00	5.36E+00	1.25E+00	2.80E-01	3.08E-01
Pu239	Ci	7.98E+01	3.21E+02	2.28E+02	5.96E+02	5.56E+02	1.42E+03	1.05E+02	1.52E+02	9.25E+01	1.73E+02	1.90E+02	3.31E+01	9.91E+00	8.16E+00
Pu240	Ci	1.91E+01	7.43E+01	5.33E+01	1.31E+02	1.36E+02	3.30E+02	2.42E+01	4.85E+01	2.33E+01	4.23E+01	4.37E+01	8.40E+00	2.28E+00	2.07E+00
Pu241	Ci	1.60E+01	6.31E+01	4.51E+01	7.93E+01	1.14E+02	2.63E+02	1.96E+01	7.82E+01	1.89E+01	3.55E+01	3.28E+01	8.03E+00	1.71E+00	1.98E+00
Pu242	Ci	1.42E-03	5.57E-03	3.98E-03	6.55E-03	9.91E-03	2.29E-02	1.72E-03	7.50E-03	1.65E-03	3.09E-03	2.82E-03	7.16E-04	1.47E-04	1.76E-04
Ra226	Ci	7.55E-05	2.73E-05	7.69E-05	5.49E-06	2.19E-06	8.16E-06	7.97E-05	7.42E-06	2.10E-05	8.14E-07	4.38E-06	6.73E-07	2.28E-07	1.66E-07
Ra228	Ci	1.10E-04	1.49E-05	1.13E-04	1.63E-06	1.90E-11	7.76E-06	1.18E-04	1.19E-03	1.22E-04	5.95E-12	3.48E-06	3.22E-05	1.82E-07	7.93E-06
Rn222	Ci	7.55E-05	2.73E-05	7.69E-05	5.49E-06	2.19E-06	8.16E-06	7.97E-05	7.42E-06	2.10E-05	8.14E-07	4.37E-06	6.73E-07	2.28E-07	1.66E-07
Se79	Ci	1.48E+00	1.96E-01	1.48E+00	8.89E-02	1.13E-01	1.82E-01	1.58E+00	3.55E-02	4.37E-01	2.82E-02	6.53E-02	1.26E-02	3.41E-03	3.10E-03
Sm151	Ci	1.33E+04	3.14E+03	1.12E+04	2.70E+04	5.60E+04	1.69E+05	1.92E+04	2.67E+04	1.49E+04	1.40E+04	1.42E+04	3.13E+03	7.44E+02	7.72E+02

Table B-4. Sensitivity Case INV1 Tank Inventory and Volume. (sheet 2 of 2)

Analytes	Units	A101	A102	A103	A104	A105	A106	AX101	AX102	AX103	AX104	A_Ancillary	AX_Ancillary	A_Pipelines	AX_Pipelines
Sn126	Ci	3.79E+00	6.40E-01	4.82E+00	1.79E-01	2.29E-01	4.01E-01	4.23E+00	1.08E+00	1.26E+00	5.69E-02	1.72E-01	5.69E-02	8.98E-03	1.40E-02
Sr90	Ci	4.00E+04	2.50E+04	4.58E+04	6.67E+05	9.54E+05	7.80E+05	6.49E+04	7.60E+04	1.47E+05	4.36E+05	1.80E+05	7.44E+04	9.42E+03	1.83E+04
Tc99	Ci	2.29E+02	3.62E+01	2.62E+02	1.24E+01	1.58E+01	8.76E+01	2.48E+02	6.30E+00	7.03E+01	1.32E+01	1.28E+01	3.44E+00	6.67E-01	8.47E-01
Th229	Ci	1.04E-02	4.49E-02	1.72E-02	6.32E-04	2.70E-08	7.44E-04	5.66E-03	4.24E-03	3.71E-04	2.32E-08	3.55E-03	1.27E-04	1.85E-04	3.12E-05
Th230	Ci	3.14E-04	1.60E-03	6.18E-04	3.38E-04	9.21E-07	1.06E-04	3.21E-04	1.35E-04	6.89E-05	2.41E-05	1.64E-04	8.73E-06	8.58E-06	2.15E-06
Th232	Ci	1.10E-04	1.49E-05	1.13E-04	1.63E-06	1.91E-11	7.76E-06	1.18E-04	1.19E-03	1.22E-04	6.34E-12	3.48E-06	3.22E-05	1.82E-07	7.93E-06
U232	Ci	2.67E-02	1.40E-01	5.36E-02	1.94E-03	4.19E-08	2.33E-03	1.77E-02	1.09E-02	6.75E-03	1.73E-06	1.10E-02	3.76E-04	5.74E-04	9.26E-05
U233	Ci	2.63E+00	1.38E+01	5.27E+00	1.94E-01	9.05E-06	2.28E-01	1.73E+00	1.07E+00	9.15E-02	7.22E-06	1.08E+00	3.27E-02	5.66E-02	8.07E-03
U234	Ci	4.75E-01	2.41E+00	9.34E-01	5.12E-01	2.95E-03	1.64E-01	4.84E-01	2.04E-01	1.04E-01	3.69E-02	2.49E-01	1.33E-02	1.30E-02	3.28E-03
U235	Ci	1.93E-02	9.78E-02	3.78E-02	2.15E-02	5.56E-05	6.68E-03	1.99E-02	8.26E-03	2.75E-03	1.53E-03	1.02E-02	5.33E-04	5.31E-04	1.31E-04
U236	Ci	1.24E-02	6.34E-02	2.46E-02	1.23E-02	1.61E-04	4.45E-03	1.27E-02	5.73E-03	3.70E-03	9.77E-04	6.42E-03	3.67E-04	3.35E-04	9.04E-05
U238	Ci	4.27E-01	2.17E+00	8.39E-01	5.07E-01	8.57E-04	1.53E-01	4.48E-01	1.80E-01	6.45E-02	3.55E-02	2.29E-01	1.20E-02	1.20E-02	2.97E-03
Zr93	Ci	4.05E+01	5.57E+00	4.17E+01	2.35E+00	3.00E+00	5.33E+00	4.33E+01	3.16E+00	1.21E+01	7.46E-01	1.81E+00	3.98E-01	9.44E-02	9.80E-02
Al	kg	4.50E+04	7.73E+03	3.46E+04	7.08E+03	8.28E+03	1.02E+04	4.96E+04	2.37E+03	1.51E+04	1.71E+03	3.08E+03	5.72E+02	1.61E+02	1.41E+02
B	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CN	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cr	kg	6.58E+03	1.63E+03	2.71E+03	1.58E+02	3.56E+02	1.93E+03	4.21E+03	1.02E+02	2.13E+03	1.87E+01	3.22E+02	3.15E+01	1.68E+01	7.76E+00
F	kg	9.85E+02	5.36E+01	1.18E+03	1.92E+00	1.68E+01	1.04E+02	1.20E+03	5.92E+01	5.39E+02	3.27E+00	2.78E+01	8.93E+00	1.45E+00	2.20E+00
Fe	kg	7.34E+02	4.65E+03	1.73E+03	2.59E+04	1.92E+04	1.83E+04	1.25E+03	6.40E+03	4.54E+03	8.77E+03	5.45E+03	1.64E+03	2.84E+02	4.03E+02
Hg	kg	3.40E+00	9.92E-01	2.69E+00	3.20E+01	2.14E+01	1.80E+02	1.32E+01	7.59E+00	5.24E+00	5.32E+00	1.23E+01	1.14E+00	6.43E-01	2.80E-01
Mn	kg	2.06E+02	9.12E+02	2.97E+02	3.63E+03	6.49E+02	8.85E+02	4.67E+01	5.22E+02	6.15E+02	1.52E+02	5.64E+02	4.30E+01	2.95E+01	1.06E+01
Ni	kg	3.27E+02	1.36E+02	2.69E+02	1.68E+03	1.55E+03	7.03E+02	1.43E+02	1.49E+02	2.70E+02	4.72E+02	3.50E+02	8.33E+01	1.83E+01	2.05E+01
NO2	kg	1.33E+05	2.25E+04	1.63E+05	5.88E+03	3.73E+02	1.15E+04	1.64E+05	5.07E+03	5.39E+04	7.27E+01	5.27E+03	9.36E+02	2.75E+02	2.31E+02
NO3	kg	2.44E+05	2.49E+04	2.29E+05	3.02E+02	9.53E+03	3.10E+04	3.04E+05	2.58E+04	6.83E+04	1.48E+03	7.85E+03	2.15E+03	4.10E+02	5.30E+02
Pb	kg	3.28E+02	3.20E+02	3.21E+02	5.65E+01	1.54E+03	8.50E+02	1.74E+02	4.43E+02	3.88E+02	3.00E+02	1.84E+02	6.38E+01	9.63E+00	1.57E+01
Sr	kg	1.83E+01	1.34E+01	1.32E+01	4.21E+01	5.34E+01	8.07E+01	3.81E+00	1.16E+02	4.58E+01	3.09E+01	1.32E+01	8.41E+00	6.88E-01	2.07E+00
Se	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sn	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TBP	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table B-5. Sensitivity Case INV2 Tank Inventory and Volume. (sheet 1 of 2)

Analytes	Units	A101	A102	A103	A104	A105	A106	AX101	AX102	AX103	AX104	A_Ancillary	AX_Ancillary	A_Pipelines	AX_Pipelines
Tank Volume	kL	10.19	10.19	10.19	93	139	10.19	10.19	10.19	10.19	10.19	6.36	1.20	3.3	2.9
Ac227	Ci	6.42E-04	6.17E-04	4.68E-04	2.68E-05	1.46E-05	1.60E-04	5.92E-04	4.39E-04	4.68E-04	2.30E-06	1.97E-04	4.43E-05	1.02E-04	1.07E-04
Am241	Ci	3.50E+00	2.41E+01	2.67E+00	6.82E+02	2.95E+03	4.91E+01	2.82E+00	1.82E+02	1.72E+01	3.26E+02	3.85E+01	1.56E+01	2.00E+01	3.75E+01
Am243	Ci	2.08E-03	1.38E-02	1.56E-03	3.57E-01	1.67E+00	1.15E-01	1.83E-03	1.76E-01	9.83E-03	1.83E-01	3.05E-02	1.09E-02	1.58E-02	2.64E-02
C14	Ci	6.43E-02	1.72E-02	3.18E-02	3.24E-01	2.75E-01	1.39E-02	5.71E-02	5.96E-03	4.35E-02	3.87E-02	1.90E-02	4.28E-03	9.86E-03	1.03E-02
Cd113m	Ci	7.87E-02	6.71E-02	5.06E-02	2.18E-01	3.12E-01	3.22E-02	7.08E-02	6.08E-02	5.55E-02	4.39E-02	2.86E-02	6.81E-03	1.49E-02	1.64E-02
Cm243	Ci	5.68E-05	3.14E-04	3.84E-05	7.21E-03	5.28E-02	3.68E-03	5.52E-05	9.39E-03	3.06E-04	5.78E-03	9.09E-04	4.58E-04	4.72E-04	1.10E-03
Cm244	Ci	6.63E-04	3.72E-03	4.49E-04	8.40E-02	6.06E-01	4.37E-02	6.59E-04	1.13E-01	3.54E-03	6.66E-02	1.06E-02	5.42E-03	5.51E-03	1.31E-02
Co60	Ci	9.94E-04	3.91E-03	4.17E-04	2.75E-01	4.03E-01	7.04E-03	7.65E-04	2.16E-02	4.20E-03	1.27E-01	7.49E-03	4.54E-03	3.89E-03	1.09E-02
Cs137	Ci	1.03E+03	1.02E+03	6.87E+02	1.89E+04	3.73E+04	1.06E+03	1.14E+03	7.70E+02	1.01E+03	6.28E+03	8.94E+02	2.72E+02	4.64E+02	6.55E+02
Eu152	Ci	7.42E-03	8.34E-03	4.00E-03	7.71E-01	6.63E+00	2.39E-01	4.31E-03	1.80E-01	3.92E-02	9.33E-01	8.62E-02	3.41E-02	4.47E-02	8.22E-02
Eu154	Ci	1.38E-01	1.56E-01	7.46E-02	2.78E+01	7.05E+01	4.39E+00	7.71E-02	1.71E+00	1.19E+00	7.81E+00	1.35E+00	3.18E-01	7.00E-01	7.67E-01
Eu155	Ci	3.02E-03	3.45E-03	1.61E-03	3.10E-01	5.97E-01	9.54E-02	1.53E-03	3.77E-02	1.68E-02	1.99E-01	1.88E-02	7.51E-03	9.78E-03	1.81E-02
H3	Ci	1.45E-02	1.14E-02	8.52E-03	1.13E-01	6.96E-02	8.63E-03	1.29E-02	1.26E-02	9.86E-03	9.84E-03	6.29E-03	1.33E-03	3.26E-03	3.21E-03
I129	Ci	2.29E-03	1.34E-03	3.35E-04	6.36E-03	9.47E-04	1.33E-03	2.12E-03	1.52E-03	1.71E-03	1.34E-04	6.29E-04	1.62E-04	3.27E-04	3.90E-04
Nb93m	Ci	3.80E-01	3.70E-01	2.77E-01	2.25E+00	2.87E+00	1.90E-01	3.49E-01	2.72E-01	2.92E-01	4.04E-01	1.74E-01	3.89E-02	9.03E-02	9.37E-02
Ni59	Ci	1.39E-01	1.22E-01	8.18E-02	8.62E+00	7.20E+00	2.60E-01	1.18E-01	1.54E-01	1.28E-01	1.01E+00	2.16E-01	4.17E-02	1.12E-01	1.01E-01
Ni63	Ci	9.41E+00	8.30E+00	5.57E+00	5.83E+02	4.93E+02	1.76E+01	8.03E+00	1.05E+01	8.72E+00	6.96E+01	1.46E+01	2.86E+00	7.60E+00	6.89E+00
Np237	Ci	1.33E-02	1.05E-02	7.79E-03	5.82E-02	7.62E-02	6.12E-03	1.17E-02	2.70E-02	1.46E-03	9.73E-03	5.17E-03	1.47E-03	2.68E-03	3.55E-03
Pa231	Ci	8.11E-04	7.81E-04	5.91E-04	3.89E-05	1.57E-05	2.02E-04	7.49E-04	5.55E-04	5.92E-04	2.85E-06	2.48E-04	5.60E-05	1.29E-04	1.35E-04
Pb210	Ci	5.33E-07	8.69E-07	3.39E-07	2.46E-06	1.45E-06	1.88E-07	4.36E-07	4.39E-07	3.83E-07	2.58E-07	2.39E-07	4.47E-08	1.24E-07	1.08E-07
Pu238	Ci	2.52E-02	6.49E-01	4.70E-02	1.39E+01	1.88E+01	1.57E+00	2.59E-02	9.60E-01	8.03E-02	3.27E+00	5.39E-01	1.28E-01	2.80E-01	3.08E-01
Pu239	Ci	7.85E-01	2.22E+01	1.58E+00	5.96E+02	5.56E+02	5.30E+01	8.84E-01	1.37E+01	2.34E+00	9.79E+01	1.91E+01	3.39E+00	9.91E+00	8.16E+00
Pu240	Ci	1.88E-01	5.16E+00	3.69E-01	1.31E+02	1.36E+02	1.23E+01	2.04E-01	4.38E+00	5.89E-01	2.39E+01	4.39E+00	8.58E-01	2.28E+00	2.07E+00
Pu241	Ci	1.58E-01	4.38E+00	3.13E-01	7.93E+01	1.14E+02	9.80E+00	1.66E-01	7.06E+00	4.79E-01	2.01E+01	3.30E+00	8.20E-01	1.71E+00	1.98E+00
Pu242	Ci	1.39E-05	3.87E-04	2.76E-05	6.55E-03	9.91E-03	8.53E-04	1.45E-05	6.76E-04	4.17E-05	1.75E-03	2.83E-04	7.32E-05	1.47E-04	1.76E-04
Ra226	Ci	7.42E-07	1.89E-06	5.33E-07	5.49E-06	2.19E-06	3.05E-07	6.71E-07	6.69E-07	5.32E-07	4.61E-07	4.40E-07	6.88E-08	2.28E-07	1.66E-07
Ra228	Ci	1.08E-06	1.03E-06	7.83E-07	1.63E-06	1.90E-11	2.90E-07	9.94E-07	1.07E-04	3.09E-06	3.37E-12	3.50E-07	3.29E-06	1.82E-07	7.93E-06
Rn222	Ci	7.42E-07	1.89E-06	5.33E-07	5.49E-06	2.19E-06	3.05E-07	6.71E-07	6.69E-07	5.32E-07	4.61E-07	4.40E-07	6.88E-08	2.28E-07	1.66E-07
Se79	Ci	1.46E-02	1.36E-02	1.03E-02	8.89E-02	1.13E-01	6.80E-03	1.33E-02	3.20E-03	1.11E-02	1.60E-02	6.57E-03	1.28E-03	3.41E-03	3.10E-03
Sm151	Ci	1.31E+02	2.18E+02	7.76E+01	2.70E+04	5.60E+04	6.30E+03	1.62E+02	2.41E+03	3.77E+02	7.90E+03	1.43E+03	3.20E+02	7.44E+02	7.72E+02

