E-Plan Evaluation - Point Source Stack Release Scenario

This scenario represents emissions of dust from a stack point source at the MVF during processing and transloading of wastes.

I. Inputs and Assumptions

1. EPA CAP88-PC Code, Ver 4.1 used for offsite dose receptor calculations
2. Prevailing wind blows from the west
3. Nearest potential offsite receptor with the highest potential dose from Stack source is 85m to the east at the facility fenceline
4. List of radionuclides was chosen based on highest dose potential, taking into consideration the scope of proposed MVF licensed activities (i.e., VLLW waste verification and processing)
5. CAP88-PC was modeled with a standard release rates of 1uCi/yr for all radionuclides. Dose to source ratios (in units of mrem/uCi) were then calculated and used for scaling to a limiting dose of 1Rem.
6. For Uranium, Thorium, and Radium, cases were run for individual parent nuclides as well as the entire decay chain in secular equilibrium

Point Source-Stack Release				
	(Nominal RR & DSR)		Limiting RR & Dose	
Nuclide	Release Rate (Ci/yr)	Effective Dose Equivalent (mrem)	Release Rate (Ci/yr) to get to 1 rem	Effective Dose Equivalent (mrem)
U-238	1.00E-06	3.23E-05	3.10E+01	1000
U-238 equil	1.00E-06	4.78E-04	2.09E+00	1000
U-235	1.00E-06	3.71E-05	2.70E+01	1000
U-234	1.00E-06	2.80E-05	3.57E+01	1000
Th-232	1.00E-06	3.66E-04	2.73E+00	1000
Th-232 equil	1.00E-06	8.11E-04	1.23E+00	1000
Ra-226	1.00E-06	1.90E-04	5.26E+00	1000
Ra-226 equil	1.00E-06	2.83E-04	3.53E+00	1000
Cs-137	1.00E-06	4.23E-05	2.36E+01	1000
Co-60	1.00E-06	2.78E-05	3.60E+01	1000
Pu-239	1.00E-06	4.58E-04	2.18E+00	1000
Pu-240	1.00E-06	4.58E-04	2.18E+00	1000
Pu-241	1.00E-06	8.38E-06	1.19E+02	1000

II. Results

II. Results

1. Th-232 (in equil) was chosen as the limiting radionuclide based on the CAP88-PC results. A scaled Release Rate of 1.23 Ci/yr was determined to be needed to incur an Effective Dose Equivalent (EDE) of 1Rem to the nearest postulated offsite receptor. CAP88-PC output file is attached.

2. In order to have a release of ~1.23Ci of Th-232 (in equil) from VLLW shipments expected at the MVF, the following types of scenarios would need to occur. Several scenarios are presented given the potential for the MVF to process wastes prior to eventual offiste disposal.

a. Gondola Railcar - (4) Gondola Railcars each loaded to 3,000pCi/g USEI WAC limit (each carrying 106 net tons of soil-like waste)

b. Drum - (1) single drum of waste with an equivalent 1.23 Ci of total inventory, containing ~400lb of soil-like material. This results in an equivalent waste concentration of ~6.7uCi/g in the drum.

c. Intermodal Container - 20yd^3 of soil-like waste (24 tons @ 1.2 tons/yd^3). Equivalent waste concentration at limiting total activity (1.23Ci) = 5.6E+04 pCi/g

d. Sealed Sources or Other Items - Although the MVF license application is requesting receipt of sources and items for brokerage purposes, all potential sources will only be received for purposes of offsite disposition, either for licensed LLRW dispsoal or transfer to Qal-Tek's Idaho Falls, ID facility license for future considerations. For these reasons, potential releases from sources are not considered in this evaluation.

III. Analysis

Waste Scenarios

1. The Drum and Intermodal Container scenarios were analyzed for potential of occurence due to their operational plausibility.

a. Drum Scenario - This scenario assumes a spill of a 400lb drum of Thorium-bearing waste that results in a total of 1.23Ci of waste that is available for transport to the site boundary. As presented in Section II above, this scenario is physically impossible for multiple reasons (activity is distributed over 400lb of soil-like waste; receptor cannot ingest/inhale all of the available limiting activity). Concentration of the soil-like wastes does increase the plausibility of such an event but at the concentrations required (>5uCi/g), the contact dose rates on the drum would likely excceed 1Rem/hr. A waste package of this type would require shielding and extensive downblending in order to meet the WAC at USEI, making it highly unlikely (near impossible) for acceptance at the MVF.

b. Intermodal Container - Scenario posits a spill of a 20 cubic yard intermodal container of Thorium-bearing waste that results in a total of 1.23Ci of waste that is available for transport to the site boundary. Approximate concentration of the waste is 56,000pCi/g in a soil-like matrix. Although the Th-232 concentration of the waste in this scenario places it in the "possible" category for processing for alternate disposal, the sheer volume of the material (`24 tons) available for uptake places it outsider of the realm of plausibility for sake of an offsite receptor dose (per CAP88-PC).

IV. Conclusions

1. Based on the CAP88-PC results and review of the plausibility for the MVF to operationally receive and handle the required radionuclide quantities to exceed an EDE of 1Rem to an offsite receptor, the MVF should not be required to prepare and administer an Emergency Plan in support of the radioactive materials license.

