West Valley Demonstration Project

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Vitrification Facility (VF) Radioisotope Inventory Report

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List of Acronyms

ALARA	As Low As Reasonably Achievable
CCTV	Closed-Circuit Television
CFMT	Concentrator Feed Makeup Tank
CMP	Characterization Management Plan for the Facility Characterization Project (WVDP-403)
ECS	Evacuated Canister System
FCP	Facility Characterization Project
HEME	High-Efficiency Mist Eliminator
HEPA	High-Efficiency Particulate Air
HLW	High-Level Waste
HLWISF	High-Level Waste Interim Storage Facility
HVAC	Heating, Ventilation, and Air Conditioning
MFHT	Melter Feed Hold Tank
NFS	Nuclear Fuel Services
NOx	Oxides of Nitrogen
PNNL	Pacific Northwest National Laboratory
SBS	Submerged Bed Scrubber
TTP	Technical Task Plan
VEMP	Vitrification Expended Materials Program
VF	Vitrification Facility
WVDP	West Valley Demonstration Project
WVNSCO	West Valley Nuclear Services Company

1.0 Introduction

This report provides a conservatively bounded long-lived curie inventory of the Vitrification Facility (VF) for use with performance assessment modeling. Evaluation and characterization activities were conducted in accordance with WVDP-403, "Characterization Management Plan for the Facility Characterization Project" (CMP) (Reference 1). The approach used to evaluate the VF and generate the inventory estimate involved the following steps:

- Collection and evaluation of existing information and data on the facility.
- Identification of key curie contributing components and areas of the facility.
- Taking in-cell radiation measurements of the key curie contributing components and areas of the facility.
- Preparation of dose-to-curie computer models.
- Identifying and applying a bounding set of radioisotopic scaling factors to the modeling results to yield a conservative curie inventory.

2.0 Facility Description

The VF is a structural-steel frame, metal-sided building immediately north of and adjacent to the Process Building. It houses the Vitrification Cell, Vitrification Operating Aisles, and Vitrification Control Room. The VF building measures 28 meters wide by 44 meters long by 45 meters high at roof level, 45 meters high at roof edge, and 46 meters at roof peak. Facilities and work areas within this structure are described in Section 2.2. See Figure 1.

2.1 Process History

The West Valley Demonstration Project (WVDP) VF was shut down in September 2002 after being used to vitrify high-level waste (HLW) and process system residuals for six years. Processing of the HLW occurred from June 1996 through November 2001, followed by a program to flush the remaining HLW through to the melter. Glass removal and shutdown followed.

During HLW processing operations, nearly 24 million curies of radioactive material were vitrified into 275 canisters of HLW glass. At least 99.7% of the curies in the HLW tanks at the WVDP were vitrified using the melter. Each canister of HLW holds approximately 2,000 kilograms of glass with an average contact dose rate of 2,600 R/hr. After vitrification processing ended, two more canisters were filled using the Evacuated Canister Process to empty the melter at shutdown (Reference 2).

The basic process used to produce canisters of HLW glass began by transferring the homogenous HLW slurry from Tank 8D-2 to the Concentrator Feed Make-Up Tank (CFMT) where the slurry was concentrated to remove excess water. While in the CFMT, the slurry was sampled and a determination made as to what chemical additives were required to make up a batch of qualified HLW glass. Chemical additives were then added to the slurry in the CFMT and the mixture sampled again to ensure target glass composition. The batched waste was then transferred from the CFMT to the Melter Feed Hold Tank (MFHT). See Figure 2.

The next step in HLW processing involved transferring feed from the MFHT to the melter, where the wastes and glass-formers melted and fused into a glass pool. During melter operation, molten glass was periodically airlifted into a stainless steel canister held in position under the melter by the canister turntable, a four-position, four-canister device that provides one position for filling, one position for canister removal and replacement, and two positions for filled canisters to cool. After being allowed to cool, the filled canister was moved from the canister turntable to the Weld Station, where a stainless steel lid was welded onto the canister. From the Weld Station, the

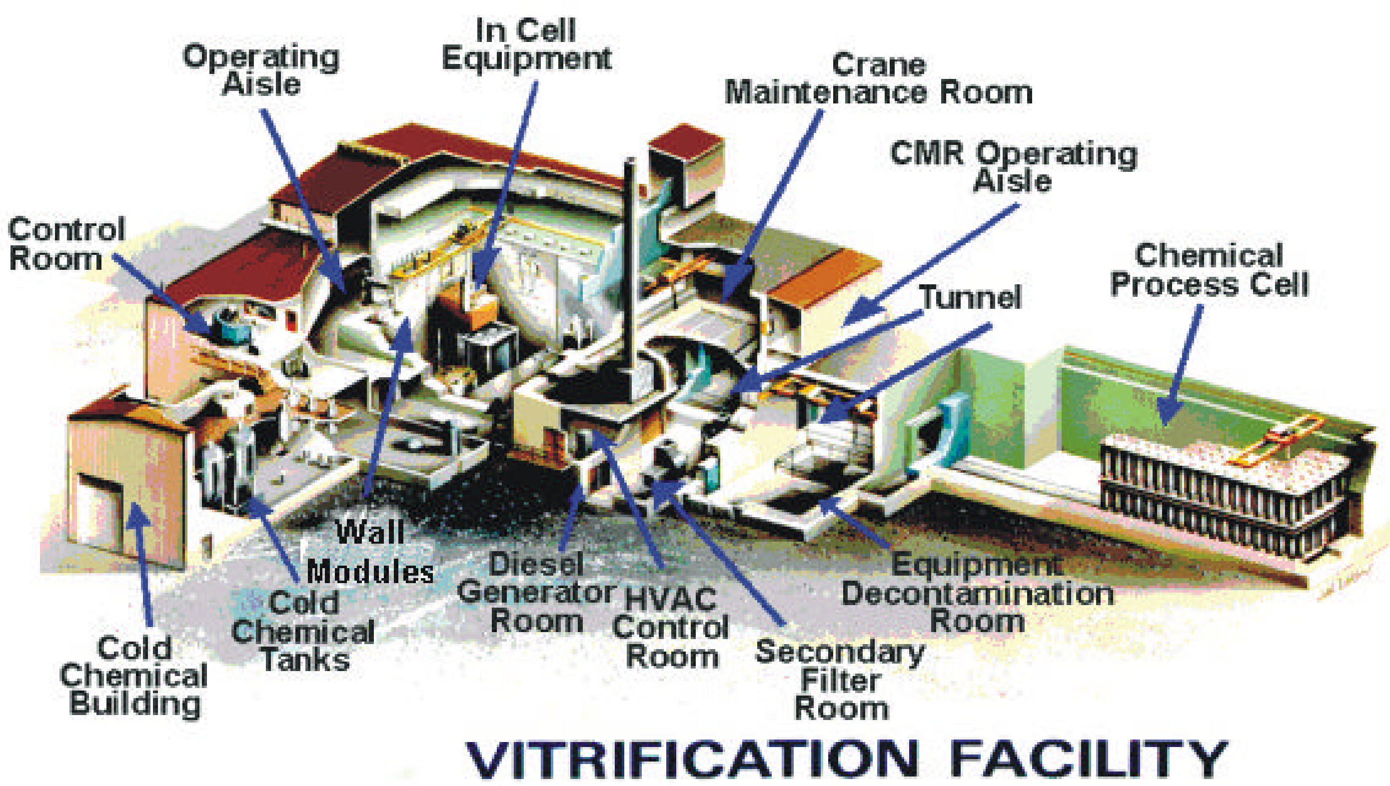


Figure 1

General Arrangement of Vitrification Facility

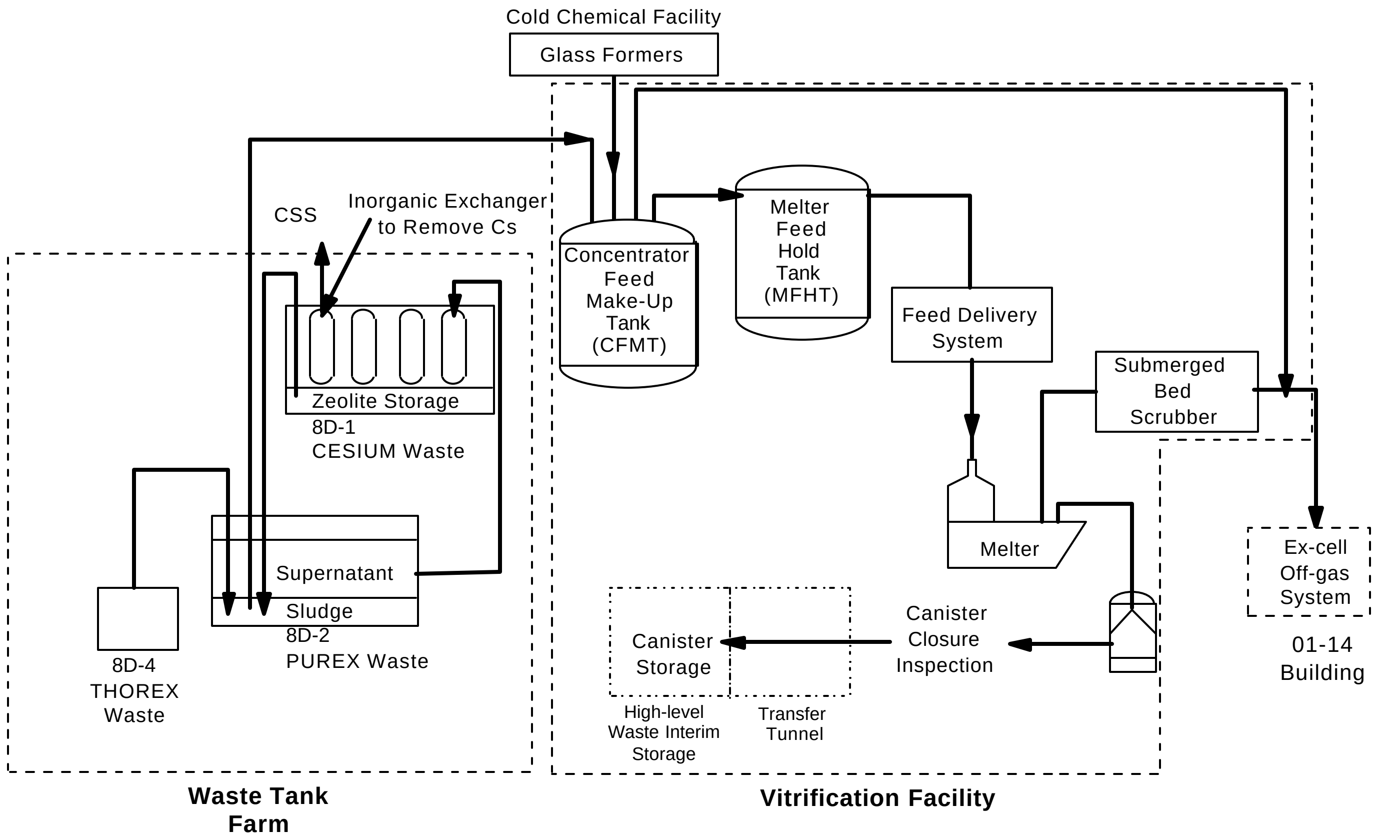


Figure 2

Vitrification Process Flow Diagram

welded canister was moved to the Canister Decontamination Station, where the surface of the canister was decontaminated by chemical etching. The used decontamination solution was recirculated back into the melter feed. The final step in canister production involved moving decontaminated canisters from the VF to the High-Level Waste Interim Storage Facility (HLWISF) (located within the original Nuclear Fuel Services (NFS) Process Building) which was retrofitted with racks to hold the HLW canisters.

During the glass-melting process, steam, volatile elements evaporating from the glass pool, and feed particles entrained in the process off-gas were vented to the Off-Gas Treatment System. The first component of this system, the Submerged Bed Scrubber (SBS), was used to quench the off-gas and remove particulate from it by scrubbing it through a submerged bed of ceramic spheres. Quenched off-gases were then drawn through a mist eliminator and high-efficiency mist eliminator (HEME) to remove mist and fine particulate. Scrubbed and treated off-gas was then heated and passed through a high-efficiency particulate air (HEPA) filter to remove particulate. Essentially free of radiological contamination at this point, the treated off-gas stream was directed through an underground trench to another building where final stages of HEPA filtering and oxides of nitrogen (NOx) abatement were completed before venting the treated off-gas through the Main Plant stack.

The Vessel Vent System was used to maintain all primary process vessels under slight vacuum during radioactive operations. This system operated by passing vessel vent gas from a header through a condenser to the off-gas stream directed toward the HEME. The Vessel Vent System also served as a means to bypass the SBS if the melter off-gas line became plugged. In-cell pressure and contamination control was provided by the Heating, Ventilation, and Air Conditioning (HVAC) System. This system was designed such that any air leakage associated with the cell shield walls flows into the Vitrification Cell where it is exhausted through the Vitrification System's HEPA filters.

2.2 Physical Description of Key Curie Contributors

The physical boundaries of the Vitrification Facility consists of the Vitrification Cell, the Transfer Tunnel, Operating Aisleways, Control Room, Secondary Filter Room, and the Crane Maintenance Room. Areas adjacent to the Vitrification Facility, including the Equipment Decontamination Room, the HLWISF, the 01-14 Building, and the Ex-Cell Off-Gas Transfer Trench are addressed as part of other Radioisotopic Inventory Reports. See Figure 3.

Based on the operating history of the VF, the key curie contributing units were identified as the major HLW processing vessels and systems, including the Melter, the CFMT, the MFHT, the SBS, the remaining components of the Off-Gas System, the Decontamination Station, Vitrification Pit, miscellaneous spent components pile, and the In-Cell Ventilation System. See Figure 4 for relative positions of the in-cell vessels and components. Certain portions of the Vitrification Cell, the Operating Aisles, Control Room, Transfer Tunnel, Crane Maintenance Room, and the Secondary Filter Room were considered insignificant to the overall source term due to minimal or no detectable radiological dose rates above background. Physical descriptions are provided below based on information from Reference 3. Attached in Appendix A are recent surveys of the Crane Maintenance Room and Secondary Filter Room. It can be seen that the dose rates in these areas are less than 20 mR/hr (window closed, which measures exclusively gamma radiation). This points to a small contribution of radioactivity when compared to general readings in the Vitrification Cell, which are on the order of thousands of mR/hr. The Transfer Tunnel and Transfer Cart are also not considered to be a significant source of radioactivity.

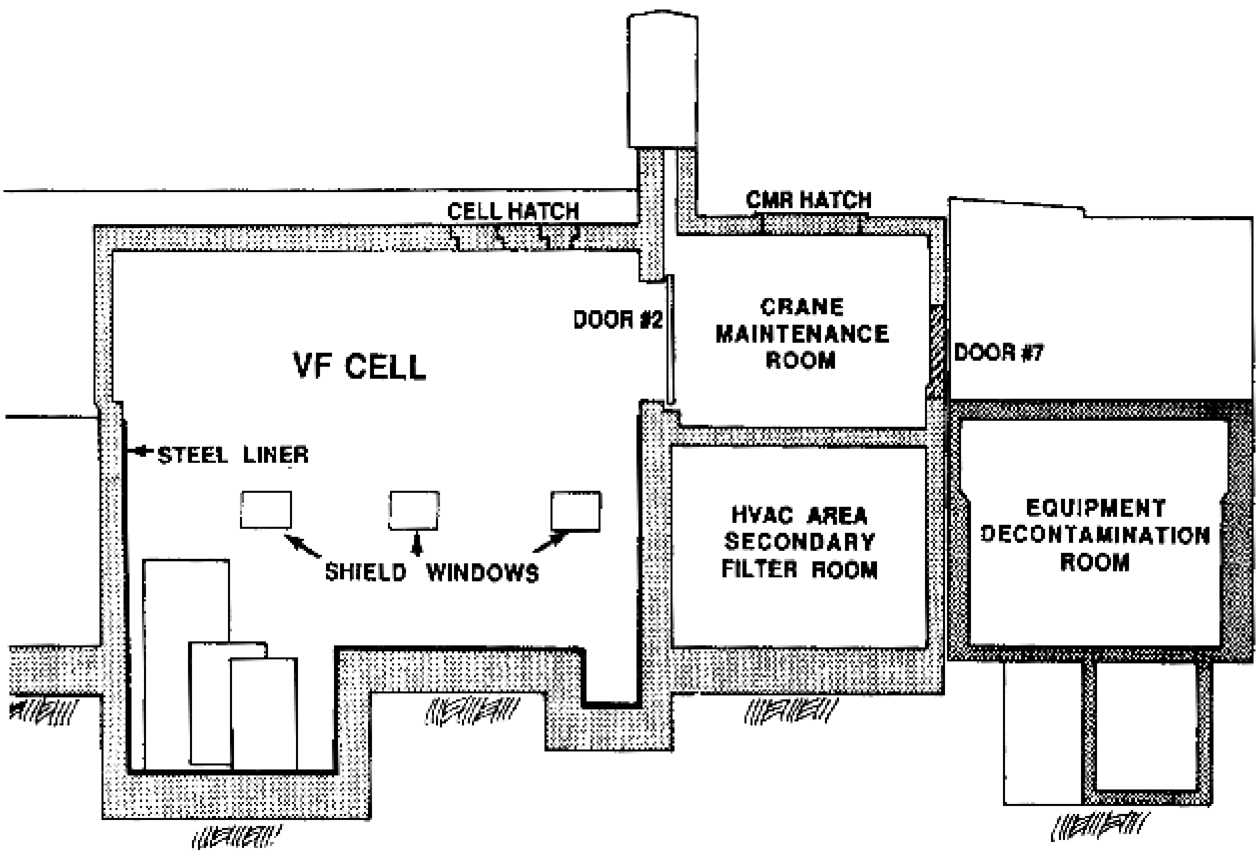


Figure 3

Physical Lay-Out of the Vitrification Facility

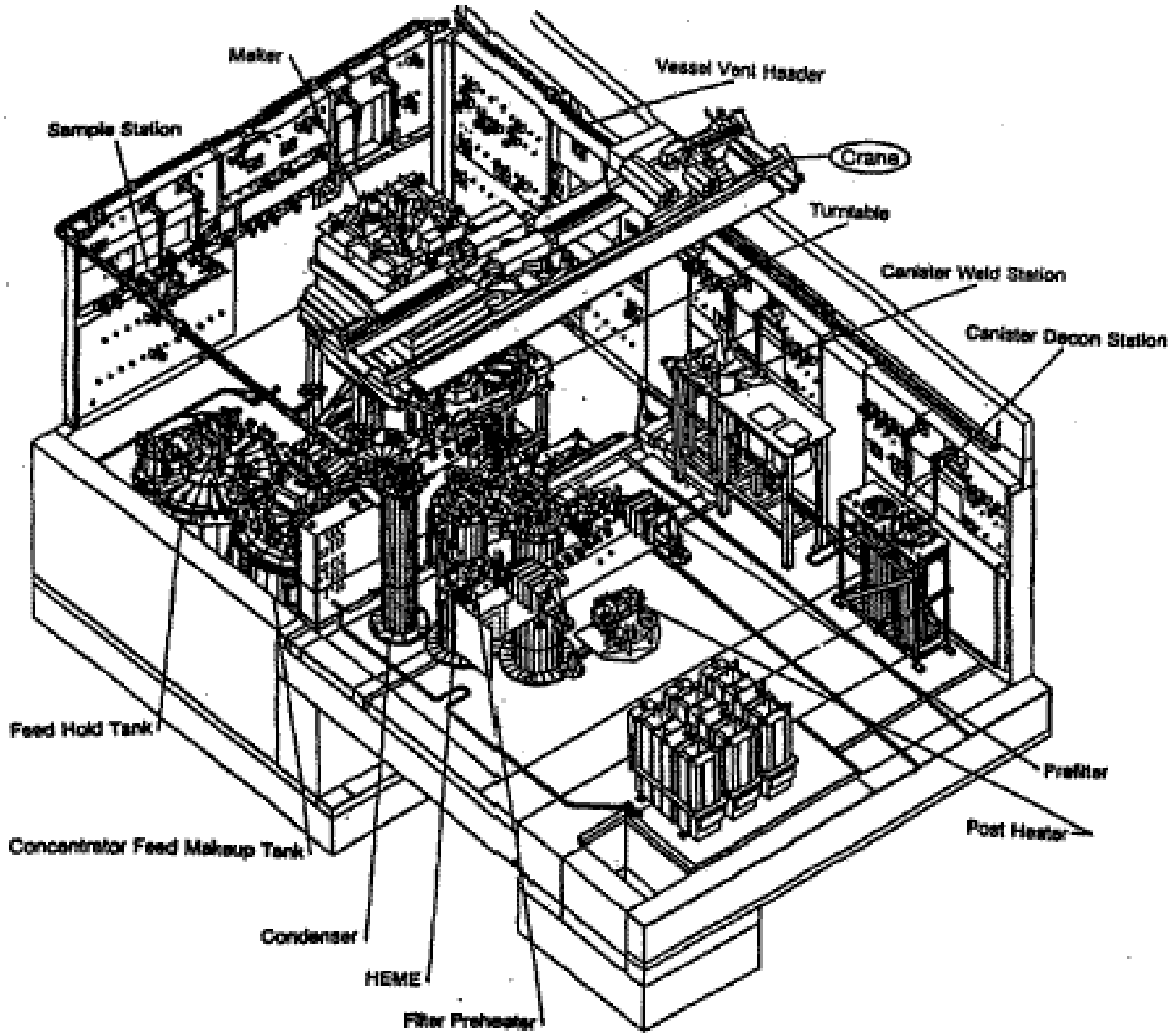


Figure 4

General Vitrification Cell Arrangement

The Transfer Cart is the only means of egress from the Vitrification Cell. The Transfer Cart moves through the Transfer Tunnel into the Equipment Decontamination Room (EDR). Both the Transfer Cart and the EDR have been surveyed and measured approximately 100 mR/hr. The Transfer Tunnel is not considered to be a significant contributor to the facility's source term because there is no history of spills or upsets within the tunnel and its only purpose is as a pathway for egress. Therefore, the Transfer Tunnel is not expected to be anymore contaminated than the Transfer Cart that runs through it.

2.2.1 Melter

The melter consists of an electrically heated, stainless steel box structure, approximately three meters by three meters by three meters, that is lined with refractory material to process radioactive slurry into molten glass. The outer shell of the melter was fabricated from Type 304L stainless steel and was provided with a jacket on the sides and bottom for water cooling of the shell. The melter was divided into two sections. The main section is the melter cavity which is where the molten glass is formed. This section is approximately 1.5 meters in height with the upper 0.6 meters forming a rectangular box. The lower 0.6 meters are an inverted truncated rectangular pyramid. The second section of the melter is the discharge. This section consists of two (primary and backup) pour chambers with spouts. The entire melter assembly is supported on a track system and a structural steel frame located in the northeast corner of the VF. Figure 5 gives a cutaway view of how the melter, turntable, and canisters are integrated.

2.2.2 Concentrator Feed Make-Up Tank (CFMT)

The CFMT held, mixed, and boiled feed for delivery to the MFHT. The CFMT is a large, cylindrical vessel, approximately three meters in height and made of Hastelloy C-22 to resist corrosion. Design volume of the tank is nominally 23,000 liters. The exterior is partially covered by two half-pipe coil heating/water jackets. The coils are dimensionally nine centimeter Schedule 10 pipe, covered with 2.5 centimeters of fiberglass blanket and 14-gauge 304L stainless steel sheet. An agitation system was installed in the tank to maintain homogeneity of the slurry. The vessel is supported on a 3.3 meter skirt from the bottom head by a 2.5 centimeter thick base plate. The base plate is bolted to a support plate positioned at the bottom of the process pit. See Figure 6.

2.2.3 Melter Feed Hold Tank (MFHT)

The MFHT held and mixed slurry feed for delivery to the melter. The MFHT is a large, cylindrical vessel approximately three meters in height and made of 304L stainless steel. Design volume of the tank is nominally 19,000 liters. The MFHT's exterior is partially covered by a cooling jacket. An agitation system was installed in the tank to maintain homogeneity of the slurry. See Figure 7. The MFHT is supported by four trunnions, each 10 centimeters in diameter.

2.2.4 In-Cell Off-Gas System

The melter Off-Gas System and its associated Vessel Ventilation System are shown in Figure 8. This system provides for the safe removal of process gases from the melter while maintaining the melter, vessels, and ducting at a slight vacuum for contamination control. Off-gases are scrubbed in the SBS, processed through a HEME, and filtered through two HEPA filters in series. Some filtering is also conducted external to the cell.

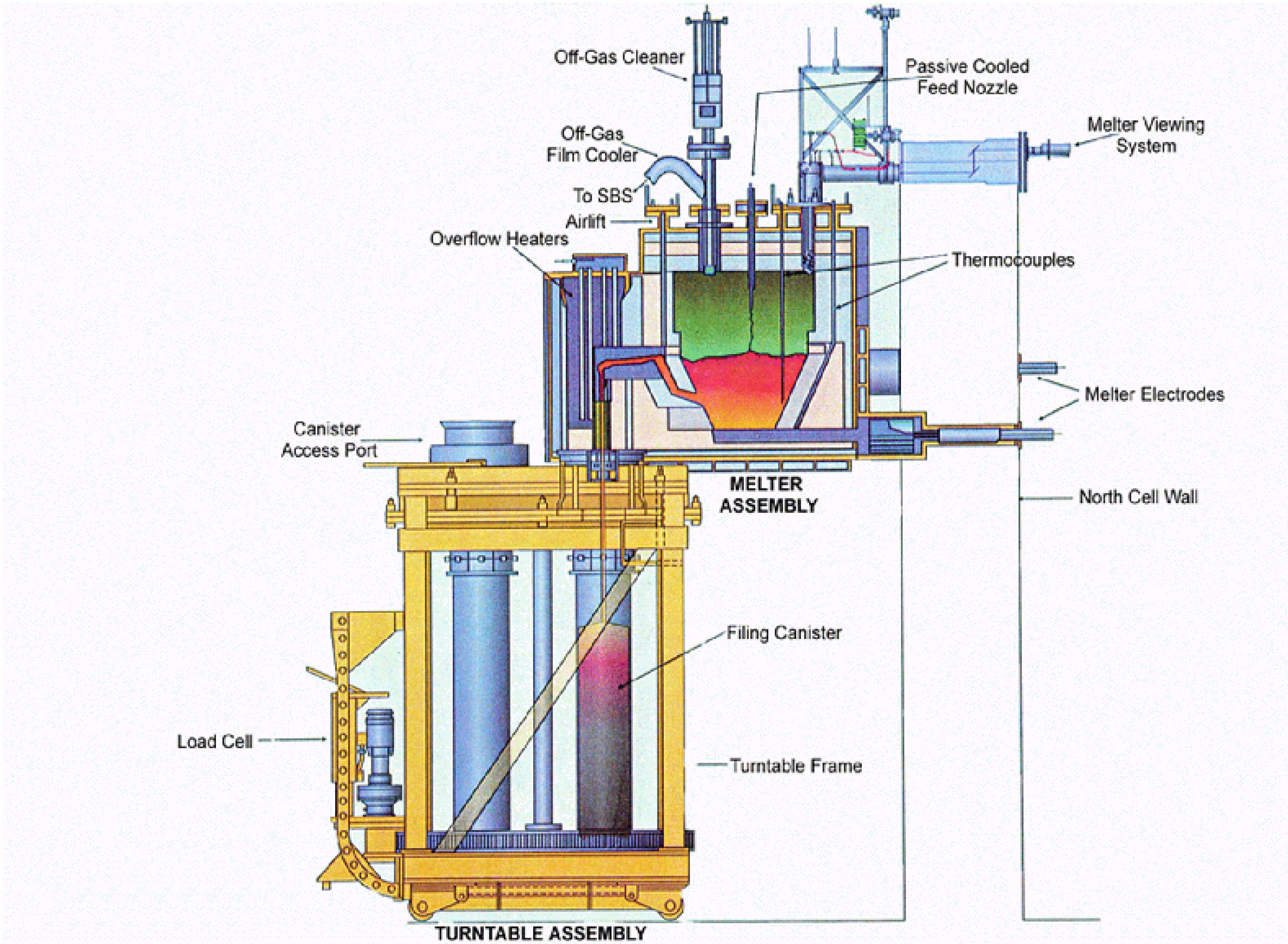


Figure 5

Cutaway View of the Melter and Turntable Assembly

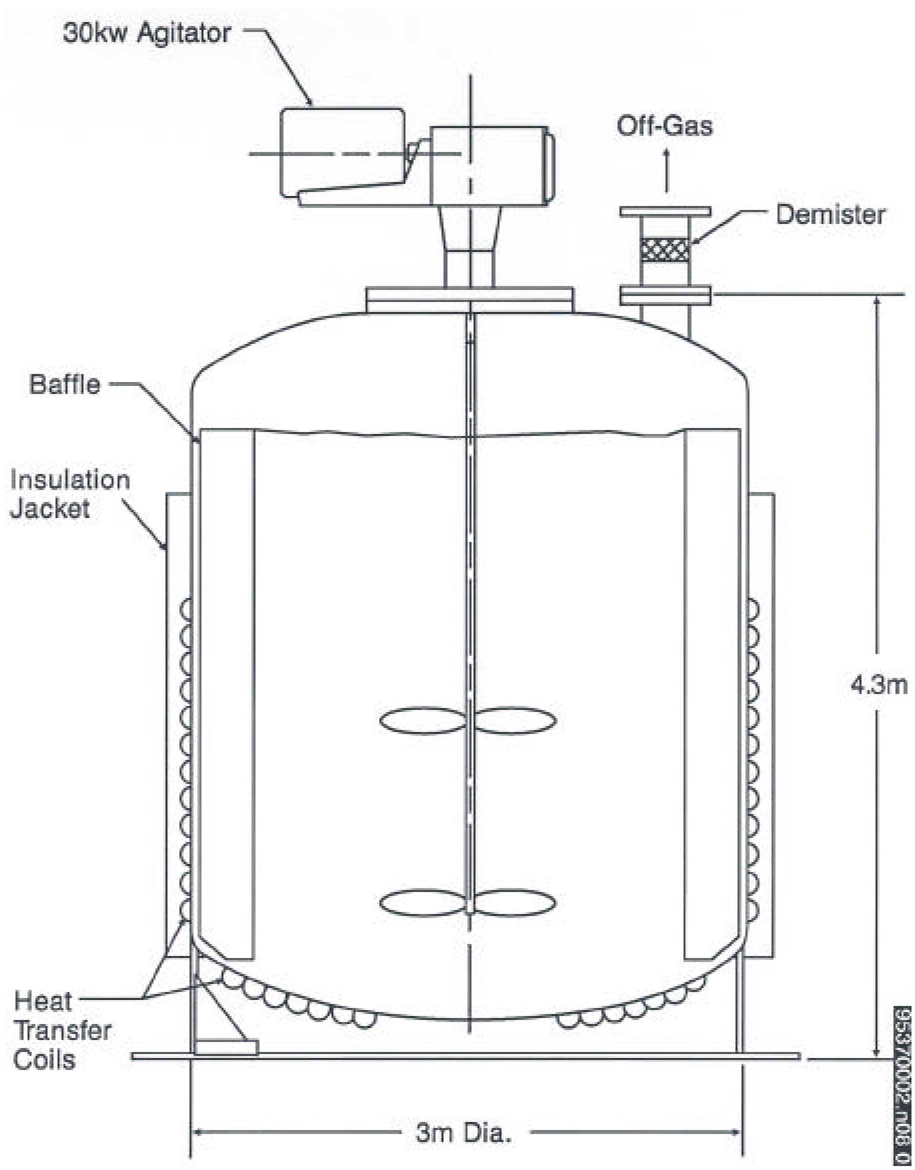


Figure 6

Concentrator Feed Makeup Tank (CFMT)

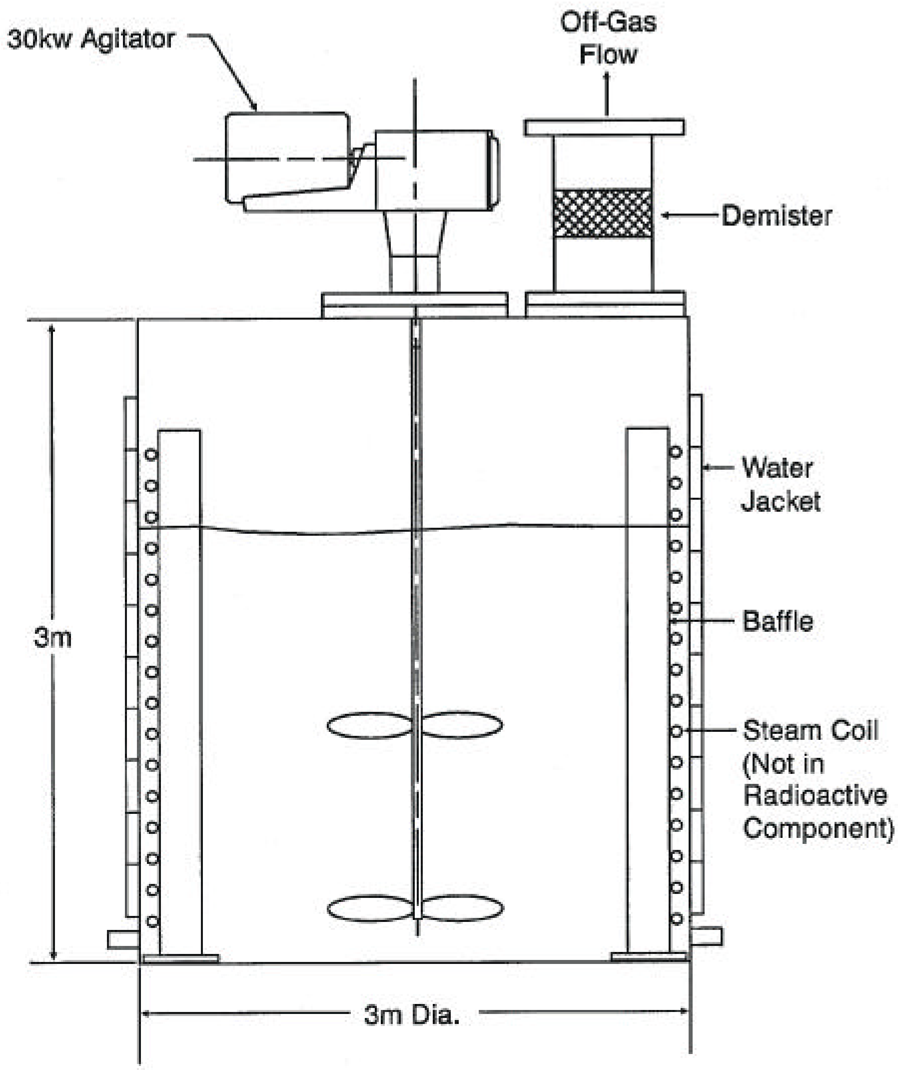


Figure 7

Melter Feed Hold Tank (MFHT)

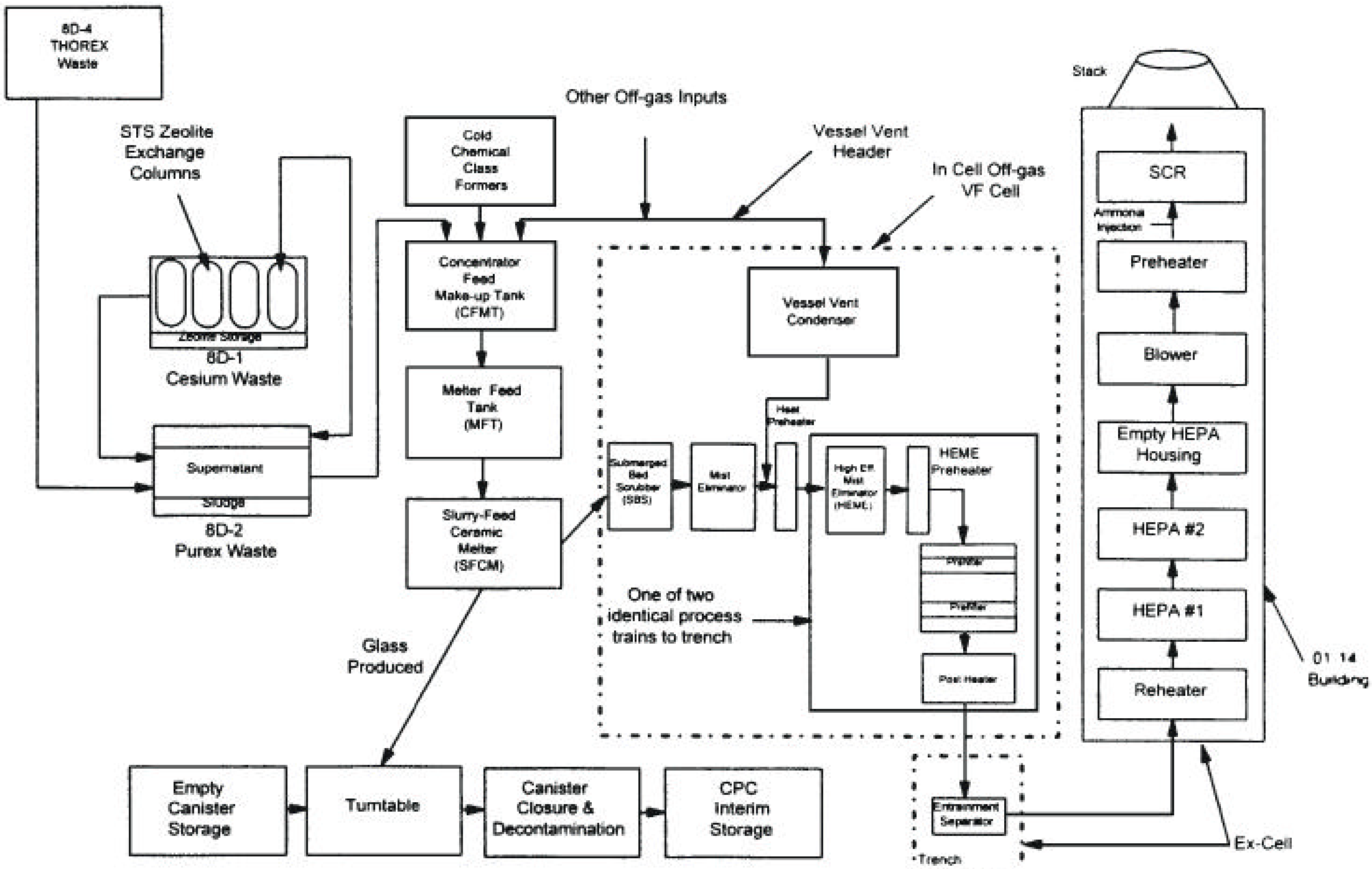


Figure 8

Melter Off-Gas System and Vessel Ventilation System

A. Submerged Bed Scrubber (SBS)

The SBS is the first component in the In-Cell Off-Gas System train and is located in the process pit immediately west and downstream of the melter. The scrubber consists of two concentric cylindrical vessels made from Hastelloy C-22. The inner vessel contains the scrubbing bed which is 1.2 meters tall by one meter in diameter and contains ceramic spheres. The outer vessel is 3.5 meters tall by two meters in diameter with a capacity of 3,300 liters. The vessel's solid bottom is dished-shaped to facilitate evacuation by jet transfer. Cooling coils are in the scrubber vessel and on the outside of the receiver vessel. See Figure 9.

B. Remaining Pieces of the In-Cell Off-Gas System

The rest of the melter’s Vessel Ventilation Off-Gas System consists of preheaters, HEPA filters, and mist eliminators that are located at reference elevation 30.5 meters. This system removed the bulk of the radioactive particulate from the off-gas stream and is located downstream of the SBS adjacent to a stub wall for utility service connections. Component housings in this system are made of Type 304L stainless steel.

Once melter off-gases were scrubbed in the SBS, they were processed through a HEME, and then filtered through two HEPA filters in series.

The cylindrical HEME vessel is 1.1 meters in diameter and 4.1 meters tall, with a base skirt 0.6 meters high. The HEME pad consists of a cylindrical, wound glass fiber element 7.6 meters in diameter and 3.0 meters tall. The HEMEs are designed so that the pads can be removed and replaced using an overhead bridge crane and a crane-suspended impact wrench.

The off-gases from the HEME passed through an electric heater before entering a prefilter housing. The 50 kilowatt electric preheater was used to raise the off-gas temperature to about 85° C (185° F), well above the off-gas dew point of about 45° C, to assure that the prefilter elements do not become wet from entrained water droplets. From there, the off-gas train then moved ex-cell through a trench to the 01-4 Building. The 01-14 Building radionuclide characterization is the subject of another report.

2.2.5 Decontamination Station

The Decontamination Station (a.k.a. Decon Station) was used to submerge each filled and seal-welded canister in a nitric acid-cerium (+4) solution to etch off a thin layer of the canister's exterior that may contain submicron particles of fixed contaminants in the oxidized surface layer. The Decon Station is located on the east wall of the cell, south of the Weld Station. The decontamination tank is made of titanium and is approximately 80 centimeters in diameter with a capacity of 1,600 liters. The tank equipment includes a nozzle for the addition of decontamination solution, a sparge ring for agitation of the solution, a level probe, a thermowell to support temperature control, heating and cooling coils, and a spray ring for removal of solution residue from the decontaminated canister. The neutralizer tank is also made of titanium, is 80 centimeters in diameter, and has a capacity of 1,500 liters. See Figure 10.