Table B-6. Sensitivity Case INV2 Tank Inventory and Volume. (sheet 2 of 2)

Analytes	Units	A101	A102	A103	A104	A105	A106	AX101	AX102	AX103	AX104	A_Ancillary	AX_Ancillary	A_Pipelines	AX_Pipelines
Sn126	Ci	3.73E-02	4.44E-02	3.34E-02	1.79E-01	2.29E-01	1.50E-02	3.56E-02	9.74E-02	3.19E-02	3.22E-02	1.73E-02	5.82E-03	8.98E-03	1.40E-02
Sr90	Ci	3.93E+02	1.73E+03	3.17E+02	6.67E+05	9.54E+05	2.91E+04	5.47E+02	6.86E+03	3.72E+03	2.47E+05	1.81E+04	7.61E+03	9.42E+03	1.83E+04
Tc99	Ci	2.25E+00	2.51E+00	1.82E+00	1.24E+01	1.58E+01	3.27E+00	2.09E+00	5.68E-01	1.78E+00	7.48E+00	1.29E+00	3.51E-01	6.67E-01	8.47E-01
Th229	Ci	1.03E-04	3.11E-03	1.19E-04	6.32E-04	2.70E-08	2.78E-05	4.77E-05	3.82E-04	9.38E-06	1.31E-08	3.57E-04	1.30E-05	1.85E-04	3.12E-05
Th230	Ci	3.09E-06	1.11E-04	4.28E-06	3.38E-04	9.21E-07	3.96E-06	2.70E-06	1.22E-05	1.74E-06	1.37E-05	1.65E-05	8.92E-07	8.58E-06	2.15E-06
Th232	Ci	1.08E-06	1.03E-06	7.83E-07	1.63E-06	1.91E-11	2.90E-07	9.94E-07	1.07E-04	3.09E-06	3.59E-12	3.50E-07	3.29E-06	1.82E-07	7.93E-06
U232	Ci	2.62E-04	9.70E-03	3.72E-04	1.94E-03	4.19E-08	8.68E-05	1.49E-04	9.82E-04	1.71E-04	9.81E-07	1.11E-03	3.84E-05	5.74E-04	9.26E-05
U233	Ci	2.59E-02	9.57E-01	3.65E-02	1.94E-01	9.05E-06	8.51E-03	1.46E-02	9.65E-02	2.31E-03	4.09E-06	1.09E-01	3.35E-03	5.66E-02	8.07E-03
U234	Ci	4.67E-03	1.67E-01	6.47E-03	5.12E-01	2.95E-03	6.11E-03	4.08E-03	1.84E-02	2.64E-03	2.09E-02	2.50E-02	1.36E-03	1.30E-02	3.28E-03
U235	Ci	1.90E-04	6.78E-03	2.62E-04	2.15E-02	5.56E-05	2.49E-04	1.68E-04	7.45E-04	6.97E-05	8.64E-04	1.02E-03	5.45E-05	5.31E-04	1.31E-04
U236	Ci	1.22E-04	4.40E-03	1.70E-04	1.23E-02	1.61E-04	1.66E-04	1.07E-04	5.17E-04	9.36E-05	5.53E-04	6.46E-04	3.75E-05	3.35E-04	9.04E-05
U238	Ci	4.20E-03	1.51E-01	5.81E-03	5.07E-01	8.57E-04	5.71E-03	3.77E-03	1.62E-02	1.63E-03	2.01E-02	2.31E-02	1.23E-03	1.20E-02	2.97E-03
Zr93	Ci	3.98E-01	3.86E-01	2.89E-01	2.35E+00	3.00E+00	1.99E-01	3.65E-01	2.85E-01	3.06E-01	4.23E-01	1.82E-01	4.07E-02	9.44E-02	9.80E-02
Al	kg	4.42E+02	5.36E+02	2.40E+02	7.08E+03	8.28E+03	3.81E+02	4.18E+02	2.14E+02	3.82E+02	9.68E+02	3.10E+02	5.85E+01	1.61E+02	1.41E+02
B	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CN	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cr	kg	6.47E+01	1.13E+02	1.88E+01	1.58E+02	3.56E+02	7.21E+01	3.55E+01	9.20E+00	5.39E+01	1.06E+01	3.24E+01	3.22E+00	1.68E+01	7.76E+00
F	kg	9.68E+00	3.72E+00	8.18E+00	1.92E+00	1.68E+01	3.88E+00	1.01E+01	5.34E+00	1.36E+01	1.85E+00	2.80E+00	9.12E-01	1.45E+00	2.20E+00
Fe	kg	7.22E+00	3.22E+02	1.20E+01	2.59E+04	1.92E+04	6.83E+02	1.05E+01	5.77E+02	1.15E+02	4.97E+03	5.48E+02	1.67E+02	2.84E+02	4.03E+02
Hg	kg	3.34E-02	6.88E-02	1.86E-02	3.20E+01	2.14E+01	6.72E+00	1.11E-01	6.85E-01	1.33E-01	3.01E+00	1.24E+00	1.16E-01	6.43E-01	2.80E-01
Mn	kg	2.03E+00	6.32E+01	2.06E+00	3.63E+03	6.49E+02	3.30E+01	3.93E-01	4.71E+01	1.56E+01	8.61E+01	5.67E+01	4.40E+00	2.95E+01	1.06E+01
Ni	kg	3.21E+00	9.43E+00	1.86E+00	1.68E+03	1.55E+03	2.63E+01	1.20E+00	1.34E+01	6.83E+00	2.67E+02	3.52E+01	8.52E+00	1.83E+01	2.05E+01
NO2	kg	1.31E+03	1.56E+03	1.13E+03	5.88E+03	3.73E+02	4.29E+02	1.38E+03	4.57E+02	1.36E+03	4.12E+01	5.30E+02	9.57E+01	2.75E+02	2.31E+02
NO3	kg	2.40E+03	1.73E+03	1.59E+03	3.02E+02	9.53E+03	1.16E+03	2.56E+03	2.33E+03	1.73E+03	8.38E+02	7.90E+02	2.20E+02	4.10E+02	5.30E+02
Pb	kg	3.22E+00	2.22E+01	2.22E+00	5.65E+01	1.54E+03	3.17E+01	1.47E+00	4.00E+01	9.81E+00	1.70E+02	1.86E+01	6.52E+00	9.63E+00	1.57E+01
Sr	kg	1.80E-01	9.29E-01	9.15E-02	4.21E+01	5.34E+01	3.01E+00	3.21E-02	1.05E+01	1.16E+00	1.75E+01	1.32E+00	8.60E-01	6.88E-01	2.07E+00
Se	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sn	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TBP	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

ATTACHMENT C

FLOW FIELD DATA FOR THE INFILTRATION SENSITIVITY CASES

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Table C-1. Darcy Flux (mm/yr) Obtained from STOMP and Used in the Infiltration Base Case for 241-A Farm Tanks (GoldSim© Element Name: DF_A_Tank_INF0). (2 sheets)

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
0	97.46284	96.6832	97.42981	97.60936	94.59303	34.74537	23.24394	8.360658
0.001	97.46284	96.6832	97.42981	97.60936	94.59303	34.74537	23.24394	8.360658
0.5	97.46252	96.68316	97.42981	97.60936	94.59303	34.61521	23.1135	8.301568
1	97.46267	96.68316	97.42981	97.60936	94.59303	32.61554	21.52094	7.66767
3	97.46268	96.68269	97.42891	97.60677	93.97094	19.65133	12.81388	4.545302
5	97.38562	96.51436	97.17841	97.13312	85.87301	13.09333	8.610817	3.07833
7	96.18139	94.52497	94.60323	93.40484	71.75145	9.689461	6.427866	2.314416
10	88.53144	84.74339	83.44948	80.36574	53.34998	6.926624	4.644661	1.686774
15	68.29168	63.39614	61.33638	57.86482	35.1865	4.680233	3.180457	1.167214
20	52.06048	47.78469	45.90033	43.03482	25.53841	3.533728	2.425337	0.897023
25	41.00745	37.50048	35.90202	33.59441	19.77845	2.841646	1.965899	0.731595
30	33.38332	30.50401	29.15186	27.26403	16.01128	2.380186	1.657652	0.620055
40	23.7728	21.76842	20.77126	19.42987	11.4128	1.801697	1.268649	0.478545
50	18.11924	16.65499	15.88669	14.87237	8.757479	1.457526	1.035621	0.393307
70	11.93344	11.06177	10.55976	9.905305	5.870617	1.073962	0.774416	0.297305
100	7.621176	7.143787	6.835263	6.431675	3.851324	0.803186	0.58927	0.229007
130	5.474709	5.177072	4.965335	4.686073	2.8354	0.670865	0.498867	0.195651
160	4.217059	4.015249	3.85929	3.652467	2.233902	0.597237	0.448781	0.177216
200	3.191226	3.059841	2.948116	2.800035	1.739133	0.542455	0.411767	0.163648
250	2.421415	2.336731	2.256935	2.152688	1.366371	0.507334	0.388257	0.155082
300	1.93798	1.879221	1.818678	1.741902	1.133553	0.489576	0.376488	0.15082
400	1.376212	1.343593	1.304443	1.259977	0.870932	0.475059	0.366974	0.1474
500	1.071539	1.051082	1.023121	0.99722	0.740759	0.470666	0.364133	0.146387
500.5	1.070383	1.049972	1.022054	0.996226	0.740301	0.470654	0.364125	0.146384
501	1.069232	1.048864	1.020988	0.995236	0.739845	0.470643	0.364118	0.146382
502	1.066939	1.046659	1.018868	0.993263	0.738938	0.47062	0.364103	0.146377
503	1.064658	1.044466	1.016759	0.991301	0.738037	0.470597	0.364088	0.146371
505	1.060134	1.040113	1.012574	0.987408	0.736255	0.470553	0.364062	0.146363
507	1.05566	1.035809	1.008432	0.983556	0.734497	0.470522	0.364064	0.146373
510	1.049039	1.029435	1.002302	0.977856	0.731907	0.470676	0.364437	0.14661
515	1.038237	1.019035	0.992296	0.968556	0.727712	0.47418	0.369855	0.149651

Table C-1. Darcy Flux (mm/yr) Obtained from STOMP and Used in the Infiltration Base Case for 241-A Farm Tanks (GoldSim© Element Name: DF_A_Tank_INF0). (2 sheets)

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
520	1.027718	1.008904	0.982549	0.9595	0.723663	0.491804	0.392761	0.161575
525	1.017471	0.999032	0.973051	0.950681	0.719755	0.542999	0.451227	0.190121
530	1.007486	0.989412	0.963795	0.942091	0.715983	0.650906	0.560601	0.240184
540	0.98825	0.970875	0.945961	0.925555	0.708819	1.060384	0.909471	0.384492
550	0.969946	0.953234	0.928993	0.909839	0.702135	1.568015	1.269844	0.517768
570	0.93594	0.920452	0.897465	0.880698	0.690095	2.177586	1.645732	0.64553
600	0.890785	0.876905	0.855599	0.84214	0.675552	2.396627	1.771453	0.686506
630	0.851754	0.839255	0.819424	0.808991	0.692572	2.430088	1.790344	0.692598
660	0.818007	0.806698	0.788169	0.780536	1.286039	2.435205	1.79319	0.693506
700	0.780146	0.770261	0.753394	0.751112	3.350079	2.435985	1.793621	0.693642
800	2.114554	2.473396	2.788667	3.426105	3.861216	2.436045	1.793651	0.693652
900	3.735538	3.729203	3.724322	3.815647	3.86232	2.436045	1.793651	0.693652
1,000	3.741318	3.732675	3.726399	3.816383	3.862321	2.436045	1.793651	0.693652
1,200	3.741328	3.73268	3.726403	3.816384	3.862321	2.436045	1.793651	0.693652
1,400	3.741328	3.73268	3.726403	3.816384	3.862321	2.436045	1.793651	0.693652
1,600	3.741328	3.73268	3.726403	3.816384	3.862321	2.436045	1.793651	0.693652
1,800	3.741328	3.73268	3.726403	3.816384	3.862321	2.436045	1.793651	0.693652
2,000	3.741328	3.73268	3.726403	3.816384	3.862321	2.436045	1.793651	0.693652
2,200	3.741328	3.73268	3.726403	3.816384	3.862321	2.436045	1.793651	0.693652
2,400	3.741328	3.73268	3.726403	3.816384	3.862321	2.436045	1.793651	0.693652
2,600	3.741328	3.73268	3.726403	3.816384	3.862321	2.436045	1.793651	0.693652
2,800	3.741328	3.73268	3.726403	3.816384	3.862321	2.436045	1.793651	0.693652
3,000	3.741328	3.73268	3.726403	3.816384	3.862321	2.436045	1.793651	0.693652
10,000	3.741328	3.73268	3.726403	3.816384	3.862321	2.436045	1.793651	0.693652

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Table C-2. Moisture Content Values obtained from STOMP and Used in the Infiltration Base Case for 241-A Farm Tanks (GoldSim© Element Name: MC_A_Tank_INF0). (2 sheets)

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
0	0.085117	0.254387	0.094557	0.104177	0.10376	0.093547	0.090741	0.086052
0.001	0.085117	0.254387	0.094557	0.104177	0.10376	0.093547	0.090741	0.086052
0.5	0.085117	0.254387	0.094557	0.104177	0.10376	0.093515	0.090693	0.085987
1	0.085117	0.254387	0.094557	0.104177	0.10376	0.092909	0.089983	0.085219
3	0.085117	0.254387	0.094557	0.104177	0.103682	0.087319	0.084508	0.080203
5	0.085112	0.25435	0.094538	0.104115	0.102515	0.083042	0.080528	0.076712
7	0.085038	0.253855	0.094326	0.103593	0.100144	0.080053	0.077767	0.074302
10	0.084547	0.251007	0.093306	0.101559	0.096321	0.076904	0.074862	0.071763
15	0.083101	0.243058	0.09077	0.097225	0.091246	0.073463	0.071685	0.068978
20	0.081759	0.235365	0.088388	0.093512	0.087586	0.071145	0.06954	0.067092
25	0.080722	0.228968	0.086388	0.090553	0.084819	0.069426	0.067949	0.065688
30	0.079933	0.223719	0.08471	0.088159	0.082628	0.068079	0.0667	0.064584
40	0.078832	0.215626	0.082024	0.084466	0.079295	0.066044	0.064812	0.062912
50	0.078115	0.209703	0.079947	0.081709	0.076831	0.064558	0.063434	0.061689
70	0.077257	0.201631	0.076885	0.077767	0.073337	0.062499	0.061528	0.059998
100	0.076605	0.19443	0.073792	0.073886	0.069927	0.060609	0.059787	0.058458
130	0.076261	0.190085	0.071654	0.071226	0.067614	0.059452	0.058732	0.057532
160	0.076052	0.187207	0.070057	0.069238	0.065902	0.058699	0.058053	0.056941
200	0.075878	0.184628	0.068443	0.067214	0.064182	0.058062	0.057486	0.056453
250	0.075746	0.182525	0.066941	0.065306	0.062596	0.057604	0.057084	0.056111
300	0.075661	0.181119	0.0658	0.063835	0.061409	0.057349	0.056864	0.055926
400	0.075562	0.179389	0.064172	0.061693	0.059788	0.057124	0.056672	0.055766
500	0.075508	0.178403	0.063081	0.060224	0.058809	0.05705	0.05661	0.055715
500.5	0.075507	0.178399	0.063076	0.060217	0.058805	0.05705	0.05661	0.055715
501	0.075507	0.178395	0.063072	0.060211	0.058801	0.05705	0.05661	0.055715
502	0.075507	0.178388	0.063063	0.060199	0.058794	0.057049	0.056609	0.055715
503	0.075506	0.17838	0.063054	0.060187	0.058787	0.057049	0.056609	0.055715
505	0.075506	0.178365	0.063036	0.060163	0.058772	0.057048	0.056608	0.055714
507	0.075505	0.17835	0.063018	0.060139	0.058757	0.057047	0.056608	0.055714
510	0.075504	0.178328	0.062992	0.060103	0.058736	0.057047	0.056609	0.055717
515	0.075502	0.178293	0.062949	0.060045	0.058701	0.057059	0.056636	0.055768

Table C-2. Moisture Content Values obtained from STOMP and Used in the Infiltration Base Case for 241-A Farm Tanks (GoldSim© Element Name: MC_A_Tank_INF0). (2 sheets)

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
520	0.0755	0.178258	0.062907	0.059987	0.058667	0.057135	0.056775	0.055984
525	0.075498	0.178224	0.062866	0.059931	0.058635	0.057388	0.057171	0.056517
530	0.075496	0.178191	0.062825	0.059875	0.058603	0.057964	0.057956	0.057442
540	0.075493	0.178127	0.062746	0.059767	0.058542	0.060227	0.06048	0.059945
550	0.075489	0.178066	0.06267	0.059663	0.058484	0.062994	0.063025	0.062112
570	0.075483	0.177952	0.062526	0.059466	0.058379	0.066244	0.065635	0.064124
600	0.075475	0.1778	0.06233	0.059197	0.058245	0.067375	0.066485	0.06475
630	0.075468	0.177668	0.062155	0.058957	0.058254	0.067542	0.066609	0.064841
660	0.075462	0.177553	0.062	0.058744	0.060647	0.067568	0.066629	0.064854
700	0.075455	0.177424	0.061822	0.058507	0.068068	0.067572	0.066631	0.064857
800	0.075692	0.182051	0.067682	0.068222	0.069667	0.067572	0.066632	0.064857
900	0.075971	0.186161	0.06972	0.069396	0.06967	0.067572	0.066632	0.064857
1,000	0.075972	0.186173	0.069724	0.069398	0.06967	0.067572	0.066632	0.064857
1,200	0.075972	0.186174	0.069724	0.069398	0.06967	0.067572	0.066632	0.064857
1,400	0.075972	0.186174	0.069724	0.069398	0.06967	0.067572	0.066632	0.064857
1,600	0.075972	0.186174	0.069724	0.069398	0.06967	0.067572	0.066632	0.064857
1,800	0.075972	0.186174	0.069724	0.069398	0.06967	0.067572	0.066632	0.064857
2,000	0.075972	0.186174	0.069724	0.069398	0.06967	0.067572	0.066632	0.064857
2,200	0.075972	0.186174	0.069724	0.069398	0.06967	0.067572	0.066632	0.064857
2,400	0.075972	0.186174	0.069724	0.069398	0.06967	0.067572	0.066632	0.064857
2,600	0.075972	0.186174	0.069724	0.069398	0.06967	0.067572	0.066632	0.064857
2,800	0.075972	0.186174	0.069724	0.069398	0.06967	0.067572	0.066632	0.064857
3,000	0.075972	0.186174	0.069724	0.069398	0.06967	0.067572	0.066632	0.064857
10,000	0.075972	0.186174	0.069724	0.069398	0.06967	0.067572	0.066632	0.064857

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Table C-3. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF1 Sensitivity Case for 241-A Farm Tanks (GoldSim© Element Name: DF_A_Tank_INF1).