2. Supporting Information for Conclusion:

a. Given that the MVF is being designed and licensed as a VLLW diffuse-waste verification and processing facility, the potential for radionuclide releases that could result in plausible large exposures to offsite receptors is very low. Justifications for this position incliude the following:

b. MVF waste activities to be performed will be limited to physical movements of waste containers for consolidation or future trans-loading of VLLW. The most credible events will be ordinary "spills" that are easily manageable within the contained facility. The expected physical form of most waste will be soils, soil-like materials and debris that will be lightly contaminated. Furthermore, The MVF will be closed during active or open-container operations is capable of being closed and confined (see 1 above) to the extent that any 'spills' can be contained and appropriately responded to without a release to the environment.

c. No processing will be performed that involves changes to physical or chemical form of the waste or use of compaction, heat or other treatment processes that could alter chemical or physical form of the waste. These operational constraints remove nearly all sources of potential (or stored) energy that could expel radioactive materials from the MVF facility and make them available for transport to the site boundary.

d. The MVF will not process wastes that are pressurized or contain gases that are capable of being released.

e. It is worth noting that all scenarios considered in this evaluation ignore the operational requirement that shipments being routed through the MVF for purposes of Alternate Disposal to USEI meet the dose and ALARA constraints in 10CFR20.2002 and all applicable license conditions. These dose constraints would most likely take precedent in Qal-Tek's evaluation of acceptable waste streams into the MVF since dose to the maximally-exposed individual (MEI) at the unlicensed USEI landfill must remain within stated program limits. This constraint thus limits the working activities of received waste shipments.

E-Plan Evaluation - Area Source Fugitive Dust Scenario

This scenario represents emissions of fugitive dust from the MVF during processing and transloading of wastes, assuming there is no air handling system.

I. Inputs and Assumptions

1. EPA CAP88-PC Code, Ver 4.1 used for offsite dose receptor calculations
2. Prevailing wind blows from the west
3. Nearest potential offsite receptor with the highest potential dose from an area source is approximatel 50m ENE on the facility fenceline
4. List of radionuclides was chosen based on highest dose potential, taking into consideration the scope of proposed MVF licensed activities (i.e., VLLW waste verification and processing)
5. CAP88-PC was modeled with a nominal release rate of 1uCi/yr for all radionuclides with the size of the area source that of a gondola car. Dose to Source ratrios (DSR, in units of mrem/uCi) were then calculated and used for scaling to a limiting does of 1Rem
6. For Uranium, Thorium, and Radium, cases were run for individual parent nuclides as well as the entire decay chain in secular equilibrium

Area Source-Fugitive Dust Release				
	(Nominal RR & DSR)		Limiting RR & Dose	
Nuclide	Release Rate (Ci/yr)	Effective Dose Equivalent (mrem)	Release Rate (Ci/yr) to get to 1 rem	Effective Dose Equivalent (mrem)
U-238	1.00E-06	2.83E-04	3.53E+00	1000
U-238 equil	1.00E-06	4.39E-03	2.28E-01	1000
U-235	1.00E-06	3.23E-04	3.10E+00	1000
U-234	1.00E-06	2.52E-04	3.97E+00	1000
Th-232	1.00E-06	3.14E-03	3.18E-01	1000
Th-232 equil	1.00E-06	7.17E-03	1.39E-01	1000
Ra-226	1.00E-06	1.69E-03	5.92E-01	1000
Ra-226 equil	1.00E-06	2.66E-03	3.76E-01	1000
Cs-137	1.00E-06	4.24E-04	2.36E+00	1000
Co-60	1.00E-06	2.35E-04	4.26E+00	1000
Pu-239	1.00E-06	4.01E-03	2.49E-01	1000
Pu-240	1.00E-06	4.01E-03	2.49E-01	1000
Pu-241	1.00E-06	7.35E-05	1.36E+01	1000

II. Results

Th-232 (in equil) was chosen as the limiting radionuclide based on the CAP88-PC results. A scaled Release Rate of 0.139 Ci/yr was determined to be needed to incur an Effective Dose Equivalent (EDE) of 1Rem to the nearest postulated offsite receptor. CAP88-PC output file is attached.

A 0.139Ci/yr Release Rate is equivalent to **51 tons of material at 3000pCi/g (USEI's WAC Limit)**

Using the "Compilation of Air Pollutant Emission Factors, Vol. 1: Stationary, Point and Area Sources." AP-42, 5th Edition a fugative dust factor was tabulated. In order to reach a fugative dust amount of 51 tons released for potential uptake, US Ecology would have to recieve and process approximately 4.95E+8 Tons of material in a single year.

III. Analysis

Waste Scenarios

As mentioned in Section II, in order to release 0.139Ci of Th-232 to the fencline for potential intake, one would have to ingest roughly 51 tons of material at 3,000pCi/g. In order for this much material to be suspsended in air as fugiitve dust, due to the transloading process, a grand total of 4.95E+8 tons of material would need to be recieved on site and processessed. This volume far exceeds the amount of waste US Ecology could even practically process at the MVF. Estimated volumes are closer to 200,000 tons annually.

IV. Conclusions

While this scenario appears to result in emitted levels that are much lower than the Stack scenario to reach the 1 rem limit, there are still several reasons why this scenario is impossible to achieve. The amount of material that would need to be recieved and processed far exceeds US Ecology's capabilities. Also, the shear volume one would need to consume to recieve a 1Rem dose is not plausible due to the low activity concentrations.