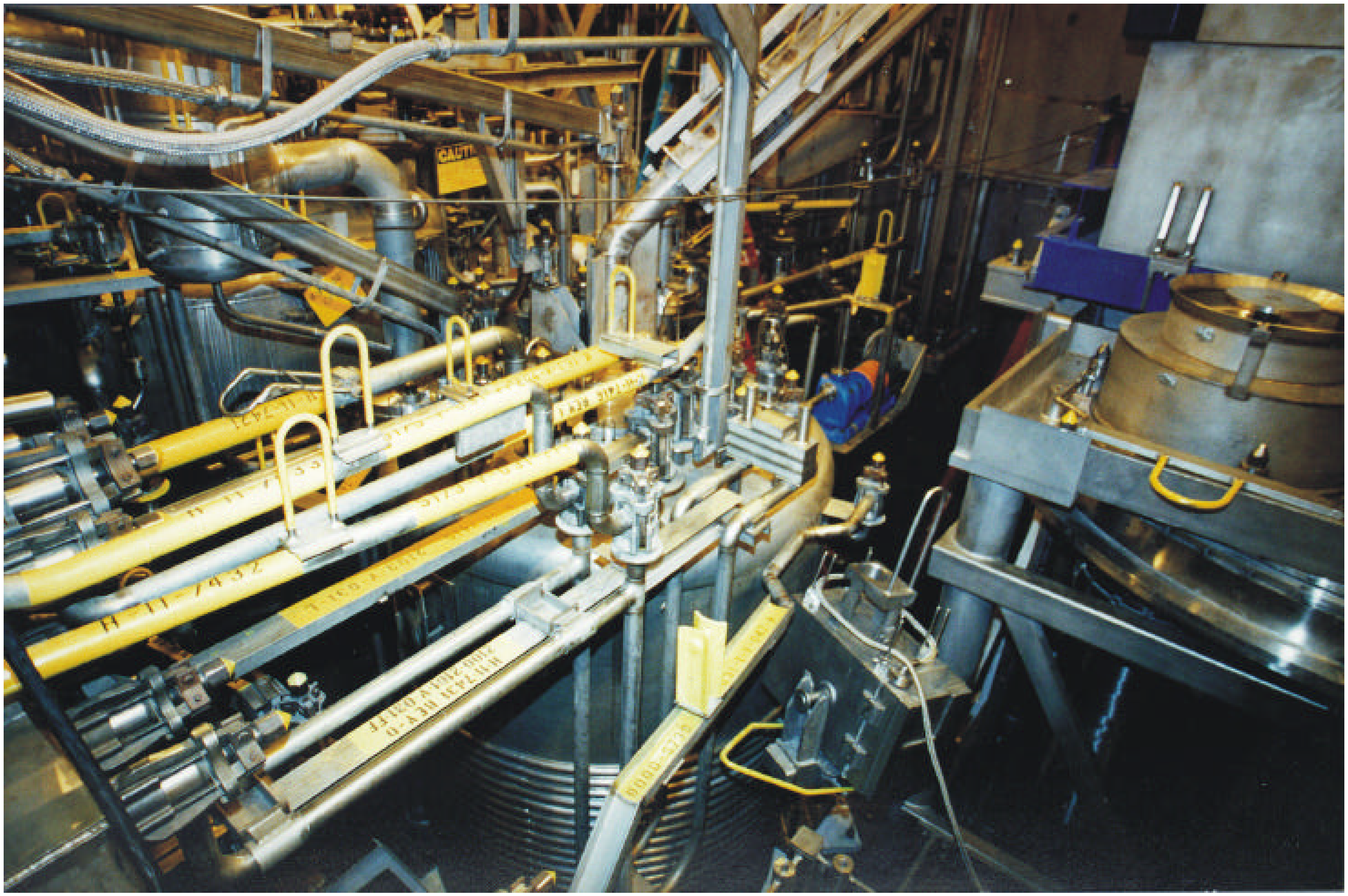


Figure 9

Submerged Bed Scrubber (SBS)

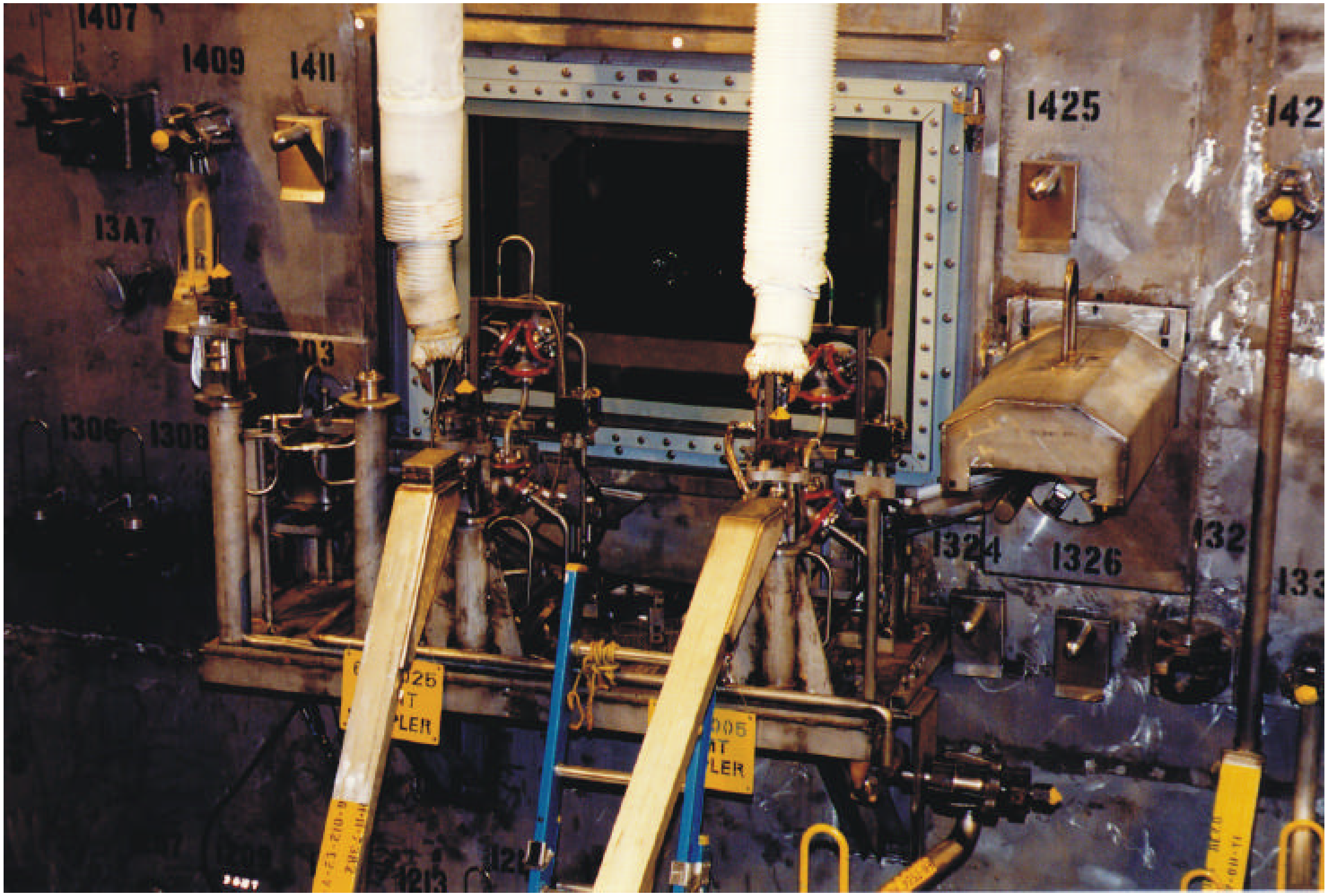


Figure 10

Canister Decontamination Station

2.2.6 Vitrification Cell Pit

The major processing vessels are contained within the pit of the Vitrification Cell. The pit is approximately seven meters long by six meters wide and is four meters deep. The pit is lined with a stainless steel liner and contains a sump along the north wall. The pit contains the SBS, CFMT, MFHT, melter and canister turntable. Each of the processing vessels are supported by a complex steel I-beam grid structure. This gridwork covers approximately two-thirds of the pit floor.

2.2.7 Miscellaneous Spent Components

Miscellaneous spent components consist of jumpers, level probes, and other hardware that was used either directly in the vitrification process or to maintain the HLW system while in operation. These materials have been set aside within the cell while waiting for final disposition. The expended equipment is contaminated with one or more of the following: HLW glass, HLW slurry, or Vitrification Cell airborne contamination. See Figure 11.

2.2.8 In-Cell Ventilation System

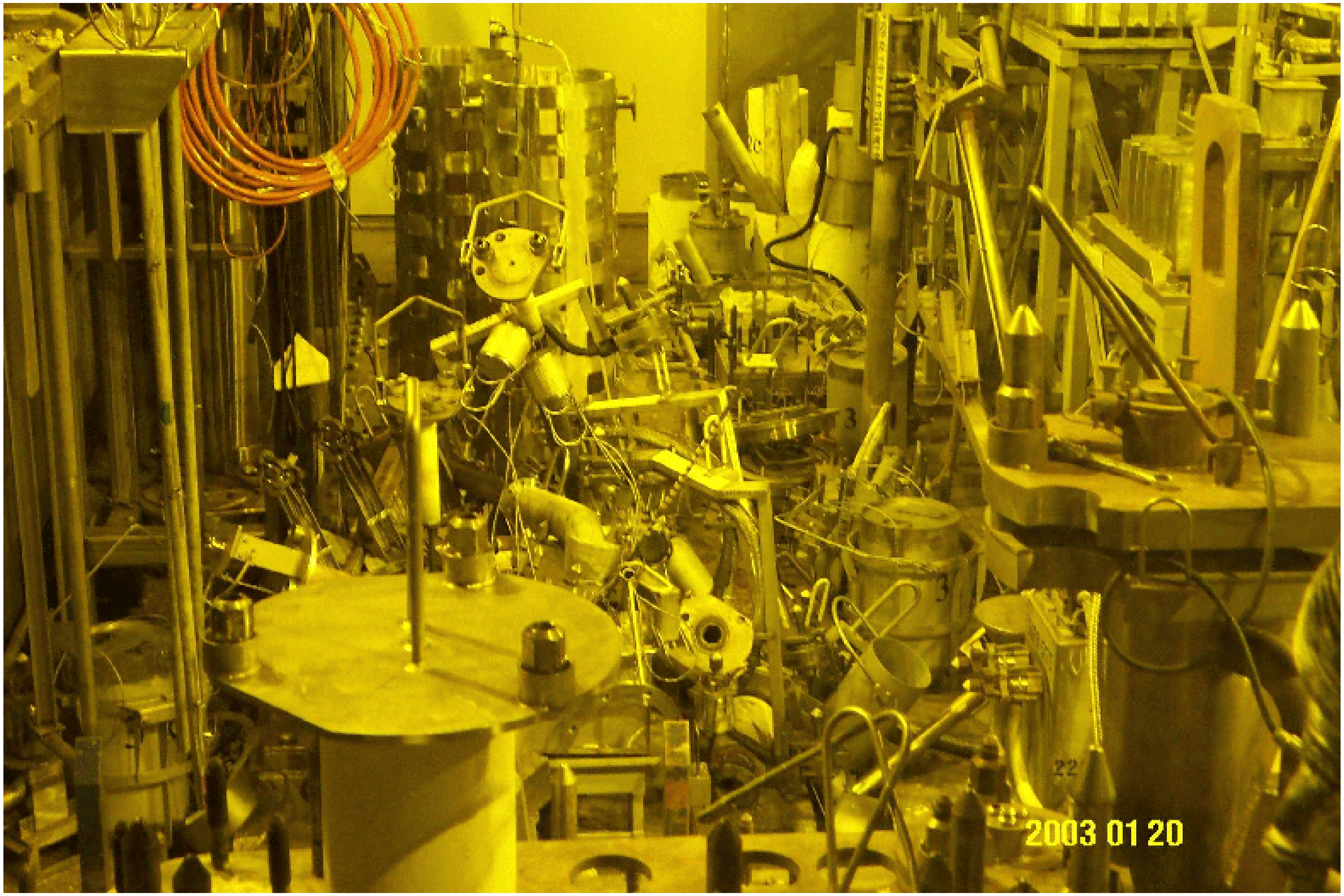
The Vitrification Facility's main HVAC System consists of one supply air handling unit, three primary in-cell filter exhaust units (HEPA filters), one secondary filter exhaust unit, two exhaust fans, ductwork, and automatic controls. The three primary in-cell filter exhaust units are located within the Vitrification Cell on the south wall. The remaining portion of the HVAC System is housed in the Secondary Filter Room and the Diesel Room.

2.3 Flushing and Controlled Shutdown

Flushing activities were conducted during the last year (2002) of the HLW processing campaign. The flushing was conducted to reduce the source term from pipe lines, tanks, and equipment that were thought to have significant accumulation of radioactive residues. The flushed materials were included in the final vitrification batches.

Flushing activities focused on the main process vessels, including the CFMT, MFHT, SBS, waste header, and accessible external surfaces of components in the cell pit and the cell itself. Flushing reagents included dilute nitric acid and water.

The effectiveness of the flushing was evaluated with both visual and radiological measurements. The video inspections conducted of the CFMT and MFHT internal surfaces showed a dramatic improvement in the degree of cleanliness (Reference 4). See Figures 12 through 15. The internal surfaces of these tanks were essentially free of any visible deposits and it was noted that even the fabrication weld beads and polishing marks could be identified. The radiation probe data from the CFMT and MFHT was not conclusive due to high background dose rates in-cell, however, in general showed an order of magnitude reduction in radiation readings. High background dose rates were caused by feed material and filled canisters being in the cell at the time that readings were collected. The SBS flushing was effective in reducing the solids content within the vessel and reducing the pressure differential across the bed. Waste header flushing was effective based on the reduction of radiation readings taken on the transfer lines. The resultant effect from external high-pressure spraying of the accessible vitrification pit components and the pit floor was difficult to assess as the degree of staining of the base metal masked the capability of the closed-circuit television (CCTV) cameras to determine cleanliness. The tank tops were cleaned off and flushed to the cell floor. The liquid on the cell floor was transferred to the CFMT for treatment.



FC1

Figure 11

Miscellaneous Spent Components

Figure 12

CFMT Agitator Before Flushing

Figure 13

CFMT Agitator After Flushing

Figure 14

MFHT Agitator Before Flushing

Figure 15

MFHT Agitator After Flushing

A special system, the Evacuated Canister System (ECS), was deployed to remove the radioactively dilute residual molten material from the melter before Vitrification System operations were brought to a formal end.

The ECS consists of a stainless steel canister of the same size and dimensions as a standard HLW canister and is equipped with a special L-shaped snorkel assembly made of 304L stainless steel. See Figure 16. Both the canister and snorkel assembly fit into a stainless steel cage that allowed the entire canister assembly to be positioned over the melter as molten glass was drawn out by a vacuum applied to the canister.

Based on data recorded before evacuated canister operations began (including melter level data), approximately 2,500 kilograms of molten glass remained in the melter cavity after the final airlift was performed (Reference 5). According to data taken during evacuated canister operations, about 2,200 kilograms (88%) of the glass was transferred from the melter to the two evacuated canister units employed inside the Vitrification Cell. The evacuated canisters were transferred to the HLWISF.

3.0 Historical Record Review

The following records and/or reports were found to contain background information and information pertinent to the characterization of the Vitrification Facility:

- Topical Report DOE/NE/44139-77, "Vitrification Facility at the West Valley Demonstration Project," DesCamp, et al., July 1996 (Reference 3)

- Pacific Northwest National Laboratory (PNNL) Reports WVSP 00-28, "WVDP Radioactive Waste Characterization Letter Report - Part 1: Physical, Chemical, and Radiochemical Analytical Data," and WVDP 01-07, "WVDP Radioactive Waste Characterization Letter Report - Part 3: Iodine-129 Measurement by Low Energy Photon Spectrometry (LEPS)," (Batch 10 analytical data) (References 6 and 7)

- Report on Deployment of Miscellaneous Tank and Piping Cleaning Equipment and Methodology, Tank Focus Area Milestone B.1-1 for Technical Task Plan (TTP) OH0-0WT-22, West Valley Nuclear Services Company, August 30, 2002 (Reference 4)

Additional background information and data (e.g., dose rate measurements/surveys, isotopic distribution analytical data) was found in:

- Routine Radiation / Contamination Survey 2CCW2003, Routine Survey of Secondary Filter Room
- Radiation and Contamination Survey Report 118378, Crane Maintenance Room Survey

A review of historical records and process knowledge indicated that there was not sufficient survey information available to complete characterization of the Vitrification Facility. This determination was based on the fact that the vessels and cell were flushed prior to system shutdown and no surveys were collected after flushing that documented the final cell and component conditions. However, additional samples were not required as the existing analytical data provided sufficient information to allow for the development of scaling factors for the key curie contributing components/areas of the facility.

Contamination of the Vitrification Facility key curie contributing components/areas is the result of contact with the high-level waste during processing. In the case of the Vitrification Cell Pit, contamination was the result of infrequent vessel foaming and the general process of washing equipment over the pit to reduce contamination prior to removal from the facility.

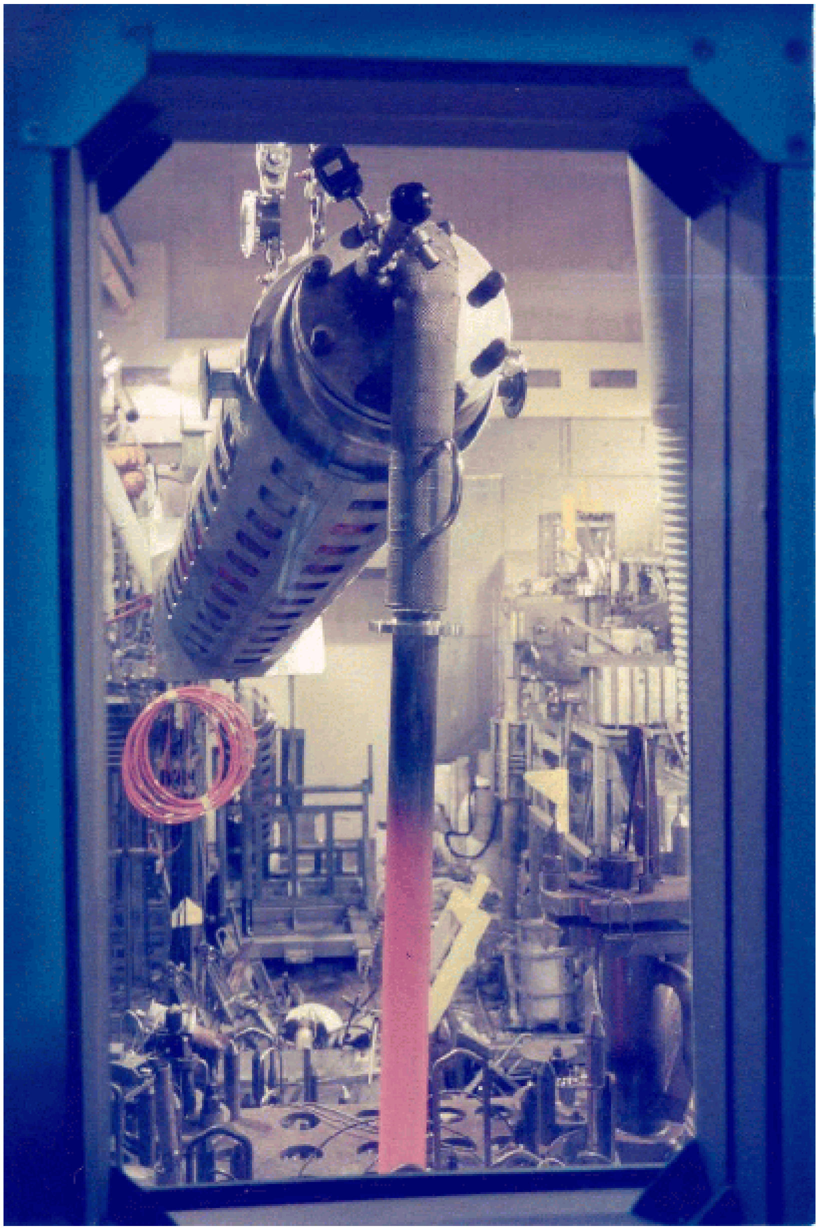


Figure 16

Glass Flow into the Evacuated Canister

4.0 Technical Approach/Data Gathering Methodology

In general, the radionuclide inventory for the Vitrification Facility was developed by collecting dose rate measurements from each of the key curie contributing components/areas and modeling these dose rate measurements and the unique geometries with MicroShield™ to generate a Cs-137 source term. Bounding scaling factors were then used to generate the inventory of other important radionuclides and the results were decay corrected to September 30, 2004 for the final inventory results.

As previously identified in Section 2.0, using available information, e.g., decontamination records, radiological survey information, available analytical data, and the facility's operating history, the following components/areas were identified as key curie contributors:

- Melter;
- CFMT;
- MFHT;
- SBS;
- remaining components of the In-Cell Off-Gas System;
- Decontamination Station;
- Vitrification Pit;
- miscellaneous spent components; and
- In-cell Ventilation System.

4.1 Dose Rate Measurement Methodologies

There were three methodologies used in gathering data. The first method used an unshielded Ludlum 133-8 radiation probe to collect general area dose rates near or at contact with most of the components. The second method, used exclusively for the melter, involved a specialized deployment device with an unshielded Ludlum 133-8 radiation probe to collect dose rates from within the melter cavity. The third method involved using a shielded Ludlum 133-8 probe to collect directional dose rates in the pit area. Table 1 summarizes these methodologies, and the following sections detail how each component/area was measured.

The Ludlum 133-8 is a Geiger-Mueller detector which is range energy compensated and halogen quenched and used for general area monitoring. The detector is compatible with general purpose survey meters. This detector is approximately one inch in diameter by four inches long.

For the melter measurements, the Ludlum probe was used in conjunction with a Ludlum Model 2241 digital survey meter, which is typically used in conjunction with not only Geiger-Mueller detectors, but can be used in proportional and scintillation detectors as well. This ratemeter directly displays dose rates.

For the other measurements, the Ludlum probe was used in conjunction with a Ludlum Model 2350 data logger, which also is typically used in conjunction with Geiger-Mueller detectors, proportional and scintillation detectors. This data logger has the capability to directly display dose rates.

Radiation readings were taken on December 26 and 27, 2002, January 9, 23, and 29, 2003. For ease of decay correction and modeling however, the date assigned to the radiation surveys was January 1, 2003.

Table 1

Vitrification Facility Characterization Methods

Component	Measurement Method Used	Work Document(s) Used	Scaling Factor(s) Used	Certificate of Calibration Appendix
Melter Cavity	Specialized deployment device with unshielded radiation probe	Work Order 75653 (Appendix B)	Based on melter bottom sludge samples from February 2001 and Batch 10*	Appendix C
Vitrification Pit	Shielded probe system	Work Orders 76851 and 75667 (Appendices D and E)	Based on Batch 10*	Appendix F
All other components	Unshielded radiation probe	Work Orders 76851 (Appendix D)	Based on Batch 10*	Appendix G

* See Section 4.2 for further explanation of Batch 10 scaling factors.

4.1.1 Melter

There were three areas of the melter that were considered significant and requiring specific measurement: the two discharge cavities and the melter cavity itself.

An unshielded radiation probe/deployment device was hung into the melter cavity using a custom designed probe holder. This device was used because the refractory surrounding the melter cavity is a formidable radiation shield, making measurement of the melter internal dose rate difficult from the outside. A photograph of the melter probe holder and detector is shown in Figure 17.

The holder was designed to deploy the probe remotely into melter nozzles, with the standoffs to be mated up with the melter nozzles. The standoffs were constructed at an angle to center the probe into any given riser, and by knowing the diameter of the riser, the depth the probe extends into the melter could be easily determined. This, in turn, determined the position of the probe relative to the internals of the melter cavity.

The melter discharge cavities were measured with the unshielded probe from the east and west sides at a position in contact with the southern-most lip of each cavity, centered (east/west) on each cavity. (The discharge lid had been removed, exposing the residual glass that had hardened in each cavity.)

4.1.2 CFMT

The radiation reading from the CFMT was taken with the unshielded radiation probe that was supported by the in-cell crane hook block which, in turn, was in contact with the tank’s uppermost seam, approximately 0.9 meter from the bottom of the tank.

4.1.3 MFHT

The radiation reading from the MFHT was taken with the unshielded radiation probe that was supported by the in-cell crane hook block which, in turn, was in contact with the tank’s uppermost seam, approximately 1.4 meters from the bottom of the tank.

4.1.4 In-Cell Off-Gas System

A. SBS

The radiation reading from the SBS was taken with the unshielded radiation probe that was supported by the in-cell crane hook block which, in turn, was in contact with the tank’s uppermost seam. The vertical position of the probe was approximately 140 centimeters from the bottom of the tank.

B. Remaining Components of the Off-Gas System

The unshielded probe radiation readings from the remaining components of the Off-Gas System (the off-gas jumper, HEMEs, HEME preheater, condenser, prefilter heaters, prefilters, and post-heater) were taken at various locations (as further described in Appendix D) with respect to each component, and on contact, where possible, with each component.

4.1.5 Decontamination Station

The radiation readings from the Decon Station tanks were taken with the unshielded radiation probe at a position with the hook block of the crane in contact with the tanks, with the probe approximately centered vertically on the tanks.

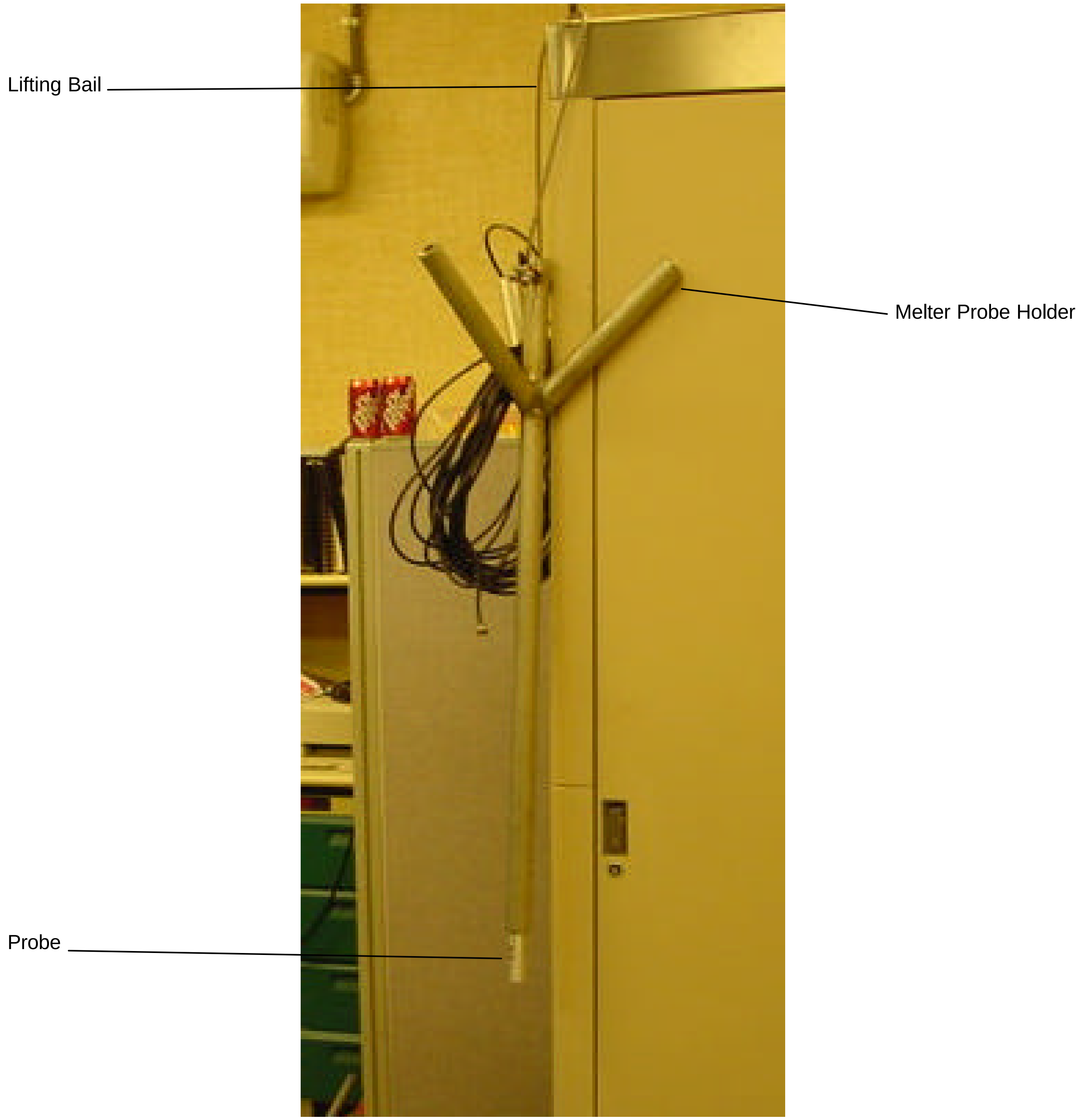


Figure 17

Radiation Probe/Deployment Device for the Melter

4.1.6 Vitrification Pit

Measurements of the pit were performed using a custom made shielded probe device. See Figure 18.

The shielded probe assembly consisted of a shielded general area probe coupled with interchangeable eight foot extension pieces to aid reaching the bottom of the pit. The probe's sides and back were shielded by approximately eight centimeters of lead to make the general area probe directional in nature. The extension pieces were deployed and held by a custom made rack that extended off the Maintenance Station. These pieces were assembled at the Maintenance Station using existing manipulators and the in-cell crane. The shielded probe was then lowered into the pit to take readings underneath the major components in the pit. Readings were also taken over the top of the pit looking “downward".

In conjunction with these readings, a device to measure relative vertical detector heights was installed on the crane. The device used a cable pull installed between the upper and lower crane blocks, and the distance between them were translated by an encoder to a digital readout. The device gave a digital readout in inches, and by taking an initial height measurement at a known elevation, and by knowing how many eight foot extension pieces were installed, the digital readout could then be translated into the vertical position of the detector at any point. See Figures 19 and 20.

4.1.7 Miscellaneous Spent Components

The radiation reading from the miscellaneous spent components was taken with the unshielded radiation probe at a position approximately centered over the pile. The spent components are located in an area in front of the Weld and Decon Stations, and occupy an area of floor space approximately two meters by seven meters. The height that the radiation reading was taken was at the same height as the Weld and Maintenance Stations, or four meters above the floor.

4.1.8 In-Cell Ventilation System

The radiation reading from the HEPA filters associated with the In-Cell Ventilation System was taken with the unshielded radiation probe at a position approximately centered with the crane hook block on contact with the north faces of each filter housing.

4.2 Scaling Factors

Two sets of scaling factors were developed for the completion of the Vitrification Facility characterization effort. The first set of scaling factors were developed using sampling data from Batch 10 (Appendix H) of the Vitrification Campaign. Batch 10 represents the first batch of the HLW campaign and are the same scaling factors used to assign an inventory to each of the HLW canisters for disposal (see References 6 and 7). It should be noted that all facility characterization project-specific isotopes were included in with Batch 10 data, with the exception of U-232. The scaling factor for this isotope was developed using historical data from spent fuel reprocessing. Relative to spent fuel reprocessing, a representation of spent fuel bounding isotopic ratios, based on the spent fuel that was reprocessed by NFS, is presented in Appendix I. Because the range of analyses dates varied for the Batch 10 data (most of them in June of 1997), a date of May 15, 1997 was conservatively chosen as the date to decay correct the scaling factors to the data of the vitrification dose rate surveys (Appendix H). Table 2 provides the decay corrected values for Batch 10 and the associated scaling factors.

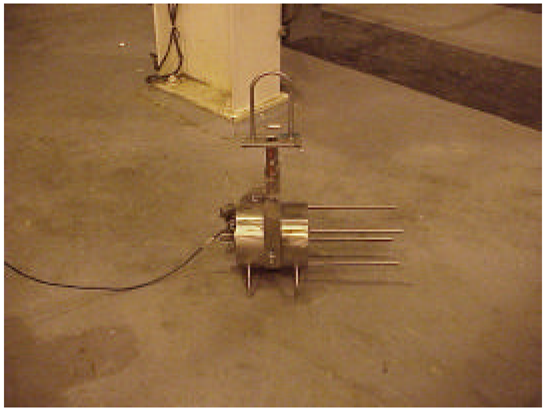


Figure 18

Shielded Radiation Probe

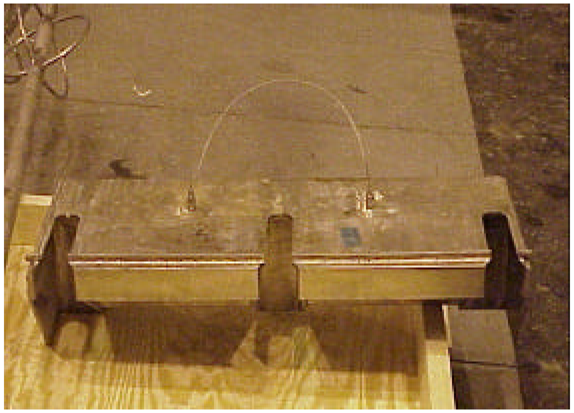


Figure 19

Custom Rack for Extension Pieces

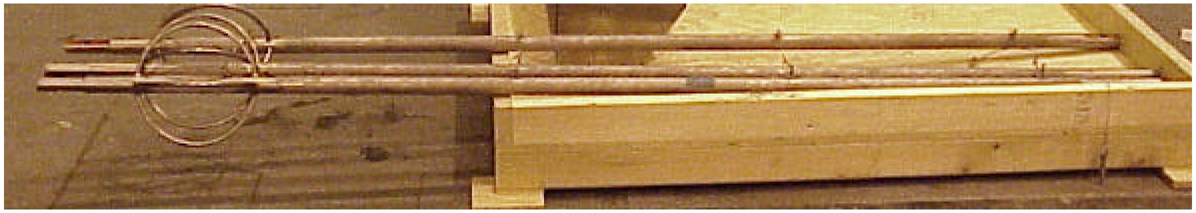


Figure 20

Extension Pieces for Deployment of Shielded Probe

Table 2

Batch 10 Scaling Factors

Radionuclide	Radionuclide Value for Batch 10 (Decay Corrected to Survey Date of January 1, 2003) (FCi/g)	Scaling Factor
Am-241	3.21e+01	1.28e-02
C-14	4.90e-04	1.96e-07
Cm-243	2.25e-01	8.98e-05
Cm-244	5.42e+00	2.16e-03
Cs-137	2.50e+03	1.00e+00
I-129	3.90e-07	1.56e-10
Np-237	2.01e-02	8.01e-06
Pu-238	3.78e+00	1.51e-03
Pu-239	1.09e+00	4.35e-04
Pu-240	7.73e-01	3.09e-04
Pu-241	2.62e+01	1.04e-02
Sr-90	2.40e+03	9.58e-01
Tc-99	8.45e-02	3.37e-05
U-232*	9.44e-03	3.78e-06
U-233	3.60e-03	1.44e-06
U-234	1.36e-03	5.44e-07
U-235	3.80e-05	1.52e-08
U-238	3.40e-04	1.36e-07

*Taken from spent fuel isotopic results (Appendix I).

The application of Batch 10 scaling factors is considered to be very conservative. First, the Batch 10 sample was collected from the first HLW transfer from Tank 8D-2 to the Vitrification Facility in 1996 and represents the waste at its most "concentrated" form with the highest ratios of key alpha-transuranic radionuclides to Cs-137. Since the time of this sample collection, processing of the supernatant in the HLW tanks continued through the cesium removal columns suspended from the roof of Tank 8D-1, selectively removing Cs-137 onto zeolite. The cesium removal columns were routinely emptied and the zeolite transferred back to Tank 8D-2 to be processed through the Vitrification Facility. This increase in the relative amount of Cs-137 in the waste resulted in the ratio of key alpha-transuranic radionuclides to Cs-137 to decrease over time. This makes application of the Batch 10 ratios conservative (Reference 8).

The second set of scaling factors developed were for the melter cavity using a combination of the Batch 10 data and analytical data from a previous sampling event. An interest in the potential accumulation of noble metals in a sludge layer in the bottom of the melter led to the collection of sludge samples in February 2001. The results of the sludge samples were reviewed against the Batch 10 sample results to evaluate any potential change in distributions. In most cases, the Batch 10 ratios proved to be the most conservative. Because the Np-237, Cm-243, and U-235 results from the sludge samples were not detected, the appropriate scaling factors were calculated based on the amount of detected Pu-239/240 in the sludge samples and corresponding ratio of Pu-239/240 to the Np-237, Cm-243, and U-235 in the Batch 10 samples. Np-237, Cm-243, and U-235 are all heavy element actinides which are expected to behave similarly to Pu-239/240 and therefore ratios constructed in this manner would provide values in place of the "less than" values reported. The higher ratio from either of the profiles was selected to provide the most conservative scaling factors for assigning a source term to the melter. The scaling factors were decay corrected to the date of the in-cell survey and peer reviewed. See Appendix J.
Table 3 summarizes the evaluation of the melter sludge samples and the Batch 10 samples. The bolding indicates the scaling factor used for the melter.

5.0 Data Collection Procedures

Work documents WR 76851 (Appendix D), WO 75667 (Appendix E), and WO 75653 (Appendix B) were written to obtain the required radiological survey readings.

No additional sampling was required to generate scaling factors as sufficient data already existed. Section 4.0 discusses the historic sampling data being used to generate scaling factors.

6.0 Data Validation

Validation of all data used in this report was conducted pursuant to the requirements of the CMP. The validation packages are maintained in the FCP Project File.

Radiation Surveys - Validation of the dose rate data indicated that all of the data reported is unconditionally acceptable for use. Dose rate meter calibration certifications are maintained in the FCP Project File along with survey validation reports.

Batch 10 Data - With the exception of Tc-99 and I-129, all of the Batch 10 data was unconditionally approved for use. The Tc-99 results were conditionally approved for use due to demonstrated interference from Ru resulting in elevated levels of Tc-99 being reported. The samples were radiochemically separated and the Tc-99 analysis repeated. Two laboratory control samples (two blank spikes) were prepared for the analysis of Tc-99. The laboratory control samples for the Tc-99 exhibited recoveries of 62% and 64%. This could indicate a possible low bias in the sample results of about 40%. However, because the matrix spike sample demonstrated an acceptable recovery, the data was not rejected but was qualified with a "J" flag and should be considered estimated. The reported values were used with no adjustments. The I-129 results were conditionally approved for use due to depressed matrix

Table 3

Melter Bottom Sample Results and Scaling Factors

Isotope	Melter Sludge Samples (FCi/g)						Batch 10 Samples		Selected Scaling Factors Aged to January 1, 2003
	Sample 1F	Sample 2F	Sample 3F	Geometric Mean	Calculated Value Based on Batch 10 Relationship	Scaling Factors Aged to January 1, 2003	Scaling Factors Aged to January 1, 2003		
Am-241	1.95e+01	2.86e+01	2.21e+01	2.31e+01		2.42e-03	Am-241	**1.28e-02**	**1.28e-02**
C-14							C-14	**1.96e-07**	**1.96e-07**
Cm-243	<9.44e+00	<7.47e+00	<9.80e+00		1.91e-01	1.91e-05	Cm-243	**8.98e-05**	**8.98e-05**
							Cm-244	**2.16e-03**	**2.16e-03**
Cs-137	1.05e+04	9.13e+03	1.02e+04	9.93e+03		1.00e+00	Cs-137	**1.00e+00**	**1.00e+00**
I-129							I-129	**1.56e-10**	**1.56e-10**
Np-237	<3.70e+00	<6.04e+00	<6.84e+00		1.50e-02	1.60e-06	Np-237	**8.01e-06**	**8.01e-06**
Pu-238	3.55e+00	2.83e+00	3.18e+00	3.17e+00		3.29e-04	Pu-238	**1.51e-03**	**1.51e-03**
Pu239/240	1.53e+00	1.26e+00	1.37e+00	1.38e+00			Pu 239/240		
Pu-239	8.68e-01	7.14e-01	7.77e-01	7.84e-01		8.24e-05	Pu-239	**4.35e-04**	**4.35e-04**
Pu-240	6.62e-01	5.46e-01	5.93e-01	5.99e-01		6.29e-05	Pu-240	**3.09e-04**	**3.09e-04**
Pu-241							Pu-241	**1.04e-02**	**1.04e-02**
Sr-90	5.65e+04	5.45e+04	5.58e+04	5.56e+04		**5.59e+00**	Sr-90	9.58e-01	**5.59e+00**
Tc-99							Tc-99	**3.37e-05**	**3.37e-05**
U-232							U-232	**3.78e-06**	**3.78e-06**
U-233						4.25e-09	U-233	**1.44e-06**	**1.44e-06**
U-234						1.73e-09	U-234	**5.44e-07**	**5.44e-07**
U-235	<3.80e+00	<2.64e+00	<3.18e+00		2.82e-05	2.96e-09	U-235	**1.52e-08**	**1.52e-08**
U-238							U-238	**1.36e-07**	**1.36e-07**

spike sample recoveries. Per the report submitted by PNNL, the results reported were corrected for the average spike yield. It was also indicated that the low yield may have been caused by a loss of iodine due to light sensitivity. In recognition of this, the data validator flagged the I-129 data as estimated ("J"), indicating the results should be considered estimated and conservative.

Sludge Data - Validation of the sludge data used to develop scaling factors was performed in accordance with the requirements of WVDP-403. The overall conclusion was that most of the data was unconditionally approved for use. Due to the inability to quantify a blank result, Am-241, Cm-243, Np-237, and U-235 were conditionally approved for use. In the case of Np-237, Cm-243, and U-235, they were all nondetected. The Am-241result for the sludge sample was less than the Batch 10 sample result and therefore, was also not selected in developing the scaling factors.

7.0 Data Analysis

Dose-to-curie modeling of the key curie contributors was conducted using MicroShield™ software. As identified in the CMP, the modeling was performed by personnel trained in the use of the MicroShield™ software. The modeling calculations have been peer reviewed.

Dose-to-curie modeling inputs include dose rate measurements, radionuclide scaling factors that can be associated with the contamination of the component/area, and the configuration/dimensions and densities of each component/area.

The modeling was performed using a dose rate that was attributed solely to Cs-137. While many radioisotopes emit gamma radiation during decay, their contribution would not significantly change the dose rate due to lower energies and/or low abundance. Per the CMP, the Vitrification Facility MicroShield™ modeling results have been decayed to the reference date of September 30, 2004. Component/area specific assumptions and modeling results are described below and in Appendices K through Z.

7.1 Melter

After the melter was “emptied” using the evacuated canisters, an evaluation was performed, and based on the level detector responses, canister weight (preliminary), and the thermocouple responses during the evolution, it was estimated that there was about 300 kilograms of glass left in the melter or an 8-inch level left in the melter cavity (Reference 9). A visual inspection of the melter confirmed that the residual glass was present in portions of the melter at the 10-inch level.

The radiation reading used to determine the curie content of the melter cavity was taken using a specialized holder, which automatically centered the probe in a nozzle, extending the probe into the melter cavity. To model the residual glass in MicroShield™, a rectangular volume was used. In addition, a custom material of glass was constructed for the source, using the top ten glass constituents (ranked by weight percent). (It should be noted that the “vitrified glass custom material” referred to in the computer model was based on input from Reference 10. Appendix K contains the input that was used in constructing the vitrified glass custom material.)

Two computer model runs were constructed with the radiation readings collected from Nozzle A using an 8-inch residual and a 10-inch residual. The higher resulting curie content, i.e., the 10-inch residual, was chosen to represent the melter inventory.

In addition to the radiation measurements taken at Nozzle A, dose rate measurements were collected from four other nozzle penetrations in the melter. The radiation readings are summarized in Table 4. One reading, from Nozzle D, was off-scale, i.e., greater than 1,000 R/hr. This was not unexpected, since Nozzle D housed the melter level probe which was changed out

several times during the life of the vitrification operations. As a result, it was expected that there would be some glass left from contact of the level probes as they were removed from the melter in the immediate vicinity of the nozzle penetration. The dose rate measurement confirms this expectation.