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
0	97.46284	96.6832	97.42981	97.60936	94.59303	34.74537	23.24394	8.360658
0.001	97.46284	96.6832	97.42981	97.60936	94.59303	34.74537	23.24394	8.360658
0.5	97.46252	96.68316	97.42981	97.60936	94.59303	34.61521	23.1135	8.301568
1	97.46267	96.68316	97.42981	97.60936	94.59303	32.61554	21.52094	7.66767
3	97.46268	96.68269	97.42891	97.60677	93.97094	19.65133	12.81388	4.545302
5	97.38562	96.51436	97.17841	97.13312	85.87301	13.09333	8.610817	3.07833
7	96.18139	94.52497	94.60323	93.40484	71.75145	9.689461	6.427866	2.314416
10	88.53144	84.74339	83.44948	80.36574	53.34998	6.926624	4.644661	1.686774
15	68.29168	63.39614	61.33638	57.86482	35.1865	4.680233	3.180457	1.167214
20	52.06048	47.78469	45.90033	43.03482	25.53841	3.533728	2.425337	0.897023
25	41.00745	37.50048	35.90202	33.59441	19.77845	2.841646	1.965899	0.731595
30	33.38332	30.50401	29.15186	27.26403	16.01128	2.380186	1.657652	0.620055
40	23.7728	21.76842	20.77126	19.42987	11.4128	1.801697	1.268649	0.478545
50	18.11924	16.65499	15.88669	14.87237	8.757479	1.457526	1.035621	0.393307
70	11.93344	11.06177	10.55976	9.905305	5.870617	1.073962	0.774416	0.297305
100	7.621176	7.143787	6.835263	6.431675	3.851324	0.803186	0.58927	0.229007
130	5.474709	5.177072	4.965335	4.686073	2.8354	0.670865	0.498867	0.195651
160	4.217059	4.015249	3.85929	3.652467	2.233902	0.597237	0.448781	0.177216
200	3.191226	3.059841	2.948116	2.800035	1.739133	0.542455	0.411767	0.163648
250	2.421415	2.336731	2.256935	2.152688	1.366371	0.507334	0.388257	0.155082
300	1.93798	1.879221	1.818678	1.741902	1.133553	0.489576	0.376488	0.15082
400	1.376212	1.343593	1.304443	1.259977	0.870932	0.475059	0.366974	0.1474
500	1.071539	1.051082	1.023121	0.99722	0.740759	0.470666	0.364133	0.146387
10,000	1.071539	1.051082	1.023121	0.99722	0.740759	0.470666	0.364133	0.146387

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Table C-4. Moisture Content Values Obtained from STOMP and Used in the INF1 Sensitivity Case for 241-A Farm Tanks (GoldSim© Element Name: MC_A_Tank_INF1).

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
0	0.085117	0.254387	0.094557	0.104177	0.10376	0.093547	0.090741	0.086052
0.001	0.085117	0.254387	0.094557	0.104177	0.10376	0.093547	0.090741	0.086052
0.5	0.085117	0.254387	0.094557	0.104177	0.10376	0.093515	0.090693	0.085987
1	0.085117	0.254387	0.094557	0.104177	0.10376	0.092909	0.089983	0.085219
3	0.085117	0.254387	0.094557	0.104177	0.103682	0.087319	0.084508	0.080203
5	0.085112	0.25435	0.094538	0.104115	0.102515	0.083042	0.080528	0.076712
7	0.085038	0.253855	0.094326	0.103593	0.100144	0.080053	0.077767	0.074302
10	0.084547	0.251007	0.093306	0.101559	0.096321	0.076904	0.074862	0.071763
15	0.083101	0.243058	0.09077	0.097225	0.091246	0.073463	0.071685	0.068978
20	0.081759	0.235365	0.088388	0.093512	0.087586	0.071145	0.06954	0.067092
25	0.080722	0.228968	0.086388	0.090553	0.084819	0.069426	0.067949	0.065688
30	0.079933	0.223719	0.08471	0.088159	0.082628	0.068079	0.0667	0.064584
40	0.078832	0.215626	0.082024	0.084466	0.079295	0.066044	0.064812	0.062912
50	0.078115	0.209703	0.079947	0.081709	0.076831	0.064558	0.063434	0.061689
70	0.077257	0.201631	0.076885	0.077767	0.073337	0.062499	0.061528	0.059998
100	0.076605	0.19443	0.073792	0.073886	0.069927	0.060609	0.059787	0.058458
130	0.076261	0.190085	0.071654	0.071226	0.067614	0.059452	0.058732	0.057532
160	0.076052	0.187207	0.070057	0.069238	0.065902	0.058699	0.058053	0.056941
200	0.075878	0.184628	0.068443	0.067214	0.064182	0.058062	0.057486	0.056453
250	0.075746	0.182525	0.066941	0.065306	0.062596	0.057604	0.057084	0.056111
300	0.075661	0.181119	0.0658	0.063835	0.061409	0.057349	0.056864	0.055926
400	0.075562	0.179389	0.064172	0.061693	0.059788	0.057124	0.056672	0.055766
500	0.075508	0.178403	0.063081	0.060224	0.058809	0.05705	0.05661	0.055715
10,000	0.075508	0.178403	0.063081	0.060224	0.058809	0.05705	0.05661	0.055715

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Table C-5. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF2 Sensitivity Case for 241-A Farm Tanks (GoldSim© Element Name: DF_A_Tank_INF2).

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
0	97.46284	96.6832	97.42981	97.60936	94.59303	34.74537	23.24394	8.360658
10,000	97.46284	96.6832	97.42981	97.60936	94.59303	34.74537	23.24394	8.360658

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Table C-6. Moisture Content Values Obtained from STOMP and Used in the INF2 Sensitivity Case for 241-A Farm Tanks (GoldSim© Element Name: MC_A_Tank_INF2).

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
0	0.085117	0.254387	0.094557	0.104177	0.10376	0.093547	0.090741	0.086052
10,000	0.085117	0.254387	0.094557	0.104177	0.10376	0.093547	0.090741	0.086052

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Table C-7. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF3 Sensitivity Case for 241-A Farm Tanks (GoldSim© Element Name: DF_A_Tank_INF3).

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
0	3.741328	3.73268	3.726403	3.816384	3.862321	2.436045	1.793651	0.693652
10,000	3.741328	3.73268	3.726403	3.816384	3.862321	2.436045	1.793651	0.693652

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Table C-8. Moisture Content Values Obtained from STOMP and Used in the INF3 Sensitivity Case for 241-A Farm Tanks (GoldSim© Element Name: MC_A_Tank_INF3).

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
0	0.075972	0.186174	0.069724	0.069398	0.06967	0.067572	0.066632	0.064857
10,000	0.075972	0.186174	0.069724	0.069398	0.06967	0.067572	0.066632	0.064857

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Table C-9. Darcy Flux (mm/yr) Obtained from STOMP and Used in the Infiltration Base Case for 241-A Tank Farm Pipelines (GoldSim© Element Name: DF_A_Pipeline_INF0). (2 sheets)

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
0	101.3869	101.1809	101.7267	101.9486	104.1009	117.8048	117.4258	111.1733
0.001	101.3869	101.1809	101.7267	101.9486	104.1009	117.8048	117.4258	111.1733
0.5	101.3866	101.1808	101.7267	101.9486	104.1009	117.226	116.5237	109.914
1	101.3868	101.1809	101.7267	101.9486	104.1009	109.4393	106.9305	99.03971
3	101.3868	101.1804	101.7259	101.9463	103.4856	60.35966	56.82884	50.93219
5	101.3139	101.0239	101.4862	101.5132	95.13374	37.20214	34.88029	31.20311
7	100.1534	99.12156	98.98035	97.95441	79.92404	26.0505	24.43908	21.90429
10	92.53512	89.36579	87.77035	84.87053	59.51762	17.55292	16.50297	14.8429
15	71.68212	67.19612	64.79821	61.3542	39.10011	11.09801	10.47185	9.466328
20	54.65924	50.65012	48.48844	45.57229	28.23954	8.003234	7.575337	6.876616
25	43.01153	39.69155	37.87599	35.48576	21.77407	6.217682	5.901671	5.376701
30	34.97307	32.23121	30.70842	28.72418	17.5607	5.0685	4.823244	4.40844
40	24.85844	22.93381	21.82637	20.38103	12.44497	3.682503	3.521021	3.236939
50	18.93207	17.51648	16.67309	15.55497	9.5127	2.890802	2.776328	2.565623
70	12.48703	11.63254	11.09089	10.33685	6.349509	2.038107	1.973623	1.840644
100	8.012341	7.532223	7.205365	6.710489	4.146791	1.45002	1.419966	1.339774
130	5.770954	5.463619	5.243434	4.88223	3.035749	1.16361	1.150983	1.096696
160	4.444752	4.231519	4.072946	3.792985	2.375999	1.003005	1.000803	0.961429
200	3.35495	3.212551	3.102906	2.891488	1.833533	0.881889	0.888222	0.860532
250	2.53561	2.441237	2.366668	2.208359	1.427547	0.803095	0.815601	0.795932
300	2.024068	1.956757	1.902981	1.778941	1.177581	0.763087	0.7791	0.763757
400	1.44062	1.400784	1.369305	1.286391	0.903537	0.731073	0.750273	0.73865
500	1.135647	1.108504	1.087985	1.028496	0.773951	0.722004	0.742245	0.731764
500.5	1.134516	1.107418	1.086941	1.027543	0.773507	0.721981	0.742224	0.731747
501	1.133388	1.106336	1.085899	1.026592	0.773065	0.721958	0.742204	0.73173
502	1.131143	1.104181	1.083825	1.024701	0.772186	0.721913	0.742165	0.731696
503	1.128911	1.102039	1.081762	1.02282	0.771314	0.721868	0.742126	0.731664
505	1.124487	1.097793	1.077673	1.019092	0.76959	0.721785	0.742068	0.731661
507	1.120114	1.093594	1.07363	1.015407	0.767891	0.721766	0.742209	0.732151
510	1.11365	1.087387	1.067651	1.009958	0.765392	0.72246	0.744212	0.736428
515	1.103124	1.077276	1.057912	1.001086	0.761351	0.732018	0.763835	0.769172

Table C-9. Darcy Flux (mm/yr) Obtained from STOMP and Used in the Infiltration Base Case for 241-A Tank Farm Pipelines (GoldSim© Element Name: DF_A_Pipeline_INF0). (2 sheets)

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
520	1.092894	1.067447	1.048443	0.992466	0.75746	0.769452	0.827564	0.859187
525	1.08295	1.057891	1.039236	0.98409	0.753715	0.858497	0.958752	1.022917
530	1.073282	1.048598	1.030284	0.97595	0.75011	1.015811	1.163919	1.256312
540	1.054711	1.030748	1.013088	0.960331	0.743286	1.512168	1.731598	1.848828
550	1.037112	1.013831	0.996793	0.945549	0.73695	2.127459	2.372825	2.482633
570	1.004613	0.982586	0.966702	0.918311	0.725617	3.290802	3.518236	3.559301
600	0.961888	0.941503	0.92715	0.882647	0.712076	4.221861	4.342297	4.250298
630	0.925401	0.906417	0.893393	0.852372	0.722251	4.415701	4.498255	4.370099
660	0.894241	0.876464	0.864604	0.826749	1.097051	4.442332	4.519008	4.385613
700	0.860086	0.843821	0.833599	0.801711	2.998466	4.445851	4.521717	4.387617
800	2.084116	2.365266	2.674604	3.189481	3.76726	4.446071	4.521885	4.38774
900	3.649731	3.636349	3.644889	3.64703	3.768755	4.446071	4.521885	4.38774
1,000	3.656154	3.640349	3.647191	3.647868	3.768757	4.446071	4.521885	4.38774
1,200	3.656163	3.640354	3.647194	3.647869	3.768757	4.446071	4.521885	4.38774
1,400	3.656163	3.640354	3.647194	3.647869	3.768757	4.446071	4.521885	4.38774
1,600	3.656163	3.640354	3.647194	3.647869	3.768757	4.446071	4.521885	4.38774
1,800	3.656163	3.640354	3.647194	3.647869	3.768757	4.446071	4.521885	4.38774
2,000	3.656163	3.640354	3.647194	3.647869	3.768757	4.446071	4.521885	4.38774
2,200	3.656163	3.640354	3.647194	3.647869	3.768757	4.446071	4.521885	4.38774
2,400	3.656163	3.640354	3.647194	3.647869	3.768757	4.446071	4.521885	4.38774
2,600	3.656163	3.640354	3.647194	3.647869	3.768757	4.446071	4.521885	4.38774
2,800	3.656163	3.640354	3.647194	3.647869	3.768757	4.446071	4.521885	4.38774
3,000	3.656163	3.640354	3.647194	3.647869	3.768757	4.446071	4.521885	4.38774
10,000	3.656163	3.640354	3.647194	3.647869	3.768757	4.446071	4.521885	4.38774

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Table C-10. Moisture Content Values Obtained from STOMP and Used in the Infiltration Base Case for 241-A Tank Farm Pipelines (GoldSim© Element Name: MC_A_Pipeline_INF0). (2 sheets)

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
0	0.085358	0.248434	0.11296	0.101658	0.105083	0.106861	0.106943	0.106874
0.001	0.085358	0.248434	0.11296	0.101658	0.105083	0.106861	0.106943	0.106874
0.5	0.085358	0.248434	0.11296	0.101658	0.105083	0.106812	0.106863	0.10675
1	0.085358	0.248434	0.11296	0.101658	0.105083	0.105988	0.105813	0.105449
3	0.085358	0.248434	0.112959	0.101658	0.105011	0.098255	0.09759	0.096808
5	0.085354	0.248401	0.112934	0.101605	0.103905	0.092287	0.091608	0.090854
7	0.085284	0.247955	0.112645	0.101147	0.101567	0.088185	0.087543	0.086849
10	0.084808	0.245288	0.111209	0.099279	0.097692	0.083932	0.083347	0.082728
15	0.083358	0.237577	0.107556	0.095148	0.09247	0.079366	0.07885	0.078319
20	0.081986	0.229955	0.104132	0.091544	0.088684	0.076338	0.075872	0.0754
25	0.080918	0.223555	0.101289	0.088656	0.085818	0.074122	0.073694	0.073268
30	0.080103	0.218274	0.098934	0.086315	0.08355	0.072401	0.072004	0.071614
40	0.078963	0.210097	0.095225	0.082704	0.080103	0.069834	0.069487	0.069155
50	0.078221	0.204096	0.092414	0.080017	0.077565	0.067982	0.067675	0.067389
70	0.077337	0.195915	0.088372	0.076203	0.073981	0.065436	0.065192	0.064976
100	0.076667	0.188587	0.084402	0.072475	0.070489	0.063079	0.062908	0.062773
130	0.07631	0.184096	0.081696	0.069916	0.068105	0.061601	0.061491	0.06142
160	0.076091	0.181063	0.079685	0.067992	0.066327	0.060614	0.060554	0.060535
200	0.075907	0.178294	0.077658	0.066023	0.06453	0.059754	0.059749	0.059784
250	0.075766	0.176006	0.075784	0.064168	0.062872	0.059117	0.059161	0.059245
300	0.075677	0.174466	0.074379	0.062749	0.061643	0.058759	0.058837	0.058952
400	0.075574	0.172581	0.07243	0.060733	0.060006	0.058446	0.058558	0.058705
500	0.075519	0.171531	0.071189	0.059416	0.059067	0.058349	0.058474	0.058632
500.5	0.075519	0.171528	0.071184	0.059411	0.059063	0.058349	0.058474	0.058631
501	0.075519	0.171524	0.071179	0.059406	0.05906	0.058349	0.058474	0.058631
502	0.075519	0.171516	0.071169	0.059395	0.059053	0.058348	0.058473	0.058631
503	0.075518	0.171508	0.071159	0.059384	0.059046	0.058348	0.058473	0.05863
505	0.075518	0.171492	0.071139	0.059363	0.059032	0.058347	0.058472	0.05863
507	0.075517	0.171477	0.07112	0.059343	0.059019	0.058346	0.058471	0.058631
510	0.075516	0.171454	0.071091	0.059312	0.058999	0.058347	0.058475	0.058642
515	0.075514	0.171417	0.071044	0.059261	0.058967	0.058371	0.058533	0.058761

Table C-10. Moisture Content Values Obtained from STOMP and Used in the Infiltration Base Case for 241-A Tank Farm Pipelines (GoldSim© Element Name: MC_A_Pipeline_INF0). (2 sheets)

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
520	0.075512	0.171381	0.070998	0.059212	0.058936	0.058493	0.058758	0.05914
525	0.07551	0.171345	0.070953	0.059163	0.058906	0.058823	0.05928	0.059885
530	0.075508	0.171311	0.070909	0.059116	0.058877	0.059459	0.060146	0.060958
540	0.075505	0.171245	0.070823	0.059024	0.058821	0.061531	0.062502	0.063462
550	0.075502	0.171182	0.070742	0.058936	0.058769	0.063912	0.064845	0.065702
570	0.075496	0.171066	0.070588	0.05877	0.058674	0.067553	0.068182	0.068749
600	0.075489	0.170913	0.070382	0.058548	0.058555	0.070004	0.070285	0.07054
630	0.075482	0.170781	0.070202	0.058352	0.058546	0.070523	0.070698	0.070867
660	0.075476	0.170668	0.070045	0.058182	0.060112	0.070598	0.070755	0.070911
700	0.07547	0.170545	0.069871	0.058004	0.067066	0.070608	0.070763	0.070917
800	0.075694	0.175088	0.076048	0.066194	0.069464	0.070609	0.070763	0.070917
900	0.075956	0.179166	0.078678	0.067525	0.069469	0.070609	0.070763	0.070917
1,000	0.075957	0.179181	0.078684	0.067528	0.069469	0.070609	0.070763	0.070917
1,200	0.075957	0.179181	0.078684	0.067528	0.069469	0.070609	0.070763	0.070917
1,400	0.075957	0.179181	0.078684	0.067528	0.069469	0.070609	0.070763	0.070917
1,600	0.075957	0.179181	0.078684	0.067528	0.069469	0.070609	0.070763	0.070917
1,800	0.075957	0.179181	0.078684	0.067528	0.069469	0.070609	0.070763	0.070917
2,000	0.075957	0.179181	0.078684	0.067528	0.069469	0.070609	0.070763	0.070917
2,200	0.075957	0.179181	0.078684	0.067528	0.069469	0.070609	0.070763	0.070917
2,400	0.075957	0.179181	0.078684	0.067528	0.069469	0.070609	0.070763	0.070917
2,600	0.075957	0.179181	0.078684	0.067528	0.069469	0.070609	0.070763	0.070917
2,800	0.075957	0.179181	0.078684	0.067528	0.069469	0.070609	0.070763	0.070917
3,000	0.075957	0.179181	0.078684	0.067528	0.069469	0.070609	0.070763	0.070917
10,000	0.075972	0.186174	0.069724	0.069398	0.06967	0.067572	0.066632	0.064857

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Table C-11. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF1 Sensitivity Case for 241-A Tank Farm Pipelines (GoldSim© Element Name: DF_A_Pipeline_INF1).

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
0	101.3869	101.1809	101.7267	101.9486	104.1009	117.8048	117.4258	111.1733
0.001	101.3869	101.1809	101.7267	101.9486	104.1009	117.8048	117.4258	111.1733
0.5	101.3866	101.1808	101.7267	101.9486	104.1009	117.226	116.5237	109.914
1	101.3868	101.1809	101.7267	101.9486	104.1009	109.4393	106.9305	99.03971
3	101.3868	101.1804	101.7259	101.9463	103.4856	60.35966	56.82884	50.93219
5	101.3139	101.0239	101.4862	101.5132	95.13374	37.20214	34.88029	31.20311
7	100.1534	99.12156	98.98035	97.95441	79.92404	26.0505	24.43908	21.90429
10	92.53512	89.36579	87.77035	84.87053	59.51762	17.55292	16.50297	14.8429
15	71.68212	67.19612	64.79821	61.3542	39.10011	11.09801	10.47185	9.466328
20	54.65924	50.65012	48.48844	45.57229	28.23954	8.003234	7.575337	6.876616
25	43.01153	39.69155	37.87599	35.48576	21.77407	6.217682	5.901671	5.376701
30	34.97307	32.23121	30.70842	28.72418	17.5607	5.0685	4.823244	4.40844
40	24.85844	22.93381	21.82637	20.38103	12.44497	3.682503	3.521021	3.236939
50	18.93207	17.51648	16.67309	15.55497	9.5127	2.890802	2.776328	2.565623
70	12.48703	11.63254	11.09089	10.33685	6.349509	2.038107	1.973623	1.840644
100	8.012341	7.532223	7.205365	6.710489	4.146791	1.45002	1.419966	1.339774
130	5.770954	5.463619	5.243434	4.88223	3.035749	1.16361	1.150983	1.096696
160	4.444752	4.231519	4.072946	3.792985	2.375999	1.003005	1.000803	0.961429
200	3.35495	3.212551	3.102906	2.891488	1.833533	0.881889	0.888222	0.860532
250	2.53561	2.441237	2.366668	2.208359	1.427547	0.803095	0.815601	0.795932
300	2.024068	1.956757	1.902981	1.778941	1.177581	0.763087	0.7791	0.763757
400	1.44062	1.400784	1.369305	1.286391	0.903537	0.731073	0.750273	0.73865
500	1.135647	1.108504	1.087985	1.028496	0.773951	0.722004	0.742245	0.731764
10,000	1.135647	1.108504	1.087985	1.028496	0.773951	0.722004	0.742245	0.731764

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Table C-12. Moisture Content Values Obtained from STOMP and Used in the INF1 Sensitivity Case for 241-A Tank Farm Pipelines (GoldSim© Element Name: MC_A_Pipeline_INF1).

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
0	0.085358	0.248434	0.11296	0.101658	0.105083	0.106861	0.106943	0.106874
0.001	0.085358	0.248434	0.11296	0.101658	0.105083	0.106861	0.106943	0.106874
0.5	0.085358	0.248434	0.11296	0.101658	0.105083	0.106812	0.106863	0.10675
1	0.085358	0.248434	0.11296	0.101658	0.105083	0.105988	0.105813	0.105449
3	0.085358	0.248434	0.112959	0.101658	0.105011	0.098255	0.09759	0.096808
5	0.085354	0.248401	0.112934	0.101605	0.103905	0.092287	0.091608	0.090854
7	0.085284	0.247955	0.112645	0.101147	0.101567	0.088185	0.087543	0.086849
10	0.084808	0.245288	0.111209	0.099279	0.097692	0.083932	0.083347	0.082728
15	0.083358	0.237577	0.107556	0.095148	0.09247	0.079366	0.07885	0.078319
20	0.081986	0.229955	0.104132	0.091544	0.088684	0.076338	0.075872	0.0754
25	0.080918	0.223555	0.101289	0.088656	0.085818	0.074122	0.073694	0.073268
30	0.080103	0.218274	0.098934	0.086315	0.08355	0.072401	0.072004	0.071614
40	0.078963	0.210097	0.095225	0.082704	0.080103	0.069834	0.069487	0.069155
50	0.078221	0.204096	0.092414	0.080017	0.077565	0.067982	0.067675	0.067389
70	0.077337	0.195915	0.088372	0.076203	0.073981	0.065436	0.065192	0.064976
100	0.076667	0.188587	0.084402	0.072475	0.070489	0.063079	0.062908	0.062773
130	0.07631	0.184096	0.081696	0.069916	0.068105	0.061601	0.061491	0.06142
160	0.076091	0.181063	0.079685	0.067992	0.066327	0.060614	0.060554	0.060535
200	0.075907	0.178294	0.077658	0.066023	0.06453	0.059754	0.059749	0.059784
250	0.075766	0.176006	0.075784	0.064168	0.062872	0.059117	0.059161	0.059245
300	0.075677	0.174466	0.074379	0.062749	0.061643	0.058759	0.058837	0.058952
400	0.075574	0.172581	0.07243	0.060733	0.060006	0.058446	0.058558	0.058705
500	0.075519	0.171531	0.071189	0.059416	0.059067	0.058349	0.058474	0.058632
10,000	0.075519	0.171531	0.071189	0.059416	0.059067	0.058349	0.058474	0.058632

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Table C-13. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF2 Sensitivity Case for 241-A Tank Farm Pipelines (GoldSim© Element Name: DF_A_Pipeline_INF2).

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
0	101.3869	101.1809	101.7267	101.9486	104.1009	117.8048	117.4258	111.1733
10,000	101.3869	101.1809	101.7267	101.9486	104.1009	117.8048	117.4258	111.1733

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Table C-14. Moisture Content Values Obtained from STOMP and Used in the INF2 Sensitivity Case for 241-A Tank Farm Pipelines (GoldSim© Element Name: MC_A_Pipeline_INF2).

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
0	0.085358	0.248434	0.11296	0.101658	0.105083	0.106861	0.106943	0.106874
10,000	0.085358	0.248434	0.11296	0.101658	0.105083	0.106861	0.106943	0.106874

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Table C-15. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF3 Sensitivity Case for 241-A Tank Farm Pipelines (GoldSim© Element Name: DF_A_Pipeline_INF3).

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
0	3.656163	3.640354	3.647194	3.647869	3.768757	4.446071	4.521885	4.38774
10,000	3.656163	3.640354	3.647194	3.647869	3.768757	4.446071	4.521885	4.38774

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Table C-16. Moisture Content Values Obtained from STOMP and Used in the INF3 Sensitivity Case for 241-A Tank Farm Pipelines (GoldSim© Element Name: MC_A_Pipeline_INF3).

Time (years)	Node_24	Node_33	Node_37	Node_44	Node_69	Node_102	Node_103	Node_104
0	0.075957	0.179181	0.078684	0.067528	0.069469	0.070609	0.070763	0.070917
10,000	0.075957	0.179181	0.078684	0.067528	0.069469	0.070609	0.070763	0.070917

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Table C-17. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF0 Sensitivity Case for 241-A Tank Farm Backfill (GoldSim© Element Name: DF_A_Backfill_INF0). (2 sheets)

Time (years)	Node_116
0	129.8343972
0.001	129.8343972
0.5	79.87181707
1	48.57020891
3	17.59218588
5	10.51621189
7	7.472362022
10	5.224240241
15	3.527728045
20	2.71010566
25	2.235801186
30	1.929697341
40	1.560365258
50	1.350803213
70	1.129644468
100	0.986069666
130	0.923490603
160	0.892275924
200	0.871513938
250	0.859840853
300	0.854701793
400	0.851160228
500	0.850306242
500.5	0.850965386
501	0.858127353
502	0.916231572
503	1.033244453
505	1.376256642
507	1.769702306

Table C-17. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF0 Sensitivity Case for 241-A Tank Farm Backfill (GoldSim© Element Name: DF_A_Backfill_INF0). (2 sheets)

Time (years)	Node_116
510	2.345529892
515	3.159202481
520	3.774697885
525	4.216089779
530	4.521794058
540	4.87609861
550	5.037550176
570	5.1433889
600	5.169475935
630	5.172383835
660	5.172723863
700	5.172766633
800	5.172769028
900	5.172769028
1000	5.172769028
1200	5.172769028
1400	5.172769028
1600	5.172769028
1800	5.172769028
2000	5.172769028
2200	5.172769028
2400	5.172769028
2600	5.172769028
2800	5.172769028
10000	5.172769028

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Table C-18. Moisture Content Values Obtained from STOMP and used in the INF0 Sensitivity Case for 241-A Tank Farm Backfill (GoldSim© Element Name: MC_Soil_Backfill_A_INF0). (2 sheets)

Time (years)	Node_116
0	0.088591
0.001	0.088591
0.5	0.085363
1	0.081419
3	0.073556
5	0.069888
7	0.067584
10	0.065279
15	0.062867
20	0.061306
25	0.060189
30	0.059342
40	0.05812
50	0.05728
70	0.056199
100	0.055307
130	0.05483
160	0.054556
200	0.054351
250	0.054224
300	0.054163
400	0.054118
500	0.054106
500.5	0.054106
501	0.054109
502	0.054146
503	0.05425
505	0.05467
507	0.055283

Table C-18. Moisture Content Values Obtained from STOMP and used in the INF0 Sensitivity Case for 241-A Tank Farm Backfill (GoldSim© Element Name: MC_Soil_Backfill_A_INF0). (2 sheets)

Time (years)	Node_116
510	0.056355
515	0.058124
520	0.059595
525	0.060701
530	0.06149
540	0.062437
550	0.062893
570	0.063217
600	0.063306
630	0.063316
660	0.063317
700	0.063317
800	0.063317
900	0.063317
1,000	0.063317
1,200	0.063317
1,400	0.063317
1,600	0.063317
1,800	0.063317
2,000	0.063317
2,200	0.063317
2,400	0.063317
2,600	0.063317
2,800	0.063317
10,000	0.063317

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Table C-19. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF1 Sensitivity Case for 241-A Tank Farm Backfill (GoldSim© Element Name: DF_Soil_Backfill_A_INF1).

Time (years)	Node_116
0	129.8344
0.001	129.8344
0.5	79.87182
1	48.57021
3	17.59219
5	10.51621
7	7.472362
10	5.22424
15	3.527728
20	2.710106
25	2.235801
30	1.929697
40	1.560365
50	1.350803
70	1.129644
100	0.98607
130	0.923491
160	0.892276
200	0.871514
250	0.859841
300	0.854702
400	0.85116
500	0.850306
10,000	0.850306

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Table C-20. Moisture Content Values Obtained from STOMP and Used in the INF1 Sensitivity Case for 241-A Tank Farm Backfill (GoldSim© Element Name: MC_Soil_Backfill_A_INF1).

Time (years)	Node_116
0	0.088591
0.001	0.088591
0.5	0.085363
1	0.081419
3	0.073556
5	0.069888
7	0.067584
10	0.065279
15	0.062867
20	0.061306
25	0.060189
30	0.059342
40	0.05812
50	0.05728
70	0.056199
100	0.055307
130	0.05483
160	0.054556
200	0.054351
250	0.054224
300	0.054163
400	0.054118
500	0.054106
10,000	0.054106

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Table C-21. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF2 Sensitivity Case for 241-A Tank Farm Backfill (GoldSim© Element Name: DF_Soil_Backfill_A_INF2).

Time (years)	Node_116
0	129.8344
10,000	129.8344

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Table C-22. Moisture Content Values Obtained from STOMP and Used in the INF2 Sensitivity Case for 241-A Tank Farm Backfill (GoldSim© Element Name: MC_Soil_Backfill_A_INF2).

Time (years)	Node_116
0	0.088591
10,000	0.088591

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Table C-23. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF3 Sensitivity Case for 241-A Tank Farm Backfill (GoldSim© Element Name: DF_Soil_Backfill_INF3).

Time (years)	Node_116
0	5.172769
10,000	5.172769

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Table C-24. Moisture Content Values Obtained from STOMP and Used in the INF3 Sensitivity Case for 241-A Tank Farm Backfill (GoldSim© Element Name: MC_Soil_Backfill_INF3).