As an additional means to evaluate the off-scale reading and its significance, the original MicroShield™ model (Appendix K) was used to verify what would be the expected dose rate reading in each of the other nozzles based on the unit geometry and Nozzle A readings. Table 4 summarizes the results and indicates a consistent fit with all of the remaining survey locations except Nozzle D. As a result, it was concluded that Nozzle D has been impacted by some surficial contamination that is not significant to the overall inventory of the melter.

For the melter discharge cavities, the model used was a rectangular volume, and assumed each discharge cavity was filled with glass (Appendix L). Additional conservatism was inherent because some of the dimensions used in the computer model were actually greater than the actual dimensions of the discharge cavities, resulting in a greater source volume, and therefore, overestimating curie content. (The actual discharge cavities are irregularly shaped, and the dimensions used were the maximum dimensions in each direction.)

Table 5 contains a summary of the modeling results.

7.2 CFMT

For the computer model of the CFMT (Appendix M), a cylindrical volume was used, and the computer model was based on the assumption that this tank was completely “filled” with contaminated water. (The actual level at the time of the radiation readings was 31 inches.) This was done not only for ease of computer modeling, but also to add conservatism in the model. It should be noted that two models were initially run, one with the internals of the CFMT contaminated and the other with the CFMT full of contaminated liquid. Radiation attenuation from the water resulted in a higher, and more conservative, Cs-137 content. Additional conservatism was built into the model based on the following:

- Some of the dimensions used in the computer model were greater than the actual dimensions of the tank, resulting in a greater source volume, overestimating curie content.

- The reading was taken with an unshielded probe. All the radiation was assumed to be coming exclusively from the tank, even though there were other radiation sources in the area. This made the determination of the curie content conservatively high.

Table 5 contains a summary of the modeling results.

7.3 MFHT

The radiation reading from the MFHT was taken on contact with the uppermost seam, approximately 54 inches from the bottom of the tank. The unit was modeled as a cylindrical volume, and was based on the assumption that this tank was “filled” with contaminated water (Appendix N). This was done not only for ease of computer modeling, but also to add conservatism in the model. (It should be noted that the indicated liquid level at the time of the radiation readings was zero. However, there is a residual heel in the MFHT not accounted for by level indication.) Additional conservatism was built into the model based on the following:

- Some of the dimensions used in the computer model were actually greater than the actual dimensions of the tank, resulting in a greater source volume, overestimating curie content.

Table 4

Actual Radiation Data Versus Theoretical Results

Nozzle Designation	Actual Radiation Reading (R/hr)	Calculated Radiation Reading (from MicroShield™) (R/hr)
Nozzle “A” (Basis for Inventory)	748	751
Nozzle “E”	660	537
Nozzle “G2”	330	302
Nozzle “D”	>1,000	674
Nozzle “BB”	700	712

Table 5

Conservative Curie Estimates for the Components of the Vitrification Cell (Decayed and Ingrown to September 30, 2004)

FC1>

Isotope	Melter (Including Discharge Cavity)	CFMT	MFHT	SBS	Remaining In-Cell Off-Gas Components	Decontamination Station	Vitrification Pit	Miscellaneous Spent Components	HVAC System	Totals
Am-241	1.1e+02	7.2e+01	3.2e+01	5.5e+01	7.5e+01	2.2e+00	2.8e+02	6.4e+01	2.7e+01	7.2e+02
C-14	1.7e-03	1.1e-03	4.9e-04	8.4e-04	1.1e-03	3.4e-05	4.3e-03	9.8e-04	4.0e-04	1.1e-02
Cm-243	7.7e-01	4.8e-01	2.2e-01	3.7e-01	5.0e-01	1.5e-02	1.9e+00	4.3e-01	1.8e-01	4.9e+00
Cm-244	1.8e+01	1.1e+01	5.1e+00	8.7e+00	1.2e+01	3.5e-01	4.4e+01	1.0e+01	4.2e+00	1.1e+02
Cs-137	8.6e+03	5.4e+03	2.4e+03	4.1e+03	5.6e+03	1.7e+02	2.1e+04	4.8e+03	2.0e+03	5.4e+04
I-129	1.4e-06	8.7e-07	3.9e-07	6.7e-07	9.1e-07	2.7e-08	3.5e-06	7.8e-07	3.2e-07	8.9e-06
Np-237	7.1e-02	4.5e-02	2.0e-02	3.4e-02	4.7e-02	1.4e-03	1.8e-01	4.0e-02	1.7e-02	4.6e-01
Pu-238	1.3e+01	8.4e+00	3.7e+00	6.4e+00	8.7e+00	2.6e-01	3.3e+01	7.5e+00	3.1e+00	8.4e+01
Pu-239	3.9e+00	2.4e+00	1.1e+00	1.9e+00	2.5e+00	7.6e-02	9.7e+00	2.2e+00	9.0e-01	2.5e+01
Pu-240	2.7e+00	1.7e+00	7.7e-01	1.3e+00	1.8e+00	5.4e-02	6.9e+00	1.6e+00	6.4e-01	1.7e+01
Pu-241	8.6e+01	5.4e+01	2.4e+01	4.1e+01	5.6e+01	1.7e+00	2.1e+02	4.8e+01	2.0e+01	5.4e+02
Sr-90	4.8e+04	5.2e+03	2.3e+03	4.0e+03	5.4e+03	1.6e+02	2.0e+04	4.6e+03	1.9e+03	9.2e+04
Tc-99	3.0e-01	1.9e-01	8.4e-02	1.5e-01	2.0e-01	5.9e-03	7.5e-01	1.7e-01	7.0e-02	1.9e+00
U-232	3.3e-02	2.1e-02	9.3e-03	1.6e-02	2.2e-02	6.5e-04	8.3e-02	1.9e-02	7.7e-03	2.1e-01
U-233	1.3e-02	8.1e-03	3.6e-03	6.2e-03	8.4e-03	2.5e-04	3.2e-02	7.2e-03	3.0e-03	8.2e-02
U-234	4.9e-03	3.1e-03	1.4e-03	2.4e-03	3.2e-03	9.6e-05	1.2e-02	2.8e-03	1.2e-03	3.1e-02
U-235	1.4e-04	8.5e-05	3.8e-05	6.5e-05	8.9e-05	2.6e-06	3.4e-04	7.6e-05	3.2e-05	8.7e-04
U-238	1.2e-03	7.6e-04	3.4e-04	5.9e-04	7.9e-04	2.4e-05	3.0e-03	6.8e-04	2.8e-04	7.7e-03

- The reading was taken with an unshielded probe. All the radiation was assumed to be coming exclusively from the tank, even though there were other radiation sources in the area. This made the determination of the curie content conservatively high.

Table 5 contains a summary of the modeling results.

7.4 In-Cell Off-Gas Equipment

7.4.1 SBS

The radiation reading from the SBS was taken 55 inches up from the bottom of the tank and approximately nine inches away from the external surface of the tank. In order for the model to consider the internal structures of the SBS, consisting of two concentric cylinders made of Hastelloy-C and the ceramic spheres (see Section 2.2.4), a custom material (based on Hastelloy-C) was constructed in MicroShield™ (Appendix O) using data from Reference 11. This custom material was used as the source media and yields a more conservative radiation attenuation versus other tank contents such as residual liquid and the ceramic spheres. Because the actual internals are not made of solid Hastelloy-C, a density had to be assigned for the internal structure. To determine the density of the internals, a density of 1.05 g/cm^3 was calculated using data from Reference 12 for the maximum operating weight of the SBS. Dimensions of the SBS were determined from Reference 13. The model also incorporated outside cladding constructed of Hastelloy-C 22. A cylindrical volume model was used to determine the curie content. Additional conservatism was inherent because the reading was taken with an unshielded probe and all the radiation dose was assumed to be coming exclusively from the tank even though there were other radiation sources in the area. Table 5 contains a summary of the modeling results.

7.4.2 Remaining In-Cell Off-Gas Equipment

The components of the remaining off-gas equipment were modeled using volumetric geometries. In order to conservatively model these components, a density and material had to be selected for input into the models. These components are made from a general mixture of metals, fiberglass paper, and other miscellaneous materials. This type of composition is analogous to the materials generated from the Vitrification Expended Materials Program (VEMP). The VEMP was a program that size reduced spent vitrification components and packaged them into steel containers. The internal structure of a component, like these discussed in this section, would be no more dense than the most dense container processed by the VEMP. (The VEMP material is closely packed into containers minimizing the available air space so is a conservative predictor of the density of a piped infrastructure.) From the VEMP, the maximum weight of one of the 30-gallon drums of cut up expended material is 225 kilograms. This translates to a density of 1.7 g/cm^3. As a selection of material, iron was used because of its conservative radiation attenuation property. The selection of iron as the material coupled with the high value of density ensures a conservative estimation of the curie content of the individual components.

HEMEs - The radiation reading from the HEMEs were taken approximately nine inches from the tank and approximately 67 inches from the bottom of the HEMEs. The HEMEs were modeled as a cylindrical volume (Appendix P). Additional conservatism was built in because the reading was taken with an unshielded probe and all the radiation was assumed to be coming exclusively from the HEME, even though there were other radiation sources in the area. Table 5 summarizes the modeling results.

Off-Gas Jumper - The radiation reading from the off-gas jumper was taken at a position on contact with the jumper, approximately four feet from the end that extends into the melter. The off-gas jumper was modeled as a cylindrical volume (Appendix Q). Additional conservatism was inherent in this model because the reading was taken with an unshielded probe and other localized sources would have contributed to the reading. Table 5 summarizes the results.

HEME Preheater - The radiation reading from the preheater was taken at a position approximately centered on contact with the east side of the preheater.

The preheater was modeled as a rectangular volume (Appendix R). Additional conservatism was inherent because the reading was taken with an unshielded probe and all the radiation was assumed to be coming exclusively from the preheater, even though there were other radiation sources in the area. Table 5 contains a summary of the modeling results.

Prefilters - The radiation readings were taken centered on the east face of the prefilters using an unshielded general area probe.

The prefilters were modeled as rectangular volumes with iron as the source media (Appendix S). Additional conservatism was built into the model as all of the dose was attributed to the prefilters, while there were other sources that would have contributed to the dose rate measurement. Table 5 contains a summary of the results.

Post-heater - The radiation readings were taken centered on contact with the top of the post-heater using an unshielded general area probe. Additional conservatism was built into the model as all of the dose was attributed to the post-heater even though there were other sources in the area that would have contributed to the radiation reading (Appendix T). Table 5 summarizes the modeling results.

Condenser - The radiation reading was taken approximately 67 inches from the bottom of the HEMEs and nine inches from the condenser wall. The condenser was modeled as a cylindrical volume (Appendix U). Additional conservatism was built into the model because all of the dose rate was attributed to the condenser even though there were other contributing sources in the area. Table 5 summarizes the modeling results.

Filter Preheaters - The radiation readings were taken on contact centered with the north face (of filter preheater E-037) and east face (of filter preheater E-034) using an unshielded general area probe. The filter preheaters were modeled as rectangular volumes (Appendix V). Additional conservatism was built into the model as all of the dose measurement was attributed to the prefilters even though other sources contributed to the reading. Table 5 contains a summary of the modeling results.

7.5 Decontamination Station

The radiation readings were taken approximately nine inches from the Decontamination Station tanks at a distance about half way up the height of the tanks. The tanks were modeled as cylindrical volumes, based on the assumption that the tanks were filled with contaminated water. The tanks were modeled using titanium (Appendix W). However, because titanium is not a standard material in the modeling program, a custom made material was constructed. A custom material is created by entering the individual elements and associated densities that make up the

material. Additional conservatism was inherent because the readings were taken with an unshielded probe and all the radiation was assumed to be coming exclusively from the tank even though there were other radiation sources in the area. Table 5 summarizes the modeling results.

7.6 Vitrification Pit

A series of readings with the shielded probe were taken on January 29, 2003 to collect data to characterize the pit floor. Readings were taken in multiple directions in locations near the CFMT, MFHT, and SBS, looking horizontally toward each component, between these components, and away from these components. In addition, multiple readings were taken looking horizontally underneath the melter and melter turntable. The shielded probe was then reconfigured to look in the downward direction and readings were taken over the southwest corner of the pit, the northwest corner near the Sample Station, and with the 12-inch standoffs in contact with the top of the CFMT, MFHT, and SBS.

The Ludlum 133-8 detector has a sensing element 1.5 inches back from the detector's face. The detector's face itself is 7/8 inches in diameter (Reference 14). This gives a half angle field of view of approximately 16 degrees.

7.6.1 Downward Readings

For the downward readings, a truncated cone geometry was used (Appendix X). The inputs to the model for each view were dependent on the individual physical arrangement (distances, density of the source, if there was a layer of water from a tank in the way, etc.), and is further explained below. Once the number of curies was determined based on the readings, as a conservative measure, all the curies were attributed to the pit floor. In other words, the curies were, in a sense, boiled down from the truncated cone source and distributed onto the floor area. This gave a concentration of curies of Cs-137 per unit area. Once these area concentrations were determined, they could then be multiplied by the total area they represent to determine the number of curies for that section. Below is the discussion of each model developed from the downward readings.

CFMT - The dose from the CFMT was taken with the radiation probe standoffs touching the flange on top of the CFMT, on the south side of the CFMT. While the readings were being taken, there were 31 inches of water at a density of 1.14 g/cm^3 in the CFMT that had to be taken into consideration in the model. This was the measured level and density of the CFMT on the day of the radiation readings (Reference 15). As a conservative measure, this density was entered into the source term of the truncated cone, in effect, filling up the truncated cone with water. To determine the density used for the "iron" source term, the actual weight and volume of the CFMT were taken into consideration resulting in a density of 0.18 g/cm^3 (Reference 16).

MFHT - The dose from the MFHT was taken with the radiation probe standoffs touching the flange on top of the MFHT, on the southwest side of the MFHT. As input for the truncated cone, the level indicator of the MFHT was reading zero, but there is a remaining heel of water where the water drops beneath the level probe of the tank. The maximum heel expected is 4.25 inches of water depth (or 770 liters). As a conservative measure, water was entered into the source term of the truncated cone, in effect, filling up the truncated cone with water. Hastelloy-C was used as the material for the source term, and the actual weight and volume of the MFHT were taken into consideration, resulting in a density of 0.47 g/cm^3 (Reference 17).

SBS -The dose from the SBS was taken with the radiation probe standoffs touching the flange on top of the SBS, on the northeast side of the SBS. As input for the truncated cone, a density of material was calculated based on the full weight and volume of the SBS. This yielded a density of 1.05 g/cm^3 of Hastelloy-C (custom material) in the source term (Reference 10).

Northwest Corner of the Pit - Two readings were taken of the northwest corner of the pit, looking downward, to determine the floor contamination levels in that area. Because part of the field of view of the detector encompassed the MFHT, the density and material data from the MFHT was used for the truncated cone. The detector was located at approximately 0.3 meters north of the south wall, and 0.9 meters east of the west wall. Knowing this was the location of the reading, it was determined that the resulting floor "area" of the pit that could be seen was approximately 45 percent of the whole circle. This was factored into calculating the concentration. In addition, the resulting number of curies had to be multiplied by a factor of 1/.45 to adjust the source term. (See Appendix X under the discussion of the pit model.)

Southwest Corner of the Pit - Two readings were taken of the southwest corner of the pit, looking downward, to determine the floor contamination levels in that area. The detector was located at approximately 0.6 meters south of the north wall, and 0.3 meters east of the west wall. Knowing this was the location of the reading, it was determined that the resulting floor "area" of the pit that could be seen was approximately 45 percent of the whole circle. This was factored into calculating the concentration. In addition, the resulting number of curies had to be multiplied by a factor of 1/.45 to adjust the source term.

Table 6 gives a summary of the downward reading results.

7.6.2 Horizontal Readings under Pit Vessels

Multiple radiation readings were also taken looking horizontally underneath the major vessels. These ranged from 7.3 R/hr, looking underneath the SBS, to 56 R/hr under the MFHT. When the detector is aimed horizontally and placed on the floor of the pit, the detector "sees" a conical field of view, intersected by the floor (see Figure 21). These readings are, in a sense, looking through the steel understructure of the tanks but also are getting some radioactive contribution from the tanks themselves. Multiple measurements were taken underneath the melter and in the direction of the canister turntable and storage rack. These readings ranged from 1.2 to 5.6 R/hr. A graphic representation of these readings is shown in Appendix X.

To determine the relationship between dose rate and floor surface contamination, a series of models were developed, modeling the floor in 0.3 meter successive rectangular shaped slices. (MicroShield™ does not have a "triangular/conical area" geometry, so the area was modeled with successive rectangular areas.) Table 7 shows the calculated dose rate reading for an area contaminated with a Cs-137 concentration of 1.3 x 10^5 FCi/cm^2. Based on the computer modeling, one would expect to detect approximately 590 R/hr rather than the 56 R/hr actually detected. Thus, the methodology of using the overhead vertical dose rates to derive the pit's inventory is conservative.

Table 6

Summary of Downward Reading Results

Location of Reading	Resulting Calculated Floor Areal Concentration (FCi/cm^2)
Over the top of the MFHT looking "down"	1.4×10^4
Over the top of the CFMT looking "down"	1.5×10^4
Over the top of the SBS looking "down"	1.0×10^3
Looking down in the southwest corner (at 336 vertical reading, or 274 inches above the pit floor)	2.5×10^4
Looking down in the northwest corner (at 275 vertical reading, or 213 inches above the pit floor)	1.3×10^5

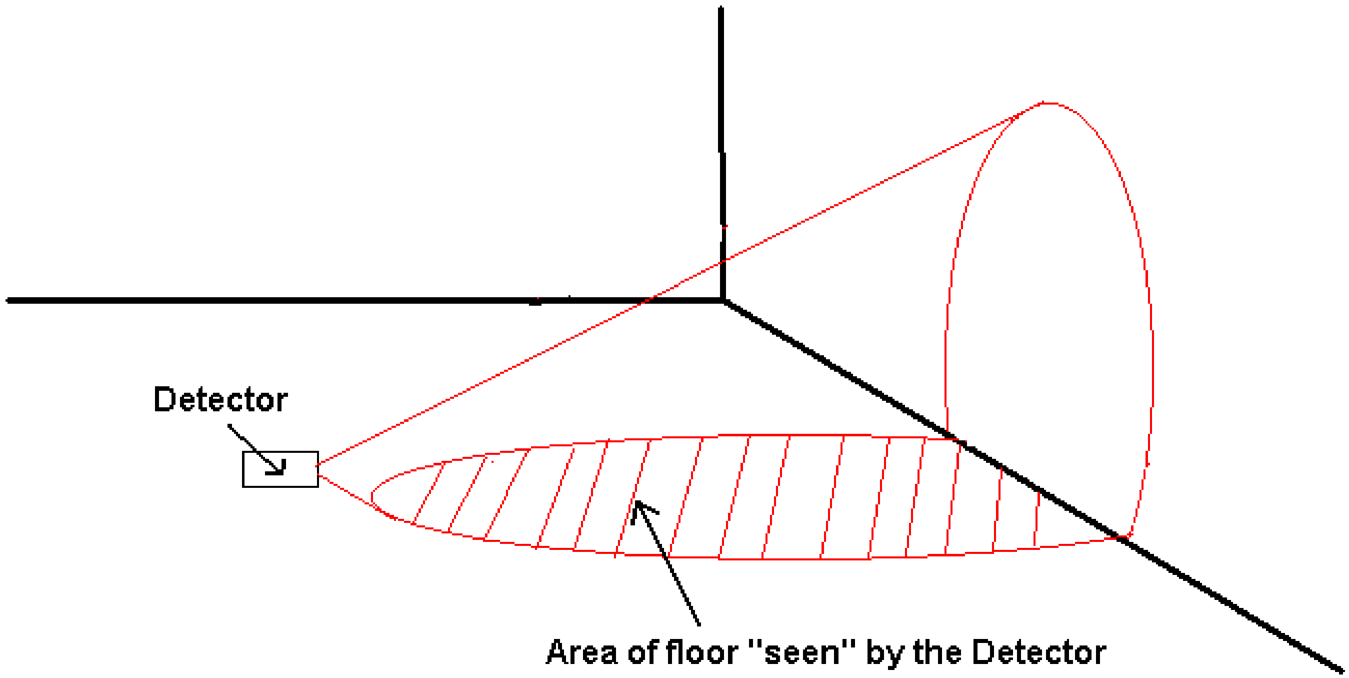


Figure 21

Detector Field of View Concept

Table 7

Modeled Dose Rates Based on a Cs-137 Concentration of 1.3 x 10^5 FCi/cm^2

Total Floor Distance Read (Feet)	Contribution (mR/hr/FCi/cm^2)	Scaled Result for 1.3E5 FCi/cm^2 (R/hr)	Calculated Total Reading (R/hr)
1	7.6e-01	9.8e+01	9.8e+01
2	6.0e-01	7.8e+01	1.8e+02
3	4.6e-01	6.0e+01	2.4e+02
4	3.7e-01	4.8e+01	2.8e+02
5	3.1e-01	4.0e+01	3.2e+02
6	2.6e-01	3.4e+01	3.6e+02
7	2.3e-01	3.0e+01	3.9e+02
8	2.1e-01	2.7e+01	4.2e+02
9	1.8e-01	2.4e+01	4.4e+02
10	1.7e-01	2.2e+01	4.6e+02
11	1.5e-01	2.0e+01	4.8e+02
12	1.4e-01	1.8e+01	5.0e+02
13	1.3e-01	1.7e+01	5.2e+02
14	1.2e-01	1.6e+01	5.3e+02
15	1.2e-01	1.5e+01	5.5e+02
16	1.1e-01	1.4e+01	5.6e+02
17	1.0e-01	1.3e+01	5.8e+02
18	9.7e-02	1.3e+01	5.9e+02

7.6.3 Pit Floor Summary and Conclusions

Based on the above evaluation, the pit floor inventory was calculated using the downward readings, while the horizontal readings proved the approach is conservative.

To determine the curie content, the pit floor was broken into three sections; a 12 foot by 12 foot section underneath the CFMT, a 12 foot by 12 foot section underneath the MFHT, and the rest of the cell. The most conservative floor concentrations from Table 6 were used in calculation, i.e., for the MFHT area, the northwest corner concentration was used, because it was higher. In the CFMT area, the southwest corner concentration was used, and in the rest of the cell, the “under SBS” concentration was used.

A total of 22,200 curies of Cs-137 was calculated to be on the pit floor. For perspective, one glass canister, on average, has about 25,000 curies of Cs-137. This would equate to about one canister of glass covering the entire pit floor.

7.7 Miscellaneous Spent Components

The radiation reading from the miscellaneous spent components was taken with an unshielded general area probe at a position centered over the pile. The spent components are located in an area in front of the Weld and Decontamination Stations, and occupy an area of floor space approximately 6.75 feet. The height that the radiation reading was taken was at the same height as the Weld and Maintenance Stations, or 12 feet 7 inches above the floor.

The pile was conservatively modeled as a solid rectangular volume. The composition of the materials were assumed to be iron which gives a conservative radiation attenuation. The pile is not a solid block of iron, therefore was assigned a density of 1.7 g/cm^3 similar to the VEMP material previously discussed. Additional conservatism was introduced because the reading was taken with an unshielded radiation probe, and all radiation was assumed to be coming exclusively from the spent component pile. See Appendix Y.

7.8 In-Cell Ventilation System

The radiation reading from the HEPA filters was taken approximately nine inches away from the filter face. The HEPA filter internals were modeled using iron as the source media (Appendix Z). The filters were modeled as a rectangular source using the density of 1.7 g/cm^3. Additional conservatism was built into the model because all of the radiation was attributed to the HEPA filter, while there were other sources that would have contributed to the dose rate measurement. Table 5 contains a summary of the modeling results.

7.9 Total Curie Estimate

The total Vitrification Facility source term was calculated by summing the curie contributions from each of the key curie contributing areas. See Appendix AA. The results (corrected to September 30, 2004) are summarized below in Table 8.

Table 8

Total Performance Assessment Radionuclides for the Vitrification Facility (Curies)*

Project Isotopes	Curie Estimate for Vitrification Facility
Am-241	7.2e+02
C-14	1.1e-02
Cm-243	4.9e+00
Cm-244	1.1e+02
I-129	8.9e-06
Np-237	4.6e-01
Pu-238	8.4e+01
Pu-239	2.5e+01
Pu-240	1.7e+01
Pu-241	5.4e+02
Tc-99	1.9e+00
U-232	2.1e-01
U-233	8.2e-02
U-234	3.1e-02
U-235	8.7e-04
U-238	7.7e-03
Sr-90**	9.2e+04
Cs-137**	5.4e+04

* The method of choosing the project isotopes is outlined in WVDP-403, "Characterization Management Plan for the Facility Characterization Project" (CMP).

** Cs-137 and Sr-90 are not critical radionuclides for the outcome of the performance assessment but are reported for completeness per WVDP-403.

The sum total of performance assessment radioisotopes, as depicted in the above table, is approximately 1,500 curies. Additionally, the contribution from Cs-137 is 54,000 curies and 92,000 curies for Sr-90.

Using best engineering judgement and available information, the following listed Technical Review and Approval Panel Members have reviewed the technical approach and resultant curie estimate for the stated area/cell and have reached consensus that the approach and resultant estimate are technically sound for purposes of this project's scope as identified in the Characterization Management Plan for the Facility Characterization Project (WVDP-403).

Sr. Project Manager:	J. Mahoney	3/27/03 Signature/Date
Project Manager:	L. Rowell	3/27/03 Signature/Date
Project Lead:	E. Lachapelle	3/26/03 Signature/Date
Radiation Engineering and Safety:	P. Winkler	Paul Winkler 3/26/2003 Signature/Date
Radiation Protection Operations:	R. Hazard	for R. Hazard 3/26/03 Signature/Date
Radiation Protection:	W. Schaper	3/26/03 Signature/Date
Regulatory Programs:	D. Westcott	D R Westcott 3/26/03 Signature/Date
Chief Engineer:	T. Kocialski	3/26/03 Signature/Date

8.0 References

1. WVDP-403, "Characterization Management Plan for the Facility Characterization Project"

2. "A Complete History of the High-Level Waste Plant at the West Valley Demonstration Project," L. L. Petkus et al., Waste Management '03 Conference.

3. Topical Report DOE/NE/44139-77, "Vitrification Facility at the West Valley Demonstration Project," V. A. DesCamp, et al., July 1996.

4. WVNSCO External Letter WD:2002:0452, Attachment A, "Report on Deployment of Miscellaneous Tank and Piping Cleaning Equipment and Methodology," dated August 27, 2002.

5. "Application of the Evacuated Canister System for Removing Residual Molten Glass from the West Valley Demonstration Project High-Level Waste Melter," J. J. May et al., Waste Management '03 Conference.

6. Pacific Northwest National Laboratory (PNNL) Report WVSP 00-28, "WVDP Radioactive Waste Characterization Letter Report - Part 1: Physical, Chemical and Radiochemical Analytical Data," dated March 2000.

7. Pacific Northwest National Laboratory (PNNL) Report WVSP 01-07, "WVDP Radioactive Waste Characterization Letter Report - Part 3: Iodine-129 Measurement by Low Energy Photon Spectrometry (LEPS)," dated November 2000.

8. D. C. Meess, Manager, High-Level Waste Tank Farm Deactivation Engineering, Personal Communication, Vitrification Transfer Tracking Charts, dated September 20, 2002.

9. L. L. Petkus, Senior Engineer, High-Level Waste Completion Project, to Distribution, "Glass in Melter," dated September 9, 2002.

10. WVDP-185, "Waste Form Compliance Plan for the West Valley Demonstration Project High-level Waste Form".

11. Chemical Engineers' Handbook, Fifth Edition, McGraw-Hill, Inc., Copyright 1973.

12. Drawing 2990E32, "Submerged Bed Scrubber Vessel Assembly".

13. Drawing 1990E31, "Submerged Bed Scrubber Vessel Layout".

14. W. Schaper, Team Lead, Radiation and Safety Instrument Laboratory and E. Lachapelle, Senior Engineer, Facility Characterization Project, Personal Communication, "Discussion of Ludlum 133-8 Probe Characteristics," January 8, 2003.

15. Plant System Operations Daily Report, January 30, 2003.

16. Drawing 900D-4782, "Vitrification In-Cell Concentrator Feed Make-up Tank 63-V-001 Installation".

17. Drawing 900D-4781, "Vitrification In-Cell Melter Feed Hold Tank 63-V-011 Installation".

Appendix A

Radiation and Contamination Survey Reports 2CCw2003, 118062, 118378, and 46178

West Valley Demonstration Project

Routine Radiation / Contamination Survey

Survey Description: CC Weekly

Survey Area: VIT SFR, DGR, SFRAL

Date: 1-5-03 Time: 0200

Survey Number: 2CCw2003

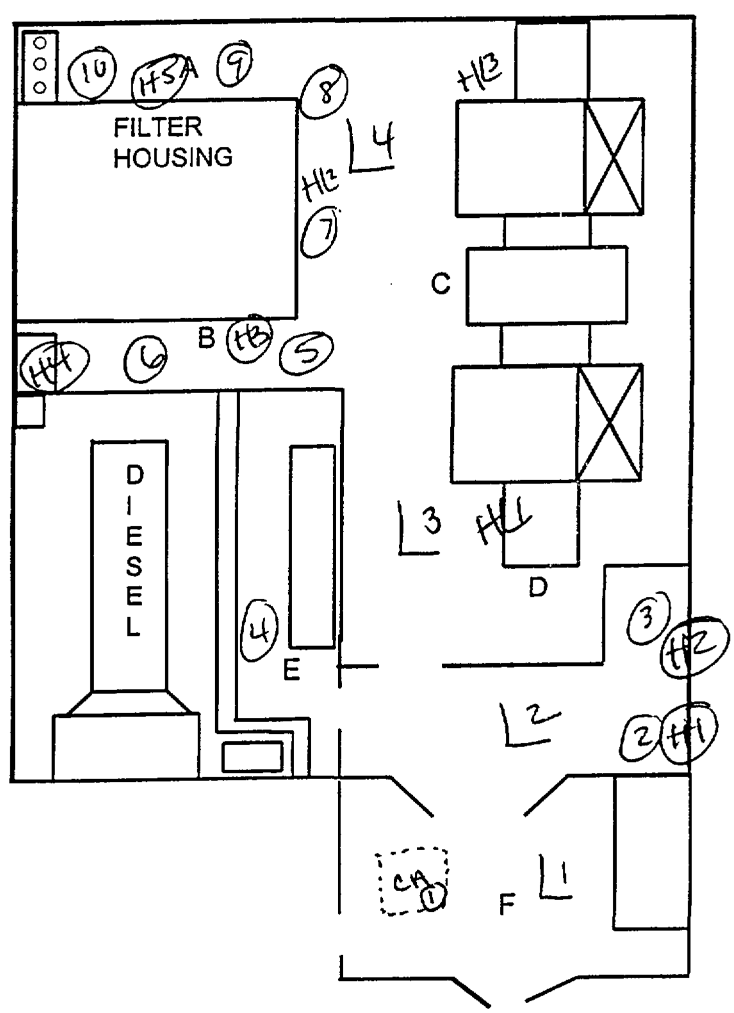
Surveyed By: James [signature]

Updated Map Drawing: 15 Aug 2001 (date)

Reviewed By: Richard Black [signature]

Instrument serial Numbers ALPHA: 102730 GM: 138314 ION: 2072 OTHER: ______

TENN: 14437 ALPHA Eff: 27.4 % BETA Eff: 40.8 %



West Valley Demonstration Project
Routine Radiation/Contamination Survey

Radiation Levels (mr/hr)		Contamination Levels (net dpm/100 cm²)			Large Area Wipes (net cpm)		
		No.	Alpha	Beta	No.	Alpha	Beta
A	0.1	1	<20	<200	1	<15	<100
B	0.1	2	↓	↓	2	↓	↓
C	0.1	3	↓	↓	3	↓	↓
D	0.1	4	↓	↓	4	<15	<100
E	0.1	5	↓	↓			
F	0.1	6	↓	↓			
		7	↓	↓			
		8	↓	↓			
		9	↓	↓			
		10	<20	<200			

Remarks	Horizontal Smears			Horizontal Wipes		
	Contamination Levels (net dpm/100 cm²)			Large Area Wipes (net cpm)		
	No.	Alpha	Beta	No.	Alpha	Beta
	H1	<20	<200	H1	<15	<100
	H2	↓	↓	H2	↓	↓
	H3	↓	↓	H3	<15	<100
	H4	↓	↓			
	H5	<20	<200			

Tools Surveyed	Location	Contamination Levels (net dpm/100 cm²)		Direct Check (net cpm)	
		Alpha	Beta	Alpha	Beta
FACESHIELD	SFRAL	<20	<200		

118062

Survey Number

Radiation and Contamination Survey Report

West Valley Nuclear Services Co.

COPY

Location VIT SFR/SFRAL/HVOR
Work Area SFR

Purpose Of Survey: SUPPORT CHANGING FILTERS

Additional Information Attached ☐ YES ☐ NO ☒ ON BACK

Instruments Used

	TYPE	SERIAL #	EFF.
☐ SCINTILLATION			
☒ GM	3-2	126353	
☒ IONIZATION	RO20	3543	
☒ PROPORTIONAL	TENN	233	α 27.8 β 39.8
☐			

AREA/MATERIALS SURVEYED	SMEARABLE NET (DPM/100 cm 2) COUNT TIME 1 MIN		DIRECT CHECK NET CPM		RADIATION LEVEL			
	ALPHA	BETA	ALPHA	BETA	READING	DISTANCE	Cor. Factor	Cor. Reading
(3) MASKS (BAGGED)	<20	<200	—	<100	—	—	—	—
BAG OF LAUNDRY	<20	<200	—	<100	—	—	—	—
(2) FILTERS (BAGGED)	<20	<200	—	<100	—	—	—	—

CONCLUSIONS - AREA/MATERIALS ☐ RELEASABLE ☐ NON-RELEASABLE ☒ INFORMATION ONLY

COMMENTS (IF ANY):

RECOMMENDATIONS: ☒ NO FURTHER ACTION REQUIRED ☐ FURTHER ACTION REQUIRED

IF FURTHER ACTION REQUIRED, DESCRIBE:

Technician Name: SMITH, DANIEL S
Signature: [signature]
Date: 05 Dec 2002
Time: 0945

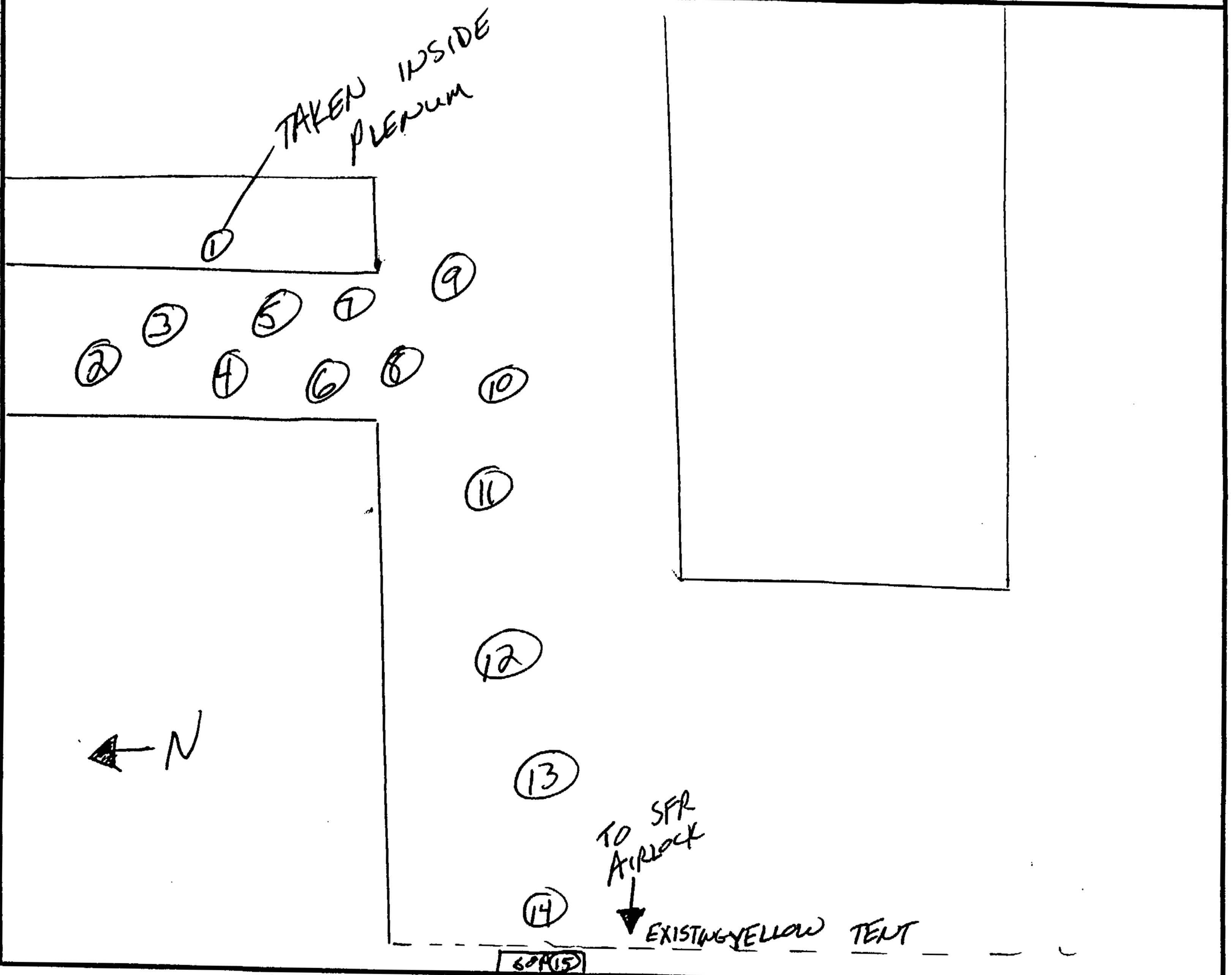
Reviewer Name (Print): Don Thacwigh
Signature: [signature]
Date: 12/6/02
Time: 0715

SMEARABLE NET
(DPM/100 cm²)

Count Time / Min.

#	ALPHA	BETA
1	<20	<200
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15	<20	<200

COMMENTS:



118378

Radiation and Contamination Survey Report

Survey Number

West Valley Nuclear Services Co.

Location VIT CMR/CMROA

Work Area CMR

COPY

Purpose Of Survey SUPPORT WORK ON CRANE

Additional Information Attached ☐ YES ☐ NO ☒ ON BACK

Instruments Used

	TYPE	SERIAL #	EFF.
☒ SCINTILLATION	177	102730	
☒ GM	3-2	102975	
☒ IONIZATION	R020	3543	
☒ PROPORTIONAL	TENN	14437	α 27.4 β 40.8
☐			

AREA/MATERIALS SURVEYED	SMEARABLE NET (DPM/100 cm 2) COUNT TIME 1 MIN ALPHA	BETA	DIRECT CHECK NET CPM ALPHA	BETA	RADIATION LEVEL READING	DISTANCE	Cor. Factor	Cor. Reading
MASKS - HUGH FOSTER	58	1610	—	—	—	—	—	—
- PAUL WELCH	<20	<200	—	—	—	—	—	—
- DAN SMITH	<20	<200	—	—	—	—	—	—
12/31/02 DS - JEFF GILES	<20	615	—	—	—	—	—	—
(4)(5) MASKS - BAGGED	<20	<200	—	<100	—	—	—	—
BAG OF LAUNDRY	<20	<200	—	1500	—	—	—	—
RAD INSTRUMENTS	<20	<200	<5	<100	—	—	—	—

CONCLUSIONS - AREA/MATERIALS ☐ RELEASABLE ☐ NON-RELEASABLE ☒ INFORMATION ONLY

COMMENTS (IF ANY):

RECOMMENDATIONS: ☒ NO FURTHER ACTION REQUIRED ☐ FURTHER ACTION REQUIRED

IF FURTHER ACTION REQUIRED, DESCRIBE:

Technician Name Signature:	BENZ, THOMAS A / Tom Benz	Date: 31 Dec 2002	Time: 1300
Technician Name Signature:	SMITH, DANIEL S / Daniel Smith	Date: 31 Dec 2002	Time: 1300
Reviewer Name (Print):	Richard Black	Date: 1/2/03	
Signature:	Richard Black	Time: 10:31 hrs.	

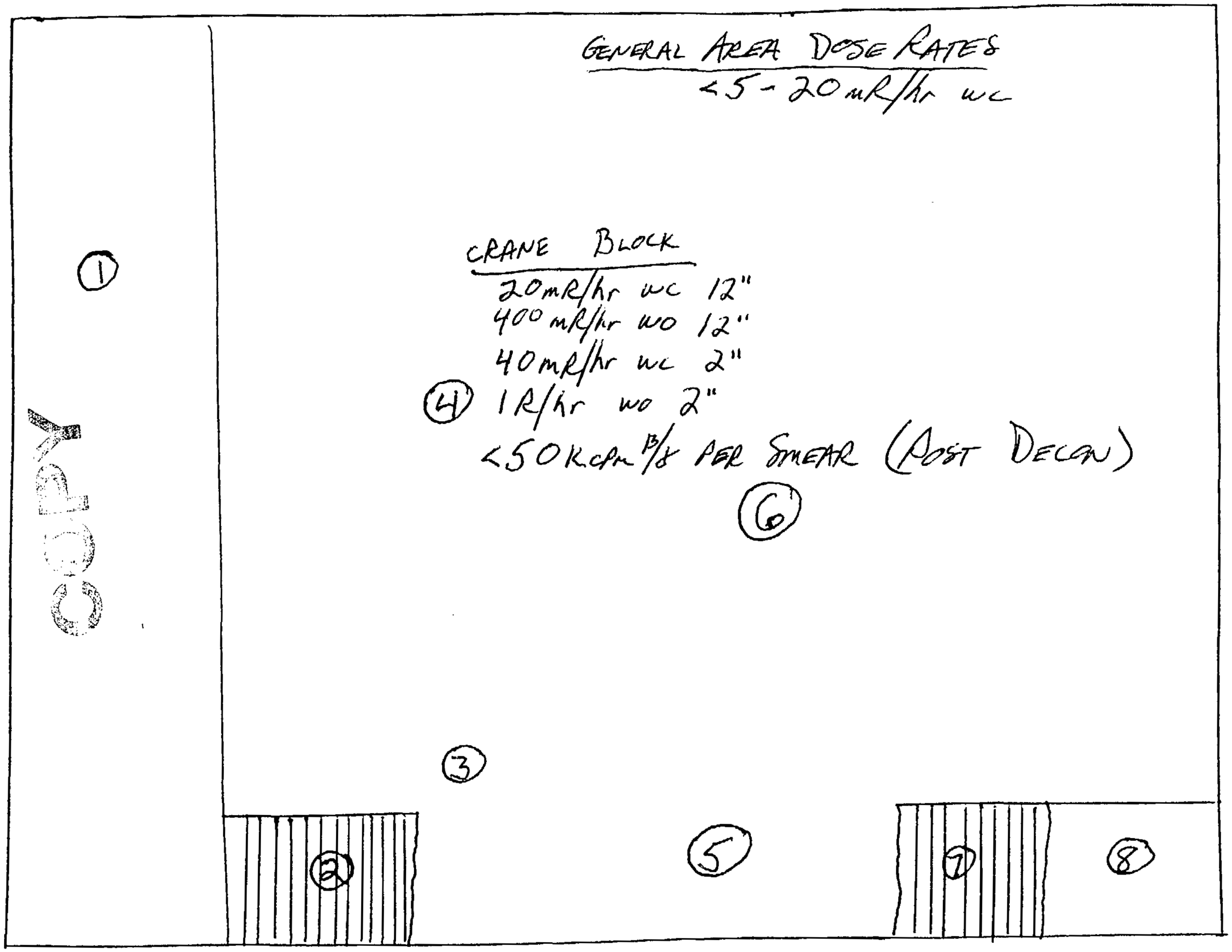
SMEARABLE NET
(DPM/100 cm²)

Count Time Min.