Time (years)	Node_116
0	0.063317
10,000	0.063317

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Table C-25. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF0 Sensitivity Case for 241-AX Farm Tanks (GoldSim© Element Name: DF_AX_Tank_INF0). (sheet 1 of 2)

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
0	96.30502	95.39021	94.12168	92.59994	92.48	89.44181	74.19691	63.45837	56.46408	46.52013	39.86144	31.58025	21.10318	7.5864
0.001	96.30502	95.39021	94.12168	92.59994	92.4795	89.44181	74.19691	63.45837	56.46408	46.52013	39.86144	31.58025	21.10318	7.5864
0.5	96.3034	95.38985	94.12168	92.59994	92.4795	89.44181	74.1969	63.4582	56.46348	46.51847	39.85897	31.57699	21.09971	7.584777
1	96.30418	95.38995	94.12168	92.59994	92.4795	89.44181	74.188	63.3898	56.33233	46.30402	39.60898	31.31459	20.87497	7.491244
3	96.30483	95.38995	94.12046	92.59671	92.47548	89.28897	67.73946	53.41551	45.58476	35.92293	30.1154	23.37886	15.35706	5.466388
5	96.24335	95.28032	93.82404	92.08133	91.89408	85.29941	52.06986	38.67774	32.38656	25.18383	21.03864	16.32288	10.75386	3.842604
7	95.2062	93.77579	91.04076	88.27913	87.82881	74.89328	39.5107	28.77015	23.98723	18.64172	15.60151	12.14991	8.052924	2.892806
10	88.136	85.29957	79.77798	75.52802	74.7478	57.7947	27.78829	20.08941	16.75476	13.07113	10.98372	8.605859	5.752409	2.081001
15	68.36196	64.80688	58.3362	54.00351	53.2341	38.71658	17.86264	12.93054	10.822	8.503205	7.187446	5.677892	3.837214	1.40065
20	52.08888	49.07537	43.59129	39.94344	39.32939	28.11513	12.86604	9.34909	7.851419	6.205329	5.268931	4.18819	2.853871	1.048695
25	40.94038	38.54914	34.08464	31.03797	30.55034	21.71654	9.93027	7.242868	6.100415	4.844355	4.12813	3.297488	2.261643	0.835474
30	33.26117	31.35929	27.68605	25.09558	24.69931	17.52634	8.024609	5.87254	4.95859	3.953233	3.378745	2.709772	1.868559	0.693273
40	23.63777	22.387	19.77703	17.7992	17.51978	12.43456	5.715491	4.206265	3.566274	2.861533	2.457365	1.983588	1.379673	0.51547
50	18.04808	17.17347	15.20384	13.60755	13.39698	9.526536	4.395447	3.249477	2.764212	2.229396	1.921748	1.559157	1.091865	0.41018
70	12.03501	11.53967	10.26673	9.112325	8.976661	6.411515	2.976427	2.216473	1.895605	1.541479	1.336693	1.093127	0.773589	0.293056
100	7.849949	7.583981	6.792898	5.97711	5.892498	4.229979	1.981446	1.490485	1.283871	1.055117	0.921681	0.760883	0.545003	0.208405
130	5.695684	5.530675	4.981677	4.354421	4.294253	3.096174	1.469386	1.11847	0.970966	0.806678	0.709693	0.590999	0.427791	0.164869
160	4.393539	4.282265	3.875486	3.368918	3.322884	2.40872	1.164802	0.899398	0.78771	0.662119	0.586769	0.492802	0.360192	0.139782
200	3.314833	3.24284	2.950589	2.550097	2.515769	1.841133	0.920674	0.726757	0.644677	0.550615	0.492587	0.418085	0.309084	0.120889
250	2.507036	2.460637	2.251807	1.936531	1.911393	1.421436	0.748997	0.608927	0.548697	0.477334	0.431421	0.370164	0.276705	0.109013
300	2.010037	1.97744	1.818837	1.559895	1.540942	1.169179	0.653084	0.545963	0.498655	0.440236	0.400963	0.346713	0.261128	0.103366
400	1.460813	1.441376	1.337117	1.145982	1.134984	0.902272	0.564641	0.492185	0.457554	0.411087	0.3776	0.329163	0.24975	0.099307
500	1.188128	1.174266	1.096738	0.942783	0.936637	0.78071	0.533881	0.475653	0.44563	0.403145	0.371441	0.324689	0.246943	0.098328
500.5	1.187144	1.173301	1.095872	0.942058	0.935931	0.7803	0.533794	0.475609	0.4456	0.403126	0.371426	0.324679	0.246937	0.098326
501	1.186163	1.17234	1.095009	0.941334	0.935228	0.779891	0.533708	0.475566	0.44557	0.403106	0.371411	0.324668	0.24693	0.098323
502	1.184213	1.170429	1.09329	0.939897	0.933828	0.779078	0.533537	0.47548	0.44551	0.403068	0.371381	0.324647	0.246917	0.098319
503	1.182275	1.168528	1.091584	0.938468	0.932438	0.778271	0.533368	0.475396	0.445451	0.40303	0.371352	0.324626	0.246905	0.098314
505	1.178438	1.164764	1.088204	0.935638	0.929685	0.776676	0.533035	0.47523	0.445335	0.402955	0.371296	0.324586	0.24688	0.098306
507	1.174649	1.16105	1.084866	0.932846	0.926968	0.775106	0.532711	0.475068	0.445222	0.402882	0.37124	0.324546	0.246855	0.098297
510	1.169056	1.155563	1.079938	0.928725	0.922959	0.772797	0.532237	0.474833	0.445058	0.402777	0.37116	0.324489	0.24682	0.098285

Table C-26. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF0 Sensitivity Case for 241-AX Farm Tanks (GoldSim© Element Name: DF_AX_Tank_INF0). (sheet 2 of 2)

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
515	1.159966	1.146649	1.071928	0.922034	0.916452	0.769066	0.531482	0.47446	0.444799	0.402612	0.371035	0.324403	0.246771	0.09827
520	1.151158	1.138007	1.064169	0.915557	0.910155	0.765478	0.53077	0.474111	0.444559	0.402469	0.370943	0.324368	0.246796	0.098295
525	1.14262	1.129629	1.056648	0.909286	0.90406	0.762028	0.530097	0.473788	0.444359	0.402429	0.371032	0.324637	0.247241	0.098549
530	1.134342	1.121506	1.049361	0.903213	0.898161	0.758709	0.529464	0.473523	0.444299	0.402824	0.371875	0.326121	0.249288	0.099649
540	1.118505	1.105968	1.035425	0.891623	0.886905	0.752435	0.52834	0.47372	0.446307	0.409955	0.384054	0.345001	0.27286	0.111745
550	1.103582	1.091324	1.022305	0.880731	0.876334	0.746619	0.527724	0.47903	0.463045	0.457089	0.456903	0.445176	0.381676	0.163626
570	1.076257	1.064508	0.99831	0.860877	0.857086	0.736239	0.54041	0.629294	0.7958	1.030086	1.112497	1.102827	0.910443	0.375471
600	1.040852	1.029759	0.967304	0.835365	0.832396	0.723653	1.029777	1.935479	2.14718	2.130615	2.002492	1.752183	1.30577	0.50824
630	1.011191	1.000648	0.941448	0.814291	0.81207	0.7197	2.443857	2.688964	2.598271	2.365019	2.160163	1.8504	1.358182	0.524393
660	0.986667	0.976599	0.920433	0.797917	0.796642	0.796497	2.944727	2.812214	2.660786	2.393856	2.178639	1.861411	1.363826	0.526082
700	0.966048	0.956801	0.908816	0.802302	0.807942	1.924894	3.02759	2.828895	2.668839	2.397413	2.180871	1.862714	1.36448	0.526275
800	2.332423	2.414369	2.877	2.978381	3.027043	3.242228	3.033312	2.82995	2.669334	2.397627	2.181003	1.86279	1.364518	0.526286
900	3.474986	3.455183	3.404521	3.189229	3.197709	3.245374	3.033316	2.829952	2.669335	2.397627	2.181003	1.86279	1.364518	0.526286
1,000	3.478989	3.458503	3.405758	3.189621	3.19801	3.245377	3.033316	2.829952	2.669335	2.397627	2.181003	1.86279	1.364518	0.526286
1,200	3.478994	3.458507	3.405761	3.189622	3.198011	3.245377	3.033316	2.829952	2.669335	2.397627	2.181003	1.86279	1.364518	0.526286
1,400	3.478994	3.458507	3.405761	3.189622	3.198011	3.245377	3.033316	2.829952	2.669335	2.397627	2.181003	1.86279	1.364518	0.526286
1,600	3.478994	3.458507	3.405761	3.189622	3.198011	3.245377	3.033316	2.829952	2.669335	2.397627	2.181003	1.86279	1.364518	0.526286
1,800	3.478994	3.458507	3.405761	3.189622	3.198011	3.245377	3.033316	2.829952	2.669335	2.397627	2.181003	1.86279	1.364518	0.526286
2,000	3.478994	3.458507	3.405761	3.189622	3.198011	3.245377	3.033316	2.829952	2.669335	2.397627	2.181003	1.86279	1.364518	0.526286
2,200	3.478994	3.458507	3.405761	3.189622	3.198011	3.245377	3.033316	2.829952	2.669335	2.397627	2.181003	1.86279	1.364518	0.526286
2,400	3.478994	3.458507	3.405761	3.189622	3.198011	3.245377	3.033316	2.829952	2.669335	2.397627	2.181003	1.86279	1.364518	0.526286
2,600	3.478994	3.458507	3.405761	3.189622	3.198011	3.245377	3.033316	2.829952	2.669335	2.397627	2.181003	1.86279	1.364518	0.526286
2,800	3.478994	3.458507	3.405761	3.189622	3.198011	3.245377	3.033316	2.829952	2.669335	2.397627	2.181003	1.86279	1.364518	0.526286
3,000	3.478994	3.458507	3.405761	3.189622	3.198011	3.245377	3.033316	2.829952	2.669335	2.397627	2.181003	1.86279	1.364518	0.526286
10,000	3.478994	3.458507	3.405761	3.189622	3.198011	3.245377	3.033316	2.829952	2.669335	2.397627	2.181003	1.86279	1.364518	0.526286

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Table C-27. Moisture Content Values Obtained from STOMP and Used in the INF0 Sensitivity Case for 241-AX Farm Tanks (GoldSim© Element Name: MC_AX_Tank_INF0). (sheet 1 of 2)

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
0	0.086768	0.256965	0.082355	0.088356	0.096308	0.102981	0.100621	0.098832	0.097593	0.095697	0.094313	0.092423	0.089662	0.085071
0.001	0.086768	0.256965	0.082355	0.088356	0.096308	0.102981	0.100621	0.098832	0.097593	0.095697	0.094313	0.092423	0.089662	0.085071
0.5	0.086768	0.256965	0.082355	0.088356	0.096308	0.102981	0.100621	0.098832	0.097593	0.095696	0.094312	0.092422	0.089661	0.08507
1	0.086768	0.256965	0.082355	0.088356	0.096308	0.102981	0.10062	0.098821	0.09757	0.095652	0.094252	0.092343	0.089561	0.084953
3	0.086768	0.256965	0.082355	0.088355	0.096308	0.102961	0.099538	0.096806	0.095106	0.092754	0.091174	0.089141	0.086333	0.081908
5	0.086765	0.256942	0.082331	0.0883	0.096232	0.102381	0.096263	0.092919	0.091079	0.0887	0.087171	0.085253	0.082662	0.078644
7	0.08671	0.256586	0.082094	0.087865	0.095655	0.100677	0.092904	0.089486	0.08769	0.085425	0.083993	0.082215	0.079832	0.076154
10	0.086325	0.2543	0.081036	0.08622	0.093549	0.097313	0.088821	0.085539	0.083858	0.081773	0.08047	0.078862	0.076718	0.073418
15	0.085149	0.247519	0.078562	0.08273	0.089194	0.092357	0.084039	0.081031	0.079516	0.077657	0.076506	0.075094	0.073217	0.070335
20	0.084056	0.240957	0.076341	0.07971	0.085478	0.088641	0.080731	0.07794	0.076546	0.074845	0.073797	0.072517	0.07082	0.068215
25	0.083225	0.235657	0.074534	0.077279	0.082512	0.085796	0.07826	0.075637	0.074333	0.07275	0.071778	0.070594	0.069027	0.066626
30	0.082605	0.231464	0.07306	0.0753	0.080111	0.083537	0.076316	0.073825	0.072593	0.071102	0.070189	0.069079	0.067613	0.065368
40	0.081763	0.225338	0.070779	0.072234	0.076416	0.080103	0.073377	0.071088	0.069963	0.068609	0.067784	0.066784	0.065467	0.063454
50	0.081233	0.221169	0.069088	0.069952	0.073683	0.077588	0.071229	0.069086	0.068039	0.066784	0.066023	0.065102	0.063892	0.062044
70	0.080625	0.215975	0.066715	0.06673	0.06985	0.074075	0.068231	0.066293	0.065355	0.064238	0.063564	0.062752	0.061689	0.060066
100	0.080175	0.211772	0.064413	0.063586	0.066136	0.07066	0.065328	0.063596	0.062768	0.06179	0.061204	0.060499	0.059576	0.058165
130	0.079933	0.209362	0.062815	0.061395	0.063557	0.068268	0.063326	0.061756	0.061014	0.060142	0.059621	0.058994	0.058171	0.056902
160	0.079783	0.207806	0.061604	0.059727	0.061597	0.066442	0.06184	0.060412	0.059744	0.058963	0.058495	0.057932	0.057186	0.056022
200	0.079657	0.206452	0.060372	0.058021	0.059596	0.064579	0.060388	0.059131	0.05855	0.057873	0.057465	0.056969	0.056303	0.05524
250	0.079562	0.205395	0.059234	0.05644	0.057746	0.062868	0.059148	0.05808	0.057592	0.05702	0.056672	0.056239	0.055644	0.054663
300	0.079502	0.204724	0.058394	0.055269	0.056378	0.061624	0.058334	0.057427	0.057013	0.056522	0.056216	0.055828	0.055279	0.05435
400	0.079436	0.203963	0.057272	0.053705	0.054553	0.060029	0.057459	0.056784	0.056467	0.056074	0.055816	0.055476	0.054975	0.054094
500	0.079403	0.203578	0.056603	0.052777	0.053471	0.059157	0.057109	0.056557	0.056286	0.055934	0.055695	0.055373	0.054888	0.054022
500.5	0.079403	0.203576	0.0566	0.052773	0.053467	0.059154	0.057108	0.056556	0.056285	0.055933	0.055695	0.055373	0.054888	0.054022
501	0.079403	0.203575	0.056598	0.052769	0.053463	0.059151	0.057107	0.056556	0.056285	0.055933	0.055694	0.055373	0.054888	0.054022
502	0.079403	0.203572	0.056593	0.052762	0.053455	0.059145	0.057104	0.056555	0.056284	0.055932	0.055694	0.055372	0.054888	0.054022
503	0.079403	0.203569	0.056587	0.052755	0.053446	0.059139	0.057102	0.056553	0.056283	0.055932	0.055693	0.055372	0.054887	0.054021
505	0.079402	0.203564	0.056577	0.052741	0.05343	0.059126	0.057098	0.056551	0.056281	0.05593	0.055692	0.055371	0.054886	0.054021
507	0.079402	0.203559	0.056567	0.052727	0.053414	0.059114	0.057094	0.056549	0.056279	0.055929	0.055691	0.05537	0.054886	0.05402
510	0.079401	0.203551	0.056552	0.052707	0.05339	0.059096	0.057089	0.056545	0.056277	0.055927	0.055689	0.055368	0.054884	0.054019

Table C-28. Moisture Content Values Obtained from STOMP and Used in the INF0 Sensitivity Case for 241-AX Farm Tanks (GoldSim© Element Name: MC_AX_Tank_INF0). (sheet 2 of 2)

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
515	0.0794	0.203538	0.056528	0.052673	0.053351	0.059067	0.057079	0.05654	0.056272	0.055924	0.055687	0.055366	0.054883	0.054018
520	0.079399	0.203525	0.056505	0.052641	0.053313	0.059039	0.057071	0.056534	0.056268	0.055921	0.055684	0.055364	0.054881	0.054017
525	0.079398	0.203513	0.056482	0.052609	0.053277	0.059012	0.057062	0.05653	0.056265	0.055918	0.055683	0.055364	0.054883	0.054022
530	0.079397	0.203501	0.056459	0.052578	0.053241	0.058985	0.057055	0.056525	0.056262	0.055918	0.055685	0.055371	0.054898	0.054047
540	0.079395	0.203478	0.056416	0.052519	0.053172	0.058935	0.05704	0.05652	0.056267	0.05595	0.055747	0.055484	0.055091	0.054337
550	0.079393	0.203457	0.056375	0.052462	0.053106	0.058888	0.057029	0.05654	0.056343	0.056191	0.056155	0.056137	0.056053	0.055568
570	0.07939	0.203418	0.056299	0.052358	0.052986	0.058804	0.057076	0.057261	0.058019	0.05933	0.06003	0.060574	0.060729	0.060032
600	0.079385	0.203367	0.056199	0.052221	0.052827	0.058698	0.059369	0.063449	0.064672	0.065239	0.065224	0.064943	0.064255	0.062756
630	0.079382	0.203325	0.056114	0.052105	0.052693	0.058643	0.065476	0.066872	0.066863	0.066527	0.066186	0.06565	0.064766	0.063118
660	0.079379	0.20329	0.056043	0.052011	0.052586	0.058985	0.067548	0.067441	0.067177	0.066694	0.066306	0.065735	0.064826	0.063159
700	0.079376	0.20326	0.055993	0.051983	0.052585	0.063589	0.067895	0.06752	0.067219	0.066716	0.066321	0.065746	0.064833	0.063164
800	0.079542	0.205208	0.059888	0.058506	0.060472	0.068345	0.06792	0.067526	0.067222	0.066717	0.066322	0.065746	0.064833	0.063165
900	0.079676	0.206683	0.060889	0.059188	0.0611	0.068357	0.06792	0.067526	0.067222	0.066717	0.066322	0.065746	0.064833	0.063165
1,000	0.079676	0.206688	0.060892	0.059189	0.061102	0.068357	0.06792	0.067526	0.067222	0.066717	0.066322	0.065746	0.064833	0.063165
1,200	0.079676	0.206688	0.060892	0.059189	0.061102	0.068357	0.06792	0.067526	0.067222	0.066717	0.066322	0.065746	0.064833	0.063165
1,400	0.079676	0.206688	0.060892	0.059189	0.061102	0.068357	0.06792	0.067526	0.067222	0.066717	0.066322	0.065746	0.064833	0.063165
1,600	0.079676	0.206688	0.060892	0.059189	0.061102	0.068357	0.06792	0.067526	0.067222	0.066717	0.066322	0.065746	0.064833	0.063165
1,800	0.079676	0.206688	0.060892	0.059189	0.061102	0.068357	0.06792	0.067526	0.067222	0.066717	0.066322	0.065746	0.064833	0.063165
2,000	0.079676	0.206688	0.060892	0.059189	0.061102	0.068357	0.06792	0.067526	0.067222	0.066717	0.066322	0.065746	0.064833	0.063165
2,200	0.079676	0.206688	0.060892	0.059189	0.061102	0.068357	0.06792	0.067526	0.067222	0.066717	0.066322	0.065746	0.064833	0.063165
2,400	0.079676	0.206688	0.060892	0.059189	0.061102	0.068357	0.06792	0.067526	0.067222	0.066717	0.066322	0.065746	0.064833	0.063165
2,600	0.079676	0.206688	0.060892	0.059189	0.061102	0.068357	0.06792	0.067526	0.067222	0.066717	0.066322	0.065746	0.064833	0.063165
2,800	0.079676	0.206688	0.060892	0.059189	0.061102	0.068357	0.06792	0.067526	0.067222	0.066717	0.066322	0.065746	0.064833	0.063165
3,000	0.079676	0.206688	0.060892	0.059189	0.061102	0.068357	0.06792	0.067526	0.067222	0.066717	0.066322	0.065746	0.064833	0.063165
10,000	0.079676	0.206688	0.060892	0.059189	0.061102	0.068357	0.06792	0.067526	0.067222	0.066717	0.066322	0.065746	0.064833	0.063165

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Table C-29. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF1 Sensitivity Case for 241-AX Farm Tanks (GoldSim© Element Name: DF_AX_Tank_INF1).

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
0	96.30502	95.39021	94.12168	92.59994	92.48	89.44181	74.19691	63.45837	56.46408	46.52013	39.86144	31.58025	21.10318	7.5864
0.001	96.30502	95.39021	94.12168	92.59994	92.4795	89.44181	74.19691	63.45837	56.46408	46.52013	39.86144	31.58025	21.10318	7.5864
0.5	96.3034	95.38985	94.12168	92.59994	92.4795	89.44181	74.1969	63.4582	56.46348	46.51847	39.85897	31.57699	21.09971	7.584777
1	96.30418	95.38995	94.12168	92.59994	92.4795	89.44181	74.188	63.3898	56.33233	46.30402	39.60898	31.31459	20.87497	7.491244
3	96.30483	95.38995	94.12046	92.59671	92.47548	89.28897	67.73946	53.41551	45.58476	35.92293	30.1154	23.37886	15.35706	5.466388
5	96.24335	95.28032	93.82404	92.08133	91.89408	85.29941	52.06986	38.67774	32.38656	25.18383	21.03864	16.32288	10.75386	3.842604
7	95.2062	93.77579	91.04076	88.27913	87.82881	74.89328	39.5107	28.77015	23.98723	18.64172	15.60151	12.14991	8.052924	2.892806
10	88.136	85.29957	79.77798	75.52802	74.7478	57.7947	27.78829	20.08941	16.75476	13.07113	10.98372	8.605859	5.752409	2.081001
15	68.36196	64.80688	58.3362	54.00351	53.2341	38.71658	17.86264	12.93054	10.822	8.503205	7.187446	5.677892	3.837214	1.40065
20	52.08888	49.07537	43.59129	39.94344	39.32939	28.11513	12.86604	9.34909	7.851419	6.205329	5.268931	4.18819	2.853871	1.048695
25	40.94038	38.54914	34.08464	31.03797	30.55034	21.71654	9.93027	7.242868	6.100415	4.844355	4.12813	3.297488	2.261643	0.835474
30	33.26117	31.35929	27.68605	25.09558	24.69931	17.52634	8.024609	5.87254	4.95859	3.953233	3.378745	2.709772	1.868559	0.693273
40	23.63777	22.387	19.77703	17.7992	17.51978	12.43456	5.715491	4.206265	3.566274	2.861533	2.457365	1.983588	1.379673	0.51547
50	18.04808	17.17347	15.20384	13.60755	13.39698	9.526536	4.395447	3.249477	2.764212	2.229396	1.921748	1.559157	1.091865	0.41018
70	12.03501	11.53967	10.26673	9.112325	8.976661	6.411515	2.976427	2.216473	1.895605	1.541479	1.336693	1.093127	0.773589	0.293056
100	7.849949	7.583981	6.792898	5.97711	5.892498	4.229979	1.981446	1.490485	1.283871	1.055117	0.921681	0.760883	0.545003	0.208405
130	5.695684	5.530675	4.981677	4.354421	4.294253	3.096174	1.469386	1.11847	0.970966	0.806678	0.709693	0.590999	0.427791	0.164869
160	4.393539	4.282265	3.875486	3.368918	3.322884	2.40872	1.164802	0.899398	0.78771	0.662119	0.586769	0.492802	0.360192	0.139782
200	3.314833	3.24284	2.950589	2.550097	2.515769	1.841133	0.920674	0.726757	0.644677	0.550615	0.492587	0.418085	0.309084	0.120889
250	2.507036	2.460637	2.251807	1.936531	1.911393	1.421436	0.748997	0.608927	0.548697	0.477334	0.431421	0.370164	0.276705	0.109013
300	2.010037	1.97744	1.818837	1.559895	1.540942	1.169179	0.653084	0.545963	0.498655	0.440236	0.400963	0.346713	0.261128	0.103366
400	1.460813	1.441376	1.337117	1.145982	1.134984	0.902272	0.564641	0.492185	0.457554	0.411087	0.3776	0.329163	0.24975	0.099307
500	1.188128	1.174266	1.096738	0.942783	0.936637	0.78071	0.533881	0.475653	0.44563	0.403145	0.371441	0.324689	0.246943	0.098328
10,000	1.188128	1.174266	1.096738	0.942783	0.936637	0.78071	0.533881	0.475653	0.44563	0.403145	0.371441	0.324689	0.246943	0.098328

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Table C-30. Moisture Content Values Obtained from STOMP and Used in the INF1 Sensitivity Case for 241-AX Farm Tanks (GoldSim© Element Name: MC_AX_Tank_INF1).

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
0	0.086768	0.256965	0.082355	0.088356	0.096308	0.102981	0.100621	0.098832	0.097593	0.095697	0.094313	0.092423	0.089662	0.085071
0.001	0.086768	0.256965	0.082355	0.088356	0.096308	0.102981	0.100621	0.098832	0.097593	0.095697	0.094313	0.092423	0.089662	0.085071
0.5	0.086768	0.256965	0.082355	0.088356	0.096308	0.102981	0.100621	0.098832	0.097593	0.095696	0.094312	0.092422	0.089661	0.08507
1	0.086768	0.256965	0.082355	0.088356	0.096308	0.102981	0.10062	0.098821	0.09757	0.095652	0.094252	0.092343	0.089561	0.084953
3	0.086768	0.256965	0.082355	0.088355	0.096308	0.102961	0.099538	0.096806	0.095106	0.092754	0.091174	0.089141	0.086333	0.081908
5	0.086765	0.256942	0.082331	0.0883	0.096232	0.102381	0.096263	0.092919	0.091079	0.0887	0.087171	0.085253	0.082662	0.078644
7	0.08671	0.256586	0.082094	0.087865	0.095655	0.100677	0.092904	0.089486	0.08769	0.085425	0.083993	0.082215	0.079832	0.076154
10	0.086325	0.2543	0.081036	0.08622	0.093549	0.097313	0.088821	0.085539	0.083858	0.081773	0.08047	0.078862	0.076718	0.073418
15	0.085149	0.247519	0.078562	0.08273	0.089194	0.092357	0.084039	0.081031	0.079516	0.077657	0.076506	0.075094	0.073217	0.070335
20	0.084056	0.240957	0.076341	0.07971	0.085478	0.088641	0.080731	0.07794	0.076546	0.074845	0.073797	0.072517	0.07082	0.068215
25	0.083225	0.235657	0.074534	0.077279	0.082512	0.085796	0.07826	0.075637	0.074333	0.07275	0.071778	0.070594	0.069027	0.066626
30	0.082605	0.231464	0.07306	0.0753	0.080111	0.083537	0.076316	0.073825	0.072593	0.071102	0.070189	0.069079	0.067613	0.065368
40	0.081763	0.225338	0.070779	0.072234	0.076416	0.080103	0.073377	0.071088	0.069963	0.068609	0.067784	0.066784	0.065467	0.063454
50	0.081233	0.221169	0.069088	0.069952	0.073683	0.077588	0.071229	0.069086	0.068039	0.066784	0.066023	0.065102	0.063892	0.062044
70	0.080625	0.215975	0.066715	0.06673	0.06985	0.074075	0.068231	0.066293	0.065355	0.064238	0.063564	0.062752	0.061689	0.060066
100	0.080175	0.211772	0.064413	0.063586	0.066136	0.07066	0.065328	0.063596	0.062768	0.06179	0.061204	0.060499	0.059576	0.058165
130	0.079933	0.209362	0.062815	0.061395	0.063557	0.068268	0.063326	0.061756	0.061014	0.060142	0.059621	0.058994	0.058171	0.056902
160	0.079783	0.207806	0.061604	0.059727	0.061597	0.066442	0.06184	0.060412	0.059744	0.058963	0.058495	0.057932	0.057186	0.056022
200	0.079657	0.206452	0.060372	0.058021	0.059596	0.064579	0.060388	0.059131	0.05855	0.057873	0.057465	0.056969	0.056303	0.05524
250	0.079562	0.205395	0.059234	0.05644	0.057746	0.062868	0.059148	0.05808	0.057592	0.05702	0.056672	0.056239	0.055644	0.054663
300	0.079502	0.204724	0.058394	0.055269	0.056378	0.061624	0.058334	0.057427	0.057013	0.056522	0.056216	0.055828	0.055279	0.05435
400	0.079436	0.203963	0.057272	0.053705	0.054553	0.060029	0.057459	0.056784	0.056467	0.056074	0.055816	0.055476	0.054975	0.054094
500	0.079403	0.203578	0.056603	0.052777	0.053471	0.059157	0.057109	0.056557	0.056286	0.055934	0.055695	0.055373	0.054888	0.054022
10,000	0.079403	0.203578	0.056603	0.052777	0.053471	0.059157	0.057109	0.056557	0.056286	0.055934	0.055695	0.055373	0.054888	0.054022

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Table C-31. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF2 Sensitivity Case for 241-AX Farm Tanks (GoldSim© Element Name: DF_AX_Tank_INF2).

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
0	96.30502	95.39021	94.12168	92.59994	92.48	89.44181	74.19691	63.45837	56.46408	46.52013	39.86144	31.58025	21.10318	7.5864
10,000	96.30502	95.39021	94.12168	92.59994	92.48	89.44181	74.19691	63.45837	56.46408	46.52013	39.86144	31.58025	21.10318	7.5864

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Table C-32. Moisture Content Values Obtained from STOMP and Used in the INF2 Sensitivity Case for 241-AX Farm Tanks (GoldSim© Element Name: MC_AX_Tank_INF2).

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
0	0.086768	0.256965	0.082355	0.088356	0.096308	0.102981	0.100621	0.098832	0.097593	0.095697	0.094313	0.092423	0.089662	0.085071
10,000	0.086768	0.256965	0.082355	0.088356	0.096308	0.102981	0.100621	0.098832	0.097593	0.095697	0.094313	0.092423	0.089662	0.085071

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Table C-33. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF3 Sensitivity Case for 241-AX Farm Tanks (GoldSim© Element Name: DF_AX_Tank_INF3).

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
0	3.478994	3.458507	3.405761	3.189622	3.198011	3.245377	3.033316	2.829952	2.669335	2.397627	2.181003	1.86279	1.364518	0.526286
10,000	3.478994	3.458507	3.405761	3.189622	3.198011	3.245377	3.033316	2.829952	2.669335	2.397627	2.181003	1.86279	1.364518	0.526286

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Table C-34. Moisture Content Values Obtained from STOMP and Used in the INF2 Sensitivity Case for 241-AX Farm Tanks (GoldSim© Element Name: MC_AX_Tank_INF3).

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
0	0.079676	0.206688	0.060892	0.059189	0.061102	0.068357	0.06792	0.067526	0.067222	0.066717	0.066322	0.065746	0.064833	0.063165
10,000	0.079676	0.206688	0.060892	0.059189	0.061102	0.068357	0.06792	0.067526	0.067222	0.066717	0.066322	0.065746	0.064833	0.063165

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Table C-35. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF0 Sensitivity Case for 241-AX Tank Farm Pipelines(GoldSim© Element Name: DF_AX_Pipeline_INF0). (sheet 1 of 2)

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
0	99.07245	99.17342	99.42272	99.47461	99.53527	100.9042	107.0505	110.8827	113.159	116.1632	118.0569	120.3137	123.0611	126.536
0.001	99.07245	99.17342	99.42272	99.47461	99.53527	100.9042	107.0505	110.8827	113.159	116.1632	118.0569	120.3137	123.0611	126.536
0.5	99.0714	99.17319	99.42272	99.47461	99.53527	100.9042	107.0505	110.8822	113.1569	116.155	118.0412	120.2844	123.0074	126.4405
1	99.07194	99.17326	99.42272	99.47461	99.53527	100.9042	107.0336	110.7109	112.7546	115.2602	116.7367	118.414	120.3724	122.7967
3	99.07228	99.1732	99.42134	99.47021	99.52991	100.6904	95.18181	88.10782	84.40174	80.3585	78.29445	76.28011	74.41598	72.88764
5	99.00858	99.06865	99.08838	98.81825	98.79316	95.41388	69.33427	59.29932	55.1553	51.10403	49.17729	47.37332	45.76526	44.48857
7	97.93736	97.60419	96.00446	94.25436	93.9021	82.50562	50.64824	42.07231	38.74162	35.58074	34.10999	32.75506	31.57278	30.67012
10	90.6427	89.10744	83.7402	79.7807	79.02209	62.53109	34.41409	28.11815	25.74475	23.52847	22.51187	21.58793	20.80003	20.23097
15	70.25266	67.96117	60.81595	56.45835	55.67095	41.26335	21.44611	17.35489	15.83502	14.42998	13.79291	13.22194	12.74887	12.43514
20	53.50808	51.50109	45.26178	41.60722	40.96401	29.76264	15.18287	12.23702	11.14807	10.14616	9.695	9.294631	8.970388	8.771753
25	42.06454	40.45391	35.31235	32.30467	31.78385	22.91515	11.59485	9.323976	8.486388	7.718026	7.373752	7.070597	6.82975	6.692946
30	34.19732	32.9073	28.65252	26.13534	25.70475	18.46975	9.307801	7.473988	6.798338	6.179801	5.903727	5.662175	5.473431	5.373778
40	24.35945	23.5053	20.465	18.59879	18.28546	13.11129	6.586679	5.279934	4.798859	4.359684	4.164823	3.99608	3.867908	3.809317
50	18.65123	18.0509	15.75394	14.28425	14.0411	10.06918	5.054314	4.047924	3.677592	3.340268	3.191323	3.063451	2.968698	2.931455
70	12.46607	12.12272	10.64704	9.624893	9.459491	6.783707	3.401066	2.723086	2.474294	2.248919	2.150441	2.067386	2.008954	1.994033
100	8.065472	7.882488	6.984286	6.293732	6.184121	4.422902	2.216918	1.780777	1.622255	1.480554	1.420031	1.370862	1.340077	1.342305
130	5.792728	5.682273	5.0729	4.559624	4.479029	3.198163	1.616151	1.309129	1.198999	1.102341	1.062355	1.031631	1.016053	1.027991
160	4.437877	4.365732	3.923519	3.520057	3.457195	2.471315	1.270032	1.041503	0.960825	0.891645	0.864236	0.844869	0.838762	0.856962
200	3.331011	3.286289	2.976522	2.666883	2.619061	1.882429	0.999704	0.83646	0.780291	0.734027	0.717152	0.707361	0.709361	0.733198
250	2.510817	2.483475	2.26853	2.032414	1.996343	1.45265	0.812547	0.698577	0.660872	0.631869	0.622946	0.620424	0.628684	0.657142
300	2.009342	1.991086	1.832306	1.643952	1.615535	1.195639	0.708131	0.624744	0.598367	0.579854	0.575731	0.577594	0.589663	0.621059
400	1.456955	1.446968	1.347895	1.216328	1.197103	0.922707	0.610649	0.560524	0.545936	0.537993	0.538589	0.544705	0.56045	0.594751
500	1.182236	1.175529	1.105387	1.005032	0.990978	0.796841	0.575921	0.540168	0.530202	0.526156	0.528411	0.535982	0.552959	0.588237
500.5	1.181242	1.174547	1.10451	1.004275	0.990241	0.796413	0.575822	0.540114	0.530161	0.526126	0.528386	0.53596	0.552941	0.588222
501	1.180253	1.173568	1.103637	1.00352	0.989506	0.795986	0.575723	0.54006	0.530121	0.526097	0.528361	0.535939	0.552923	0.588207
502	1.178282	1.17162	1.101899	1.002019	0.988045	0.795138	0.575527	0.539953	0.53004	0.526038	0.528312	0.535898	0.552888	0.588177
503	1.176325	1.169684	1.100171	1.000528	0.986593	0.794295	0.575334	0.539847	0.529961	0.52598	0.528263	0.535856	0.552853	0.588147
505	1.172448	1.16585	1.096749	0.997574	0.983718	0.792631	0.574954	0.53964	0.529806	0.525867	0.528167	0.535776	0.552785	0.588089
507	1.16862	1.162064	1.09337	0.994658	0.98088	0.790991	0.574582	0.539438	0.529654	0.525757	0.528074	0.535698	0.55272	0.588034
510	1.162968	1.156472	1.08838	0.990353	0.976691	0.788579	0.57404	0.539143	0.529434	0.525598	0.52794	0.535586	0.552629	0.587966