#	ALPHA	BETA
1	N/A	12500
2		187500
3		62500
4		187500
5		62500
6		62500
7	↓	31250
8	N/A	15625

* (rows 1–8)

COMMENTS: * SMEARS COUNTED USING GM 3-2 #102975 WITH CF OF 6.25



WEST VALLEY NUCLEAR SERVICES CO., INC.

RADIATION & CONTAMINATION SURVEY REPORT

SURVEY FORM No 46178

LOCATION: EDR

WORK AREA: EDR

PURPOSE: ☐ ROUTINE ☒ SPECIAL

IF SPECIAL DESCRIBE: Survey to investigate contamination levels after CAM alarm due to loss of Vit VOG Ventilation

ADDITIONAL INFORMATION ATTACHED ☐ YES ☒ NO ☒ ON BACK

INSTRUMENTS USED

	TYPE	SERIAL#
☐ SCINTILLATION		
☒ GM	3-2	126340
☒ IONIZATION	RO20	2169
☒ PROPORTIONAL	LB5100	233/618

AREA/MATERIALS SURVEYED	SMEARABLE NET (DPM/100 cm²)		DIRECT CHECK NET CPM		RADIATION LEVEL	
	ALPHA	BETA	ALPHA	BETA	READING	DISTANCE
DOSE RATES ON CART (PT. A. ON MAP)					200 mR/HR	W.O. @ 2"
					80 mR/HR	W.O. @ 12"
					60 mR/HR	W.C. @ 12"
DOSE RATE AT PT. B. (GENERAL AREA)					3.0 mR/HR	W.C. @ 12"
DOSE RATE AT PT. C. (GENERAL AREA)					3.5 mR/HR	W.C. @ 12"
DOSE RATES AT PT. D.					150 mR/HR	W.O. @ 2"
					100 mR/HR	W.O. @ 12"
					50 mR/HR	W.C. @ 12"
DOSE RATES AT PT. E.					300 mR/HR	W.O. @ 2"
					100 mR/HR	W.O. @ 12"
					10 mR/HR	W.C. @ 12"
DOSE RATE A PT. F (GENERAL AREA)					5 mR/HR	W.C. @ 12"

CONCLUSIONS - AREA/MATERIALS: ☐ RELEASABLE ☐ NON-RELEASABLE ☒ INFORMATION ONLY

COMMENTS (IF ANY):

RECOMMENDATIONS: ☒ NO FURTHER ACTION REQUIRED ☐ FURTHER ACTION REQUIRED

IF FURTHER ACTION REQUIRED, DESCRIBE:

SURVEYOR NAME (PRINT): PAUL WINKLER / Carl Frank DATE: 6-20-97

SIGNATURE: Paul Winkler / Carl Frank TIME: 1300

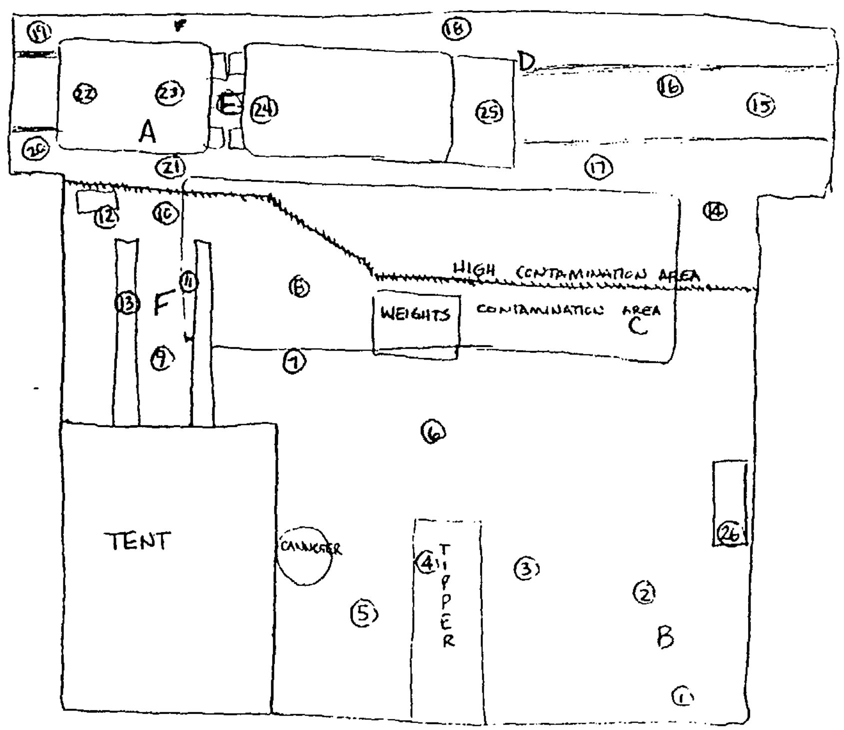
REVIEWED NAME (PRINT): Don Tharnish DATE: 6/20/97

SIGNATURE: Don Tharnish TIME: 1355

2 MINUTE SMEAR COUNT TIME SMEAR RESULTS EXCEPT 22-25 NET (DPM/100 cm²)		
#	ALPHA	BETA
1	<20	<200
2	35	790
3	25	720
4	20	560
5	125	5600
6	95	3000
7	35	775
8	20	965
9	50	1330
10	25	580
11	20	610
12	45	1570
13	<20	330
14	820	33,660
15	265	9970
16	170	5470
17	1005	33,420
18	175	7250
19	90	4225
20	205	5685
21	185	5275
22	—	625,000
23	—	625,000
24	—	1,875,000
25	—	1,875,000
26	<20	<200
2		

COMMENTS: SMEARS 22-25 COUNTED WITH GM.

EDR



Appendix B

Work Order 75653, "Obtain Radiation Readings in the Vitrification Melter"

J1-WORK AUTHORIZATION FORM

1. Work Control Number VFS-75653 WO — Off-Shift Issuance: ______ Signature ______ Date/Time

2. Originator: E. Lachapelle/OB-1/2117 (Print Name/MS/Ext) — [signature] 10/31/02 (Signature/Date)

3. Peer Review: MARK AGNEW 48 (Print Name/MS) — [signature] 11/7/02 (Signature/Date)

4. Charge No. (Labor) (M & S): WH 5310004 /WH

5. Equipment I.D.: Eqpt/Instr/Valve # N/A — NA

NOV 20 2002 WORK CONTROL CENTER

6. Performance Code
- A. ✓ Special Preparation
- B. __ Normal Preparation
- Other: ______

System:
- 0 __ May be shut down
- 1 ✓ Must be shut down
- 2 __ Must be operating
- 3 __ NA

Equipment:
- 0 __ May be shut down
- 1 ✓ Must be shut down
- 2 __ Must be operating
- 3 __ NA

7. Estimated/Actual Hours

SUPPORT GROUP		EST.	ACTUAL
Vit/PSO	Ops	8	
Maint			
QA		4	
RC Tech		8	
~~[illegible]~~		~~8~~ BG 11/20/02	

8. System: 63 A

9. Location: EDR/VC

10. Dwg/Sketch: Yes __ No ✓ Attached __

11. Docs./Dwgs Rqd. Revs: TM# N/A ECN# ______ NA

12. Profile No.: 013.001R ~~N/A~~ EL 11/13/02

13. Document Ref. No.: N/A

14. Quality Level: C

15. Safety Class: N

16. ALARA Trigger Level(s) [WV-984, Sec. 7.8.3] Exceeded Yes __ No ✓
ALARA Checklist Attached: Yes ______ N/A ✓
Detailed Dose Estimate Attached: Yes ______ N/A ✓

17. Eng. Approval Rqd. Yes __ No ✓

18. RWP Required: Yes ✓ No __ — RWP No. ______

19. Hoisting & Rigging: NA __ Routine ✓ Non-routine __ Critical __ (Ref. SOP 00-38)

20. QA Insp. Rqd: Yes ✓ No __

21. Welding or Special Process Rqd: Yes __ No ✓ — If Yes, Cite ______

22. Special Qualification Rqd.: Yes ______ No ✓

23. IWP required: Yes ______ No ✓ — IWP No. ______

24. Ground Disturbance Permit Required: Yes ______ NA ✓ Attached ______

25. RWG Walkdown: (Print) NAME: LARRY KOLB DATE: 11/15/02

26. Reqd. Finish Date: ~~11/15/02~~ 11/30/02 BG 11/20/02

27. Key Event: 5C0P

28. "Is a USQD (USQP Form WV-3306, Sections V, VI, and VII) required? *Yes __ No ✓

[signature] (USQD Originator or Safety Analyst Signature) — E. Lachapelle (Printed) — 10/31/02 (Date)

If Yes: attach the completed USQD (USQP Form WV-3306, Sections V, VI, and VII).

29A. HLW - Does W.O. provide instr. For Maint., Ops. Support etc. for Vit Sys 63I, 63J, L, K, 63P, 68, 69A, B or 200A, B — Yes __ No ✓
B. Is Maint/support/testing/R&D issue listed in WVDP-200 Part IV HLW activities list)? — Yes __ No __
C. Is the activity designated HLW? — Yes __ No __

30. Type of work:
- __ Fab
- __ Install
- __ Mod/Repair
- __ Insp
- __ Test
- __ Calib
- ✓ Other

31. Title: Obtain Radiation Readings in the Vitrification Melter

31a. Pre-Job Brief Required ✓ Yes ______ No

32. Resp. WVNS Work Group: PSO (Vit)

33. WGS (Print Name): George Trowbridge — WGS [signature] [Walkdown Sat]

34. Work Group Manager: J. Curcio

35. Review/Walkdown Approvals (Signature/Date)

CM	[signature]	MS- B1A	IH&S	[signature] 11/19/02	MS- AA15
Maint	N/A	MS-	QA	[signature] 11/20/02	MS- 7H-3
RE	[signature] 11/18/2002	MS- Z-26	Eng	N/A	MS-
FM	[signature] 11/20/02	MS- MF2	EA	EL 11/13/02	MS-
WMS	[signature] 11/13/02	MS- 31H	Orig	[signature]	MS- B1A
		MS-			MS-

36. Changed during review cycle — Reroute to: MS- __ MS- __ MS- __ MS- __ MS- __

37. Brief Information of Work Completion for History Record
[ ] Yes
[✓] No (Check One)
Lessons Learned __ Yes ✓ No

(Attach additional pages as necessary)

38. Documentation of Work Completion
[signature] Work Group Supervisor — Date 1/22/03
[signature] Originator — Date 1/27/03

39. Work Order Closed: WCC Signature ______ Date ______

1.0 INTRODUCTION:

1.1 General

1.1.1 Data from this work order will be used to determine the radionuclide inventory of the internals of the melter in the vitrification facility (not including the discharge cavities). The work order is not only in accordance with the "Technical Approach for Determination of Radioactivity (Curies) in the Vitrification Cell" which is available in the project files associated with the Facility Characterization Department, but also with WVDP-403, "Characterization Management Plan for the Facility Characterization Project."

1.2 Purpose:

1.2.1 The purpose of this work order is to deploy the melter detector holder and detector (hereafter called "the device") into the Vitrification Cell and to obtain one or more radiation readings inside the melter. See figure 1. The readings will be used to estimate the radionuclide inventory associated with the melter.

1.3 Scope:

1.3.1 This work involves:

[1] Transfer of the device into the Vitrification Cell via the EDR and transfer cart

[2] Using the in-cell crane for picking up and moving the device around the Vitrification Cell.

[3] Connecting the detector to an existing cable, which runs through a

penetration in the Vitrification Cell wall.

[4] Lowering the device into nozzles in the melter.

[5] Taking radiation readings.

2.0 PRECAUTIONS AND LIMITATIONS

2.1 It is required that a representative from Facility Characterization Projects be present while readings are taken.

2.2 Load in of the device will not require entry into the high contamination area of the EDR.

2.3 No movement of radioactive materials in to, out of or within the Vitrification Cell are to be conducted during performance of this work order.

3.0 PREREQUISITES

3.1 The transfer cart is to be used for transfer of the device into the cell and must be functional and in position for transporting the device into the Vitrification Cell from the EDR.

3.2 The following conditions must apply before the readings are able to be taken:

3.2.1 All flushing activities must be completed.

3.2.2 All HLW and evacuated canisters must be removed from the Vitrification Cell prior to taking the readings

3.2.3 The melter must be thermally cold.

(+) 3.3 QA perform a pre-load in inspection per attached SOP 68-02 checklist.

3.4 Cognizant Facility Characterization Representative confirm below by observation that the radiation probe has been functionally checked:

(+) Signature [signature] Date 11/18/02

3.5 Work Order 74480 has to have been completed prior to taking readings to allow access to the melter.

3.5 Materials/Special Tools

3.5.1 The device (manufactured by J-15 number 74414) and associated equipment shown in Figure 1 is needed for completion of this work order.

4.0 PERFORMANCE

4.1 ~~D&D Ops~~ [initials] 11/20/02: If not already performed, transfer the device and associated detector into the EDR per SOP 68-02. Entry into the EDR shall be per SOP 00-43.

4.2 ~~D&D Ops~~ [initials] 11/20/02: If not already performed, place the device in one of the equipment holsters located on the transfer cart canister rack using the EDR crane.

4.3 PSO: If not already performed, move the device into the Vitrification Cell per SOP 63-56.

4.4 PSO: Using the in-cell crane, pick up the device out of the equipment holster and move it over to the shield window near the sample station.

4.5 PSO: Move the transfer cart back to the EDR per SOP 63-56

4.6 PSO: Using the manipulators, connect up the device to the radiation probe using the cable which goes through the penetration for the left MSM in the Middle North Operating Aisle.

4.7 Rad Protection Ops: Connect the other end of the cable to an instrument for read out of radiation levels.

4.8 Rad Protection Ops: Record initial survey radiation detector information in Table 1.

4.9 PSO: Using a combination of the manipulators and the in-cell crane, move the device over to one of the open melter nozzles as directed by the Facility Characterization Representative.

4.10 PSO: Lower the device into the melter nozzle until the upper cross supports are resting on top of the riser with the detector centered in the riser.

4.11 Rad Protection Ops: Take the radiation reading. Document the radiation reading in Table 1.

4.12 Repeat steps 4.9 through 4.11 as directed by the Facility Characterization Representative.

4.13 PSO: Once completed with the radiation readings, return the device to one of the previously measured nozzles.

4.14 Rad Protection Ops: Record the "replication reading" in Table 1.

5.0 POST MAINTENANCE TESTING

5.1 None.

6.0 POST COMPLETION CONFIGURATION

6.1 PSO: Disconnect the radiation probe and store the device at the maintenance station or another retrievable location for possible future usage.

(+) 6.2 PSO ~~Vitrification Operations~~ Shift Supervisor verify by personal observation that the post completion configuration is satisfactory by signing below:

Signature [signature] Date 1/23/03

rad Probe is being stored off the front of the maint table with Cable's around it.

Table 1

Initial Survey Radiation Detector Information

Instrument Model 2241

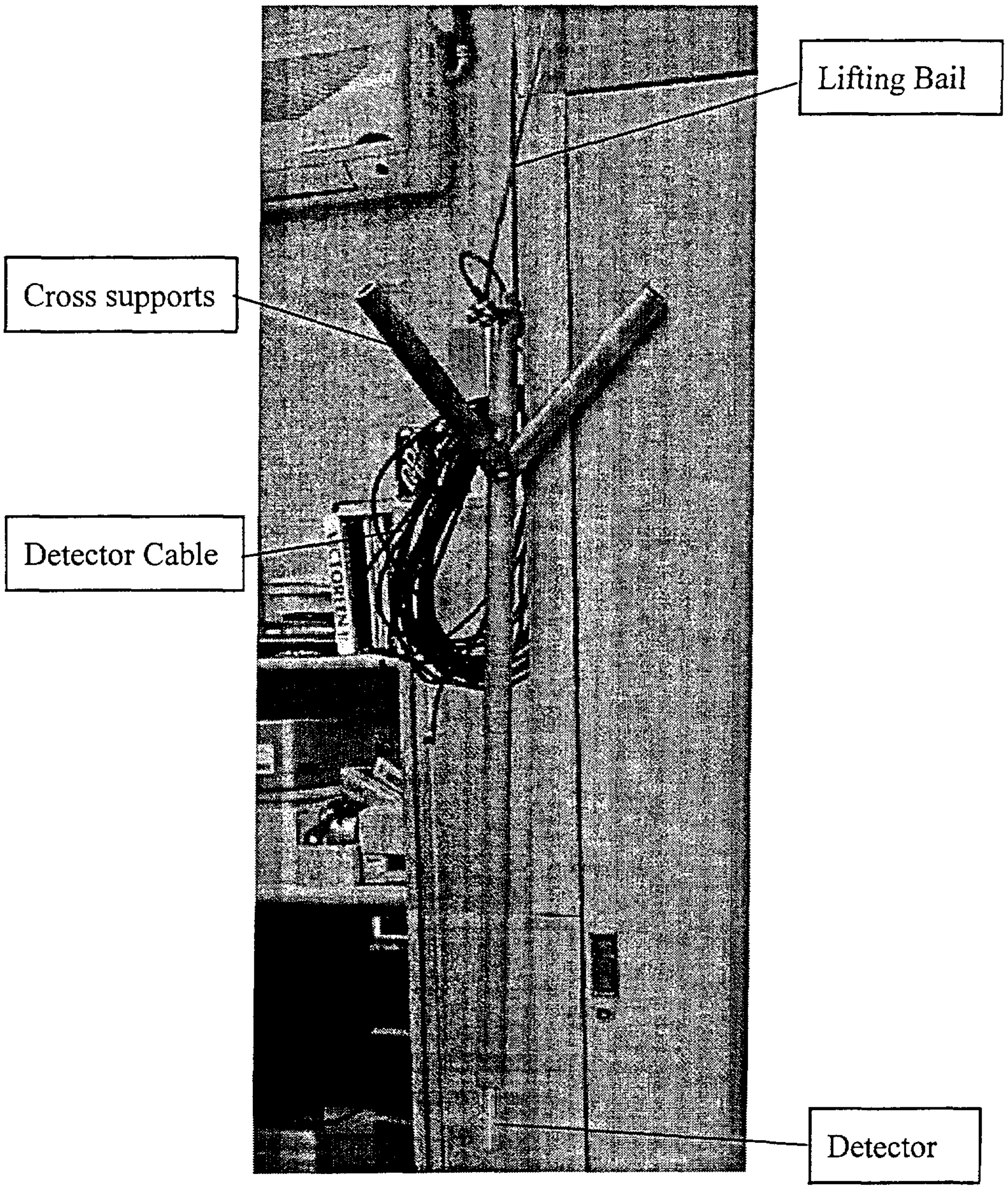
Instrument Serial Number 151610

Survey Date/Time 01·22·03 1100

Name of Surveyor Holly Baker Signature of Surveyor Holly Baker

Nozzle Designation	Radiation Reading
Nozzle "A"	748 R/hr
Nozzle "E"	660 R/hr
Nozzle "G2"	330 R/hr
Nozzle "D"	>1000 R/hr
Nozzle "BB"	700 R/hr
Nozzle designation of replication reading	**Radiation Reading**
Nozzle "A"	749 R/hr

Figure 1



Appendix B-1
SPECIFIC INSTRUCTIONS FOR ENTRY FORM
EQUIPMENT DECONTAMINATION ROOM (EDR)
(Page 1 of 3)

1. The following must be <u>VERIFIED</u> prior to removing the personnel access control device from the EDR personnel access door to allow entry to EDR:

   a. The radiation monitor in the EDR is not in alarm.

   ____
   Work Group Supervisor / Date

   b. Both EDR rad. probe readings are ≤100% above normal. If either of the two EDR rad. probe readings are > 100% above normal or out of service, obtain RCO Supervisor's approval for entry. (Normal readings will be established by RCO Supervisor). RCO Tech. "NA" RCO Supervisor signature if both probes are reading ≤ 100% above normal.

   ____
   RCO Tech / Date

   ____
   RCO Supervisor / Date

   c. There are no canisters containing glass or category 1,2 or 3 vit expended materials on the transfer cart either in the EDR or in the tunnel leading from the Vitrification Process Cell to EDR.

NOTE: *The transfer cart, empty, or with empty canisters, may be in the EDR on its charge plates.*

   ____
   Work Group Supervisor / Date

   d. The North Tunnel Shield Door, 63-M-001, is **CLOSED** and disconnect switch DS-63-M-001/1, located on the east outside wall of the Vitrification Process building, is **OFF** and a blue lock is installed to prevent DS-63-M-001/1 from being turned on.

   ____
   Work Group Supervisor / Date

   e. The CPC-EDR shielding door, 3M-3, is **CLOSED**, and the disconnect switch DS-DR-3M3, located in the EDR Viewing Aisle, is **OFF** and is locked in the **OFF** position using a blue lock.

   ____
   Work Group Supervisor / Date

N/A
BJ 1/2/03

75653

Appendix B-1
SPECIFIC INSTRUCTIONS FOR ENTRY FORM
EQUIPMENT DECONTAMINATION ROOM (EDR)
(Page 2 of 3)

f. If the entry requires work in the area near the CPC-EDR shield door posted "High Radiation Area", verify the CPC-EDR door shield has been placed on the cart tracks ready to be moved into position.

____
Work Group Supervisor / Date

g. Personnel entering the EDR must install Personal Protection Locks and Tags per SOP-00-04, section 5.3, on 63-M-001 per step 1d and 3M-3 per step 1e.

____
Work Group Supervisor / Date

2. The Work Group Supervisor attests to the fact all of the above verifications have been completed. The access control device may now be removed from the EDR Access Door.

____
Work Group Supervisor / Date

3. If the EDR entry will require entry into the area of the CPC-EDR shield door posted "High Radiation Area," push the CPC-EDR door shield into place as close as possible to the CPC-EDR shielding door. If not, mark N/A in this step sign off.

____
Work Group Supervisor / Date

4. Prior to leaving the last person exiting the EDR, move the CPC-EDR door shield north to where the EDR crane can engage the shield. If the door shield was not installed in step 3, mark N/A for this step.

____
Work Group Supervisor / Date

5. When the last person exits the EDR, the blue lock is reinstalled on the EDR access door. Work group supervisor verifies all personnel have exited the area and that the blue lock is reinstalled.

____
Work Group Supervisor / Date

N/A BB 1/22/03

73653

Appendix B-1
SPECIFIC INSTRUCTIONS FOR ENTRY FORM
EQUIPMENT DECONTAMINATION ROOM (EDR)
(Page 3 of 3)

6. All personal protection locks are removed from items locked out in steps 1d and 1e as soon as possible after completing the EDR entry. Work group supervisor to verify.

____
Work Group Supervisor / Date

7. Blue locks are removed from items locked out in steps 1d and 1e after personal locks are removed. Work group supervisor to verify.

____
Work Group Supervisor / Date

8. Attach this Specific Instructions Form to the Entry Work Package.

BJ
1/21/03

HAZARDS SCREEN CHECKLIST

Project/Document ID:	**Rev.**	**FC#**
Hazards Analyst: E. Lachapelle	**Date:** 10/29/02	

If the answer to any of the following questions in "Yes," consult the Hazard Control Specialty Area indicated in the right-hand column for assignment of a Hazards Controls Specialist. Screening of a field change needs to address only the impact of the field change on the original Hazards Screen Checklist.

Hazard Control Speciality Areas Acronyms

CSE - Criticality Safety Engineer
EA - Environmental Affairs
EM - Emergency Management
FM - Facility Manager
FP - Fire Protection
IH&S - Industrial Hygiene & Safety
MPOSS - Main Plant Operations Shift Supervisor
RP - Radiation Protection
USQD Orig - USQD Originator
WMS - Waste Management Services

YOU SHALL CONSIDER BOTH NORMAL OPERATIONS AND PROCESS UPSET CONDITIONS.
Sheet 1 of 4

#	Yes	No	Potentially Hazardous Situations	Cog. Function
Radiological and Utilities				
1a	✓		Will the work be performed in a radiologically posted area, i.e., radiological buffer area, radiation area, high radiation area, contamination area, etc.?	RP
1b		✓	Will the work involve high-activity sealed radioactive sources?	RP
1c		✓	Will the work involve any type of excavation or ground intrusion (e.g., driving posts, installing Hilti bolts)? (See WV-370; use Form WV-3521.)	RP, IH&S
1d		✓	Will the work involve any type of construction, remodeling, or demolition?	RP, IH&S
1e		✓	Will the work be conducted on equipment containing radiation detectors?	RP
1f	✓		Will the work involve systems or vessels containing Highlyl Radioactive Waste?	RP
Chemical			Note: Obtain and review Material Safety Data Sheets for all chemicals involved.	
2a		✓	Will toxic, carcinogenic, flammable, or reactive chemicals be involved (either used, e.g., lead paint, PCBs, or generated, e.g., wastes)?	IH&S, EM, EA
2b		✓	Will corrosive or oxidizing chemicals other than water be used or generated?	IH&S
2c		✓	Will compressed or uncompressed gases in cylinders or bottles or cryogenics be involved, e.g., halon in cylinders?	IH&S
2d		✓	Will the work involve piped-in chemicals, chemical sensors, or equipment or piping containing chemicals?	IH&S
2e		✓	Will the work involve Trade/Brand name chemicals that do not list all the ingredients on the MSDS?	IH&S, EM, EA
2f		✓	Will the work involve the purchase of new or increase an existing inventory level of chemicals?	IH&S, EA, EM, WMS

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YOU SHALL CONSIDER BOTH NORMAL OPERATIONS AND PROCESS UPSET CONDITIONS.
Sheet 2 of 4

#	Yes	No	Potentially Hazardous Situations	Cog. Function
Fire and Explosion				
3a		✓	A. Will an open flame be used or produced?	IH&S, FP
3b		✓	B. Will a heat source greater than 100°C be used, produced, or located in close proximity to the work?	IH&S, FP
3c		✓	C. Will the work involve or require disabling a fire alarm or protection system?	IH&S, FP, MPOSS
Safety Basis			Note: This question is intended to trigger the early involvement of a USQD Originator and does <u>not</u> replace the USQP required by WV-914.	
4a	~~✓~~ Ed 10/8/02	✓	Will the work involve any changes to facilities or procedures as described in a safety analysis or involve tests or experiments?	USQD Orig
Emergency Preparedness				
5a		✓	Will the work disable the 812-all-page system, the 222-plant-page system, or the sheltering alarm? (See SOP 00-04; use Form WV-2164.)	EM, MPOSS
5b		✓	Will the work disable the meteorological tower or instrumentation?	EA, EM, MPOSS
5c		✓	Will the work block or render inaccessible any emergency access or emergency relocation routes or assembly areas?	EM, MPOSS
5d		✓	Will the work affect the ability to respond to an emergency at an adjacent facility?	EM, MPOSS
5e		✓	Will the work involve maintenance on or temporary or permanent relocation or disablement of emergency response equipment?	EM, MPOSS
5f		✓	Will the work require the development of new or a change to existing emergency management postings, signs, or instructions (e.g., relocation route postings, assembly area maps, or ventilation or sheltering instructions)?	EM
5g		✓	Will the work directly or indirectly affect the operability of the Emergency Operations Center's (EOC's) or the Technical Support Center's (TSC's) facility or equipment?	EM, MPOSS
Environmental, Waste Minimization, Pollution Prevention, and Regulatory				
6a		✓	Will the work potentially result in any airborne releases (e.g., smoke, fumes, gases, exhaust, asbestos, dust, mercury, radioactive material)?	EA
6b		✓	Will the work potentially result in any liquid releases (e.g., water, petroleum products, mercury, chemicals) into the environment?	EA
6c		✓	Will the work produce any waste products (e.g., *industrial waste, hazardous waste, mixed waste,* radioactive waste) or involve the on-site or off-site transportation of any waste products?	WMS, EA
6d		✓	Will the work result in changes to the site storm water drainage system (e.g., changes to drainage pathways/patterns) or result in removal of established vegetative ground cover or exposure of soil to rain/snowfall?	EA
6e		✓	Will the work result in the siting of new structures, the relocation, demolition, or removal of existing structures, or modifications to existing structures (e.g., removing a tank or adding floor space to a building)?	EA
6f		✓	Will the work disable or be performed in close proximity to any environmental monitoring equipment (i.e., air monitors, groundwater wells, etc.)?	EA

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YOU SHALL CONSIDER BOTH NORMAL OPERATIONS AND PROCESS UPSET CONDITIONS.
Sheet 3 of 4

#	Yes	No	Potentially Hazardous Situations	Cog. Function
6g		✓	Will the work require the disturbance of migratory bird nests or involve animal control?	EA
6h		✓	Will the work involve PCB items in use (e.g., transformers, capacitors, voltage regulators), PCB wastes, or the removal or abandonment of pipes that distribute natural gas?	EA
6i		✓	Will the work potentially affect wetlands, the flow of creeks or streams, or lake discharges?	EA
Equipment Status			• Facility Manager shall decide whether the Radiation and Safety Committee must review the proposed activity pursuant to WV-906.	
7a		✓	Will the work involve removing Process Safety Requirement (PSR) controlled equipment from service? (See WVDP-218.)	FM *
7b		✓	Will the work be performed on equipment identified in any Process Safety Requirement? (See WVDP-218.)	FM *
7c		✓	Will the work be performed on or disable Safety Class A, B, or C equipment? (See WVDP-204.)	FM *
7d		✓	Will the work be performed on ventilation systems or air effluent monitoring systems?	FM *
7e		✓	Will the work impair the operability of or have the potential to inadvertently actuate any alarm (e.g., fire detection, fire suppression, carbon monoxide, NOx, ammonia) system?	FM *, IH&S, MPOSS
7f		✓	Will the work be performed on any standby or backup power supply? (See SOP 00-04, Appendix E.)	FM *
7g		✓	Will the work impair any breathing air supply or fresh air intake?	FM *
Industrial Hygiene and Safety, Emergency Management and Construction Safety				
8a		✓	Will the work be performed on open-sided platforms or roofs more than 4 feet above ground level or more than 6 feet up on a ladder?	IH&S
8b		✓	Will the work require designing and/or building a permanent fall-protection system for other than field or construction use?	IH&S
8c		✓	Will the work require burning, welding, or grinding or involve forms of high energy (e.g., electrical, steam, high-pressure air, or water)?	IH&S
8d		✓	Will the work require entry into a confined space?	IH&S
8e		✓	Will the work produce a breathing hazard (dust, fumes, solvent vapors, etc.) requiring use of respiratory protection for non-radiological purposes?	IH&S
8f		✓	Will the work require handling asbestos or insulation-containing materials?	IH&S
8g		✓	Will the work be conducted on or near live electrical components with more than 50 volts alternating current (VAC)?	IH&S
8h		✓	Could the work or job location result in "heat" or "cold" injuries such as heat exhaustion, frost bite, or hypothermia?	IH&S
8i		✓	Will the work produce noise greater than 85 dBA at the job site or at other locations?	IH&S
8j		✓	Will the work produce paint or chemical fumes at the job site or at other locations?	IH&S
8k		✓	Will the activity involve manual lifting of materials, power tools, vibrating equipment, or repetitive motions that could cause musculoskeletal injury?	IH&S
8l	✓	~~✓~~	Will the work involve hoisting and/or rigging activities?	IH&S

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YOU SHALL CONSIDER BOTH NORMAL OPERATIONS AND PROCESS UPSET CONDITIONS.
Sheet 4 of 4

#	Yes	No	Potentially Hazardous Situations	Cog. Function
8m		✓	Will the work result in the temporary or permanent routing of utilities (e.g., electricity, air, gas, steam, water, gasoline, fuel oil) that may become damaged as a result of exposure to personnel or vehicular traffic?	IH&S
8n		✓	Will the work result in the temporary or permanent routing of utilities (e.g., electricity, air, gas, steam, water, gasoline, fuel oil) that may unintentionally become covered in some manner by material (e.g., snow, water, sand, dirt, gravel, mud, boxes, containers)?	IH&S
8o		✓	Will the work breach a system known or suspected to contain hazardous materials (e.g., mercury) or energy sources (e.g., steam, electricity)?	IH&S
8p		✓	Will the work be performed in an area where previous spills of hazardous materials (e.g., mercury) are known or suspected to have occurred?	IH&S
8q	✓	~~✓~~	Will the work involve conditions where the unexpected energization or startup of machines or equipment or the release of stored energy could cause injury or death to personnel? (See SOP 00-04.)	FM
Nuclear Criticality				
9a		✓	Will the work involve or potentially involve greater than 1 gram of fissionable material (e.g., U-233, U-235, Pu-239, Pu-241)?	CSE
9b		✓	Will the work involve spent fuel handling outside an approved shipping container?	CSE
9c		✓	Will the work involve storage of fissile material in a container other than described in PSR-6 or PSR-18?	CSE
9d		✓	Will the work impact any fissionable material contained in the GPC, PMC, XC-1, XC-2, or PPC?	CSE

Appendix C

Certificate of Calibration for the Melter Probe

CERTIFICATE OF CALIBRATION

Manufacturer: Ludlum   Instrument Model: 2241   Serial No.: 151610   Date of Calibration: 11-8-02

Instrument Received: ✓ Within +/-10%   ____ Out of Tolerance   ____ Requiring Repair

Electronic Calibration: Mini Pulser Serial No.: 153617

Cal Point	Scaler: As Found	Scaler: As Left	Rate meter: As Found	Rate meter: As Left
400 cpm	399 cpm	399 cpm	400 cpm	400 cpm
800 cpm	799 cpm	799 cpm	800 cpm	800 cpm
4000 cpm	3997 cpm	3997 cpm	3.99k cpm	3.99k cpm
8000 cpm	7990 cpm	7990 cpm	8.00k cpm	8.00k cpm
40000 cpm	39969 cpm	39969 cpm	39.9k cpm	39.9k cpm
80000 cpm	79889 cpm	79889 cpm	79.9k cpm	79.9k cpm
400000 cpm	399467 cpm	399467 cpm	399k cpm	399k cpm
800000 cpm	798848 cpm	798848 cpm	798k cpm	798k cpm

RP CALIBRATION
S/N 2O2-SURRT-151610
BY GR DATE 5 / 31 / 02
DATE DUE 11 / 30 / 02

Detector Setup:

	Model	Serial #	HV	Dead Time Corr. Factor	Calibration Constant
Detector	133-8	PR155645	460	36E-6	390E2

Source Response:

Source type Cs137   Source Serial Number 122

Detector Model	Serial Number	Source # / Height	Source Cal Point	Instrument Reading
133-8 OW 70'ccro	PR155645	#3 @ 4.5"	870 mR/hr	850 mR/hr
		#7 @ 4.5"	3.65 R/hr	3.5 R/hr
		#4 @ 4.5"	23 R/hr	24.9 R/hr
		#8 @ 4.5"	160 R/hr	170 R/hr
		#8 @ 1.5"	280 R/hr	286 R/hr

REMAINING PORTION TO BE COMPLETED AT CALIBRATION / MAINTENANCE

Comments: ____

Maintenance: PM CHECKS - OK

Batteries Inspected ✓ Changed/Charged — Contacts Cleaned —

Next Calibration Due Date: 5-31-03

Calibration Tech Signature* [signature]   Date: 11-8-02

Reviewed By: [signature]   Date: 12/3/02

* FOR CALIBRATION CYCLES, CERTIFIES THAT CALIBRATION WAS COMPLETED SATISFACTORILY

APPROVAL OF CERTIFICATE FOR USE:

Approved: [signature] 10/24/02
R P Labs Team Lead   Date

Approved: [signature] 10/24/02
R P Operations Manager   Date

Appendix D

Work Request 76851, "Deployment of Unshielded Radiation Probe into the Vitrification Facility Through Transfer Drawer"

J15 - Work Request
Pg. 1 of 8 7

Work Control Number: VFS - 76851 - I/WR Off Shift Issuance: ________ ________
Signature Date/Time

Title: Deployment of Bore Radiation Probe into the Vitrification Facility through Transfer Drawer

Action Steps: See attached

ISSUED
DEC 20 2002
B
WORK CONTROL CENTER

(Attach additional pages as necessary and paginate)

Originator: E. Lachapelle / OB-1 / 2117 (Print Name/MS/Ext) E. Lachapelle 12/19/02 (Signature/Date)

Manager L. Rowell / OB-1 (Print Name/Mail Stop)

5. Equipment Instrument Valve NA: ✓

(Component Number / Noun Name)

System Number: 63A	7. Location Acronym: VF	8. ECN: TM: NA: ✓ Number:	9. RWG/Signature/Date: 1250 12-20-02

Materials/Special Tools and Equipment: NA: ✓

11. ALARA Trigger Level(s) exceeded (WV-984, 7.8.3) Yes____ No ✓

Quality Level: C	13. QA Signature (Level C or above) 12/20/02	14. Charge Number(s): WH 5310004 WH

GDP No.: NA: ✓	16. Est. Hours: 24	17. Key Event Number: 560	18. Profile No. N/A	19. Required Finish Date: 12/30/02

Deleted

Facility Manager Approval: ☐ Checking this box indicates only the FM is authorized to approve WR changes.
K E SANDERS (Print Name) (Signature) 12/20/02 (Date)

NOTE: Block 22 and 23 to be completed by the WGS. 22: IWP Number: NA: ✓ 23: RWP Number: NA: ___

Brief Description of Work Completion for History Record: Same as Block 3: ___ Lessons Learned ___ Yes ___ No

Completed By: ________ 26. Hours: ____

Documentation of Work Completion:

(Work Group Supervisor - Print Name) (Signature/Date)

(Originator - Print Name) (Signature/Date)

Work Request Closed: WCC Signature ________ Date ________

1.0 If not already performed, using the transfer drawer, transfer the bare radiation probe (and lifting bail) into the Vitrification Cell. This probe will be supplied by the cognizant Facility Characterization Project engineer.

2.0 Place the probe on to the clevis on the crane

NOTE *It is required that a representative from Facility Characterization Projects be present while readings are taken.*

NOTE *Prior to taking readings, the vertical measuring device should be installed and operational. Operation of the device will not preclude completion of this procedure.*

NOTE *Any available penetrations with applicable cables and connectors (for the radiation probe) can be used interchangeably while performing this procedure.*

3.0 Using the manipulators, connect up the device to the radiation probe using the cable which goes through the penetration for the right MSM in the Middle North Operating Aisle or the cable which goes through a penetration in the Middle East Operating Aisle.

(+) 3.1 Radiation Protection Operations record initial survey radiation detector information in Table 1.

NOTE *The radiation reading locations specified in Figure 1 are for informational purposes only and are not to be considered exact.*

(+) 4.0 If not already performed, using a combination of the manipulators, the in-cell cranes move the device to a surface of known elevation and place the probe in contact with that surface (e.g., the maintenance station). If the elevation device is operational and if the visual display can be seen, take the initial reading and location of the initial elevation

reading on Table 1.

5.0 If not already performed, using a combination of the manipulators, the in-cell cranes move the device to various locations in-cell. These locations are specified in Appendix A, with each reading set also shown in Figure 1.

(+) 6.0 Radiation Protection Operations take the radiation readings. Document the radiation readings in Table 1.

(+) 7.0 If the elevation device is operational and if the visual display can be seen, record the elevation reading associated with each radiation reading in Table 1.

(+) 8.0 If there is any additional information needed with each reading, the Facility Characterization Projects representative will record it under the "Additional Description" column in Table 1.

NOTE *Additional readings may be taken at the request of the Facility Characterization Representative.*

NOTE Not all readings specified in Appendix B and Figure 1 may be required.

1/28/03 EL 1/27/03 1/28/03

9.0 Repeat steps 4.0 through 8.0 until either all readings have been completed as outlined in Appendix B. Make additional blank copies of Table 1 as needed to facilitate completion of surveys.

10.0 If possible, store the device at a retrievable location for possible future use.

Table 1

Initial Survey Radiation Detector Information

Instrument Model 2350-1 Instrument Serial Number 149792 Survey Date/Time 1/9/03 / 1500

Name of Surveyor Tom Benz Signature of Surveyor Tom Benz

Initial location of elevation reading N/A Initial elevation reading N/A

Component	Radiation reading	Elevation reading	Additional description
HEME 63-T-036	63 R/hr	N/A	Contact with crane block, just below in-pipe penetration at weld
HEME 63-T-033	18 R/hr	N/A	Contact with crane block, just below in-pipe penetration @ weld
West Discharge cavity	40 R/hr	N/A	Contact with south lip of cavity centered (No refractory in way)
East Discharge cavity	6 R/hr	N/A	Contact with south lip of cavity centered (No refractory in way)
Melter nozzel "E"	23 R/hr	N/A	Center of nozzle, even with top
Melter nozzle "A"	15 R/hr	N/A	Center of nozzle, even with top
Melter nozzle "D"	42 R/hr	N/A	Center of nozzle, even with top

Table 1

Initial Survey Radiation Detector Information

Instrument Model LUDLUM 2350-1 (133-8) Instrument Serial Number 149792 Survey Date/Time 12-27-02 11:10

Name of Surveyor JAMES PHILLIPS Signature of Surveyor James B Phillips

Initial location of elevation reading N/A Initial elevation reading N/A

Component	Radiation reading	Elevation reading	Additional description
South Decon Station tank	9.5 R/HR	N/A	Crane block distance away, approx center
North Decon Station tank	13.0 R/HR	N/A	Crane block distance away, approx centered
Spent Components	27.0 R/HR	N/A	Approx centered over pile, height of weld station
West Discharge lid	40.0 R/HR	N/A	Centered on contact
East Discharge lid	13.0 R/HR	N/A	Centered on contact
Off gas jumper	20.0 R/HR	N/A	Center contact on upper part
SBS (side)	38.0 R/HR	N/A	Block distance away, contact next to ridges
MFMT (side)	35.0 R/HR	N/A	Contact on seam
CIMT (side)	32.0 R/HR	N/A	Block at the seam, block contact
Pit	48.0 R/HR	N/A	Approx 12" from floor, between the tanks

Table 1

Initial Survey Radiation Detector Information

Instrument Model LUDLUM 2350-1 (133?) Instrument Serial Number 149792 Survey Date/Time 12-26-02 14:30

Name of Surveyor JAMES PHILLIPS Signature of Surveyor [signature]

Initial location of elevation reading N/A Initial elevation reading N/A

Component	Radiation reading	Elevation reading	Additional description
MFHT (TOP)	21.0 R/HR	N/A	Top of MFHT Flange, east side *
CFMT (TOP)	12.0 R/HR	N/A	Top of CFMT Flange, South side *
SBS (TOP)	18 R/HR	N/A	Top of SBS Flange, South side *
Meltriser BB	24 R/HR	N/A	Center of riser
HEME Prefilter E-032	26 R/HR	N/A	Center contact on East side
Condenser E-015	40 R/HR	N/A	Contact with flange on top, east side,
Condenser E-015	70 R/HR	N/A	Next to seam in center. Note: the prox is ½ distance to the
~~EL 12/26/02~~	~~EL 12/26/02~~	~~EL 12/26/02~~	radius of the Crane block
HEME T-0~~36~~ 33 EL 12/26/02	35 R/HR	N/A	Contact with flange on top, east side
HEME T-036	42 R/HR	N/A	Contact with flange on top, east side
HEME T-036	~~8~~ 105 R/HR	N/A	Close to where input piping is. ½ measurement of block (small)
Prefilter heater E-037	50 R/HR	N/A	Contact, centered on north face side
Prefilter T-038	70 R/HR	N/A	Contact, centered on the east face
Prefilter ~~T-035~~ Heater E-034 EL 12/26/02	90 ~~R~~ R/HR EL 12/26/02	N/A	Contact with flange near center on ~~north~~ east EL 12/26/02 face,
Prefilter T-035	40 ~~R~~ R/HR EL 12/26/02	N/A	Contact near center on east face
Post heater E-039	18.5 R/HR	N/A	Contact with top, near to lifting bail
HEPA Filter T001 C	28.0 R/HR	N/A	Contact center on north face (contact ~~with bail~~ crane block) EL 12/26/02
HEPA Filter T001 B	33.0 R/HR	N/A	Contact center on north face (contact ~~with bail~~ crane block) EL 12/26/02
HEPA Filter T001 A	27.0 R/HR	N/A	Contact center on north face (contact ~~with bail~~ crane block) EL 12/26/02

* MFHT level is 0", CFMT level is 21", SBS level is 20"

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Appendix A

Reading Set	Component	Number of Readings	Description
A	Prefilter T-035	1	Side measurement, contact if possible, centered on the component.
B	Prefilter T-038	1	Side measurement, contact if possible, centered on the component.
C	HEME prefilter E-032	1	Side measurement, contact if possible, centered on the component.
D	HEPA filter T001A	1	Back contact measurement, (north side) centered on the filter.
E	HEPA filter T001B	1	Back contact measurement, (north side) centered on the filter.
F	HEPA filter T001C	1	Back contact measurement, (north side) centered on the filter.
G	Canister Decon. Station	about 20	Measurements at vertical intervals of approximately 12 inches and repeat the measurements on contact (if possible) along the outside of each tank of each component.
H	Post heater E-039	1	Top measurement, contact if possible, centered on the component
I	Prefilter heater E-034	1	Top measurement, contact if possible, centered on the component
J	Prefilter heater E-037	1	Top measurement, contact if possible, centered on the component
K	Melter Discharge Cavities	2	Remove discharge lid. One reading centered over each discharge cavity. Put detector as close to the top as possible without contacting internals.
L	Pit (under the SBS, CFMT and MFHT)	3	Take each reading directly over each tank. Contact probe on one of the flanges on top of the tank.
M	Miscellaneous spent components	TBD	Areal survey over the components. Locations to be determined by the Facility Characterization Representative. **Location not shown on Figure 1.**
N	Off Gas jumper	1	Center the device on contact with the jumper.
O	Feed jumper	1	Center the device on contact with the jumper. **Location not shown on Figure 1.**
P	SBS	about 10	Measurements at vertical intervals of approximately 12 inches and repeat the measurements along the outside of SBS for the entire height of the SBS.
Q	CFMT	about 10	Measurements at vertical intervals of approximately 12 inches and repeat the measurements along the outside (contact if possible) of CFMT for the entire height of the CFMT.

Reading Set	Component	Number of Readings	Description
R	MFHT	about 10	Measurements at vertical intervals of approximately 12 inches and repeat the measurements along the outside (contact if possible) of MFHT for the entire height of the MFHT.
S	HEME T-033	about 10	Measurements at vertical intervals of approximately 12 inches and repeat the measurements along the outside (contact if possible) of HEME for the entire height of the HEME.
T	Condenser E-015	about 10	Measurements at vertical intervals of approximately 12 inches and repeat the measurements along the outside of component (contact if possible).
U	HEME T-036	about 10	Measurements at vertical intervals of approximately 12 inches and repeat the measurements along the outside (contact if possible) of HEME for the entire height of the HEME.
V and W	Pit	about 10	Lower the probe into the pit so the probe is close to (contact if possible) the pit floor, Locate the probe in the approximate locations shown in Figure 1.
X	Melter internals	about 2	Lower the device into the melter risers as low into the melter as possible Take measurements in the risers as determined by the Facility Characterization Representative. In addition, take other measurements on contact outside of the melter as determined by the Facility Characterization Representative. **Location not shown on Figure 1.**

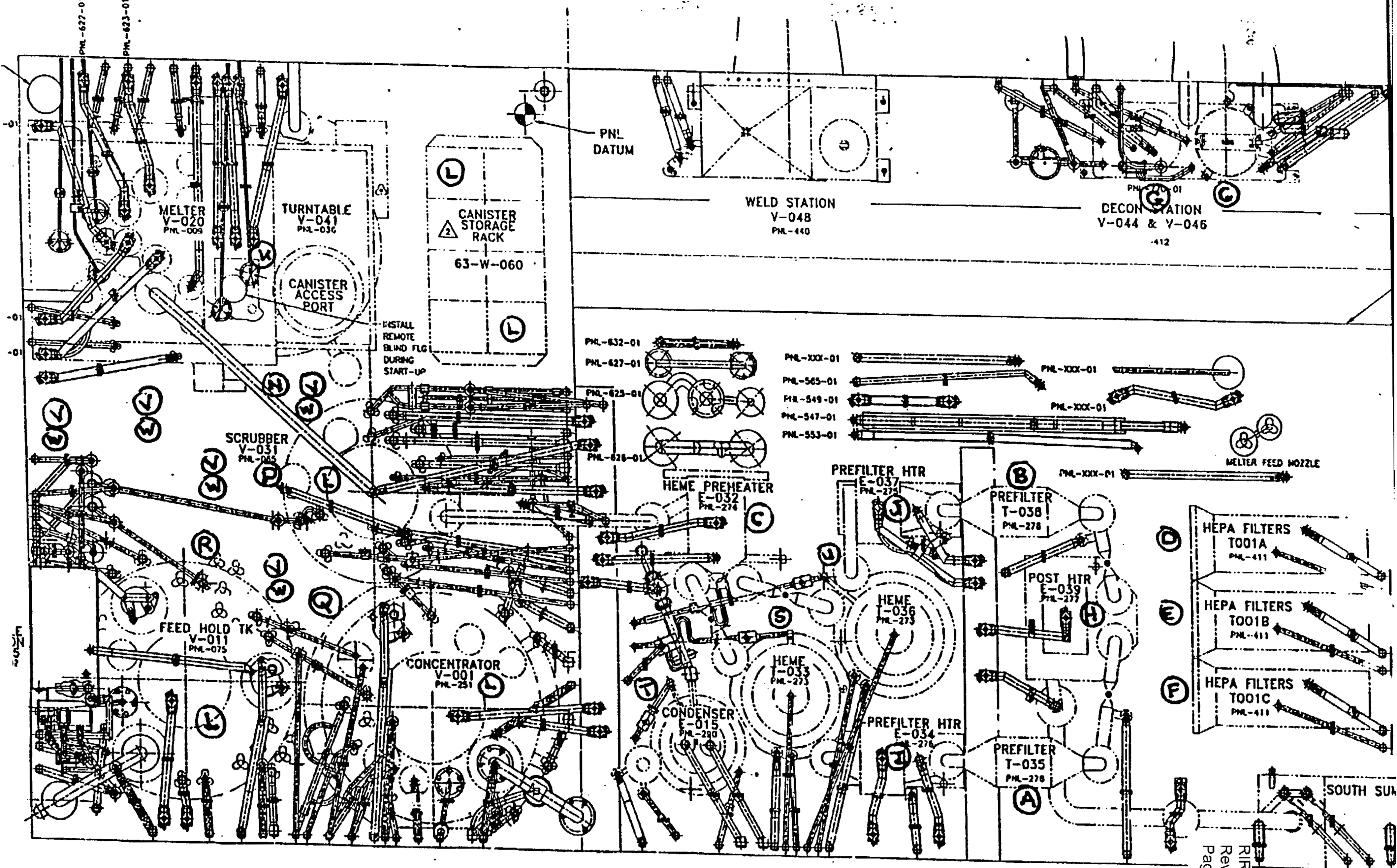

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FIGURE 1

WVNS VITRIFICATION FACILITY

HAZARDS SCREEN CHECKLIST

Project/Document ID: Deployment of Rad Probe into VF through Tran. Drawer **Rev.** **FC#**

Hazards Analyst: E. Lachapelle **Date:** 12/19/02

If the answer to any of the following questions in "Yes," consult the Hazard Control Specialty Area indicated in the right-hand column for assignment of a Hazards Controls Specialist. Screening of a field change needs to address only the impact of the field change on the original Hazards Screen Checklist.

Hazard Control Speciality Areas Acronyms

CSE - Criticality Safety Engineer	IH&S - Industrial Hygiene & Safety
EA - Environmental Affairs	MPOSS - Main Plant Operations Shift Supervisor
EM - Emergency Management	RP - Radiation Protection
FM - Facility Manager	USQD Orig - USQD Originator
FP - Fire Protection	WMS - Waste Management Services

YOU SHALL CONSIDER BOTH NORMAL OPERATIONS AND PROCESS UPSET CONDITIONS.
Sheet 1 of 4

#	Yes	No	Potentially Hazardous Situations	Cog. Function
Radiological and Utilities				
1a	√		Will the work be performed in a radiologically posted area, i.e., radiological buffer area, radiation area, high radiation area, contamination area, etc.?	RP
1b		√	Will the work involve high-activity sealed radioactive sources?	RP
1c		√	Will the work involve any type of excavation or ground intrusion (e.g., driving posts, installing Hilti bolts)? (See WV-370; use Form WV-3521.)	RP, IH&S
1d		√	Will the work involve any type of construction, remodeling, or demolition?	RP, IH&S
1e		√	Will the work be conducted on equipment containing radiation detectors?	RP
1f		√	Will the work involve systems or vessels containing Highlyl Radioactive Waste?	RP
Chemical			Note: Obtain and review Material Safety Data Sheets for all chemicals involved.	
2a		√	Will toxic, carcinogenic, flammable, or reactive chemicals be involved (either used, e.g., lead paint, PCBs, or generated, e.g., wastes)?	IH&S, EM, EA
2b		√	Will corrosive or oxidizing chemicals other than water be used or generated?	IH&S
2c		√	Will compressed or uncompressed gases in cylinders or bottles or cryogenics be involved, e.g., halon in cylinders?	IH&S
2d		√	Will the work involve piped-in chemicals, chemical sensors, or equipment or piping containing chemicals?	IH&S
2e		√	Will the work involve Trade/Brand name chemicals that do not list all the ingredients on the MSDS?	IH&S, EM, EA
2f		√	Will the work involve the purchase of new or increase an existing inventory level of chemicals?	IH&S, EA, EM, WMS

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YOU SHALL CONSIDER BOTH NORMAL OPERATIONS AND PROCESS UPSET CONDITIONS.
Sheet 2 of 4

#	Yes	No	Potentially Hazardous Situations	Cog. Function
Fire and Explosion				
3a		✓	A. Will an open flame be used or produced?	IH&S, FP
3b		✓	B. Will a heat source greater than 100°C be used, produced, or located in close proximity to the work?	IH&S, FP
3c		✓	C. Will the work involve or require disabling a fire alarm or protection system?	IH&S, FP, MPOSS
Safety Basis			Note: This question is intended to trigger the early involvement of a USQD Originator and does not replace the USQP required by WV-914.	
4a		✓	Will the work involve any changes to facilities or procedures as described in a safety analysis or involve tests or experiments?	USQD Orig
Emergency Preparedness				
5a		✓	Will the work disable the 812-all-page system, the 222-plant-page system, or the sheltering alarm? (See SOP 00-04; use Form WV-2164.)	EM, MPOSS
5b		✓	Will the work disable the meteorological tower or instrumentation?	EA, EM, MPOSS
5c		✓	Will the work block or render inaccessible any emergency access or emergency relocation routes or assembly areas?	EM, MPOSS
5d		✓	Will the work affect the ability to respond to an emergency at an adjacent facility?	EM, MPOSS
5e		✓	Will the work involve maintenance on or temporary or permanent relocation or disablement of emergency response equipment?	EM, MPOSS
5f		✓	Will the work require the development of new or a change to existing emergency management postings, signs, or instructions (e.g., relocation route postings, assembly area maps, or ventilation or sheltering instructions)?	EM
5g		✓	Will the work directly or indirectly affect the operability of the Emergency Operations Center's (EOC's) or the Technical Support Center's (TSC's) facility or equipment?	EM, MPOSS
Environmental, Waste Minimization, Pollution Prevention, and Regulatory				
6a		✓	Will the work potentially result in any airborne releases (e.g., smoke, fumes, gases, exhaust, asbestos, dust, mercury, radioactive material)?	EA
6b		✓	Will the work potentially result in any liquid releases (e.g., water, petroleum products, mercury, chemicals) into the environment?	EA
6c		✓	Will the work produce any waste products (e.g., industrial waste, hazardous waste, mixed waste, radioactive waste) or involve the on-site or off-site transportation of any waste products?	WMS, EA
6d		✓	Will the work result in changes to the site storm water drainage system (e.g., changes to drainage pathways/patterns) or result in removal of established vegetative ground cover or exposure of soil to rain/snowfall?	EA
6e		✓	Will the work result in the siting of new structures, the relocation, demolition, or removal of existing structures, or modifications to existing structures (e.g., removing a tank or adding floor space to a building)?	EA
6f		✓	Will the work disable or be performed in close proximity to any environmental monitoring equipment (i.e., air monitors, groundwater wells, etc.)?	EA

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YOU SHALL CONSIDER BOTH NORMAL OPERATIONS AND PROCESS UPSET CONDITIONS.
Sheet 3 of 4

#	Yes	No	Potentially Hazardous Situations	Cog. Function
6g		✓	Will the work require the disturbance of migratory bird nests or involve animal control?	EA
6h		✓	Will the work involve PCB items in use (e.g., transformers, capacitors, voltage regulators), PCB wastes, or the removal or abandonment of pipes that distribute natural gas?	EA
6i		✓	Will the work potentially affect wetlands, the flow of creeks or streams, or lake discharges?	EA
Equipment Status			* Facility Manager shall decide whether the Radiation and Safety Committee must review the proposed activity pursuant to WV-906.	
7a		✓	Will the work involve removing Process Safety Requirement (PSR) controlled equipment from service? (See WVDP-218.)	FM *
7b		✓	Will the work be performed on equipment identified in any Process Safety Requirement? (See WVDP-218.)	FM *
7c		✓	Will the work be performed on or disable Safety Class A, B, or C equipment? (See WVDP-204.)	FM *
7d		✓	Will the work be performed on ventilation systems or air effluent monitoring systems?	FM *
7e		✓	Will the work impair the operability of or have the potential to inadvertently actuate any alarm (e.g., fire detection, fire suppression, carbon monoxide, NOx, ammonia) system?	FM *, IH&S, MPOSS
7f		✓	Will the work be performed on any standby or backup power supply? (See SOP 00-04, Appendix E.)	FM *
7g		✓	Will the work impair any breathing air supply or fresh air intake?	FM *
Industrial Hygiene and Safety, Emergency Management and Construction Safety				
8a		✓	Will the work be performed on open-sided platforms or roofs more than 4 feet above ground level or more than 6 feet up on a ladder?	IH&S
8b		✓	Will the work require designing and/or building a permanent fall-protection system for other than field or construction use?	IH&S
8c		✓	Will the work require burning, welding, or grinding or involve forms of high energy (e.g., electrical, steam, high-pressure air, or water)?	IH&S
8d		✓	Will the work require entry into a confined space?	IH&S
8e		✓	Will the work produce a breathing hazard (dust, fumes, solvent vapors, etc.) requiring use of respiratory protection for non-radiological purposes?	IH&S
8f		✓	Will the work require handling asbestos or insulation-containing materials?	IH&S
8g		✓	Will the work be conducted on or near live electrical components with more than 50 volts alternating current (VAC)?	IH&S
8h		✓	Could the work or job location result in "heat" or "cold" injuries such as heat exhaustion, frost bite, or hypothermia?	IH&S
8i		✓	Will the work produce noise greater than 85 dBA at the job site or at other locations?	IH&S
8j		✓	Will the work produce paint or chemical fumes at the job site or at other locations?	IH&S
8k		✓	Will the activity involve manual lifting of materials, power tools, vibrating equipment, or repetitive motions that could cause musculoskeletal injury?	IH&S
8l		✓	Will the work involve hoisting and/or rigging activities?	IH&S

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YOU SHALL CONSIDER BOTH NORMAL OPERATIONS AND PROCESS UPSET CONDITIONS.
Sheet 4 of 4

#	Yes	No	Potentially Hazardous Situations	Cog. Function
8m		✓	Will the work result in the temporary or permanent routing of utilities (e.g., electricity, air, gas, steam, water, gasoline, fuel oil) that may become damaged as a result of exposure to personnel or vehicular traffic?	IH&S
8n		✓	Will the work result in the temporary or permanent routing of utilities (e.g., electricity, air, gas, steam, water, gasoline, fuel oil) that may unintentionally become covered in some manner by material (e.g., snow, water, sand, dirt, gravel, mud, boxes, containers)?	IH&S
8o		✓	Will the work breach a system known or suspected to contain hazardous materials (e.g., mercury) or energy sources (e.g., steam, electricity)?	IH&S
8p		✓	Will the work be performed in an area where previous spills of hazardous materials (e.g., mercury) are known or suspected to have occurred?	IH&S
8q		✓	Will the work involve conditions where the unexpected energization or startup of machines or equipment or the release of stored energy could cause injury or death to personnel? (See SOP 00-04.)	FM
Nuclear Criticality				
9a		✓	Will the work involve or potentially involve greater than 1 gram of fissionable material (e.g., U-233, U-235, Pu-239, Pu-241)?	CSE
9b		✓	Will the work involve spent fuel handling outside an approved shipping container?	CSE
9c		✓	Will the work involve storage of fissile material in a container other than described in PSR-6 or PSR-18?	CSE
9d		✓	Will the work impact any fissionable material contained in the GPC, PMC, XC-1, XC-2, or PPC?	CSE

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Appendix E

Work Order 75667, "Obtain Radiation Readings in the Vitrification Cell"

J3-WORK AUTHORIZATION FIELD CHANGE FORM

Off-Shift Issuance: ____________ ____________
Signature Date/Time

J3 FIELD CHANGE	1. Work Order Number: VFS - 75667 - WO	2. Field Change Number: (Obtained from WCC) FC [1]

3. Originator* E. Lachapelle (Name/MS) [signature] 12/18/02 (Signature/Date)	3A. Peer Reviewer MARK AGNEW BIC (Name/MS) M. Agnew 12/19/02 (Signature/Date)

4. WO Title: Obtain Radiation Readings in the Vitrification Cell.	5A. RWG/Walkdown (Print) NAME: T. P Shaw DATE: 1/03/03	6. ALARA Trigger Level Exceed Yes ___ No ✓
5. WO Group: PSO	5B. WGS [signature] [Walkdown Sat] 1/03/03	

6A. Pre-Job Brief Required Yes X No ____	6B. ECN/TM # N/A

7. Description of Field Change:
Change was made to delete deployment using the transfer cart. An additional work order has been written to deploy the equipment using the recovery cart/trailer
Replace pgs 1-9 with new ones 1-9

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8. Reason for Change: The transfer cart is not functioning.

9. "Is a USQD (USQP Form WV-3306, Sections V, VI, and VII) required? Yes ____ No ✓

[signature] (USQD Originator or Safety Analyst Signature) E. Lachapelle (Printed) 12/18/02 (Date)

If Yes: attach the completed USQD (USQP Form WV-3306, Sections V, VI, and VII).

10. Review/Concurrence Approval (Signature/Date)				11. Estimated Hours
CM [signature]	MS- B1A	IH&S [signature] 1/3/03	MS- AA15	Ops ____
Maint N/A	MS- ____	QA [signature] 1/3/03	MS- AAL3	Maint ____
RE Eva Wenler 3 Jan 03	MS- 226	Eng. N/A	MS- ____	RP ____
FM [signature] 1/3/03	MS- 205	Orig. [signature] 1/3/03	MS- OB-1	QA ____
____	MS- ____	____	MS- ____	Other ____

12.
A. ☑ No Hazards Identified/No existing Hazards Modified (No new screen attached)
B. ☐ Hazard Screen (Form WV-3909) Attached. (For Review Only)

CC: ____________ MS- ____________

* If the J3 originator is not the same person as the J1 originator, advise J1 originator and include in cc:

J1-WORK AUTHORIZATION FORM

1. Work Control Number: VFS- 75667 - WO
Off-Shift Issuance: ______ Signature ______ Date/Time

2. Originator: E. Lachapelle /OB-1/2117 (Print Name/MS/Ext) — [signature] 11/7/02 (Signature/Date)	3. Peer Review: BERNIE BRILL (Print Name/MS) — [signature] 11-8-02 (Signature/Date)
4. Charge No. (Labor) (M & S) — WH 5310004 /WH	5. Equipment I.D. — Eqpt/Instr/Valve # N/A

6. Performance Code
A. ✓ Special Preparation
B. ___ Normal Preparation
Other: ______

System: 0 ___ May be shut down; 1 ✓ Must be shut down; 2 ___ Must be operating; 3 ___ NA

Equipment: 0 ___ May be shut down; 1 ✓ Must be shut down; 2 ___ Must be operating; 3 ___ NA

7. Estimated/Actual Hours

SUPPORT GROUP		EST.	ACTUAL
Vit	Ops	32	
Maint			
QA		4	
RC Tech		8	
D+D Ops		8	

8. System	9. Location	10. Dwg/Sketch	11. Docs./Dwgs Rqd. Revs	12. Profile No.	13. Document Ref. No.
63A	EDR/VC	Yes ___ No ✓; Attached ___	TM# N/A; ECN# ___ NA ___	013.001R (~~N/A~~ TJ 11/15/02)	N/A

14. Quality Level: C
15. Safety Class: N
16. ALARA Trigger Level(s) [WV-984, Sec. 7.8.3] Exceeded: Yes ___ No ✓
ALARA Checklist Attached: Yes ___ N/A ✓
Detailed Dose Estimate Attached: Yes ___ N/A ✓
17. Eng. Approval Rqd.: Yes ___ No ✓

18. RWP Required: Yes ✓ No ___ ; RWP No. ______
19. Hoisting & Rigging: NA ___ ; Routine ✓ Non-routine ___ ; Critical ___ (Ref. SOP 00-38)
20. QA Insp. Rqd: Yes ✓ No ___
21. Welding or Special Process Rqd: Yes ___ No ✓ ; If Yes, Cite ______

22. Special Qualification Rqd.: Yes ___ No ✓
23. IWP required: Yes ___ No ✓ ; IWP No. ______
24. Ground Disturbance Permit Required: Yes ___ NA ✓ ; Attached ______

25. RWG Walkdown: (Print) NAME: Alfred B Montgomery DATE: 11/11/02
26. Reqd. Finish Date: 12/1/02
27. Key Event: 560P

28. "Is a USQD (USQP Form WV-3306, Sections V, VI, and VII) required? *Yes ✓ No ___
[signature] (USQD Originator or Safety Analyst Signature) — E. Lachapelle (Printed) — 11/7/02 (Date)
If Yes: attach the completed USQD (USQP Form WV-3306, Sections V, VI, and VII).

29A. HLW - Does W.O. provide instr. For Maint., Ops. Support etc. for Vit Sys 63I, 63J, L, K, 63P, 68, 69A, B or 200A, B — Yes ___ No ✓
B. Is Maint/support/testing/R&D issue listed in WVDP-200 Part IV HLW activities list)? — Yes ___ No ___
C. Is the activity designated HLW? — Yes ___ No ___

30. Type of work: ___ Fab; ___ Test; ___ Install; ___ Calib; ___ Mod/Repair; ✓ Other; ___ Insp

31. Title: Obtain Radiation Readings in the Vitrification Cell

31a. Pre-Job Brief Required ______ Yes ______ No

32. Resp. WVNS Work Group: PSO (Vit)
33. WGS (Print Name): S McPeak; WGS [signature] for S McPeak (Walkdown Sat)
34. Work Group Manager: J. Curcio

35. Review/Walkdown Approvals (Signature/Date)

CM	[signature]	MS- 8H	IH&S	N/A	MS-
Maint	N/A	MS-	QA	[signature] 11/15/02	MS-
RE	[signature] 15Nov02	MS- Z3L	Eng	[signature] 11/15/02	MS- B1A
FM	[signature] 11/20/02	MS- MPZ	EA	Gerald Hoch 11/15/02	MS- WV-50
WMS	[signature] 11/15/02	MS- 31H	Orig	[signature] 11/15/02	MS- B1A
DEAOPS	[signature] 11/15/02	MS- B1H			MS-

36. Changed during review cycle — Reroute to: MS- ___ (×5)

37. Brief Information of Work Completion for History Record
[ ] Yes
[✓] No (Check One)
Lessons Learned ___ Yes ✓ No
(Attach additional pages as necessary)

38. Documentation of Work Completion
[signature] 2-3-03 — Work Group Supervisor / Date
[signature] 2/10/03 — Originator / Date

39. Work Order Closed: WCC Signature ______ Date ______

NOV 20 ... CONTROL CENTER

1.0 INTRODUCTION:

1.1 General

1.1.1 Data from this work order will be used to determine the radionuclide inventory of the internals of the in-cell components in the vitrification facility (not including the melter). The work order is not only in accordance with the "Technical Approach for Determination of Radioactivity (Curies) in the Vitrification Cell" which is available in the project files associated with the Facility Characterization Department, but also with WVDP-403, "Characterization Management Plan for the Facility Characterization Project."

1.2 Purpose:

1.2.1 This work order is to take remote radiation readings of components in the Vitrification Cell using a custom made deployment device and Ludlum series 133 radiation probe (hererafter called the "device"). These readings will be used to determine the Curie content of various components in the Vitrification Cell. The readings will be used to estimate the radionuclide inventory.

1.3 Scope:

1.3.1 This work involves:

FC 1> ~~[1] Transfer of the device and in-cell support bracket into the Vitrification Cell via the EDR and transfer cart~~

~~[2] Using the in-cell crane, picking up and installing the in-cell support bracket on the maintenance station.~~

75667
FC#1

[1] Using the in-cell crane and manipulators, assembling and deploying the device around the Vitrification Cell.

[2] Connecting the detector to an existing cable, which runs through a penetration in the Vitrification Cell wall.

[3] Taking initial in-cell functional check readings.

[4] Taking various radiation readings and position readings.

[5] Taking functional check radiation readings at the same point as step 1.3.1[3] to ensure radiation probe reliability.

2.0 PRECAUTIONS AND LIMITATIONS

FC 1> ~~2.1 Load-in of the device will not require entry into the high contamination area of the EDR.~~

2.1 It is required that a representative from Facility Characterization Projects be present while readings are taken.

2.2 No movement of radioactivity in to, out of or within the Vitrification Cell are to be conducted during performance of this procedure.

3.0 PREREQUISITES

FC 1> 3.1 ~~The transfer cart is to be used for transfer of the device into the cell and must be functional and in position for transporting the device into the Vitrification Cell from the EDR~~. The device has already been loaded into the Vitrification Cell.

3.2 The following conditions must apply before the readings are able to be taken:

75667
FC#1

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3.2.1 All flushing activities must be completed.

3.2.2 All HLW and evacuated canisters must be removed from the Vitrification Cell prior to taking the readings

3.2.3 The melter must be thermally cold.

FC 1> ~~3.3 QA perform a pre-load in inspection per attached SOP 68-02 checklist.~~

~~3.4 Cognizant Facility Characterization Project Representative confirm below by observation that the total system has been functionally checked and that the probe has been calibrated.~~

~~(+) Signature~~________________________________ ~~Date~~________________

3.3 Prior to each set of readings to be taken (e.g., at the beginning of a shift), an initial functional check radiation measurement must be taken at a point specified by the Facility Characterization Project representative. This reading must be repeated at the end of each set of readings (e.g., at the end of the shift) also, with the results being within $\pm$ 20% of each other.

3.4 Debris must be removed from the maintenance station to facilitate work.

3.5 Materials/Special Tools

3.7.1 The device and associated equipment outlined in Appendix A is needed for completion of this work order.

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3.7.2 Cognizant Facility Characterization Project Representative confirm below by observation that the associated equipment has been staged for the work.

(+) Signature_________________________________ Date__________________

4.0 PERFORMANCE

NOTE *Unless otherwise specified, the following action steps will be performed by PSO.*

FC 1> 4.1 D&D Ops: Transfer the device, associated extension pieces, associated detector and in-cell support bracket into the EDR per SOP 68-02. Entry into the EDR shall be per SOP 00-43.

4.2 D&D Ops: Place the all pieces on the transfer cart.

4.3 Move the transfer cart into the Vitrification Cell per SOP 63-56.

4.3.1 If not already installed, install the maintenance station. Clean and remove debris from the maintenance station that may interfere with installation of the in-cell support bracket and with setting the device on the maintenance station per SOP 68-04.

4.4 Using the in-cell crane, pick the in-cell support bracket up off the transfer cart and move it over to the maintenance station.

4.5 Install the in-cell support bracket on the maintenance station.

4.6 Using the in-cell crane, pick up the device and associated pieces off the transfer cart and stage them on the maintenance station.

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NOTE *The radiation reading locations specified in Figure 1 are for informational purposes only and are not to be considered exact.*

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NOTE Not all readings specified in Appendix B and Figure 1 may be required

4.1 Using a combination of the manipulators, the in-cell cranes and the in-cell support bracket, connect up the number of suggested extension pieces to begin taking readings. Locations of readings to be taken are specified in Appendix B, with each reading set also shown in Figure 1.

4.2 Using the manipulators, connect up the device to the radiation probe using the cable which goes through the penetration for the right MSM in the Middle North Operating Aisle or the cable which goes through a penetration in the Middle East Operating Aisle.

4.3 Radiation Protection Operations record initial survey radiation detector information in Table 1.

4.4 Using a combination of the manipulators and the in-cell cranes, move the device to a position to take an initial functional check radiation reading to a location determined by the Facility Characterization Representative. Record the reading in Table 1.

4.5 Repeat the initial functional check radiation reading by moving the device away from the position and moving it back again.

4.6 Record the functional check radiation reading in Table 1.

4.7 Repeat steps 4.5 through 4.6 twice more.

[1] Take the average of the four readings to establish an initial functional

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check reading.

[2] Record the average of these readings in Table 1.

[3] Facility Characterization Projects Representative establish the low range reading and high range reading (± 20% of the average) and record in Table 1. Any additional comments will be entered into Table 1 by the Facility Characterization Projects Representative.

4.8 Perform a vertical positioning "zero" reading by placing the device on a flat surface of known elevation (for example, the maintenance station) and record the reading and associated information on Table 2.

NOTE *The number of extension pieces used for the measurements may vary from the ones specified in Appendix B. The number of extension pieces may be changed to facilitate proper location of the device.*

NOTE *The radiation reading locations specified in Figure 1 are for informational purposes only and are not to be considered exact.*

4.9 If not already performed, using a combination of the manipulators, the in-cell cranes and the in-cell support bracket, connect up the number of suggested extension pieces and move the device to various locations in-cell. These locations are specified in Appendix B, with each reading set also shown in Figure 1.

4.10 Radiation Protection Operations take the radiation readings. Document the radiation readings in Table 2.

4.11 In addition, Operations record applicable vertical position readings and number of extension pieces associated with each radiation reading in Table 2. If there is any

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additional information needed with each reading, the Facility Characterization Projects representative will record it under the "Additional Description" column.

4.12 Every 20 radiation readings, return the device to one of the previously measured positions to perform a "replication reading."

4.13 Radiation Protection Operations record the "replication reading" in Table 2.

[1] If the "replication reading" is not within ± 20% of the previously taken reading, change the radiation probe out per Appendix C and consult with the Facility Characterization Projects Representative.

4.14 In addition, operations record the vertical position reading and number of extension pieces associated with the "replication reading" in Table 2. If there is any additional information needed with this reading, the Facility Characterization Projects representative will record it under the "Additional Description" column.

4.15 At least every 20 radiation readings, re-perform the vertical positioning "zero" reading by placing the device on a flat surface of known elevation (for example, the maintenance station) and record the reading and associated information on Table 2.

4.16 Repeat steps 4.9 through 4.15 until either all readings have been completed as outlined in Appendix B or the work reaches the end of the shift. Make additional copies of Table 2 as needed to facilitate completion of surveys.

4.17 Return the device to the location specified earlier (in paragraph 4.4) to take the functional check radiation reading.

4.18 Radiation Protection Operations record the date and radiation reading in Table 1.

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4.19 In addition, operations record the vertical position reading associated with the final radiation reading in Table 1.

[1] If the functional check radiation reading is not between the low and high range established in Table 1, change the radiation probe out per Appendix C and consult with the Facility Characterization Projects Representative.

4.20 If readings have not been completed, when the next shift occurs, return the device to the location specified earlier (in paragraph 4.4) to take the functional check radiation reading.

[1] Radiation Protection Operations record the date and radiation reading in Table 1.

[2] In addition, operations record the vertical position reading associated with the functional check radiation reading in Table 1.

[3] If the functional check radiation reading is not between the low and high range established in Table 1, change the radiation probe out per Appendix C and consult with the Facility Characterization Projects Representative.

[4] Continue with radiation readings specified in steps 4.8 through 4.19.

5.0 POST MAINTENANCE TESTING

None

6.0 POST COMPLETION CONFIGURATION

6.1 Store the device at a retrievable location for possible future use.

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6.2 If not already reinstalled, reinstall the blank cover and lid on the melter.

(+) 6.3 Vitrification Operations Shift Supervisor verify by personal observation that the post completion configuration is satisfactory by signing below:

Signature ____________ Date 2/10/02

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Table 1

Initial Survey Radiation Detector Information

Instrument Model 2350-1 Instrument Serial Number 149798

Survey Date/Time 1-23-03 1130 / 1300

Name of Surveyor ~~JAMES PHILLIPS~~ RICK CHAPMAN Signature of Surveyor [signature]

Initial Functional Check Reading

Location of Functional Check reading Maintenance station, contact with center vice bracket

Orientation of Detector Horizontal, facing north wall

Reading 1 565 mR/hr

Reading 2 550 mR/hr

Reading 3 558 mR/hr

Reading 4 570 mR/hr EL 1/23/02

Average of four readings ~~540~~ 560 mR/hr

Low range reading ~~430~~ 450 mR/hr EL 1/23/02 High range reading 670 mR/hr

Additional Comments On 1/29/03, T. Benz is Radiological Technician EL 1/29/03

Verified that Instrument 149798 was used on 1/29/03 EL 1/29/03

Date of Functional Check Reading	Time of Functional Check Reading	Functional Check reading
1/23/03	16:48	615 mR/hr
1/29/03	1105	600 mr/hr
1/29/03	1630	550 mr/hr

Readings taken 1/23/03

Table 2

Reference Surface Description Maint Station Vertical Positioning Zero Reading 218 # Extension Pieces 0 Detector Orientation Horizontal

Reading Number	Component	Detector orientation	# extension pieces	Vertical position reading	Radiation reading	Additional description
1	Spent components	Vertical	∅	259	5.05 R/hr	Centered over spent components
2	Pit floor	Vertical	2	168	6.55 R/hr	Contact with pit floor East of off gas jumper, West of melter
3	Pit floor	Vertical	2	163	11.3 R/hr	Contact with pit floor West of melter east of jumper that connects swapé station to SBS
4	Pit floor	Vertical	2	187	12.4 R/hr	Not on contact with pit floor, space between CFMT, MFMT and SBS
5	Pit floor	Vertical	2	188	1.45 R/hr	Inside canister storage rack, SW canister position
6	Pit floor	Horizontal	2	161	1.44 R/hr	Same as reading #2, Pointed north
7	Pit floor	Horizontal	2	177	2.95 R/hr	Same as reading #2, Pointed west (Not in contact with floor)
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
Duplicate						

Readings taken 1/29/03

Table 2

Reference Surface Description: Pit Floor — Vertical Positioning Zero Reading: 160 — # Extension Pieces: 2 — Detector Orientation: Horizontal

Reading Number	Component	Detector orientation	# extension pieces	Vertical position reading	Radiation reading	Additional description
1	Pit Floor	Horizontal	2	~~175~~ 172 EL 1/29/03	11R/hr	Area between CFMT, MFHT and SBS, pointed west (On an I-beam)
2	Pit Floor	Horizontal	2	114	22R/hr	Facing CFMT, same area as reading #1. Looks like on I-Beam/tank support
3	Pit Floor	Horizontal	2	160	17R/hr	Facing CFMT, back a little to clear tank supports (Still area between CFMT, MFHT + SBS, toward NW direction.
4	Pit Floor	Horizontal	2	Not able to be read	36R/hr	Facing SBS, same location as # 3
5	Pit Floor	Horizontal	2	156	56R/hr	Facing MFHT, same location as # 3
6	Pit Floor	Horizontal	2	Not able to be read	15R/hr	Facing between CFMT + MFHT. same location as # 3 EL 1/29/03
7	Pit Floor	Horizontal	2	Not able to be read	15R/hr	Facing between ~~MFHT~~ CFMT and SBS, same location as # 3
8	Pit Floor	Horizontal	2	160	15R/hr	Facing sample station, same location as 3
9	Pit Floor	Horizontal	2	159	4.5R/hr	Facing north, same location as 3
10	Pit Floor	Horizontal	2	157	7.3R/hr	Facing ~~northeast~~ southeast EL 1/29/03, same location as 3
11	Pit Floor	Horizontal	2	157	30R/hr	Facing East, same location as 3
12	Pit Floor	Horizontal	2	157	11R/hr	Facing northeast, same location as 3
13	Pit Floor	Horizontal	2	158	2.4R/hr	Facing north of northeast, same location as 3
14	Pit Floor	Horizontal	2	157	1.7R/hr	Next to west wall of melter, facing underneath melter (east) approximately 7' south of north wall
15	Pit Floor	Horizontal	2	157	3.3R/hr	Same position as 14, facing north
16	Pit Floor	Horizontal	2	158	1.3R/hr	Same position as ~~13~~, 14, Facing SE EL 1/29/03
17	Pit Floor	Horizontal	2	Not able to be read	5.6R/hr	3 Feet south of north wall, adjacent to the melter, pointed underneath melter (east)
18	Pit Floor	Horizontal	2	159	3.2R/hr	9 Feet South of north wall, adjacent to the melter pointed underneath melter (east)
19	Pit Floor	Horizontal	2	157	1.2R/hr	At end of melter + turntable, pointed east underneath both The melter and turntable
20	Pit Floor	Horizontal	2	159	1.4R/hr	At end of melter, looking SE underneath turntable
Duplicate	Pit Floor	Horizontal	2	159	1.5R/hr	Duplicate of reading 20

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Readings taken 1/29/03

Table 2

Reference Surface Description Pit Floor Vertical Positioning Zero Reading 160 # Extension Pieces 2 Detector Orientation Horizontal

Reading Number	Component	Detector orientation	# extension pieces	Vertical position reading	Radiation reading	Additional description
1	Pit Floor	Horizontal	2	158	5.1 R/hr	End of melter (SW corner) laying underneath SBS
2	Over SW corner	Vertical	1	336	920 mr/hr	Southwest corner behind tanks. (SW corner of the pit)
3	Over SW corner	Vertical	1	311	1.2 R/hr	Same position as # 2
4	Over NW corner	Vertical	1	250	2.5 R/hr	Behind sample station. (NW corner of pit)
5	Over NW corner	Vertical	1	275	4.2 R/hr	Same as # 4
6	~~CFMT~~ MFHT 1/29/03	Vertical	1	215	2.3 R/hr	Two legs contacting SW flange on top
7	CFMT	Vertical	1	261	2.2 R/hr	Two legs contacting S flange on top
8	SBS	Vertical	1	225	1.5 R/hr	Two legs contacting Northeast flange on top.
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
Duplicate						

Appendix A

Parts List

1. Ludlum Series 133 detector
2. 100 feet of cable for the detector
3. Shielded housing for the detector and shield block
4. Associated holding bracket for the shielded housing
5. 3 extension pieces for the shielded housing/associated holding bracket
6. In-cell support bracket

Appendix B

Reading Set	Component	Detector Orientation	Number of Readings	Number Extension pieces	Description
A	Prefilter T-035	Horizontal	1	1	Side measurement, contact if possible, centered on the component.
B	Prefilter T-038	Horizontal	1	1	Side measurement, contact if possible, centered on the component.
C	HEME prefilter E-032	Horizontal	1	1	Side measurement, contact if possible, centered on the component.
D	HEPA filter T001A	Horizontal	1	1	Back contact measurement, (north side) centered on the filter.
E	HEPA filter T001B	Horizontal	1	1	Back contact measurement, (north side) centered on the filter.
F	HEPA filter T001C	Horizontal	1	1	Back contact measurement, (north side) centered on the filter.
G	Canister Decon. Station	Horizontal	about 20	1	Measurements at vertical intervals of approximately 12 inches and repeat the measurements along the outside of each tank of each component. Contact 12 inch standoffs on outside.
H	Post heater E-039	Vertical	1	1	Top measurement, contact if possible, centered on the component
I	Prefilter heater E-034	Vertical	1	1	Top measurement, contact if possible, centered on the component
J	Prefilter heater E-037	Vertical	1	1	Top measurement, contact if possible, centered on the component
K	Melter Discharge Cavities	Vertical	2	1	Remove discharge lid. One reading centered over each discharge cavity. Put detector as close to the top as possible without contacting internals.
L	Pit (under the SBS, CFMT and MFHT)	Vertical	3	1	Take each reading directly over each tank. Contact two of the standoff legs on one of the flanges on top of the tank.