Table C-36. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF0 Sensitivity Case for 241-AX Tank Farm Pipelines(GoldSim© Element Name: DF_AX_Pipeline_INF0). (sheet 2 of 2)

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
515	1.153783	1.147385	1.080269	0.983362	0.969889	0.784679	0.573176	0.538677	0.529088	0.525354	0.527749	0.53546	0.552604	0.588131
520	1.144878	1.138575	1.072406	0.976592	0.963304	0.780925	0.572359	0.538244	0.528786	0.525223	0.527766	0.535738	0.553376	0.58987
525	1.136244	1.130032	1.064783	0.970035	0.956927	0.777313	0.571589	0.537877	0.528639	0.525564	0.528637	0.537574	0.557014	0.596893
530	1.127871	1.121746	1.057393	0.963684	0.950752	0.773835	0.570872	0.537699	0.52899	0.527338	0.531992	0.543769	0.568386	0.617755
540	1.111847	1.105888	1.043255	0.951553	0.938962	0.767255	0.569741	0.539308	0.534743	0.54474	0.562172	0.596394	0.660413	0.777756
550	1.096736	1.090934	1.029933	0.940146	0.927882	0.761146	0.569857	0.550356	0.564482	0.625969	0.696366	0.815054	1.00676	1.304661
570	1.069041	1.063521	1.005544	0.91933	0.907679	0.750232	0.592416	0.73842	0.979907	1.438633	1.757555	2.129485	2.55117	3.03686
600	1.033097	1.027939	0.973963	0.892542	0.881717	0.737432	1.095357	2.230416	2.722198	3.142053	3.334287	3.530701	3.75324	4.041167
630	1.002949	0.998095	0.947638	0.870541	0.860486	0.738363	2.627731	3.240668	3.389566	3.540125	3.632599	3.750627	3.913192	4.15628
660	0.978317	0.97376	0.926984	0.855005	0.84601	0.836886	3.255283	3.410262	3.481331	3.587745	3.666374	3.774333	3.929656	4.167585
700	0.961113	0.957517	0.924297	0.877617	0.875703	1.889627	3.356548	3.432039	3.492538	3.593322	3.670252	3.777001	3.93147	4.168801
800	2.149657	2.21768	2.822719	3.12902	3.168038	3.330169	3.363028	3.433328	3.493184	3.593635	3.670467	3.777147	3.931567	4.168864
900	3.452487	3.452186	3.43706	3.352852	3.347812	3.333303	3.363033	3.433329	3.493184	3.593635	3.670467	3.777147	3.931567	4.168864
1,000	3.457767	3.45684	3.438284	3.353199	3.348081	3.333306	3.363033	3.433329	3.493184	3.593635	3.670467	3.777147	3.931567	4.168864
1,200	3.457774	3.456847	3.438286	3.353199	3.348081	3.333306	3.363033	3.433329	3.493184	3.593635	3.670467	3.777147	3.931567	4.168864
1,400	3.457774	3.456847	3.438286	3.353199	3.348081	3.333306	3.363033	3.433329	3.493184	3.593635	3.670467	3.777147	3.931567	4.168864
1,600	3.457774	3.456847	3.438286	3.353199	3.348081	3.333306	3.363033	3.433329	3.493184	3.593635	3.670467	3.777147	3.931567	4.168864
1,800	3.457774	3.456847	3.438286	3.353199	3.348081	3.333306	3.363033	3.433329	3.493184	3.593635	3.670467	3.777147	3.931567	4.168864
2,000	3.457774	3.456847	3.438286	3.353199	3.348081	3.333306	3.363033	3.433329	3.493184	3.593635	3.670467	3.777147	3.931567	4.168864
2,200	3.457774	3.456847	3.438286	3.353199	3.348081	3.333306	3.363033	3.433329	3.493184	3.593635	3.670467	3.777147	3.931567	4.168864
2,400	3.457774	3.456847	3.438286	3.353199	3.348081	3.333306	3.363033	3.433329	3.493184	3.593635	3.670467	3.777147	3.931567	4.168864
2,600	3.457774	3.456847	3.438286	3.353199	3.348081	3.333306	3.363033	3.433329	3.493184	3.593635	3.670467	3.777147	3.931567	4.168864
2,800	3.457774	3.456847	3.438286	3.353199	3.348081	3.333306	3.363033	3.433329	3.493184	3.593635	3.670467	3.777147	3.931567	4.168864
10,000	3.457774	3.456847	3.438286	3.353199	3.348081	3.333306	3.363033	3.433329	3.493184	3.593635	3.670467	3.777147	3.931567	4.168864

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Table C-37. Moisture Content Values Obtained from STOMP and Used in the INF0 Sensitivity Case for 241-AX Tank Farm Pipelines (GoldSim© Element Name: MC_AX_Pipeline_INF0). (sheet 1 of 2)

Time (yr)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
0	0.086907	0.25987	0.083249	0.095132	0.097739	0.104625	0.105402	0.105845	0.106088	0.106379	0.10654	0.106701	0.106835	0.106838
0.001	0.086907	0.25987	0.083249	0.095132	0.097739	0.104625	0.105402	0.105845	0.106088	0.106379	0.10654	0.106701	0.106835	0.106838
0.5	0.086907	0.25987	0.083249	0.095132	0.097739	0.104625	0.105402	0.105845	0.106088	0.106379	0.106539	0.106699	0.106831	0.106832
1	0.086907	0.25987	0.083249	0.095132	0.097739	0.104625	0.1054	0.10583	0.106053	0.106301	0.106427	0.10654	0.106611	0.106533
3	0.086907	0.25987	0.083249	0.095131	0.097738	0.1046	0.103922	0.102923	0.102356	0.101691	0.101322	0.100926	0.100487	0.09993
5	0.086904	0.259846	0.083223	0.095061	0.097654	0.103903	0.099755	0.097769	0.096857	0.09589	0.095392	0.094887	0.094365	0.09377
7	0.086849	0.259473	0.082974	0.094525	0.097045	0.101961	0.09575	0.093511	0.092531	0.091517	0.091006	0.090495	0.089981	0.089421
10	0.086457	0.257012	0.08188	0.092578	0.094921	0.098305	0.091088	0.088815	0.087841	0.086846	0.08635	0.08586	0.085379	0.084873
15	0.085263	0.249478	0.079359	0.088593	0.090685	0.093098	0.0858	0.083625	0.0827	0.081762	0.081297	0.080844	0.080407	0.079967
20	0.084153	0.241971	0.077121	0.085218	0.087135	0.089263	0.08222	0.080146	0.079268	0.078377	0.077938	0.077511	0.077106	0.076711
25	0.083309	0.235775	0.075314	0.082532	0.084323	0.086355	0.079581	0.077594	0.076752	0.0759	0.07548	0.075074	0.074692	0.074328
30	0.082681	0.230793	0.073848	0.080361	0.082055	0.08406	0.077527	0.075611	0.074799	0.073978	0.073574	0.073185	0.072821	0.072481
40	0.081827	0.223389	0.07159	0.07702	0.078572	0.080597	0.07446	0.072657	0.071892	0.071119	0.07074	0.070375	0.070038	0.069733
50	0.081291	0.218254	0.069922	0.074546	0.075997	0.078075	0.07224	0.070522	0.069794	0.069058	0.068697	0.068351	0.068034	0.067754
70	0.08067	0.211685	0.067562	0.071036	0.07235	0.074525	0.069116	0.067527	0.066854	0.066175	0.065844	0.065529	0.065243	0.065002
100	0.080198	0.206142	0.065208	0.067547	0.068724	0.070979	0.066004	0.064562	0.063956	0.06335	0.063057	0.062783	0.062541	0.062349
130	0.079944	0.202903	0.063551	0.065102	0.066178	0.068483	0.063859	0.062547	0.062003	0.061467	0.061212	0.060977	0.060777	0.060632
160	0.079789	0.200816	0.062298	0.06325	0.064248	0.066603	0.062297	0.061108	0.060623	0.060152	0.059933	0.059737	0.059578	0.059477
200	0.07966	0.199008	0.061026	0.061366	0.062281	0.06471	0.060797	0.059761	0.059349	0.058961	0.058786	0.058637	0.058527	0.058478
250	0.079563	0.1976	0.059852	0.059615	0.060452	0.062988	0.059528	0.058664	0.058333	0.058033	0.057906	0.057806	0.057748	0.057752
300	0.079503	0.196707	0.058981	0.058308	0.059085	0.061739	0.05869	0.057974	0.057711	0.057484	0.057394	0.057332	0.057312	0.057355
400	0.079436	0.195691	0.057806	0.056528	0.057223	0.060122	0.057767	0.057274	0.057105	0.056972	0.056929	0.056913	0.056937	0.057023
500	0.079403	0.195171	0.057091	0.055436	0.056081	0.059213	0.05738	0.057015	0.056893	0.056804	0.056781	0.056784	0.056826	0.056928
500.5	0.079403	0.195169	0.057088	0.055431	0.056076	0.059209	0.057379	0.057014	0.056893	0.056803	0.056781	0.056784	0.056826	0.056928
501	0.079403	0.195167	0.057085	0.055427	0.056072	0.059206	0.057378	0.057014	0.056892	0.056803	0.056781	0.056783	0.056826	0.056928
502	0.079403	0.195164	0.05708	0.055419	0.056063	0.059199	0.057376	0.057012	0.056891	0.056802	0.05678	0.056783	0.056825	0.056927
503	0.079403	0.19516	0.057074	0.05541	0.056054	0.059193	0.057373	0.057011	0.05689	0.056801	0.056779	0.056782	0.056825	0.056927
505	0.079402	0.195152	0.057063	0.055393	0.056037	0.059179	0.057369	0.057008	0.056888	0.0568	0.056778	0.056781	0.056824	0.056926
507	0.079402	0.195145	0.057052	0.055377	0.056019	0.059166	0.057364	0.057005	0.056885	0.056798	0.056776	0.05678	0.056823	0.056925
510	0.079401	0.195134	0.057036	0.055352	0.055993	0.059147	0.057358	0.057001	0.056882	0.056795	0.056774	0.056778	0.056821	0.056924

Table C-38. Moisture Content Values Obtained from STOMP and Used in the INF0 Sensitivity Case for 241-AX Tank Farm Pipelines (GoldSim© Element Name: MC_AX_Pipeline_INF0). (sheet 2 of 2)

Time (yr)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
515	0.0794	0.195117	0.05701	0.055312	0.055951	0.059116	0.057347	0.056995	0.056877	0.056792	0.056771	0.056775	0.056819	0.056923
520	0.079399	0.1951	0.056984	0.055273	0.05591	0.059086	0.057337	0.056989	0.056872	0.056788	0.056768	0.056774	0.056819	0.056926
525	0.079398	0.195083	0.056959	0.055234	0.055871	0.059057	0.057328	0.056983	0.056868	0.056787	0.056769	0.056778	0.05683	0.056948
530	0.079397	0.195067	0.056935	0.055197	0.055832	0.059029	0.057319	0.056978	0.056866	0.056791	0.056779	0.056798	0.056869	0.057021
540	0.079395	0.195036	0.056888	0.055125	0.055757	0.058975	0.057303	0.056977	0.056883	0.056853	0.056891	0.056996	0.057211	0.057594
550	0.079393	0.195007	0.056843	0.055056	0.055685	0.058925	0.057293	0.057015	0.056997	0.057173	0.057418	0.05784	0.058506	0.059452
570	0.07939	0.194954	0.056759	0.054929	0.055552	0.058833	0.057369	0.057782	0.058696	0.060439	0.061602	0.062883	0.064206	0.06549
600	0.079385	0.194884	0.056649	0.054761	0.055377	0.05872	0.05946	0.063926	0.065743	0.067153	0.067716	0.068213	0.068669	0.069097
630	0.079381	0.194826	0.056554	0.054617	0.055228	0.058674	0.065711	0.067931	0.068373	0.068721	0.068891	0.069079	0.069297	0.069546
660	0.079378	0.194778	0.056475	0.054502	0.05511	0.059043	0.068163	0.068604	0.068742	0.068915	0.069031	0.069177	0.069366	0.069594
700	0.079376	0.194742	0.05643	0.054484	0.055117	0.063188	0.068559	0.068693	0.068789	0.068939	0.069047	0.069189	0.069374	0.069599
800	0.079519	0.1969	0.060302	0.061982	0.063198	0.068535	0.068585	0.068698	0.068791	0.06894	0.069048	0.069189	0.069374	0.069599
900	0.079674	0.199231	0.061555	0.062754	0.063846	0.068547	0.068585	0.068698	0.068791	0.06894	0.069048	0.069189	0.069374	0.069599
1000	0.079674	0.19924	0.061557	0.062755	0.063847	0.068547	0.068585	0.068698	0.068791	0.06894	0.069048	0.069189	0.069374	0.069599
1200	0.079674	0.19924	0.061557	0.062755	0.063847	0.068547	0.068585	0.068698	0.068791	0.06894	0.069048	0.069189	0.069374	0.069599
1400	0.079674	0.19924	0.061557	0.062755	0.063847	0.068547	0.068585	0.068698	0.068791	0.06894	0.069048	0.069189	0.069374	0.069599
1600	0.079674	0.19924	0.061557	0.062755	0.063847	0.068547	0.068585	0.068698	0.068791	0.06894	0.069048	0.069189	0.069374	0.069599
1800	0.079674	0.19924	0.061557	0.062755	0.063847	0.068547	0.068585	0.068698	0.068791	0.06894	0.069048	0.069189	0.069374	0.069599
2000	0.079674	0.19924	0.061557	0.062755	0.063847	0.068547	0.068585	0.068698	0.068791	0.06894	0.069048	0.069189	0.069374	0.069599
2200	0.079674	0.19924	0.061557	0.062755	0.063847	0.068547	0.068585	0.068698	0.068791	0.06894	0.069048	0.069189	0.069374	0.069599
2400	0.079674	0.19924	0.061557	0.062755	0.063847	0.068547	0.068585	0.068698	0.068791	0.06894	0.069048	0.069189	0.069374	0.069599
2600	0.079674	0.19924	0.061557	0.062755	0.063847	0.068547	0.068585	0.068698	0.068791	0.06894	0.069048	0.069189	0.069374	0.069599
2800	0.079674	0.19924	0.061557	0.062755	0.063847	0.068547	0.068585	0.068698	0.068791	0.06894	0.069048	0.069189	0.069374	0.069599
10000	0.079674	0.19924	0.061557	0.062755	0.063847	0.068547	0.068585	0.068698	0.068791	0.06894	0.069048	0.069189	0.069374	0.069599

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Table C-39. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF1 Sensitivity Case for 241-AX Tank Farm Pipelines (GoldSim© Element Name: DF_AX_Pipeline_INF1).