Appendix B

Reading Set	Component	Detector Orientation	Number of Readings	Number Extension pieces	Description
M	Miscellaneous spent components	Vertical	TBD	1	Areal survey over the components. Locations to be determined by the Facility Characterization Representative. **Location not shown on Figure 1.**
N	Off Gas jumper	Horizontal or Vertical	1	1	Center the device on the jumper, with the 12 inch standoffs contacting.
O	Feed jumper	Horizontal or Vertical	1	1	Center the device on the jumper, with the 12 inch standoffs contacting. **Location not shown on Figure 1.**
P	SBS	Horizontal	about 10	2	Measurements at vertical intervals of approximately 12 inches and repeat the measurements along the outside of SBS for the entire height of the SBS. Contact 12 inch standoffs on outside.
Q	CFMT	Horizontal	about 10	2	Measurements at vertical intervals of approximately 12 inches and repeat the measurements along the outside of CFMT for the entire height of the CFMT. Contact 12 inch standoffs on outside.
R	MFHT	Horizontal	about 10	2	Measurements at vertical intervals of approximately 12 inches and repeat the measurements along the outside of MFHT for the entire height of the MFHT. Contact 12 inch standoffs on outside.
S	HEME T-033	Horizontal	about 10	2	Measurements at vertical intervals of approximately 12 inches and repeat the measurements along the outside of HEME for the entire height of the HEME. Contact 12 inch standoffs on outside.
T	Condenser E-015	Horizontal	about 10	2	Measurements at vertical intervals of approximately 12 inches and repeat the measurements along the outside of component. Contact 12 inch standoffs on outside.
U	HEME T-036	Horizontal	about 10	2	Measurements at vertical intervals of approximately 12 inches and repeat the measurements along the outside of HEME for the entire height of the HEME. Contact 12 inch standoffs on outside.

Appendix B

Reading Set	Component	Detector Orientation	Number of Readings	Number Extension pieces	Description
V	Pit (under the melter)	Horizontal	about 5	3	Lower the device into the pit so the support legs of the device contact the pit floor, with the front of the detector facing the melter. Locate the device in the approximate locations shown in Figure 1.
W	Pit (measuring the floor in the open space between tanks)	Vertical	about 5	3	Lower the device into the pit so the 12 inch standoffs are in contact with the pit floor. Locate the device in the approximate locations shown in Figure 1.

Appendix C

Instructions to change out the radiation probe on the device

1. Locate the device near either the window at the sample station or maintenance station

2. Using the manipulators and/or cranes as appropriate, remove the block/detector combination and disconnect from the radiation detector cable.

3. Transfer the new block/detector combination through the transfer drawer per SOP 063-82.

4. Using the manipulators, connect the radiation detector cable to the new detector.

5. Replace the new block/detector combination into the device.

6. Using an additional "clean" copy of Table 1, return to step 4.9 of the main work order and continue work. Repeat readings that were obtained since the last "good" radiation check.

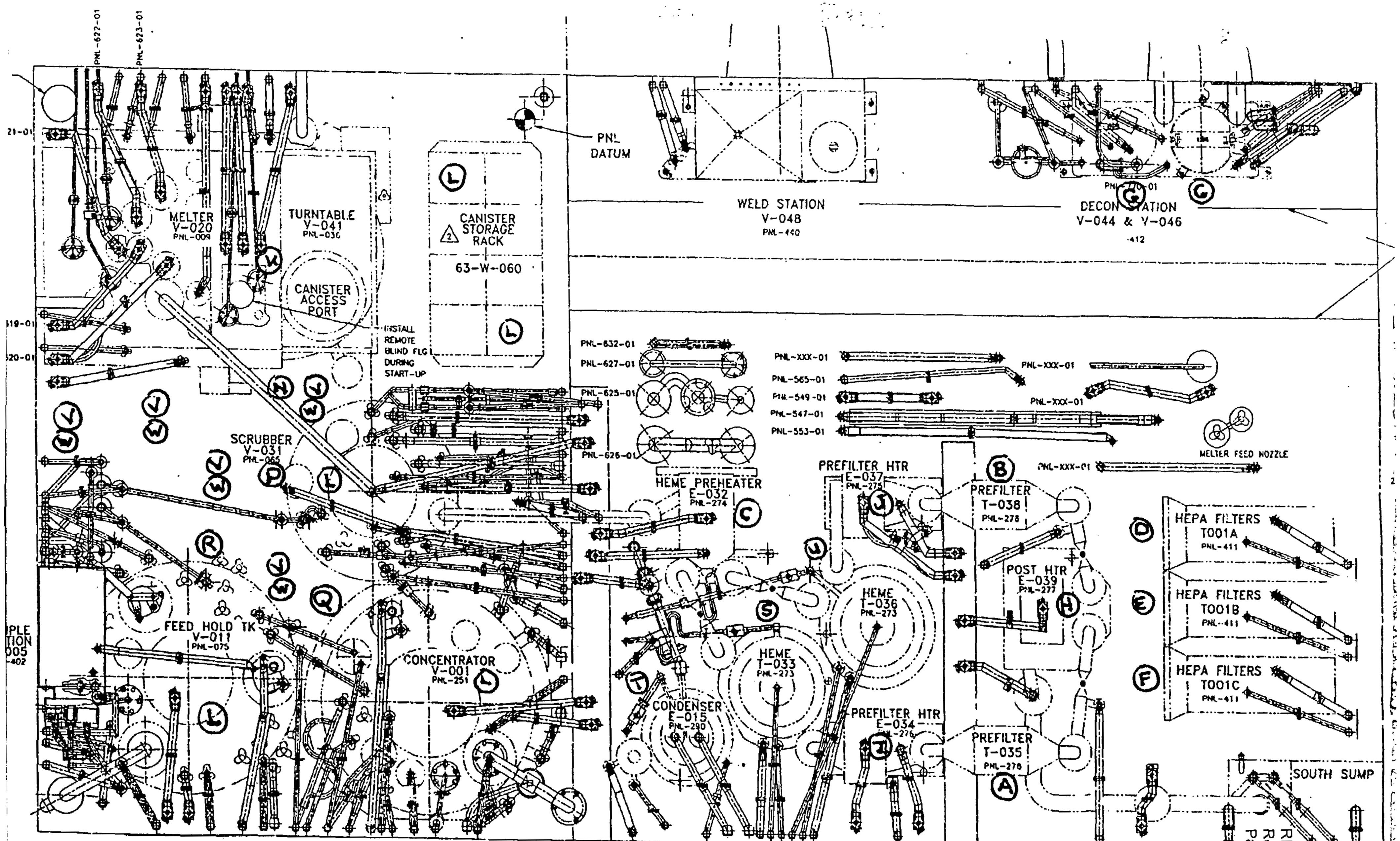


FIGURE 1

WVNS VITRIFICATION FACILITY

Appendix B-1
SPECIFIC INSTRUCTIONS FOR ENTRY FORM
EQUIPMENT DECONTAMINATION ROOM (EDR)
(Page 1 of 3)

1. The following must be **VERIFIED** prior to removing the personnel access control device from the EDR personnel access door to allow entry to EDR:

a. The radiation monitor in the EDR is not in alarm.

N/A EL 1/29/03

Work Group Supervisor / Date

b. Both EDR rad. probe readings are ≤100% above normal. If either of the two EDR rad. probe readings are > 100% above normal or out of service, obtain RCO Supervisor's approval for entry. (Normal readings will be established by RCO Supervisor). RCO Tech. "NA" RCO Supervisor signature if both probes are reading ≤ 100% above normal.

RCO Tech / Date

RCO Supervisor / Date

c. There are no canisters containing glass or category 1,2 or 3 vit expended materials on the transfer cart either in the EDR or in the tunnel leading from the Vitrification Process Cell to EDR.

NOTE: *The transfer cart, empty, or with empty canisters, may be in the EDR on its charge plates.*

Work Group Supervisor / Date

d. The North Tunnel Shield Door, 63-M-001, is **CLOSED** and disconnect switch DS-63-M-001/1, located on the east outside wall of the Vitrification Process building, is **OFF** and a blue lock is installed to prevent DS-63-M-001/1 from being turned on.

Work Group Supervisor / Date

e. The CPC-EDR shielding door, 3M-3, is **CLOSED**, and the disconnect switch DS-DR-3M3, located in the EDR Viewing Aisle, is **OFF** and is locked in the **OFF** position using a blue lock.

Work Group Supervisor / Date

Appendix B-1
SPECIFIC INSTRUCTIONS FOR ENTRY FORM
EQUIPMENT DECONTAMINATION ROOM (EDR)
(Page 2 of 3)

f. If the entry requires work in the area near the CPC-EDR shield door posted "High Radiation Area", verify the CPC-EDR door shield has been placed on the cart tracks ready to be moved into position.

N/A ES 1/29/03

Work Group Supervisor / Date

g. Personnel entering the EDR must install Personal Protection Locks and Tags per SOP-00-04, section 5.3, on 63-M-001 per step 1d and 3M-3 per step 1e.

Work Group Supervisor / Date

2. The Work Group Supervisor attests to the fact all of the above verifications have been completed. The access control device may now be removed from the EDR Access Door.

Work Group Supervisor / Date

3. If the EDR entry will require entry into the area of the CPC-EDR shield door posted "High Radiation Area," push the CPC-EDR door shield into place as close as possible to the CPC-EDR shielding door. If not, mark N/A in this step sign off.

Work Group Supervisor / Date

4. Prior to leaving the last person exiting the EDR, move the CPC-EDR door shield north to where the EDR crane can engage the shield. If the door shield was not installed in step 3, mark N/A for this step.

Work Group Supervisor / Date

5. When the last person exits the EDR, the blue lock is reinstalled on the EDR access door. Work group supervisor verifies all personnel have exited the area and that the blue lock is reinstalled.

Work Group Supervisor / Date

Appendix B-1
SPECIFIC INSTRUCTIONS FOR ENTRY FORM
EQUIPMENT DECONTAMINATION ROOM (EDR)
(Page 3 of 3)

6. All personal protection locks are removed from items locked out in steps 1d and 1e as soon as possible after completing the EDR entry. Work group supervisor to verify.

N/A EJ 1/29/03

____
Work Group Supervisor / Date

7. Blue locks are removed from items locked out in steps 1d and 1e after personal locks are removed. Work group supervisor to verify.

____
Work Group Supervisor / Date

8. Attach this Specific Instructions Form to the Entry Work Package.

APPENDIX E
LOAD-IN EQUIPMENT AND REPAIR/REPLACEMENT PARTS INSPECTION
(Page 1 of 6)

Equipment Identification: (From Cognizant Engineer) Parts as listed in Appendix C

Date of Inspection: ______

Inspector: (print name) ______

Inspection Procedure: Visual

N/A
[illegible] 12/29/03

Drawing/Sketch/Rev/ECN: (From Cognizant Engineer) ______

Characteristics Inspected: (From Cognizant Engineer) Items designated on pages 2 through 6

Inspection Criteria: Drawing/Sketch requirements

Special Inspection Tools: (enter none if none used) ______

Inspection Results: (circle one) Sat Unsat

Issue Report # (enter none unless inspection results are unsat) ______

Inspector: ______
Signature Date

VOSS: ______
Signature Date

APPENDIX E
LOAD-IN EQUIPMENT AND REPAIR/REPLACEMENT PARTS INSPECTION
(Page 2 of 6)

PIPE JUMPER		Items Inspected
A.	3 JAW PUREX CONNECTOR	
1.	Gasket(s) in place	
2.	Gasket unmarked/undamaged	
3.	Gasket black in color	
4.	Gasket keeper ring/keeper plate tight	
5.	No shipping/storage plugs in openings -blow through ok	
6.	All three jaws are free	
7.	Keeper roll pins are in all three jaw pivot shafts	
8.	No space in the stack i.e. no shoulders showing	
9.	All six hex head bolts tight N/A EL 11/7/02	
10.	All six hex head bolts lock wired in pairs	
11.	The skirt is correct for the application horizontal v/s vertical	
12.	**Nuclear grade** Never-Seize on threads	
13.	Hand run threads full travel	
14.	Leave three jaws in full open (out) position	
15.	Plane of skirt is 90 degrees to centerline of block in two planes	
B.	PUREX NOZZLE END (IF APPLICABLE)	
1.	No shipping/storage plugs in opening(s) - blow through OK	
2.	No dings in sealing surface (spherical machined area)	
3.	Kick plate installed and welded	

APPENDIX E
LOAD-IN EQUIPMENT AND REPAIR/REPLACEMENT PARTS INSPECTION
(Page 3 of 6)

PIPE JUMPER		Items Inspected
C.	HANDLING/BALANCING (ALL JUMPERS AND EQUIPMENT)	
1.	Bail can be reached by crane hook in the in-use configuration	
2.	Bail can be reached by crane hook in the transport configuration	
3.	Bail is not deformed	
~~4.~~	~~Hinged bail has stops enabling access and operates freely~~ N/A EJ 11/7/02	
5.	Dunnage is welded in place	
6.	Jumper is not bent by its own weight i.e. bracing is adequate	
7.	Flex jumper ends handle by bails with connectors in appropriate planes on both ends i.e. three axes, both ends at once N/A EJ 11/7/02	
8.	Flex jumper end(s) will interface with nozzles without side push i.e. simply hanging from the crane	
9.	Jumper (non-flex) hangs to contact lower end first unless it is a flange-end, a dip tube, or a tank insert type.	

APPENDIX E
LOAD-IN EQUIPMENT AND REPAIR/REPLACEMENT PARTS INSPECTION
(Page 4 of 6)

ELECTRICAL JUMPERS	Items Inspected
1. Check insulator plate for appropriate material, peek or ceramic IAW print	
2. Check insulator plate for cracks and for three fasteners	
3. Check pins or sockets for alignment (parallelism) and that they are true to the drawing	
4. Check point to point continuity per drawing	
5. Check pin to pin megger (power jumper) or VOM (signal jumper)	
6. Check pin to ground megger (power jumper) or VOM (signal jumper)	
7. Guide pins not bent and are secure	
8. Hooks are straight, securely pinned, and operate freely	
9. **Nuclear grade** Never-Seize on the threads N/A EL 11/7/02	
10. Hand operate threads full travel	
11. Leave hooks spread wide (open)	
12. Cap screws holding "C" ring cover are tight	
13. Flex conduit will exclude water i.e. no tears or loose shrink tubing	
14. Flex electrical jumper strain reliefs are properly made up and jumper cable weight can be taken by crane to ensure landing purex electrical	
15. Check that the type matches the intended receiving socket i.e. some lower bodies have spikes, some don't; it's important to get this right	

FC1>

All JUMPERS N/A EL 11/7/02	Items Inspected
1. Verify that jumpers are properly labeled	
2. Verify that jumper ID's (labels) match drawings	

APPENDIX E
LOAD-IN EQUIPMENT AND REPAIR/REPLACEMENT PARTS INSPECTION
(Page 5 of 6)

EQUIPMENT		Items Inspected
A.	MOTORS	
1.	Motor meggers OK	
2.	Check bolted electrical connections for proper wrap (include glass tape)	
3.	Purex electrical meggers OK pin to pin (in pairs)	
4.	Purex electrical meggers OK pins to ground	
5.	Motor coupling lubed with NRRG lube	
6.	Motor to gearbox alignment checked OK	
7.	Gearbox to tank flange plate bolts torqued	
8.	Main shaft bearings lubed with NRRG	
9.	Oil (NRRO) from test run drained & held for in-cell replacement	
10.	Oil level gauge checked during the draining	
11.	Run in the test/transfer stand; no noise, runout OK	
12.	Check pinout per drawing, 6 leads to 6 pins	
B.	IN-CELL PREFILTERS	
1.	In-cell prefilters are HEPA quality and have pleats vertical in housing	
2.	The filters must have screens on both faces	
3.	Are the 2,000 CFM rated ones	
4.	Have a dedicated slip sheet to protect the faces	
C.	THERMOCOUPLES	
1.	Thermocouples have been iced and the found junctions matchpinout on print to the vertical position in the assembly	

N/A CL 11/7/02

APPENDIX E
LOAD-IN EQUIPMENT AND REPAIR/REPLACEMENT PARTS INSPECTION
(Page 6 of 6)

EQUIPMENT		Items Inspected
D. MELTER INSERTS		
1.	Electrical isolation is checked IAW print	
2.	Flange orientation checked to print - many were built with the right flange mounted upside down on the insert	
3.	All cut inconel surfaces in glass contact are to have been "buttered" with weld material to prevent accelerated attack	
4.	Gaskets OK	
5.	Assembly bolts tight	
6.	Bails are OK N/A EL 11/7/02	
7.	Purex nozzles are free of scratches and dings	
E. MISCELLANIOUS		
1.	All studs tight	
2.	All threads have proper blunt start (on top thread at least)	
3.	All nuts have both ends of thread with blunt start	
4.	All studs are neverseized and have been run with a good nut	
5.	Equipment free from damage	
6.	Foreign material exclusion	
7.	Metal tags, cable ties, tape, etc. which could hinder the remote handling/installation or use of the equipment has been removed	
8.	Subsuquent to receipt inspection,all modifications to equipment resulting from drawing revision, ECN, or pending ECN have been made	
9.	Proper equipment identification	
10.	Compare new component against existing component to identify any visual differences.	
F. HOISTING AND RIGGING EQUIPMENT		
1.	Inspect for all attributes required by WVDP-082 Hoisting and Rigging Manual.	
~~2.~~	~~Equipment is labeled properly.~~ N/A EL 11/7/02	

HAZARDS SCREEN CHECKLIST

Project/Document ID:	Rev.	FC#
Hazards Analyst: E Lachapelle	Date: 1/7/02	

If the answer to any of the following questions in "Yes," consult the Hazard Control Specialty Area indicated in the right-hand column for assignment of a Hazards Controls Specialist. Screening of a field change needs to address only the impact of the field change on the original Hazards Screen Checklist.

Hazard Control Speciality Areas Acronyms

CSE - Criticality Safety Engineer	IH&S - Industrial Hygiene & Safety
EA - Environmental Affairs	MPOSS - Main Plant Operations Shift Supervisor
EM - Emergency Management	RP - Radiation Protection
FM - Facility Manager	USQD Orig - USQD Originator
FP - Fire Protection	WMS - Waste Management Services

YOU SHALL CONSIDER BOTH NORMAL OPERATIONS AND PROCESS UPSET CONDITIONS.
Sheet 1 of 4

#	Yes	No	Potentially Hazardous Situations	Cog. Function
Radiological and Utilities				
1a	✓		Will the work be performed in a radiologically posted area, i.e., radiological buffer area, radiation area, high radiation area, contamination area, etc.?	RP
1b		✓	Will the work involve high-activity sealed radioactive sources?	RP
1c		✓	Will the work involve any type of excavation or ground intrusion (e.g., driving posts, installing Hilti bolts)? (See WV-370; use Form WV-3521.)	RP, IH&S
1d		✓	Will the work involve any type of construction, remodeling, or demolition?	RP, IH&S
1e		✓	Will the work be conducted on equipment containing radiation detectors?	RP
1f	✓		Will the work involve systems or vessels containing Highlyl Radioactive Waste?	RP
Chemical			Note: Obtain and review Material Safety Data Sheets for all chemicals involved.	
2a		✓	Will toxic, carcinogenic, flammable, or reactive chemicals be involved (either used, e.g., lead paint, PCBs, or generated, e.g., wastes)?	IH&S, EM, EA
2b		✓	Will corrosive or oxidizing chemicals other than water be used or generated?	IH&S
2c		✓	Will compressed or uncompressed gases in cylinders or bottles or cryogenics be involved, e.g., halon in cylinders?	IH&S
2d		✓	Will the work involve piped-in chemicals, chemical sensors, or equipment or piping containing chemicals?	IH&S
2e		✓	Will the work involve Trade/Brand name chemicals that do not list all the ingredients on the MSDS?	IH&S, EM, EA
2f		✓	Will the work involve the purchase of new or increase an existing inventory level of chemicals?	IH&S, EA, EM, WMS

YOU SHALL CONSIDER BOTH NORMAL OPERATIONS AND PROCESS UPSET CONDITIONS.
Sheet 2 of 4

#	Yes	No	Potentially Hazardous Situations	Cog. Function
Fire and Explosion				
3a		✓	A. Will an open flame be used or produced?	IH&S, FP
3b		✓	B. Will a heat source greater than 100°C be used, produced, or located in close proximity to the work?	IH&S, FP
3c		✓	C. Will the work involve or require disabling a fire alarm or protection system?	IH&S, FP, MPOSS
Safety Basis			Note: This question is intended to trigger the early involvement of a USQD Originator and does not replace the USQP required by WV-914.	
4a	✓		Will the work involve any changes to facilities or procedures as described in a safety analysis or involve tests or experiments?	USQD Orig
Emergency Preparedness				
5a		✓	Will the work disable the 812-all-page system, the 222-plant-page system, or the sheltering alarm? (See SOP 00-04; use Form WV-2164.)	EM, MPOSS
5b		✓	Will the work disable the meteorological tower or instrumentation?	EA, EM, MPOSS
5c		✓	Will the work block or render inaccessible any emergency access or emergency relocation routes or assembly areas?	EM, MPOSS
5d		✓	Will the work affect the ability to respond to an emergency at an adjacent facility?	EM, MPOSS
5e		✓	Will the work involve maintenance on or temporary or permanent relocation or disablement of emergency response equipment?	EM, MPOSS
5f		✓	Will the work require the development of new or a change to existing emergency management postings, signs, or instructions (e.g., relocation route postings, assembly area maps, or ventilation or sheltering instructions)?	EM
5g		✓	Will the work directly or indirectly affect the operability of the Emergency Operations Center's (EOC's) or the Technical Support Center's (TSC's) facility or equipment?	EM, MPOSS
Environmental, Waste Minimization, Pollution Prevention, and Regulatory				
6a		✓	Will the work potentially result in any airborne releases (e.g., smoke, fumes, gases, exhaust, asbestos, dust, mercury, radioactive material)?	EA
6b		✓	Will the work potentially result in any liquid releases (e.g., water, petroleum products, mercury, chemicals) into the environment?	EA
6c	✓	X (initialed, 11/15/02)	Will the work produce any waste products (e.g., industrial waste, hazardous waste, mixed waste, radioactive waste) or involve the on-site or off-site transportation of any waste products?	WMS, EA
6d		✓	Will the work result in changes to the site storm water drainage system (e.g., changes to drainage pathways/patterns) or result in removal of established vegetative ground cover or exposure of soil to rain/snowfall?	EA
6e		✓	Will the work result in the siting of new structures, the relocation, demolition, or removal of existing structures, or modifications to existing structures (e.g., removing a tank or adding floor space to a building)?	EA
6f		✓	Will the work disable or be performed in close proximity to any environmental monitoring equipment (i.e., air monitors, groundwater wells, etc.)?	EA

YOU SHALL CONSIDER BOTH NORMAL OPERATIONS AND PROCESS UPSET CONDITIONS.
Sheet 3 of 4

#	Yes	No	Potentially Hazardous Situations	Cog. Function
6g		✓	Will the work require the disturbance of migratory bird nests or involve animal control?	EA
6h		✓	Will the work involve PCB items in use (e.g., transformers, capacitors, voltage regulators), PCB wastes, or the removal or abandonment of pipes that distribute natural gas?	EA
6i		✓	Will the work potentially affect wetlands, the flow of creeks or streams, or lake discharges?	EA
Equipment Status			• Facility Manager shall decide whether the Radiation and Safety Committee must review the proposed activity pursuant to WV-906.	
7a		✓	Will the work involve removing Process Safety Requirement (PSR) controlled equipment from service? (See WVDP-218.)	FM •
7b		✓	Will the work be performed on equipment identified in any Process Safety Requirement? (See WVDP-218.)	FM *
7c		✓	Will the work be performed on or disable Safety Class A, B, or C equipment? (See WVDP-204.)	FM *
7d		✓	Will the work be performed on ventilation systems or air effluent monitoring systems?	FM *
7e		✓	Will the work impair the operability of or have the potential to inadvertently actuate any alarm (e.g., fire detection, fire suppression, carbon monoxide, NOx, ammonia) system?	FM *, IH&S, MPOSS
7f		✓	Will the work be performed on any standby or backup power supply? (See SOP 00-04, Appendix E.)	FM •
7g		✓	Will the work impair any breathing air supply or fresh air intake?	FM •
Industrial Hygiene and Safety, Emergency Management and Construction Safety				
8a		✓	Will the work be performed on open-sided platforms or roofs more than 4 feet above ground level or more than 6 feet up on a ladder?	IH&S
8b		✓	Will the work require designing and/or building a permanent fall-protection system for other than field or construction use?	IH&S
8c		✓	Will the work require burning, welding, or grinding or involve forms of high energy (e.g., electrical, steam, high-pressure air, or water)?	IH&S
8d		✓	Will the work require entry into a confined space?	IH&S
8e		✓	Will the work produce a breathing hazard (dust, fumes, solvent vapors, etc.) requiring use of respiratory protection for non-radiological purposes?	IH&S
8f		✓	Will the work require handling asbestos or insulation-containing materials?	IH&S
8g		✓	Will the work be conducted on or near live electrical components with more than 50 volts alternating current (VAC)?	IH&S
8h		✓	Could the work or job location result in "heat" or "cold" injuries such as heat exhaustion, frost bite, or hypothermia?	IH&S
8i		✓	Will the work produce noise greater than 85 dBA at the job site or at other locations?	IH&S
8j		✓	Will the work produce paint or chemical fumes at the job site or at other locations?	IH&S
8k		✓	Will the activity involve manual lifting of materials, power tools, vibrating equipment, or repetitive motions that could cause musculoskeletal injury?	IH&S
8l	✓		Will the work involve hoisting and/or rigging activities?	IH&S

YOU SHALL CONSIDER BOTH NORMAL OPERATIONS AND PROCESS UPSET CONDITIONS.
Sheet 4 of 4

#	Yes	No	Potentially Hazardous Situations	Cog. Function
8m		✓	Will the work result in the temporary or permanent routing of utilities (e.g., electricity, air, gas, steam, water, gasoline, fuel oil) that may become damaged as a result of exposure to personnel or vehicular traffic?	IH&S
8n		✓	Will the work result in the temporary or permanent routing of utilities (e.g., electricity, air, gas, steam, water, gasoline, fuel oil) that may unintentionally become covered in some manner by material (e.g., snow, water, sand, dirt, gravel, mud, boxes, containers)?	IH&S
8o		✓	Will the work breach a system known or suspected to contain hazardous materials (e.g., mercury) or energy sources (e.g., steam, electricity)?	IH&S
8p		✓	Will the work be performed in an area where previous spills of hazardous materials (e.g., mercury) are known or suspected to have occurred?	IH&S
8q		✓	Will the work involve conditions where the unexpected energization or startup of machines or equipment or the release of stored energy could cause injury or death to personnel? (See SOP 00-04.)	FM
Nuclear Criticality				
9a		✓	Will the work involve or potentially involve greater than 1 gram of fissionable material (e.g., U-233, U-235, Pu-239, Pu-241)?	CSE
9b		✓	Will the work involve spent fuel handling outside an approved shipping container?	CSE
9c		✓	Will the work involve storage of fissile material in a container other than described in PSR-6 or PSR-18?	CSE
9d		✓	Will the work impact any fissionable material contained in the GPC, PMC, XC-1, XC-2, or PPC?	CSE

UNREVIEWED SAFETY QUESTION PROCESS (USQP)

USQD # 02-USQ-056

USQD # is assigned by Records and Information only for USQDs

I. **Information** for the [ ] DISCOVERY or the [■] PROPOSED ACTIVITY.

A. Date: November 19, 2002 B. System #: 63

C. Description:
Issuance of Work Order VFS 75667 and performing the work described therein, which entails transfer of a radiation probe and support bracket into the Vit cell, installation of the support bracket, and use of the probe to take remote radiation readings of components in the Vit cell.

D. Document to which this USQP will be attached (e.g., ER, ECN, work instruction, procedure, issue report, memo, J-2 for an occurrence report):
W.O. VFS 75667

E. Cognizant Manager and Department: Laurene Rowell, Facility Characterization Project

II. **USQ SCREEN.** (See DOE G 424.1-1, Appendix B, Section B.11.)
Answer all questions in either Section II.A <u>or</u> Section II.B, but <u>not</u> both.

A. DISCOVERY (e.g., Occurrence Report; Deficiency Issue Documentation)

1. Does the facility configuration or operation differ from that described in the existing DOCUMENTED SAFETY ANALYSES listed in WV-914, Attachments C and E? (See DOE G 424.1-1, Sections 1 and 2.4.)
   ☐ No
   ☐ Yes
   ☐ Maybe

2. Is there reason to believe that the existing DOCUMENTED SAFETY ANALYSES listed in WV-914, Attachments C and E may not be bounding or may be otherwise inadequate? (See 10 CFR 830.203(d)(4) and DOE G 424.1-1, Section 2.4.)
   ☐ No
   ☐ Yes
   ☐ Maybe

B. **<u>PROPOSED ACTIVITY</u>** (e.g., ER, ECN, work order)

1. Will the PROPOSED ACTIVITY involve a temporary or permanent change in the facility as described in the existing DOCUMENTED SAFETY ANALYSES listed in WV-914, Attachments C and E? (See 10 CFR 830.203(d)(1).)
   ■ No
   ☐ Yes
   ☐ Maybe

2. Will the PROPOSED ACTIVITY involve a temporary or permanent change in the procedures as described in the existing DOCUMENTED SAFETY ANALYSES listed in WV-914, Attachments C and E? (See 10 CFR 830.203(d)(2).)
   ☐ No
   ■ Yes
   ☐ Maybe

3. Will the PROPOSED ACTIVITY involve a test or experiment NOT described in the existing DOCUMENTED SAFETY ANALYSES listed in WV-914, Attachments C and E that might affect safe operations? (See 10 CFR 830.203(d)(3) and DOE G 424.1-1, Section 2.3.)
   ■ No
   ☐ Yes
   ☐ Maybe

4. Will the PROPOSED ACTIVITY require that a change (i.e., a modification, addition, or deletion) be made to the TECHNICAL SAFETY REQUIREMENTS listed in WV-914, Attachment C? (See DOE G 424.1-1, Section 3.2 and Appendix B, Section B.7.)
   ■ No
   ☐ Yes
   ☐ Maybe

5. Will the PROPOSED ACTIVITY invalidate any of the SAFETY MANAGEMENT PROGRAM POLICY STATEMENTS listed in WV-914,
   ■ No
   ☐ Yes

Attachment E? (See 10 CFR 830.203(d).) ☐ Maybe

II. USQ SCREEN. (Concluded)

If the answers to all of the questions in Section II.A or II.B above are "No," then complete Sections III and IV.

If the answer to any of the questions in Section II.A or II.B above is "Yes" or "Maybe," then complete Sections IV, V, VI, and VII.

If the answer to Section II.B.4 above is "Yes" or "Maybe," then DOE approval may be required prior to implementing the PROPOSED ACTIVITY. See WV-365, "Preparation of WVDP Safety Documents," for details.

If the answer to Section II.B.5 above is "Yes" or "Maybe," then DOE approval may be required prior to implementing the PROPOSED ACTIVITY. See WV-365, "Preparation of WVDP Safety Documents," for details.

III. **USQ SCREEN Basis and References.** (Use of this Section is optional. The SAFETY BASIS DOCUMENTS are listed in WV-914, Attachments C, D, and E. Attach additional pages, if needed.)

IV. **USQ SCREEN Conclusion.**

A. Conclusion (Select only one conclusion.)

1. The DISCOVERY or the PROPOSED ACTIVITY is such that a USQD is not required per WV-914. [ ]

2. The DISCOVERY or the **PROPOSED ACTIVITY** is such that a USQD **SHALL** be performed per WV-914. [■]

   The USQD ORIGINATOR **SHALL** provide the completed Sections I, II, III {optional} and IV of USQP FORM WV-3306 to the SAFETY ANALYST who **SHALL** obtain a USQD number from Records and Information and who **SHALL** complete Sections V, VI and VII of USQP FORM WV-3306.

B. Signoff

1. [signature] for Roy Schubert | Roy L. Schubert | November 19, 2002
USQD ORIGINATOR (Signature) | (Printed) | Date

USQD ORIGINATOR **SHALL** have successfully completed USQP training within the last 28 months.

If this is a USQD EXCLUSION per WV-914, Section 7.8, then only a SAFETY ANALYST **SHALL** sign as the USQD ORIGINATOR.

V. **USQD.** (See 10 CFR 830.3 and DOE G 424.1-1, Section 3.3 and Appendix A.)
Obtain USQD # from Records and Information.
DOCUMENTED SAFETY ANALYSES are listed in WV-914, Attachments C and E.

A. Could the probability of occurrence of an ACCIDENT previously evaluated in the existing DOCUMENTED SAFETY ANALYSES be increased?
- ■ No
- ☐ Yes
- ☐ Maybe

B. Could the consequences of an ACCIDENT previously evaluated in the existing DOCUMENTED SAFETY ANALYSES be increased?
- ■ No
- ☐ Yes
- ☐ Maybe

C. Could the probability of occurrence of a malfunction of SAFETY SSCs previously evaluated in the existing DOCUMENTED SAFETY ANALYSES be increased?
- ■ No
- ☐ Yes
- ☐ Maybe

D. Could the consequences of a malfunction of SAFETY SSCs previously evaluated in the existing DOCUMENTED SAFETY ANALYSES be increased?
- ■ No
- ☐ Yes
- ☐ Maybe

E. Could the possibility of an ACCIDENT of a different type than previously evaluated in the existing DOCUMENTED SAFETY ANALYSES be created?
- ■ No
- ☐ Yes
- ☐ Maybe

F. Could the possibility of a malfunction of SAFETY SSCs of a different type than previously evaluated in the existing DOCUMENTED SAFETY ANALYSES be created?
- ■ No
- ☐ Yes
- ☐ Maybe

G. Could the MARGIN OF SAFETY as defined in the basis for any TECHNICAL SAFETY REQUIREMENT be reduced?
- ■ No
- ☐ Yes
- ☐ Maybe

VI. **USQD Basis and References.**

This Section **SHALL** justify each of the USQD responses in Section V. It should also include the specific revision of the documents that were reviewed. The SAFETY BASIS DOCUMENTS are listed in WV-914, Attachments C, D, and E. Attach additional pages, if needed.

See attached pages 5 and 6

VII. **USQD Conclusion.**

A. Conclusion (Select only one conclusion.)

1. The DISCOVERY or the PROPOSED ACTIVITY is not a USQ. [■]

2. The DISCOVERY is a potential USQ that **SHALL** be reviewed by the RADIATION AND SAFETY COMMITTEE (R&SC). [ ]

3. The PROPOSED ACTIVITY, if implemented, would be a USQ. [ ]

The Cognizant Manager **SHALL** ensure: (1) preparation of a proposed revision to the DOCUMENTED SAFETY ANALYSIS per WV-365 and receipt of DOE approval of it prior to implementation of the PROPOSED ACTIVITY; or (2) modification of the PROPOSED ACTIVITY; or (3) termination of the PROPOSED ACTIVITY. (See 10 CFR 830.203(e).)

B. Signoff

1. JC Wolniewicz for Roy Schubert	R.L. Schubert	November 19, 2002
SAFETY ANALYST (Signature)	(Printed)	Date

SAFETY ANALYST **SHALL** have successfully completed USQP training within the last 28 months.

Concurrence

2. JC Wolniewicz	J.C. Wolniewicz	November 19, 2002
SAFETY ANALYST REVIEWER (Signature)	(Printed)	Date

SAFETY ANALYST REVIEWER **SHALL** have successfully completed USQP training within the last 28 months.

VI. **USQD Basis and References. (Continued)**

WVNS-SAR-003(Rev. 8), Section C.5.2.6 and Table C.9.3-2 was consulted to establish the accuracy of the following responses. The PROPOSED ACTIVITY entails transfer of a radiation probe and support bracket into the Vit cell, installation of the support bracket onto the maintenance station using the in-cell crane, and then using the in-cell crane to move the probe around the Vit cell to take remote radiation readings of components in the Vit cell.

A. Could the probability of occurrence of an ACCIDENT previously evaluated in the existing DOCUMENTED SAFETY ANALYSES be increased?

The accident evaluated in WVNS-SAR-003 (Rev. 8) that is relevant to the PROPOSED ACTIVITY is the possibility of the loss of vitrified HLW from a filled canister due to a heavy object dropped on the canister. Because the canisters have been removed from the Vit Cell, it is not the case that the probability of this accident can be increased. Similarly, the removal of the HLW from the Vit cell precludes the possibility of an increase in the probability of occurrence of other accidents previously analyzed in WVNS-SAR-003. Thus, it is not the case that the probability of occurrence of an ACCIDENT previously evaluated in the existing DOCUMENTED SAFETY ANALYSES will be increased.

B. Could the consequences of an ACCIDENT previously evaluated in the existing DOCUMENTED SAFETY ANALYSES be increased?

The accident evaluated in WVNS-SAR-003 (Rev 8) that is relevant to the PROPOSED ACTIVITY is the possibility of the loss of vitrified HLW from a filled canister due to a heavy object dropped on the canister. Because the canisters have been removed from the Vit Cell, it is not the case that the consequences of this accident can be increased. Similarly, the removal of the HLW from the Vit cell precludes the possibility of an increase in the consequences of other accidents previously analyzed in WVNS-SAR-003. The PROPOSED ACTIVITY will not increase the hazardous material inventory of the Vit Cell, nor will it disable any preventative or mitigative features. Thus,it is not the case that the PROPOSED ACTIVITY will increase the consequences of an accident previously evaluated in the existing DOCUMENTED SAFETY ANALYSES

C. Could the probability of occurrence of a malfunction of SAFETY SSCs previously evaluated in the existing DOCUMENTED SAFETY ANALYSES be increased?

There is no equipment important to safety associated with the PROPOSED ACTIVITY, and therefore it is not the case that the probability of occurrence of a malfunction of SAFETY SSCs previously evaluated in the existing DOCUMENTED SAFETY ANALYSES will be increased.

D. Could the consequences of a malfunction of SAFETY SSCs previously evaluated in the existing DOCUMENTED SAFETY ANALYSES be increased?

There is no equipment important to safety associated with the PROPOSED ACTIVITY, and therefore it is not the case that the consequences of a malfunction of SAFETY SSCs previously evaluated in the existing DOCUMENTED SAFETY ANALYSES will be increased.

E. Could the possibility of an ACCIDENT of a different type than previously evaluated in the existing DOCUMENTED SAFETY ANALYSES be created?

Because the PROPOSED ACTIVITY will not introduce any new source terms or credible significant energy sources, nor will it affect equipment or structures that present a significant energy source, it is not the case that the possibility of an ACCIDENT of a different type than previously evaluated in the existing DOCUMENTED SAFETY ANALYSES will be created.

VI. **USQD Basis and References. (Concluded)**

F. Could the possibility of a malfunction of SAFETY SSCs of a different type than previously evaluated in the existing DOCUMENTED SAFETY ANALYSES be created?

There is no equipment important to safety associated with the PROPOSED ACTIVITY, and therefore it is not the case that the possibility of a malfunction of SAFETY SSCs of a different type than previously evaluated in the existing DOCUMENTED SAFETY ANALYSES will be created

G. Could the MARGIN OF SAFETY as defined in the basis for any TECHNICAL SAFETY REQUIREMENT be reduced?

There are no TSRs associated with the PROPOSED ACTIVITY, and therefore it is not the case that the MARGIN OF SAFETY as defined in the basis for any TECHNICAL SAFETY REQUIREMENT be reduced.

Appendix F

Certificate of Calibration for the Shielded Radiation Probe

CERTIFICATE OF CALIBRATION

Ludlum Model 2350

Serial Number: 149798   Batteries Changed: NO   Calibration Date: 1-7-03

Instrument Received: ✓ Within ± 10%   ____ Out of Tolerance   ____ Requiring Repair

Digital Readout Calibration: (use Det #5 Parameters)   Pulser Serial Number: 153617

As Found Data		As Left Data			
400 cpm	400 cpm	400 cpm	400 cpm	800 cpm	800 cpm
4000 cpm	3.99K cpm	4000 cpm	3.99K cpm	8000 cpm	7.99K cpm
40000 cpm	39.8K cpm	40000 cpm	39.8K cpm	80000 cpm	79.7K cpm
400000 cpm	399K cpm	400000 cpm	399K cpm	800000 cpm	798K cpm

Detector Setup:

	Model	Serial #	HV	Threshold	Window	Units / Time Base	Dead Time Corr. Factor	Calibration Constant	Display
Det # 1									
Det # 2	133-8	PR192948	460	100	OFF	4/2	20 uSEC	3.6E4	1
Det # 3									
Det # 4									

Units: 0 - Rad, 1 - Gray, 2 - Rem, 3 - Sv, 4 - R, 5 - C/Kg, 6 - Disintegrations, 7 - Counts, 8 - Ci/cm, 9 - Bq/cm sq
Time Base: 0 - Seconds, 1 - Minutes, 2 - Hours
Display: 1 - Ratemeter, 2 - Scaler, 3 - Rate + Scaler, 4 - Integrated Dose, 5 - Rate + Int Dose, 6 - Scaler + Int Dose, 7 - All Counters

Source Cal Point Check:

Source type Cs 137   Source Serial Number 122

Detector Number	Source Cal Point	Instrument Reading	Detector Number	Source Cal Point	Instrument Reading
#2 ON	#3 @ 5" 810 mR/hr	850 mR/hr			
50' cond vertical	#4 @ 5" 20.7 R/hr	22.3 R/hr			
	#8 @ 5" 145 R/hr	154 R/hr			
	#8 @ 2" 250 R/hr	255 R/hr			

Comments: Source Check performed in Cal Lab with detector #2 in fixture using Cs137 source SN 2145GF @ 8" = 100 mR/hr

Maintenance: PM checks - OK

Batteries Inspected ✓ Changed/Charged — Contacts Cleaned —

Next Calibration Due Date: 7-31-03

Calibration Tech Signature* [signature]   Date: 1-7-03

Reviewed By: [signature]   Date: 1/28/03

RP CALIBRATION
S/N 202-SURPO-149798
BY GR DATE 7/3/03
DATE DUE 1/31/03

* FOR CALIBRATION CYCLES, CERTIFIES THAT CALIBRATION WAS COMPLETED SATISFACTORILY

APPROVAL OF CERTIFICATE FOR USE:

Approved: [signature] 12/31/02   Approved: [signature] 1/2/03
R P Labs Team Lead   Date   R P Operations Manager   Date

Appendix G

Certificate of Calibration for the Unshielded Radiation Probe

CERTIFICATE OF CALIBRATION

Ludlum Model 2350

Serial Number: 149792 **Batteries Changed:** YES **Calibration Date:** 12-20-02

Instrument Received: ✓ Within ± 10% ____ Out of Tolerance ____ Requiring Repair

Digital Readout Calibration: (use Det #5 Parameters) **Pulser Serial Number:** N/A *

As Found Data

400 cpm	cpm
4000 cpm	N/A * cpm
40000 cpm	cpm
400000 cpm	cpm

As Left Data

400 cpm	cpm	800 cpm	cpm
4000 cpm	N/A * cpm	8000 cpm	N/A * cpm
40000 cpm	cpm	80000 cpm	cpm
400000 cpm	cpm	800000 cpm	cpm

Detector Setup:

	Model	Serial #	HV	Threshold	Window	Units / Time Base	Dead Time Corr. Factor	Calibration Constant	Display
Det # 1									
Det # 2									
Det # 3									
Det # 4	133-8-1	PR164124	460	100	OFF	4/2	17 usec	4.4E4	1
Det # 6									

Units: 0 - Rad, 1 - Gray, 2 - Rem, 3 - Sv, 4 - R, 5 - C/Kg, 6 - Disintegrations, 7 - Counts, 8 - Ci/cm, 9 - Bq/cm sq
Time Base: 0 - Seconds, 1 - Minutes, 2 - Hours
Display: 1 - Ratemeter, 2 - Scaler, 3 - Rate + Scaler, 4 - Integrated Dose, 5 - Rate + Int Dose, 6 - Scaler + Int Dose, 7 - All Counters

Source Cal Point Check:

Source type Cs^{137} Source Serial Number 122

Detector Number	Source Cal Point	Instrument Reading	Detector Number	Source Cal Point	Instrument Reading
#4 ON	#3 @ 4.5" 870 mR/hr	880 mR/hr			
100' CABLE	#4 @ 4.5" 23 R/hr	24.2 R/hr			
	#8 @ 4.5" 160 R/hr	164 R/hr			
	#8 @ 1.5" 280 R/hr	278 R/hr			

Comments: * ADDED DETECTOR

Maintenance: PM CHECKS-OK

Next Calibration Due: 1-31-03 Signature:* [signature] 12-20-02
Calibration Technician Date

* FOR CALIBRATION CYCLES, CERTIFIES THAT CALIBRATION WAS COMPLETED SATISFACTORILY

APPROVAL OF CERTIFICATE FOR USE:

Approved: [signature] 6/4/02 Approved: [signature] 6/4/02
R P Labs Team Lead Date R P Operations Manager Date

Appendix H

Peer Reviewed Results of Scaling Factors

Radionuclide	Radionuclide value for batch 10 (decayed to survey date of 1/1/03)	Scaling Factor
Am-241	3.21e+01	1.28e-02
C-14	4.90e-04	1.96e-07
Cm-243	2.25e-01	8.98e-05
Cm-244	5.42e+00	2.16e-03
Cs-137	2.50e+03	1.00e+00
I-129	3.90e-07	1.56e-10
Np-237	2.00e-02	8.01e-06
Pu-238	3.78e+00	1.51e-03
Pu-239	1.09e+00	4.35e-04
Pu-240	7.73e-01	3.09e-04
Pu-241	2.62e+01	1.04e-02
Sr-90	2.40e+03	9.58e-01
Tc-99	8.45e-02	3.37e-05
U-232	9.44e-03	3.78e-06
U-233	3.60e-03	1.44e-06
U-234	1.36e-03	5.44e-07
U-235	3.80e-05	1.52e-08
U-238	3.40e-04	1.36e-07

Decay and Scaling Factor Originator [signature] / F. Lachapelle / 1/27/03
Signature/Print Name/Date

Decay and Scaling Factor Peer Reviewer [signature] / L. Michalczak / 1/27/03
Signature/Print Name/Date

Appendix I

WVNSCO Internal Memorandum FI:2002:0003 (Reissue), "Bounding Isotope Ratios for NFS Spent Fuels"

WVNSCO
West Valley Nuclear Services Company

Department	:	Facility Characterization Project			
Ext/MS	:	4183/WV-51			
Memo #	:	FI:2002:0003 - **Reissue**			
Date	:	February 19, 2002			
Subject	:	Bounding Isotope Ratios for NFS Spent Fuels			
To	:	A. Drobot	WV-48	L. E. Rowell	WV-53
		J. A. Choroser	WV-B1F	P. A. Winkler	WV-Z26
		L. M. Michalczak	WV-TSB		
cc	:	[redacted]			
		FI Letter Log	WV-51		

For facility characterization purposes, the relative proportions of key radioactive isotopes must be used to calculate the amount of isotopes present in particular areas of the process building. This memo presents bounding ratios (relative to Cs-137) of most of the key isotopes. It was derived from WVDP-EIS-014, "Characterization of Reactor Fuel Reprocessed at West Valley." In WVDP-EIS-014, the various fuels were modeled by Pacific Northwest National Laboratory using ORIGEN to compute the fission isotopes, activated isotopes, and actinide isotopes. Isotope values (decayed to January 1, 1993) were entered into a spreadsheet (available from the author) as shown in Attachment A.

Graphic representation of the various curie amounts are presented in Attachment B. For many of the isotopes, there is a clear relationship to the presence of Cs-137 as would be expected. Bounding values were selected for the ratio to Cs-137 (for most isotopes) and are presented in Table 1. Use of these ratios must be carefully reviewed to ensure that these ratios apply to the area in question. NFS conducted numerous separations (including removing activated stainless steel fittings in the PMC) which will impact some of these ratios dramatically.

The one notable set of isotopes which required a different approach were the uranium isotopes. NFS processed a set of fuel assemblies from Hanford that had not been run through a reactor operating cycle (NFS Campaign #14). Also, the final campaign processed solutions from the fabrication of a plutonium/uranium fuel (SEFOR). Thus, the amount of U-235 or U-238 was not related to any Cs-137 value since fission production of Cs-137 had not occurred.

Also of note, the unusual uranium isotopes of U-232, U-233, and U-234 were generated during the reactor life cycle of the ThO_2/UO_2 fuel (NFS Campaign #11). Compared to a normal uranium-based fuel, the relative amounts of these isotopes from the THOREX fuel is thousands to billions of times higher.

Using summaries of NFS accountability for recovered and accounted losses of uranium, the mixture of unaccounted uranium (and corresponding Cs-137) from all the NFS campaigns was calculated (Attachment C). The scaling factors for U-235 and U-238 were picked such that 95% of the unaccounted uranium would be associated with the corresponding Cs-137 value.

The challenge for the other uranium isotopes was to select a bounding value for these isotopes from the THOREX campaign. Since the NFS ThO_2 fuel uranium accounting showed more than 100% accounted, the unaccounted value was adjusted. A value was selected such that the relative proportion of U-232 to (U-235+U-236) matched a high value from the recent ARPR job (Sample RC-1). The presence of U-232, U-233, and U-234 in the ARPR samples show that not all the uranium from the ThO_2 fuel was accurately accounted for by NFS. In other words, historic records optimistically suggested that less uranium was left in the Process Building from THOREX than what current sampling data indicates. The specific isotope ratios were calculated relative to U-238 and are presented in Table 2.

Table 1

Bounding Ratio of Key Isotopes to Cs-137 for
NFS Reprocessed Fuels
REFERENCE DATE = 1/1/93

Isotope	Ratio to Cs-137
C-14	1.3E-4
Tc-99	2.7E-4
I-129	6.3E-7
Np-237	4.5E-6
Pu-238	1.69E-2
Pu-239	2.84E-2
Pu-240	1.48E-2
Pu-241	0.910
Am-241	8.58E-2
Cm-242	2.0E-4
Cm-243	5.9E-5
Cm-244	1.52E-3

Table 2

Bounding Ratio of Uranium Isotopes for
NFS Reprocessed Fuels
REFERENCE DATE = 1/1/93

Isotope	Scaling Isotope	Scaling Factor
U-232	U-238	0.69
U-233	U-238	1.40
U-234	U-238	0.090
U-235	Cs-137	1.5E-6
U-236	U-238	0.139
U-238	Cs-137	2.6E-5

The bounding ratios in these tables reflect conservative estimates and can be adjusted as appropriate. All the ratios will need to be adjusted to account for the Cs-137 decay since the January 1, 1993 reference date. Note that some isotopes (Pu-241, Am-241) will need to be adjusted to match the short decay life of Pu-241 and the accompanying ingrowth of Am-241. The uranium bounding values may need to be updated as other information is collected during the facility characterization effort.

J. L. Mahoney, Senior Project Manager

JLM:MLG

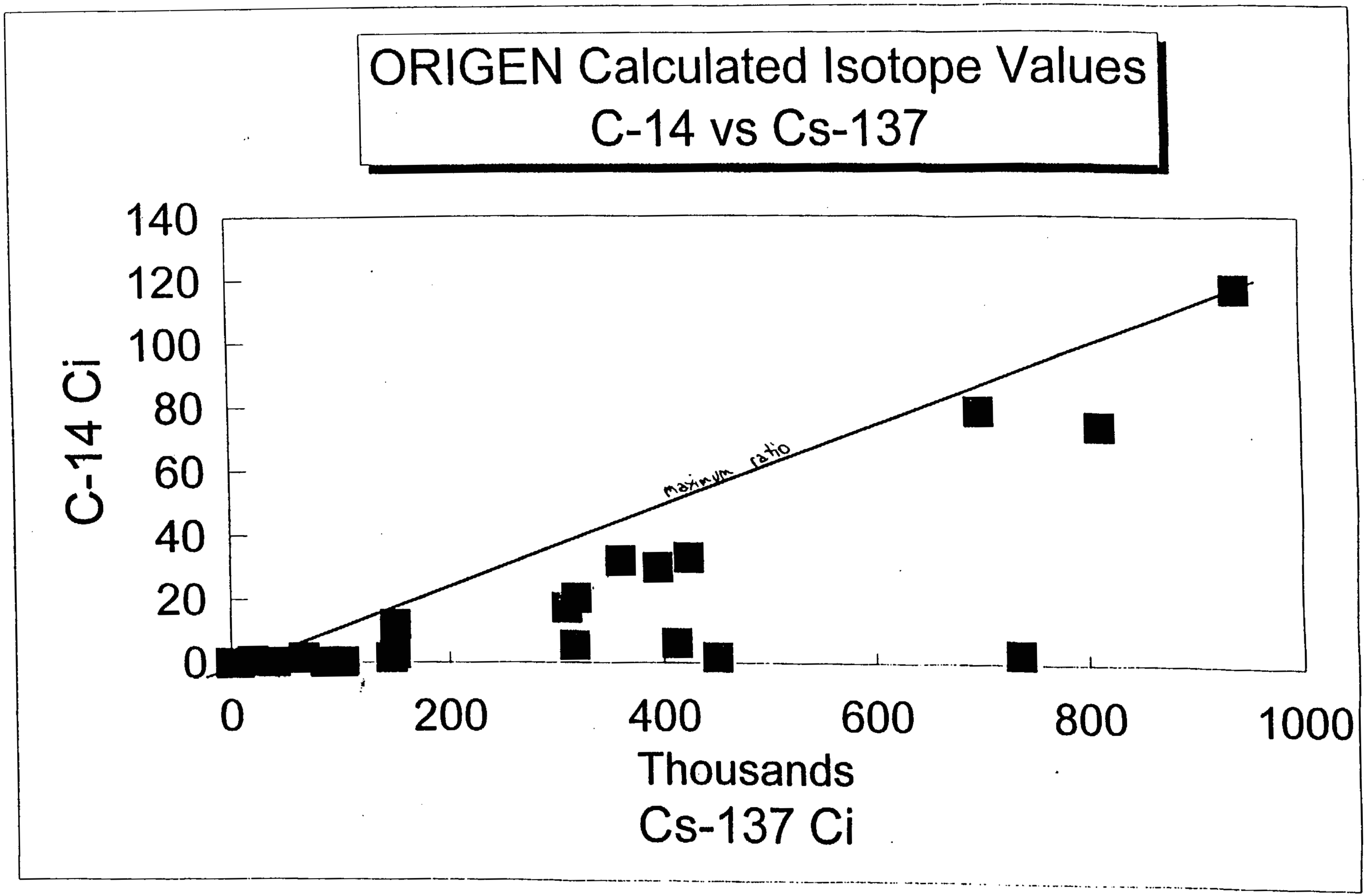
Attachment: A) ORIGEN Calculated Curies - NFS Campaigns
B) Graphic Representation of Various Curie Amounts
C) Calculation of Spent Fuel Uranium Isotopic Ratios

Attachment A

ORIGEN Calculated Curies - NFS Campaigns

	#1, #2	#3	#4 Batch 1	#4 Batch 3	#4 Batch 4	#5	#6, #7, #8	#11	#9, #10, #12	#13	#14	#15	#16	#18	#19	#20	#21	#22	#23	#17, #24	#25	#26	Total
H-3	1.21E+01	2.09E+02	2.85E+02	6.55E+02	2.91E+02	1.85E+03	9.94E+02	6.43E+02	1.69E+03	1.47E+03	0.00E+00	9.53E+02	9.00E+02	8.51E+01	6.68E+02	6.99E+02	2.10E+02	4.14E+01	8.89E+02	1.75E+03	1.45E+02	3.32E+02	1.48E+04
C-14	3.04E-02	4.73E-01	2.85E+00	5.61E+00	1.22E+01	1.18E+02	1.94E+00	3.23E+01	3.08E+00	7.96E+01	0.00E+00	6.38E+00	3.33E+01	4.23E-01	1.74E+01	2.05E+01	3.24E-01	6.45E-01	3.01E+01	7.47E+01	1.58E+00	1.74E+00	4.43E+02
Ni-59	7.37E-03	1.13E-01	2.12E+00	4.04E+00	2.25E+01	2.45E+02	4.58E-01	6.99E+01	7.27E-01	1.60E+02	0.00E+00	4.78E+00	6.72E+01	7.32E-02	5.68E+01	4.08E+01	7.64E-02	2.57E+00	1.00E+02	1.50E+02	4.41E+00	9.60E+00	9.41E+02
Co-60	7.98E-01	1.23E+01	9.48E+01	2.11E+02	1.12E+03	1.22E+04	5.91E+01	3.88E+03	1.08E+02	9.84E+03	0.00E+00	3.96E+02	3.86E+03	1.47E+01	4.99E+03	2.96E+03	1.49E+01	2.45E+02	8.58E+03	1.12E+04	6.82E+02	9.57E+02	6.14E+04
Fe-55	7.91E-02	1.22E+00	5.10E+00	1.35E+01	1.03E+02	1.28E+03	6.99E+00	4.75E+02	1.48E+01	1.28E+03	0.00E+00	3.87E+01	4.70E+02	4.47E-01	4.51E+02	4.60E+02	2.66E+00	1.72E+01	6.61E+02	1.80E+03	2.59E+00	9.37E+00	7.09E+03
Ni-63	7.39E-01	1.15E+01	2.41E+02	4.74E+02	2.60E+03	2.53E+04	4.72E+01	7.21E+03	7.55E+01	1.70E+04	0.00E+00	5.77E+02	7.12E+03	8.62E+00	6.78E+03	4.42E+03	8.07E+00	3.03E+02	1.21E+04	1.62E+04	5.55E+02	1.17E+03	1.02E+05
Nb-94	3.41E-03	5.28E-02	2.84E-01	5.53E-01	9.18E-02	8.66E-01	2.16E-01	2.38E-01	3.42E-01	5.90E-01	0.00E+00	6.36E-01	2.41E-01	6.30E-02	1.08E+00	1.48E-01	3.60E-02	7.99E-02	2.78E+00	5.41E-01	1.56E-01	1.34E+00	1.03E+01
Tc-99	1.66E+00	2.67E+01	4.12E+01	8.30E+01	3.95E+01	2.41E+02	1.13E+02	9.10E+01	1.80E+02	1.69E+02	0.00E+00	9.93E+01	1.04E+02	9.61E+00	7.38E+01	7.41E+01	1.99E+01	4.60E+00	9.36E+01	1.90E+02	1.52E+01	3.37E+01	1.70E+03
Sr-90	5.58E+03	8.57E+04	1.13E+05	2.16E+05	1.22E+05	7.83E+05	3.54E+05	3.41E+05	5.76E+05	5.61E+05	0.00E+00	2.82E+05	3.29E+05	3.44E+04	2.61E+05	2.52E+05	6.69E+04	1.71E+04	3.10E+05	6.71E+05	5.44E+04	1.17E+05	5.55E+06
I-129	2.97E-03	5.37E-02	9.15E-02	2.00E-01	8.12E-02	4.83E-01	2.43E-01	1.49E-01	3.89E-01	3.54E-01	0.00E+00	2.38E-01	2.26E-01	1.79E-02	1.44E-01	1.57E-01	4.31E-02	8.44E-03	1.99E-01	3.84E-01	2.85E-02	6.98E-02	3.56E+00
Cs-137	6.13E+03	1.02E+05	1.49E+05	3.16E+05	1.50E+05	9.40E+05	4.50E+05	3.60E+05	7.36E+05	6.99E+05	0.00E+00	4.12E+05	4.24E+05	3.92E+04	3.09E+05	3.18E+05	8.55E+04	1.92E+04	3.95E+05	8.12E+05	6.58E+04	1.46E+05	6.93E+06
Np-237	2.15E-02	3.81E-01	5.67E-01	1.42E+00	5.06E-01	3.27E+00	1.76E+00	6.97E-01	2.83E+00	3.02E+00	0.00E+00	1.69E+00	1.82E+00	7.65E-02	8.49E-01	1.43E+00	3.12E-01	3.24E-02	1.35E+00	3.34E+00	8.47E-02	5.06E-01	2.60E+01
Pu-238	2.32E-01	2.36E+02	8.97E+02	5.23E+03	8.37E+02	5.56E+03	2.34E+03	7.91E+02	4.03E+03	9.34E+03	0.00E+00	6.15E+03	5.43E+03	3.34E+01	1.32E+03	5.36E+03	4.55E+02	1.69E+01	3.33E+03	1.03E+04	1.59E+02	1.29E+03	6.31E+04
Pu-239	2.30E+02	2.90E+03	3.64E+03	5.03E+03	2.30E+03	1.06E+04	9.65E+03	1.05E+01	1.50E+04	5.28E+03	0.00E+00	5.63E+03	4.10E+03	8.78E+02	3.56E+03	2.13E+03	1.66E+03	3.47E+02	4.80E+03	5.03E+03	5.41E+02	1.40E+03	8.47E+04
Pu-240	2.45E+00	7.98E+02	2.06E+03	4.67E+03	1.42E+03	6.92E+03	4.95E+03	5.32E+00	8.05E+03	5.48E+03	0.00E+00	5.46E+03	3.93E+03	1.88E+02	2.11E+03	2.44E+03	8.93E+02	7.46E+01	3.73E+03	5.29E+03	5.36E+02	1.19E+03	6.02E+04
Pu-241	2.50E+00	1.47E+04	7.64E+04	2.70E+05	6.05E+04	3.17E+05	1.89E+05	1.78E+02	3.41E+05	3.13E+05	0.00E+00	3.75E+05	2.32E+05	3.37E+03	9.48E+04	1.60E+05	4.18E+04	1.32E+03	2.18E+05	3.10E+05	1.28E+04	7.40E+04	3.10E+06
Pu-242	6.00E-07	6.62E-02	8.30E-01	6.06E+00	6.84E-01	3.56E+00	1.70E+00	1.36E-03	3.08E+00	6.42E+00	0.00E+00	7.70E+00	4.52E+00	8.65E-03	8.45E-01	3.48E+00	3.44E-01	3.15E-03	2.82E+00	5.75E+00	2.27E-01	1.03E+00	4.91E+01
Am-241	2.26E-01	1.32E+03	8.37E+03	2.71E+04	5.86E+03	2.91E+04	1.55E+04	1.51E+01	2.60E+04	2.57E+04	0.00E+00	3.05E+04	1.97E+04	2.47E+02	6.97E+03	1.19E+04	2.78E+03	9.31E+01	1.59E+04	2.29E+04	8.83E+02	5.13E+03	2.56E+05
Am-242m	9.09E-08	1.61E-01	8.20E+00	7.53E+01	5.57E+00	1.94E+01	7.39E+00	1.35E-02	1.41E+01	4.38E+01	0.00E+00	6.72E+01	3.30E+01	1.06E-02	5.95E+00	3.04E+01	1.59E+00	1.56E-02	3.17E+01	4.54E+01	3.04E-01	8.20E+00	3.98E+02
Am-242	9.04E-08	1.60E-01	8.16E+00	7.49E+01	5.54E+00	1.93E+01	7.36E+00	1.34E-02	1.40E+01	4.36E+01	0.00E+00	6.68E+01	3.28E+01	1.06E-02	5.92E+00	3.02E+01	1.58E+00	1.56E-02	3.15E+01	4.52E+01	3.03E-01	8.15E+00	3.96E+02
Am-243	2.27E-08	2.97E-02	1.74E+00	2.60E+01	1.62E+00	8.89E+00	1.23E+00	2.43E-03	2.30E+00	3.02E+01	0.00E+00	3.54E+01	1.94E+01	5.96E-03	1.88E+00	1.89E+01	2.57E-01	2.07E-03	9.09E+00	2.69E+01	3.09E-01	3.75E+00	1.88E+02
Cm-242	7.48E-08	1.32E-01	6.75E+00	6.20E+01	4.58E+00	1.60E+01	6.08E+00	1.11E-02	1.16E+01	3.61E+01	0.00E+00	5.53E+01	2.72E+01	8.75E-03	4.90E+00	2.50E+01	1.31E+00	1.29E-02	2.61E+01	3.74E+01	2.51E-01	6.74E+00	3.27E+02
Cm-243	1.71E-10	6.41E-03	9.01E-01	1.87E+01	8.06E-01	3.54E+00	6.62E-01	1.38E-03	1.37E+00	1.83E+01	0.00E+00	2.27E+01	1.15E+01	4.88E-04	9.14E-01	1.41E+01	1.61E-01	6.15E-04	6.49E+00	1.85E+01	2.44E-01	2.34E+00	1.21E+02
Cm-244	5.43E-08	1.53E+00	1.14E+01	3.82E+02	1.29E+01	7.79E+01	1.43E+02	1.60E-02	2.97E+02	5.54E+02	0.00E+00	6.28E+02	3.14E+02	1.59E-02	1.67E+01	4.27E+02	3.60E+01	5.46E-03	1.19E+02	5.23E+02	2.77E+00	5.73E+01	3.60E+03
Eu-154	3.71E-01	1.84E+02	6.51E+02	3.12E+03	7.80E+02	5.41E+03	1.84E+03	1.32E+03	3.39E+03	8.08E+03	0.00E+00	5.13E+03	4.51E+03	7.15E+01	1.84E+03	4.62E+03	4.44E+02	3.44E+01	3.59E+03	1.01E+04	7.26E+02	1.52E+03	5.74E+04
Eu-155	1.05E+01	9.39E+01	1.83E+02	5.20E+02	1.94E+02	1.20E+03	3.76E+02	3.31E+02	6.87E+02	1.27E+03	0.00E+00	9.83E+02	7.54E+02	8.93E+01	5.90E+02	7.44E+02	1.01E+02	4.40E+01	8.86E+02	1.68E+03	1.20E+02	3.42E+02	1.12E+04

	#1, #2	#3	#4 Batch 1	#4 Batch 3	#4 Batch 4	#5	#6, #7, #8	#11	#9, #10, #12	#13	#14	#15	#16	#18	#19	#20	#21	#22	#23	#17, #24	#25	#26	Total
U-232	3.03E-06	2.72E-03	9.13E-03	3.84E-02	8.93E-03	7.83E-02	2.58E-02	9.27E+02	4.43E-02	1.19E-01	0.00E+00	4.85E-02	6.72E-02	3.99E-04	1.48E-02	6.54E-02	5.02E-03	2.58E-04	3.21E-02	1.35E-01	5.41E-04	1.27E-02	9.28E+02
U-233	3.21E-06	5.40E-05	8.16E-05	1.84E-04	7.13E-05	4.78E-04	2.28E-04	1.89E+03	3.51E-04	3.89E-04	0.00E+00	1.99E-04	2.37E-04	1.12E-05	1.10E-04	1.73E-04	3.61E-05	4.91E-06	1.62E-04	4.15E-04	9.67E-06	5.88E-05	1.89E+03
U-234	2.21E-03	3.51E-02	1.05E-01	5.10E-01	9.37E-02	6.53E-01	2.45E-01	8.93E+01	4.00E-01	8.71E-01	6.90E-04	5.30E-01	5.16E-01	7.47E-03	1.35E-01	4.58E-01	4.18E-02	3.71E-03	2.91E-01	9.14E-01	1.34E-02	1.09E-01	9.52E+01
U-235	1.04E+00	8.80E-01	4.41E-01	3.35E-01	4.25E-01	2.61E+00	1.56E+00	1.60E+00	2.31E+00	8.63E-01	1.16E+00	3.73E-01	5.53E-01	4.06E-01	9.20E-01	3.10E-01	2.55E-01	2.18E-01	6.86E-01	1.02E+00	6.55E-02	2.24E-01	1.83E+01
U-236	4.73E-02	6.87E-01	9.45E-01	1.58E+00	1.03E+00	6.60E+00	2.61E+00	3.05E+00	4.11E+00	4.36E+00	0.00E+00	1.90E+00	2.52E+00	2.77E-01	2.05E+00	1.88E+00	4.55E-01	1.39E-01	2.31E+00	5.16E+00	3.45E-01	8.60E-01	4.29E+01
U-237	6.13E-05	3.60E-01	1.88E+00	6.63E+00	1.49E+00	7.77E+00	4.64E+00	4.37E-03	8.35E+00	7.67E+00	0.00E+00	9.21E+00	5.68E+00	8.28E-02	2.33E+00	3.91E+00	1.03E+00	3.24E-02	5.34E+00	7.60E+00	3.13E-01	1.82E+00	7.61E+01
U-238	1.62E+01	1.55E+01	6.26E+00	6.43E+00	3.72E+00	1.60E+01	3.16E+01	1.89E-02	4.75E+01	6.25E+00	1.00E+01	7.04E+00	5.03E+00	3.15E+00	5.96E+00	2.42E+00	5.25E+00	1.34E+00	6.77E+00	5.94E+00	1.15E+00	1.87E+00	2.05E+02



Attachment B

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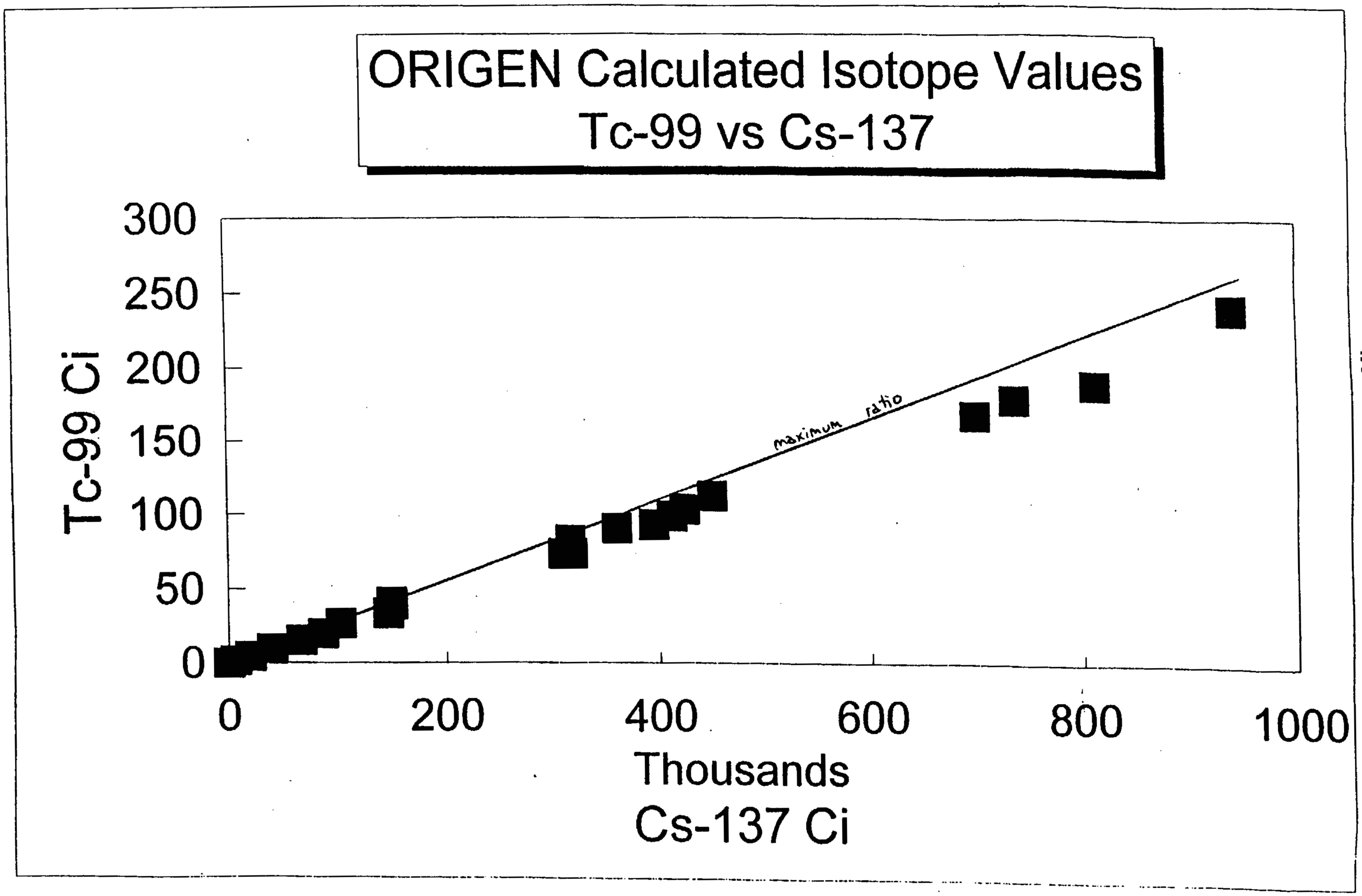
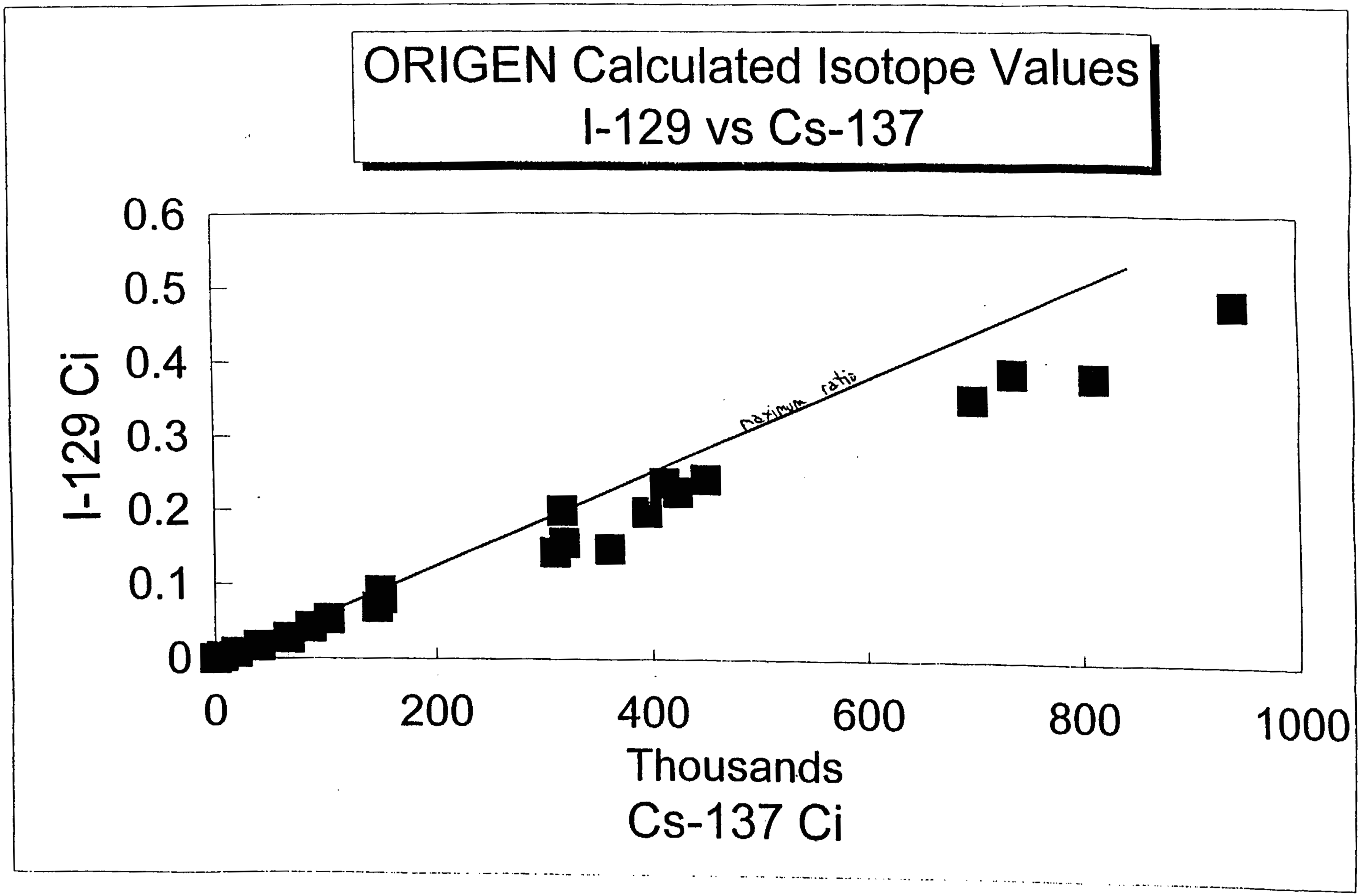
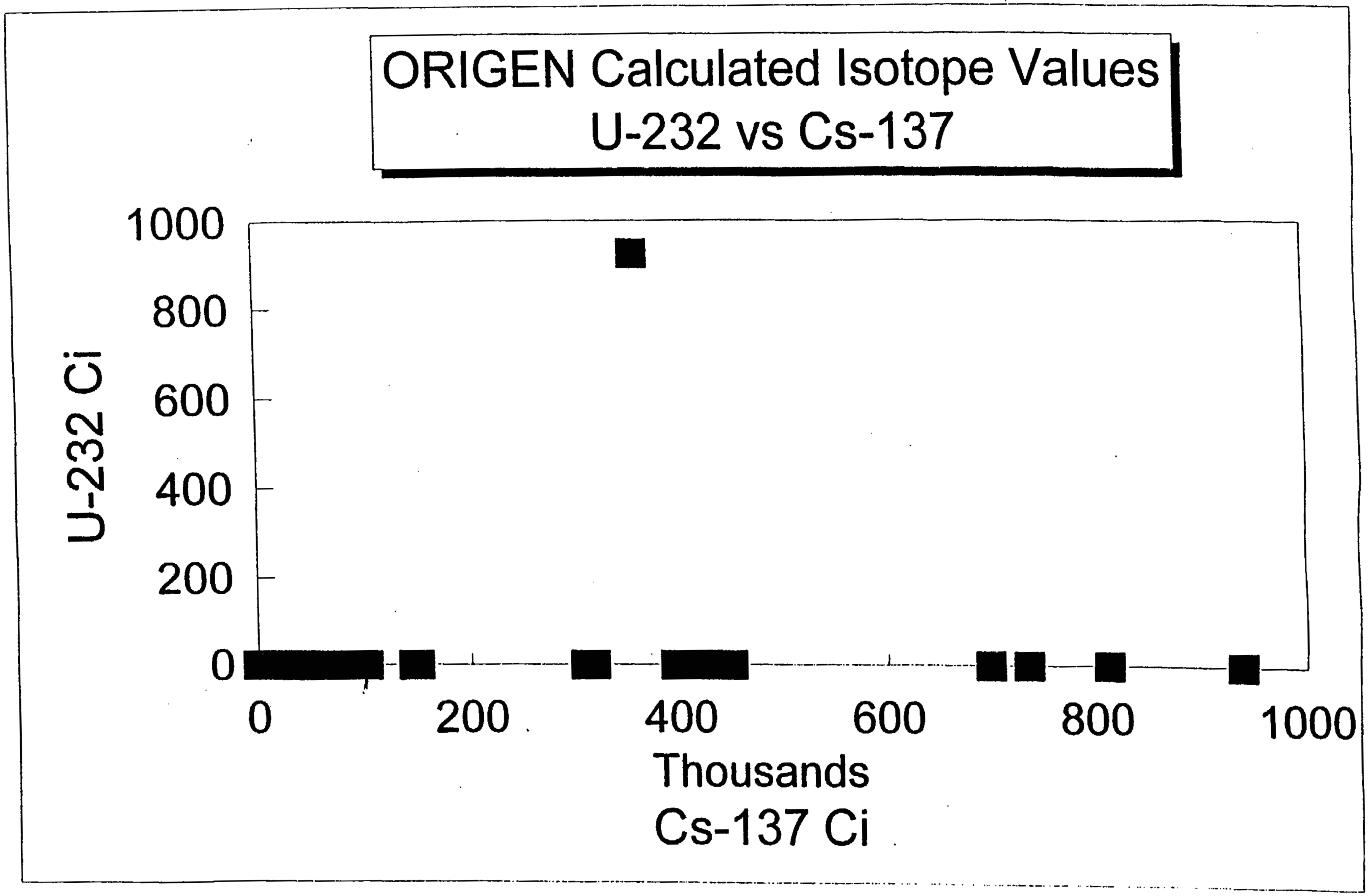
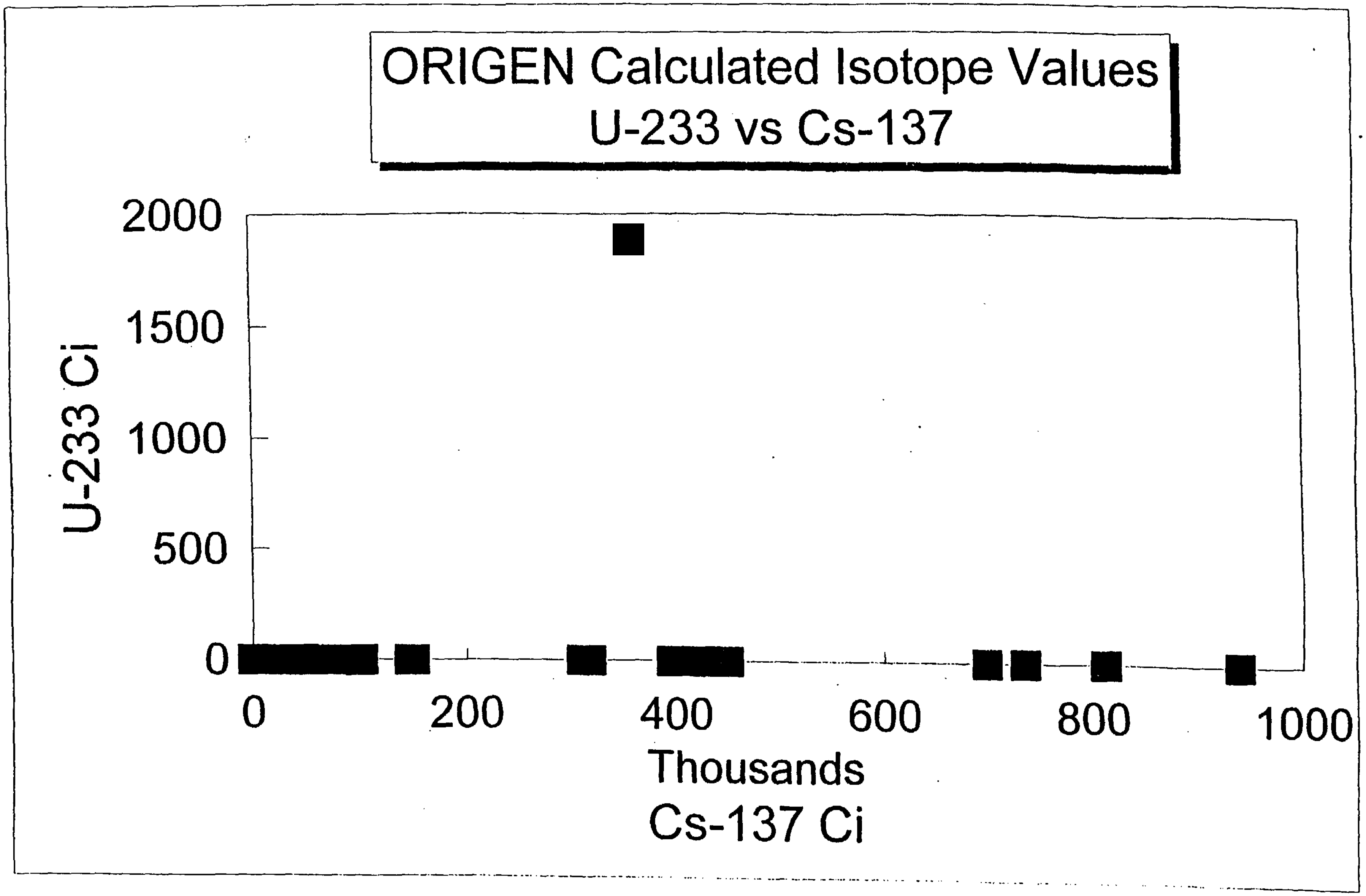

ORIGEN Calculated Isotope Values
Tc-99 vs Cs-137
Tc-99 Ci
300
250
200
150
100
50
0
0
200
400
600
800
1000
Thousands
Cs-137 Ci
maximum ratio