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
0	99.07245	99.17342	99.42272	99.47461	99.53527	100.9042	107.0505	110.8827	113.159	116.1632	118.0569	120.3137	123.0611	126.536
0.001	99.07245	99.17342	99.42272	99.47461	99.53527	100.9042	107.0505	110.8827	113.159	116.1632	118.0569	120.3137	123.0611	126.536
0.5	99.0714	99.17319	99.42272	99.47461	99.53527	100.9042	107.0505	110.8822	113.1569	116.155	118.0412	120.2844	123.0074	126.4405
1	99.07194	99.17326	99.42272	99.47461	99.53527	100.9042	107.0336	110.7109	112.7546	115.2602	116.7367	118.414	120.3724	122.7967
3	99.07228	99.1732	99.42134	99.47021	99.52991	100.6904	95.18181	88.10782	84.40174	80.3585	78.29445	76.28011	74.41598	72.88764
5	99.00858	99.06865	99.08838	98.81825	98.79316	95.41388	69.33427	59.29932	55.1553	51.10403	49.17729	47.37332	45.76526	44.48857
7	97.93736	97.60419	96.00446	94.25436	93.9021	82.50562	50.64824	42.07231	38.74162	35.58074	34.10999	32.75506	31.57278	30.67012
10	90.6427	89.10744	83.7402	79.7807	79.02209	62.53109	34.41409	28.11815	25.74475	23.52847	22.51187	21.58793	20.80003	20.23097
15	70.25266	67.96117	60.81595	56.45835	55.67095	41.26335	21.44611	17.35489	15.83502	14.42998	13.79291	13.22194	12.74887	12.43514
20	53.50808	51.50109	45.26178	41.60722	40.96401	29.76264	15.18287	12.23702	11.14807	10.14616	9.695	9.294631	8.970388	8.771753
25	42.06454	40.45391	35.31235	32.30467	31.78385	22.91515	11.59485	9.323976	8.486388	7.718026	7.373752	7.070597	6.82975	6.692946
30	34.19732	32.9073	28.65252	26.13534	25.70475	18.46975	9.307801	7.473988	6.798338	6.179801	5.903727	5.662175	5.473431	5.373778
40	24.35945	23.5053	20.465	18.59879	18.28546	13.11129	6.586679	5.279934	4.798859	4.359684	4.164823	3.99608	3.867908	3.809317
50	18.65123	18.0509	15.75394	14.28425	14.0411	10.06918	5.054314	4.047924	3.677592	3.340268	3.191323	3.063451	2.968698	2.931455
70	12.46607	12.12272	10.64704	9.624893	9.459491	6.783707	3.401066	2.723086	2.474294	2.248919	2.150441	2.067386	2.008954	1.994033
100	8.065472	7.882488	6.984286	6.293732	6.184121	4.422902	2.216918	1.780777	1.622255	1.480554	1.420031	1.370862	1.340077	1.342305
130	5.792728	5.682273	5.0729	4.559624	4.479029	3.198163	1.616151	1.309129	1.198999	1.102341	1.062355	1.031631	1.016053	1.027991
160	4.437877	4.365732	3.923519	3.520057	3.457195	2.471315	1.270032	1.041503	0.960825	0.891645	0.864236	0.844869	0.838762	0.856962
200	3.331011	3.286289	2.976522	2.666883	2.619061	1.882429	0.999704	0.83646	0.780291	0.734027	0.717152	0.707361	0.709361	0.733198
250	2.510817	2.483475	2.26853	2.032414	1.996343	1.45265	0.812547	0.698577	0.660872	0.631869	0.622946	0.620424	0.628684	0.657142
300	2.009342	1.991086	1.832306	1.643952	1.615535	1.195639	0.708131	0.624744	0.598367	0.579854	0.575731	0.577594	0.589663	0.621059
400	1.456955	1.446968	1.347895	1.216328	1.197103	0.922707	0.610649	0.560524	0.545936	0.537993	0.538589	0.544705	0.56045	0.594751
500	1.182236	1.175529	1.105387	1.005032	0.990978	0.796841	0.575921	0.540168	0.530202	0.526156	0.528411	0.535982	0.552959	0.588237
10,000	1.182236	1.175529	1.105387	1.005032	0.990978	0.796841	0.575921	0.540168	0.530202	0.526156	0.528411	0.535982	0.552959	0.588237

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Table C-40. Moisture Content Values Obtained from STOMP and Used in the INF1 Sensitivity Case for 241-AX Tank Farm Pipelines (GoldSim© Element Name: MC_AX_Pipeline_INF1).

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
0	0.086907	0.25987	0.083249	0.095132	0.097739	0.104625	0.105402	0.105845	0.106088	0.106379	0.10654	0.106701	0.106835	0.106838
0.001	0.086907	0.25987	0.083249	0.095132	0.097739	0.104625	0.105402	0.105845	0.106088	0.106379	0.10654	0.106701	0.106835	0.106838
0.5	0.086907	0.25987	0.083249	0.095132	0.097739	0.104625	0.105402	0.105845	0.106088	0.106379	0.106539	0.106699	0.106831	0.106832
1	0.086907	0.25987	0.083249	0.095132	0.097739	0.104625	0.1054	0.10583	0.106053	0.106301	0.106427	0.10654	0.106611	0.106533
3	0.086907	0.25987	0.083249	0.095131	0.097738	0.1046	0.103922	0.102923	0.102356	0.101691	0.101322	0.100926	0.100487	0.09993
5	0.086904	0.259846	0.083223	0.095061	0.097654	0.103903	0.099755	0.097769	0.096857	0.09589	0.095392	0.094887	0.094365	0.09377
7	0.086849	0.259473	0.082974	0.094525	0.097045	0.101961	0.09575	0.093511	0.092531	0.091517	0.091006	0.090495	0.089981	0.089421
10	0.086457	0.257012	0.08188	0.092578	0.094921	0.098305	0.091088	0.088815	0.087841	0.086846	0.08635	0.08586	0.085379	0.084873
15	0.085263	0.249478	0.079359	0.088593	0.090685	0.093098	0.0858	0.083625	0.0827	0.081762	0.081297	0.080844	0.080407	0.079967
20	0.084153	0.241971	0.077121	0.085218	0.087135	0.089263	0.08222	0.080146	0.079268	0.078377	0.077938	0.077511	0.077106	0.076711
25	0.083309	0.235775	0.075314	0.082532	0.084323	0.086355	0.079581	0.077594	0.076752	0.0759	0.07548	0.075074	0.074692	0.074328
30	0.082681	0.230793	0.073848	0.080361	0.082055	0.08406	0.077527	0.075611	0.074799	0.073978	0.073574	0.073185	0.072821	0.072481
40	0.081827	0.223389	0.07159	0.07702	0.078572	0.080597	0.07446	0.072657	0.071892	0.071119	0.07074	0.070375	0.070038	0.069733
50	0.081291	0.218254	0.069922	0.074546	0.075997	0.078075	0.07224	0.070522	0.069794	0.069058	0.068697	0.068351	0.068034	0.067754
70	0.08067	0.211685	0.067562	0.071036	0.07235	0.074525	0.069116	0.067527	0.066854	0.066175	0.065844	0.065529	0.065243	0.065002
100	0.080198	0.206142	0.065208	0.067547	0.068724	0.070979	0.066004	0.064562	0.063956	0.06335	0.063057	0.062783	0.062541	0.062349
130	0.079944	0.202903	0.063551	0.065102	0.066178	0.068483	0.063859	0.062547	0.062003	0.061467	0.061212	0.060977	0.060777	0.060632
160	0.079789	0.200816	0.062298	0.06325	0.064248	0.066603	0.062297	0.061108	0.060623	0.060152	0.059933	0.059737	0.059578	0.059477
200	0.07966	0.199008	0.061026	0.061366	0.062281	0.06471	0.060797	0.059761	0.059349	0.058961	0.058786	0.058637	0.058527	0.058478
250	0.079563	0.1976	0.059852	0.059615	0.060452	0.062988	0.059528	0.058664	0.058333	0.058033	0.057906	0.057806	0.057748	0.057752
300	0.079503	0.196707	0.058981	0.058308	0.059085	0.061739	0.05869	0.057974	0.057711	0.057484	0.057394	0.057332	0.057312	0.057355
400	0.079436	0.195691	0.057806	0.056528	0.057223	0.060122	0.057767	0.057274	0.057105	0.056972	0.056929	0.056913	0.056937	0.057023
500	0.079403	0.195171	0.057091	0.055436	0.056081	0.059213	0.05738	0.057015	0.056893	0.056804	0.056781	0.056784	0.056826	0.056928
10,000	0.079403	0.195171	0.057091	0.055436	0.056081	0.059213	0.05738	0.057015	0.056893	0.056804	0.056781	0.056784	0.056826	0.056928

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Table C-41. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF2 Sensitivity Case for 241-AX Tank Farm Pipelines (GoldSim© Element Name: DF_AX_Pipeline_INF2).

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
0	99.07245	99.17342	99.42272	99.47461	99.53527	100.9042	107.0505	110.8827	113.159	116.1632	118.0569	120.3137	123.0611	126.536
10,000	99.07245	99.17342	99.42272	99.47461	99.53527	100.9042	107.0505	110.8827	113.159	116.1632	118.0569	120.3137	123.0611	126.536

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Table C-42. Moisture Content Values Obtained from STOMP and Used in the INF2 Sensitivity Case for 241-AX Tank Farm Pipelines (GoldSim© Element Name: MC_AX_Pipeline_INF2).

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
0	0.086907	0.25987	0.083249	0.095132	0.097739	0.104625	0.105402	0.105845	0.106088	0.106379	0.10654	0.106701	0.106835	0.106838
10,000	0.086907	0.25987	0.083249	0.095132	0.097739	0.104625	0.105402	0.105845	0.106088	0.106379	0.10654	0.106701	0.106835	0.106838

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Table C-43. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF3 Sensitivity Case for 241-AX Tank Farm Pipelines (GoldSim© Element Name: DF_AX_Pipeline_INF3).

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
0	3.457774	3.456847	3.438286	3.353199	3.348081	3.333306	3.363033	3.433329	3.493184	3.593635	3.670467	3.777147	3.931567	4.168864
10,000	3.457774	3.456847	3.438286	3.353199	3.348081	3.333306	3.363033	3.433329	3.493184	3.593635	3.670467	3.777147	3.931567	4.168864

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Table C-44. Moisture Content Values Obtained from STOMP and Used in the INF3 Sensitivity Case for 241-AX Tank Farm Pipelines (GoldSim© Element Name: MC_AX_Pipeline_INF3).

Time (years)	Node_23	Node_29	Node_43	Node_50	Node_51	Node_67	Node_89	Node_94	Node_96	Node_98	Node_99	Node_100	Node_101	Node_102
0	0.079674	0.19924	0.061557	0.062755	0.063847	0.068547	0.068585	0.068698	0.068791	0.06894	0.069048	0.069189	0.069374	0.069599
10,000	0.079674	0.19924	0.061557	0.062755	0.063847	0.068547	0.068585	0.068698	0.068791	0.06894	0.069048	0.069189	0.069374	0.069599

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Table C-45. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF0 Sensitivity Case for 241-AX Tank Farm Backfill (GoldSim© Element Name: DF_Soil_Backfill_AX_INF0). (2 sheets)

Time (years)	Node_114
0	129.2111789
0.001	129.2080517
0.5	101.7152635
1	68.87927678
3	25.11583068
5	14.3171105
7	9.742093746
10	6.448221579
15	4.050037399
20	2.93679678
25	2.30889291
30	1.912388173
40	1.445256022
50	1.187482947
70	0.925216808
100	0.764196285
130	0.697501328
160	0.665989721
200	0.64653108
250	0.636735635
300	0.632966755
400	0.630780452
500	0.630363607
500.5	0.63277465
501	0.637150895
502	0.650471443
503	0.669395356
505	0.730067229
507	0.834778718

Table C-45. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF0 Sensitivity Case for 241-AX Tank Farm Backfill (GoldSim© Element Name: DF_Soil_Backfill_AX_INF0). (2 sheets)

Time (years)	Node_114
510	1.096602322
515	1.760500814
520	2.497979628
525	3.127986966
530	3.594219071
540	4.13296969
550	4.357399783
570	4.47959969
600	4.500299257
630	4.501676966
660	4.501783437
700	4.501792879
800	4.501793375
900	4.501793375
1,000	4.501793375
1,200	4.501793375
1,400	4.501793375
1,600	4.501793375
1,800	4.501793375
2,000	4.501793375
2,200	4.501793375
2,400	4.501793375
2,600	4.501793375
2,800	4.501793375
10,000	4.501793375

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Table C-46. Moisture Content Values Obtained from STOMP and Used in the INF0 Sensitivity Case for 241-AX Tank Farm Backfill (GoldSim© Element Name: MC_Soil_Backfill_AX_INF0). (2 sheets)

Time (years)	Node_114
0	0.107723502
0.001	0.107723495
0.5	0.105067235
1	0.100200493
3	0.088319346
5	0.082484393
7	0.078808099
10	0.075136071
15	0.071300326
20	0.068816666
25	0.067035973
30	0.065681722
40	0.063722168
50	0.062372065
70	0.060649634
100	0.059266608
130	0.058556489
160	0.05817168
200	0.057907346
250	0.057760534
300	0.057699186
400	0.057660721
500	0.057652741
500.5	0.057655948
501	0.057665554
502	0.057701921
503	0.057757699
505	0.057935224
507	0.058238529

Table C-46. Moisture Content Values Obtained from STOMP and Used in the INF0 Sensitivity Case for 241-AX Tank Farm Backfill (GoldSim© Element Name: MC_Soil_Backfill_AX_INF0). (2 sheets)

Time (years)	Node_114
510	0.059032879
515	0.061224036
520	0.063762529
525	0.065943477
530	0.06755189
540	0.069397277
550	0.070172194
570	0.070606828
600	0.070685271
630	0.070690934
660	0.070691397
700	0.070691441
800	0.070691444
900	0.070691444
1,000	0.070691444
1,200	0.070691444
1,400	0.070691444
1,600	0.070691444
1,800	0.070691444
2,000	0.070691444
2,200	0.070691444
2,400	0.070691444
2,600	0.070691444
2,800	0.070691444
10,000	0.070691444

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Table C-47. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF1 Sensitivity Case for 241-AX Tank Farm Backfill (GoldSim© Element Name: DF_Soil_Backfill_AX_INF1).

Time (years)	Node_114
0	129.2111789
0.001	129.2080517
0.5	101.7152635
1	68.87927678
3	25.11583068
5	14.3171105
7	9.742093746
10	6.448221579
15	4.050037399
20	2.93679678
25	2.30889291
30	1.912388173
40	1.445256022
50	1.187482947
70	0.925216808
100	0.764196285
130	0.697501328
160	0.665989721
200	0.64653108
250	0.636735635
300	0.632966755
400	0.630780452
500	0.630363607
10,000	0.630363607

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Table C-48. Moisture Content Values Obtained from STOMP and Used in the INF1 Sensitivity Case for 241-AX Tank Farm Backfill (GoldSim© Element Name: MC_Soil_Backfill_INF1).

Time (years)	Node_114
0	0.107723502
0.001	0.107723495
0.5	0.105067235
1	0.100200493
3	0.088319346
5	0.082484393
7	0.078808099
10	0.075136071
15	0.071300326
20	0.068816666
25	0.067035973
30	0.065681722
40	0.063722168
50	0.062372065
70	0.060649634
100	0.059266608
130	0.058556489
160	0.05817168
200	0.057907346
250	0.057760534
300	0.057699186
400	0.057660721
500	0.057652741
10,000	0.057652741

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Table C-49. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF2 Sensitivity Case for 241-AX Tank Farm Backfill (GoldSim© Element Name: DF_Soil_Backfill_AX_INF2).

Time (years)	Node_114
0	129.2111789
10,000	129.2111789

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Table C-50. Moisture Content Values Obtained from STOMP and Used in the INF2 Sensitivity Case for 241-AX Tank Farm Backfill (GoldSim© Element Name: MC_Soil_Backfill_AX_INF2).

Time (years)	Node_114
0	0.107723502
10,000	0.107723502

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Table C-51. Darcy Flux (mm/yr) Obtained from STOMP and Used in the INF3 Sensitivity Case for 241-AX Tank Farm Backfill (GoldSim© Element Name: DF_Soil_Backfill_AX_INF3).

Time (years)	Node_114
0	4.501793375
10,000	4.501793375

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Table C-52. Moisture Content Values Obtained from STOMP and Used in the INF3 Sensitivity Case for 241-AX Tank Farm Backfill (GoldSim© Element Name: MC_Soil_Backfill_AX_INF3).

Time (years)	Node_114
0	0.070691444
10,000	0.070691444

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