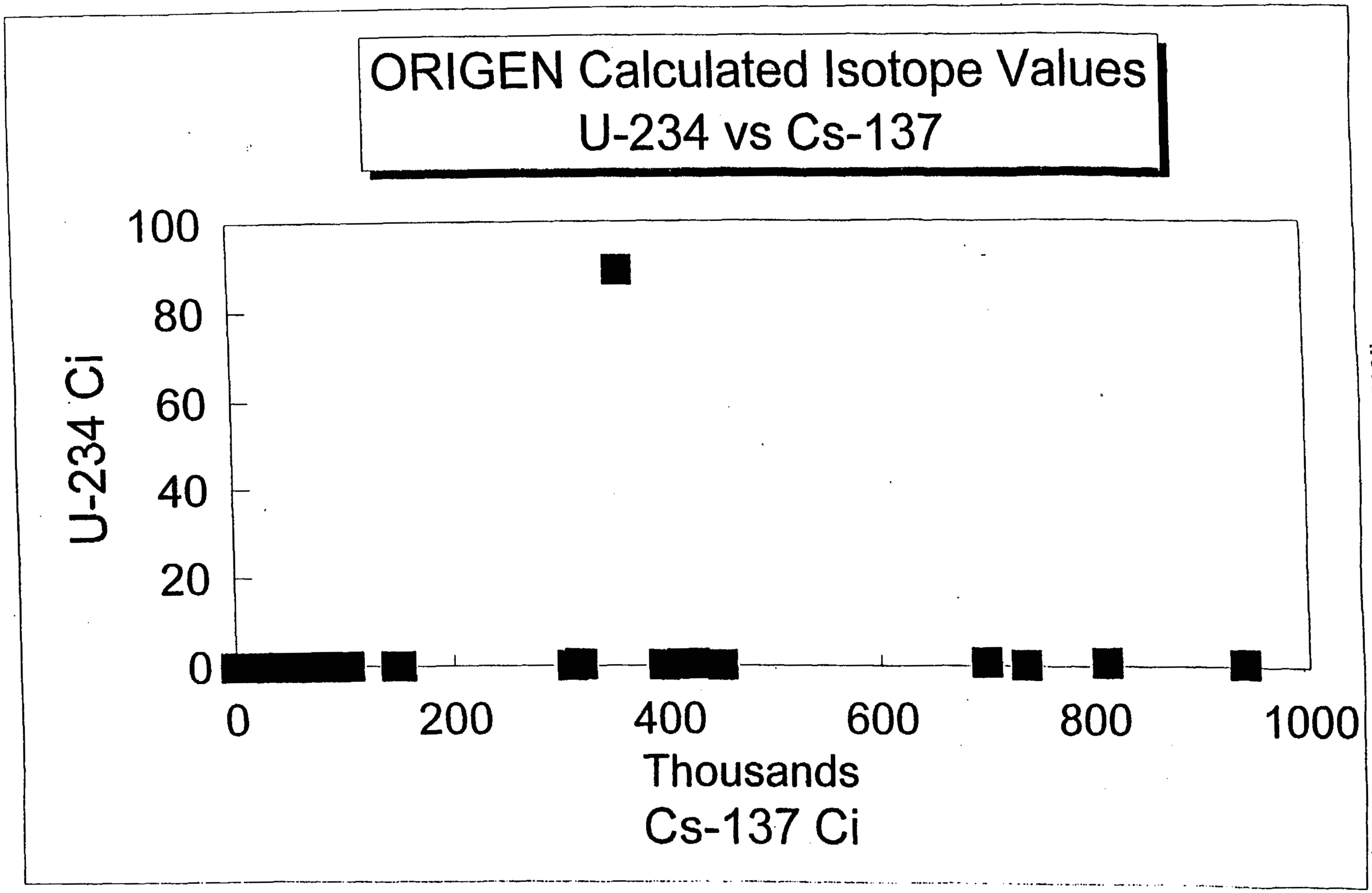
Attachment B

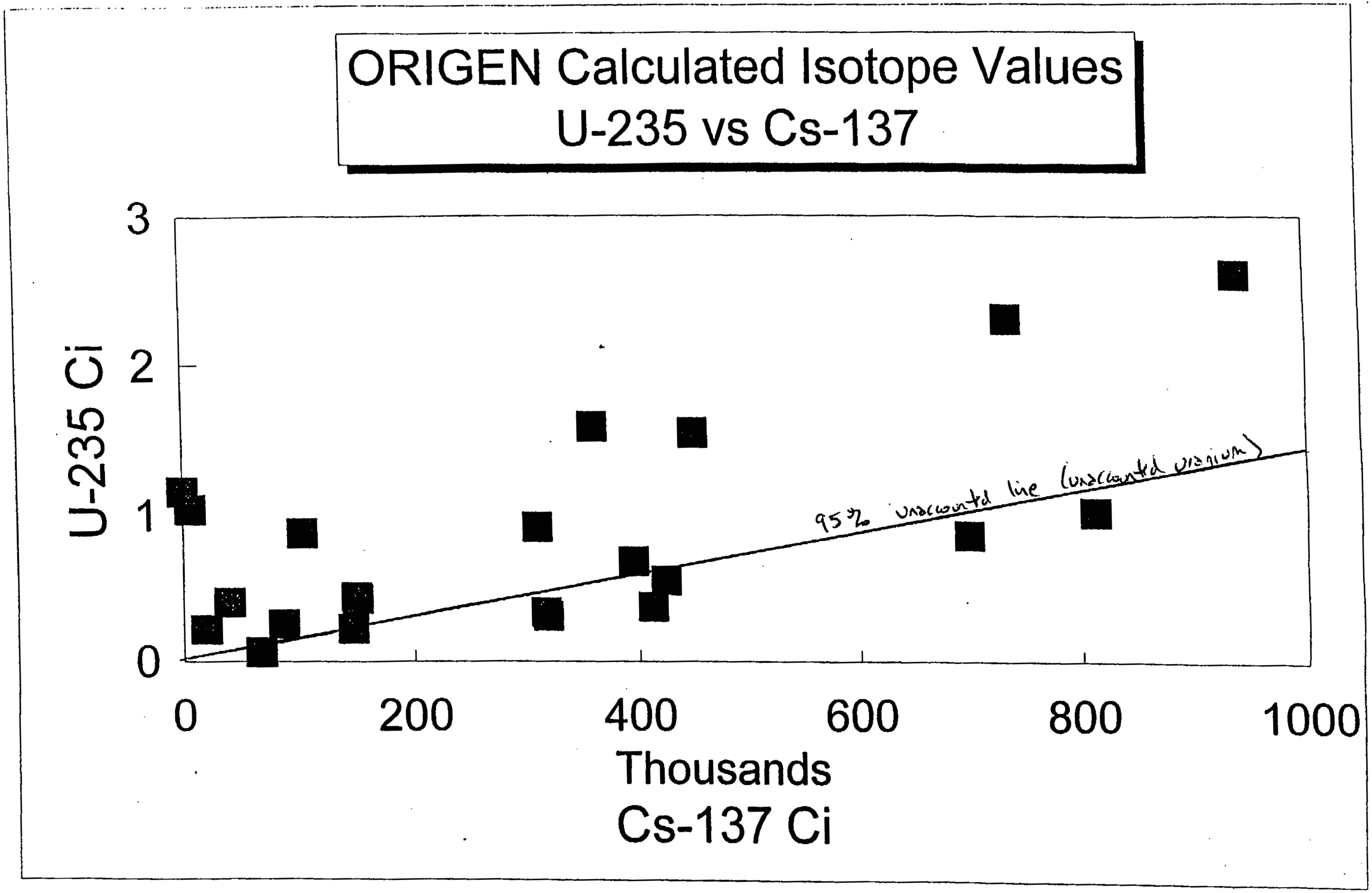
FI:2002:0003


ORIGEN Calculated Isotope Values
U-232 vs Cs-137
U-232 Ci
1000
800
600
400
200
0
0
200
400
600
800
1000
Thousands
Cs-137 Ci


ORIGEN Calculated Isotope Values
U-233 vs Cs-137
2000
1500
1000
500
0
U-233 Ci
0
200
400
600
800
1000
Thousands
Cs-137 Ci

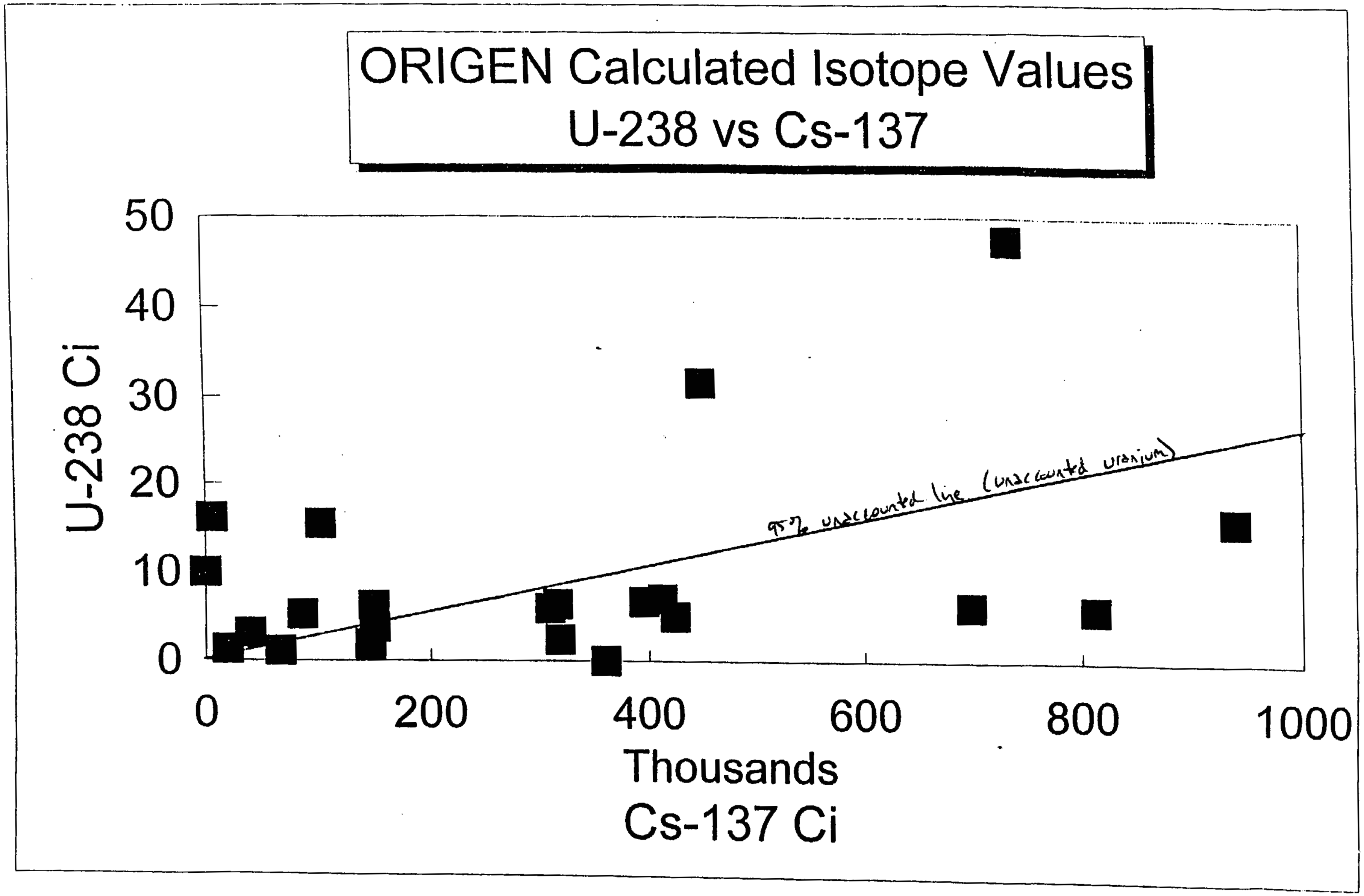
FI:2002:0003

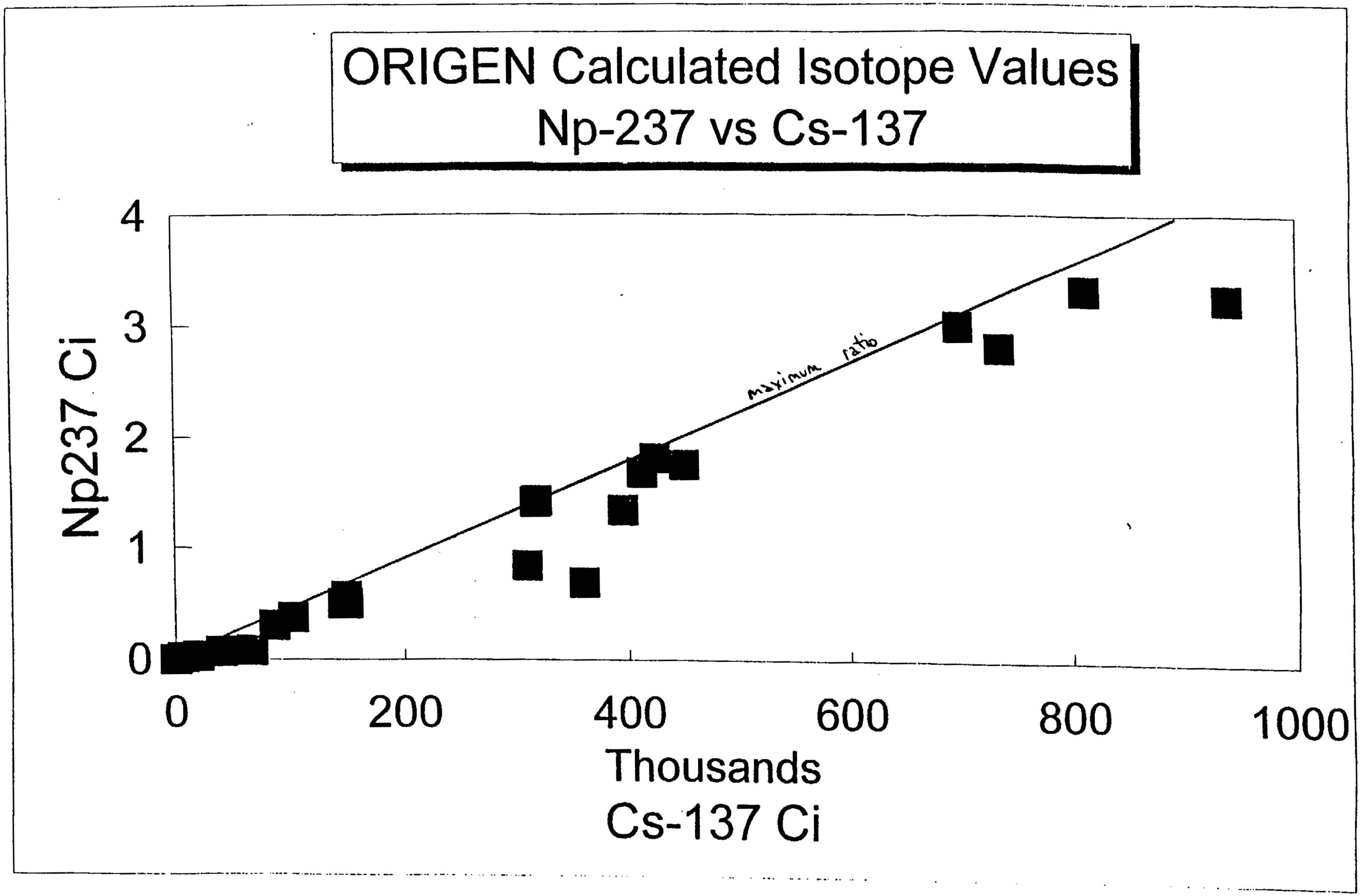

ORIGEN Calculated Isotope Values
U-234 vs Cs-137
U-234 Ci
100
80
60
40
20
0
0
200
400
600
800
1000
Thousands
Cs-137 Ci



Attachment B

FI:2002:0003

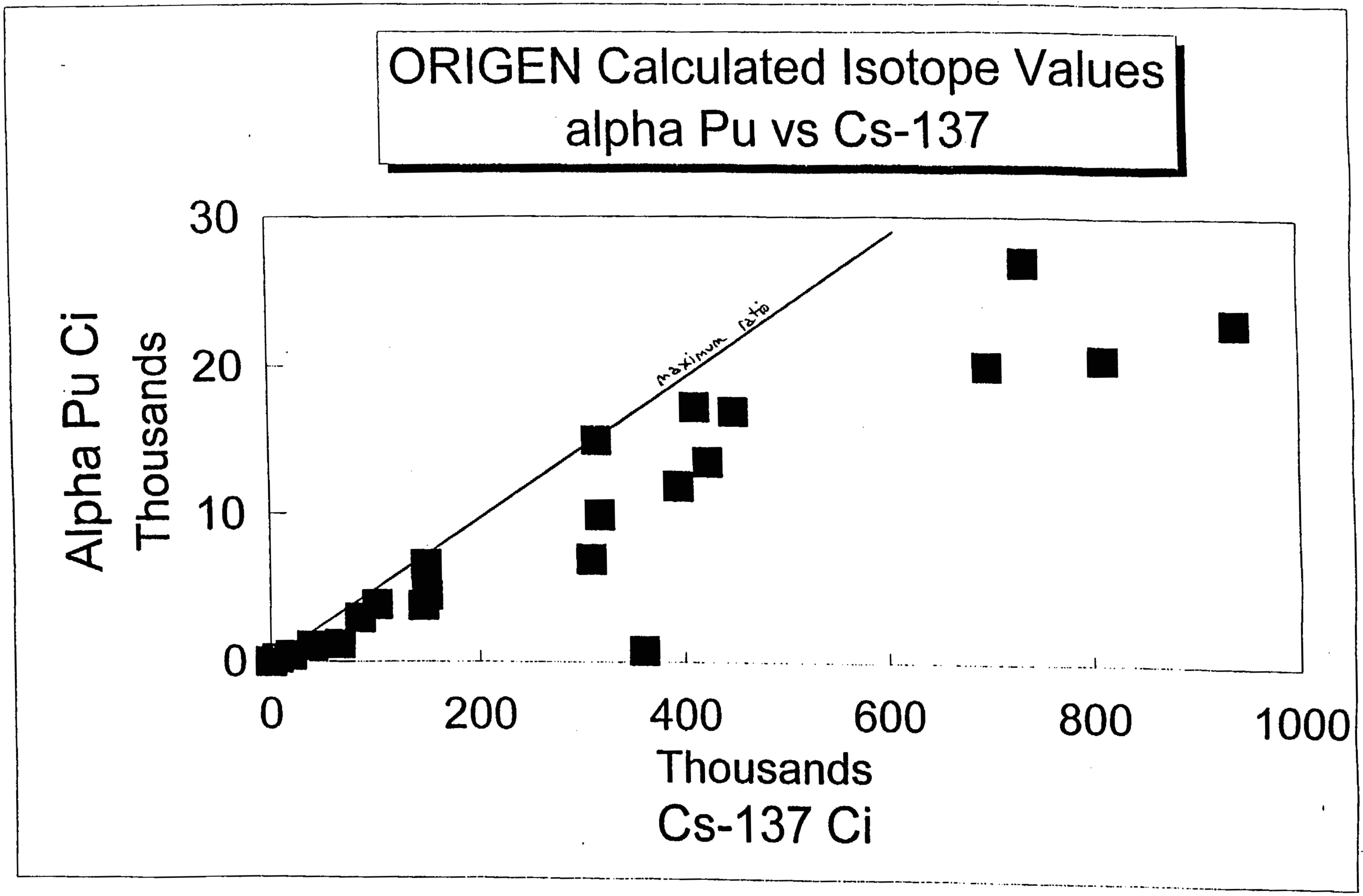

ORIGEN Calculated Isotope Values
U-238 vs Cs-137
U-238 Ci
50
40
30
20
10
0
0
200
400
600
800
1000
Thousands
Cs-137 Ci
95% unaccounted line (unaccounted uranium)

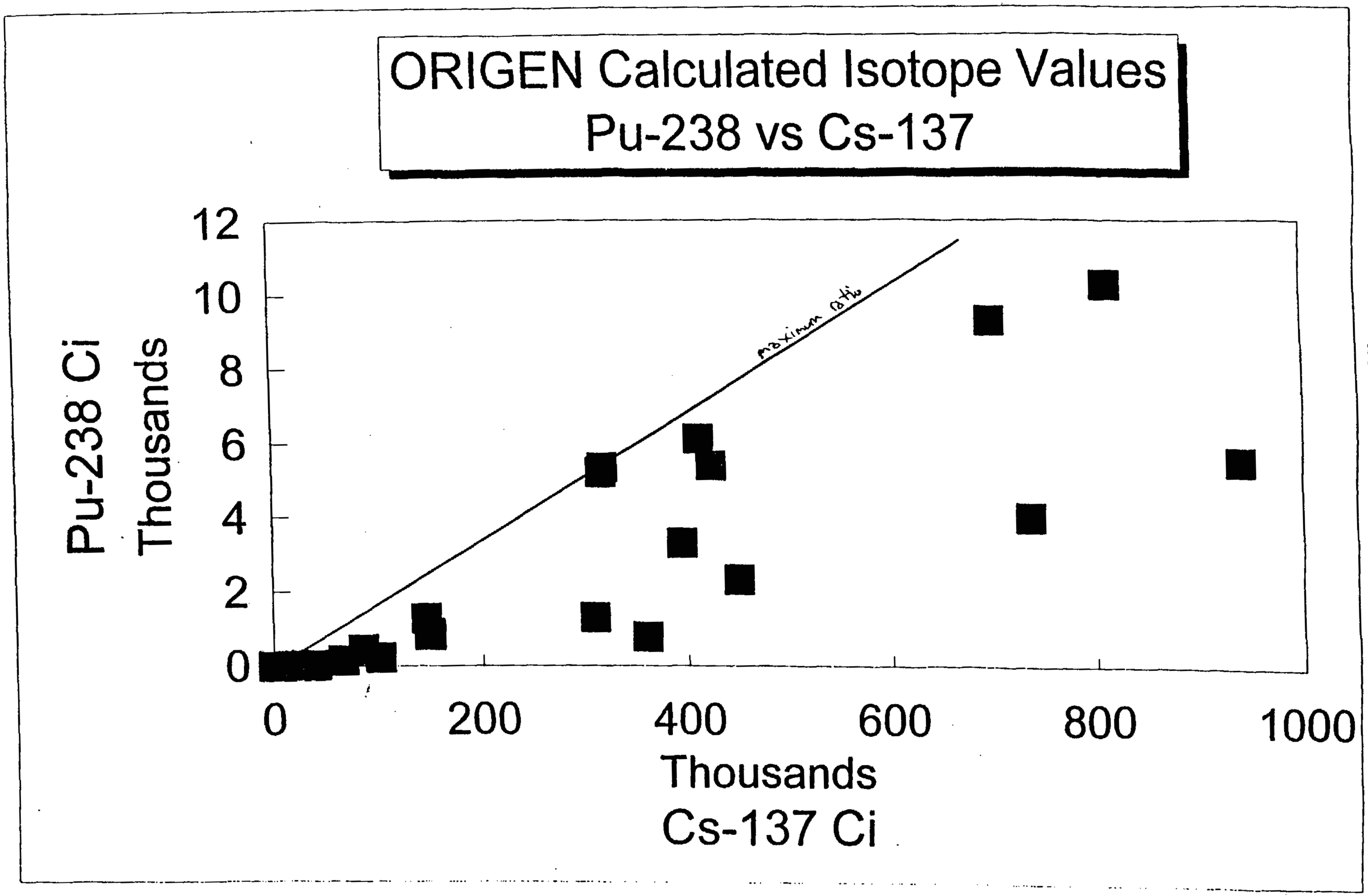


B-9

Attachment B

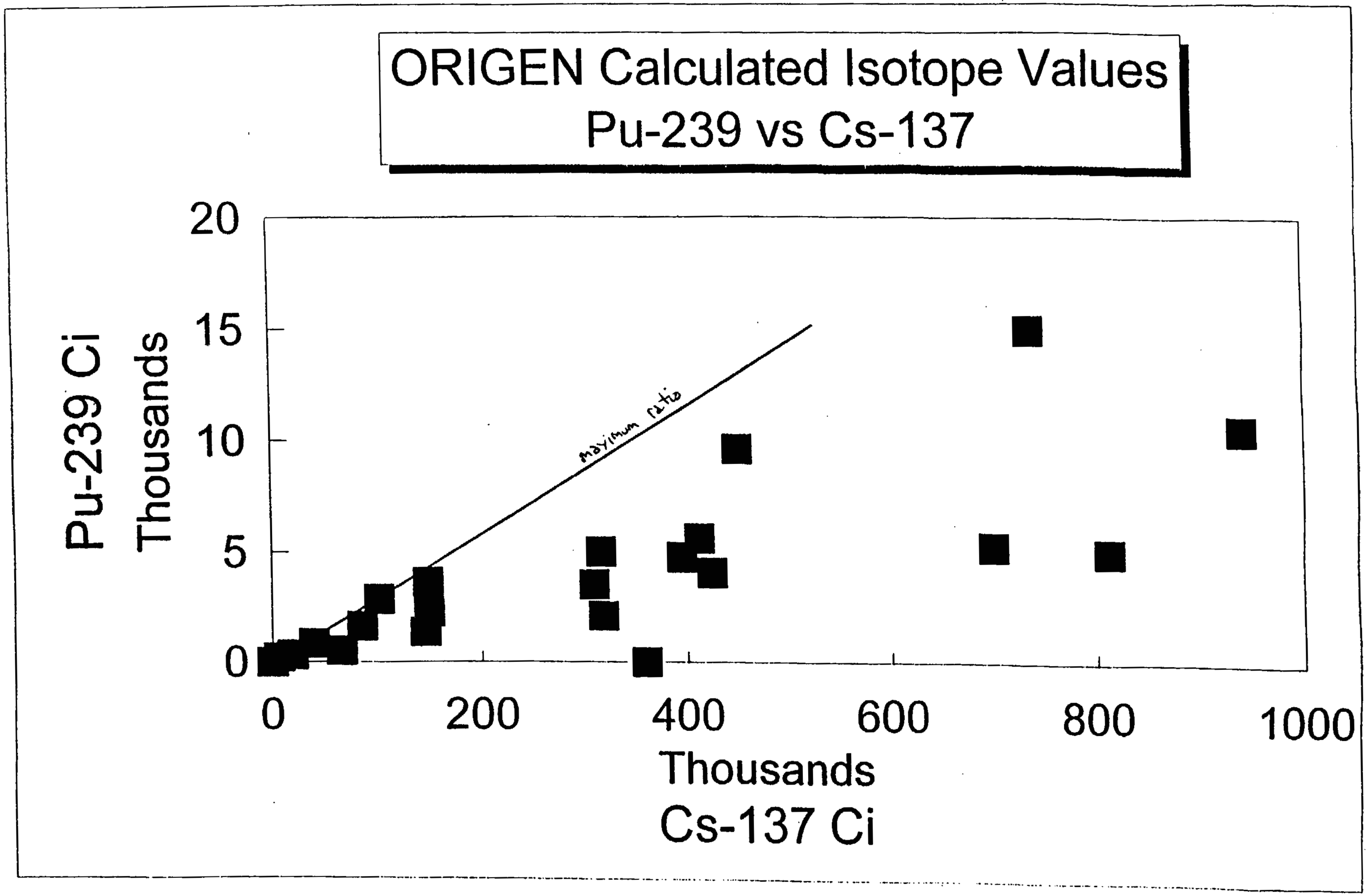
FI:2002:0003

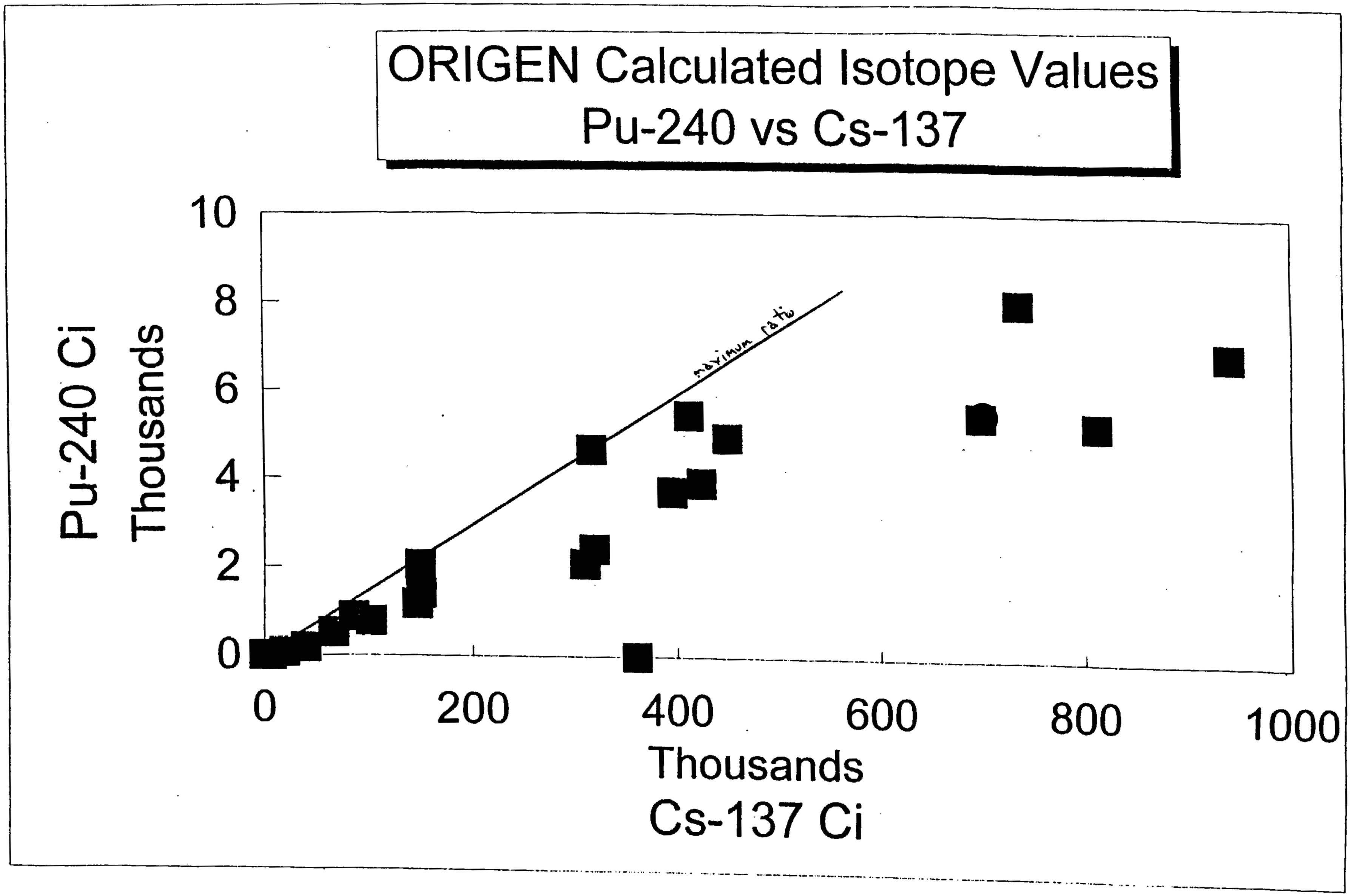

ORIGEN Calculated Isotope Values
alpha Pu vs Cs-137
Alpha Pu Ci
Thousands
30
20
10
0
maximum ratio
0
200
400
600
800
1000
Thousands
Cs-137 Ci

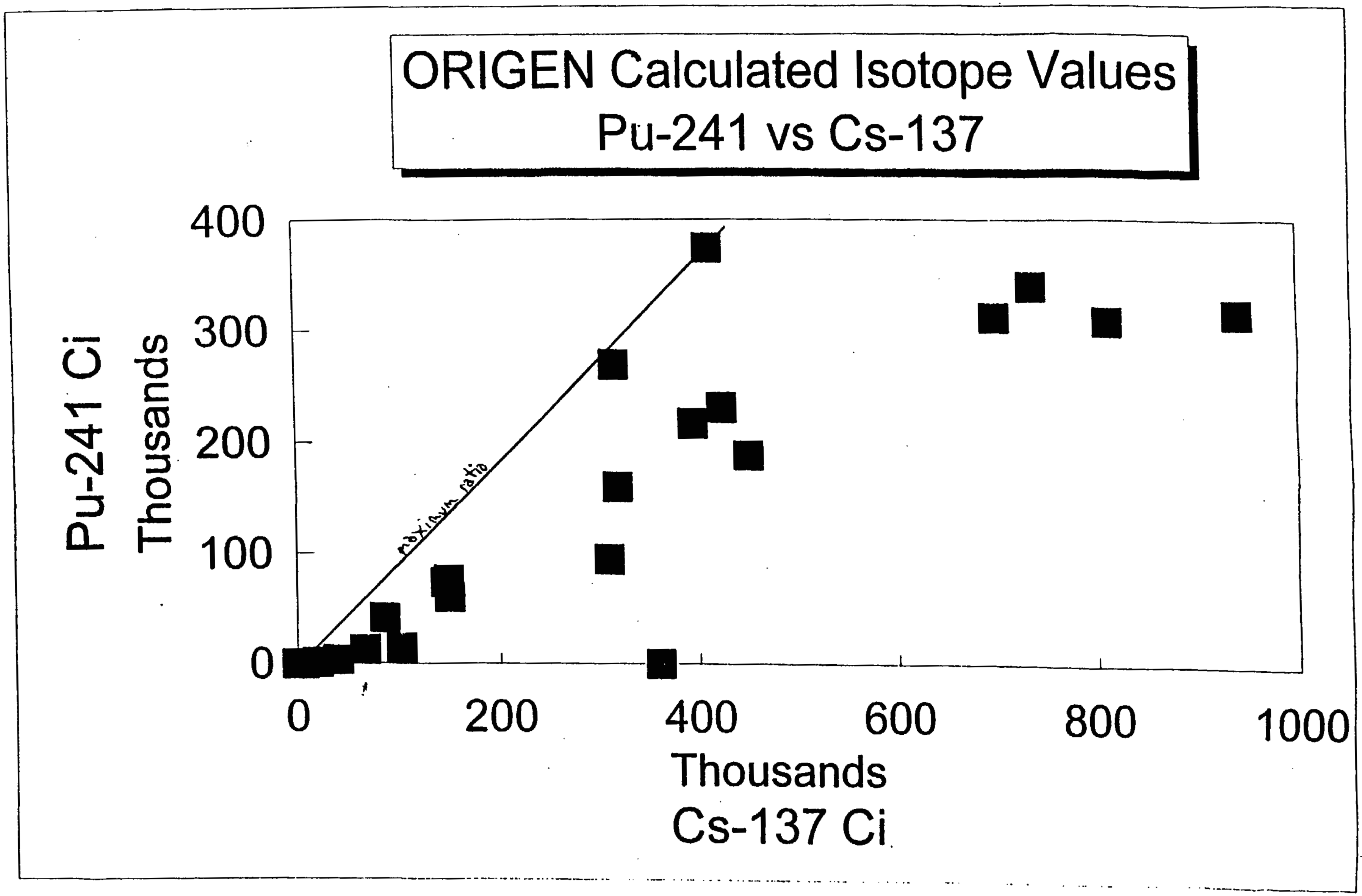


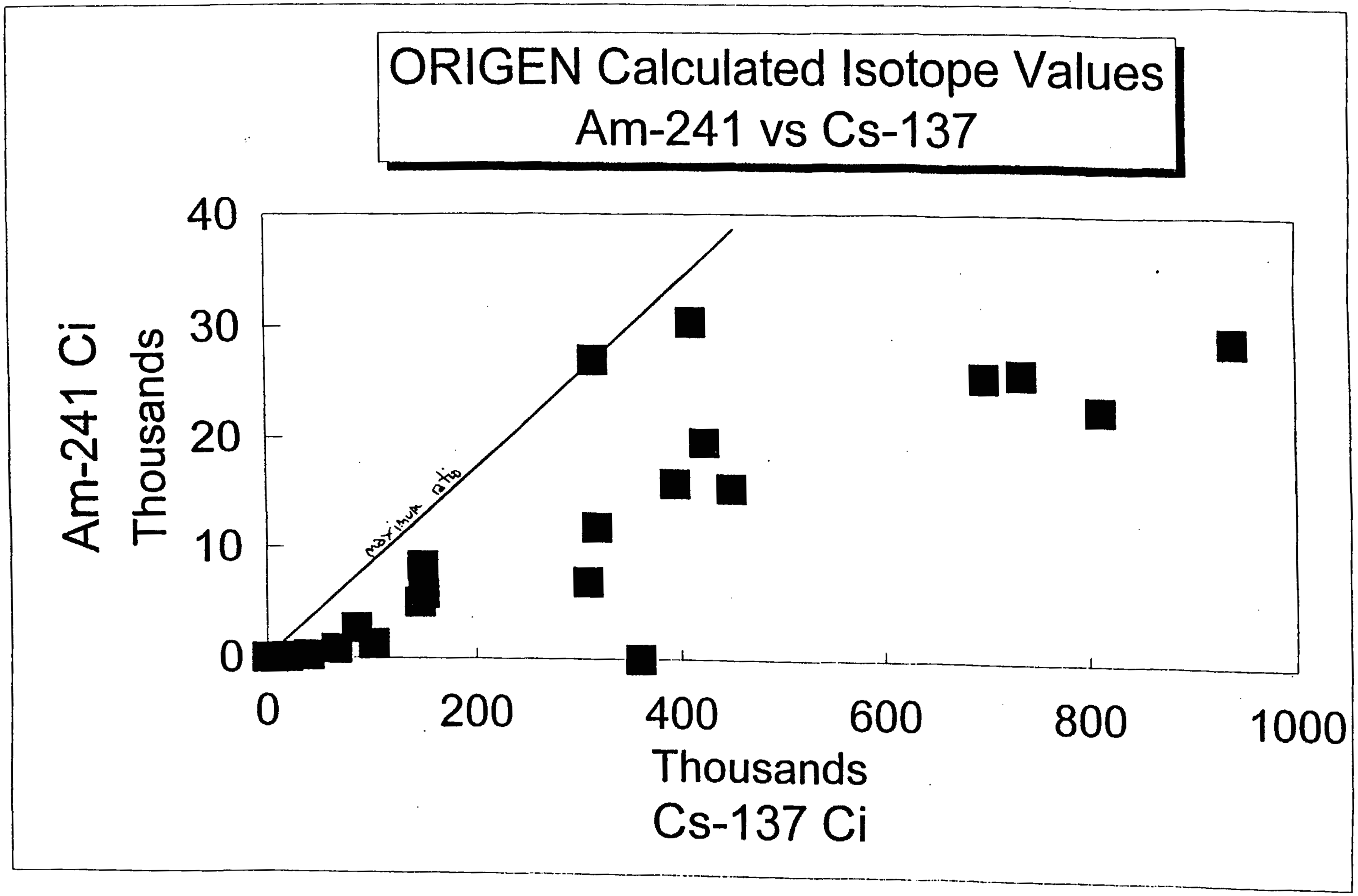
Attachment B

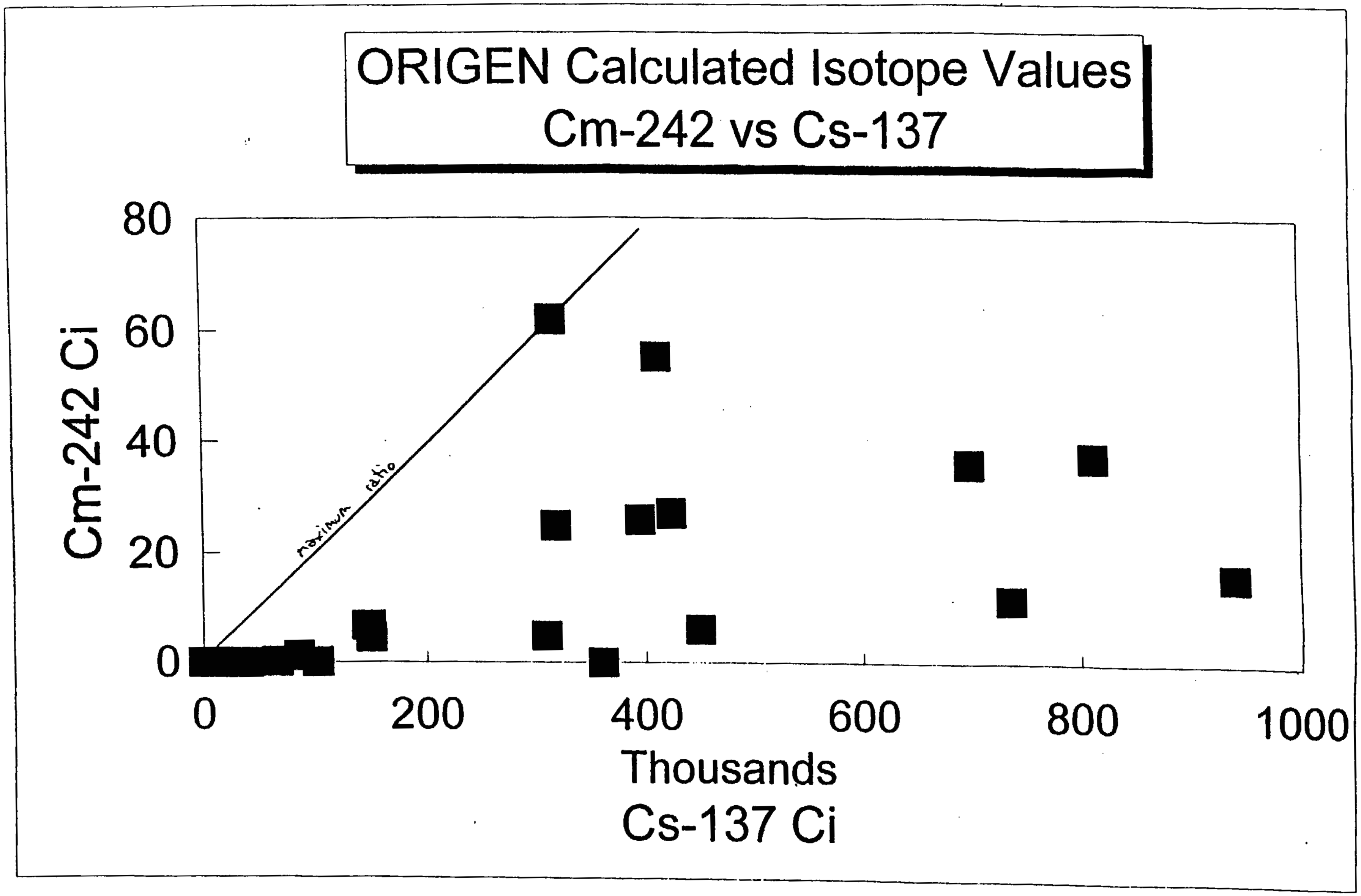
FI:2002:0003


ORIGEN Calculated Isotope Values
Pu-239 vs Cs-137
Pu-239 Ci
Thousands
20
15
10
5
0
0
200
400
600
800
1000
Thousands
Cs-137 Ci
maximum ratio


ORIGEN Calculated Isotope Values
Pu-240 vs Cs-137
Pu-240 Ci
Thousands
0
2
4
6
8
10
0
200
400
600
800
1000
Thousands
Cs-137 Ci
maximum ratio

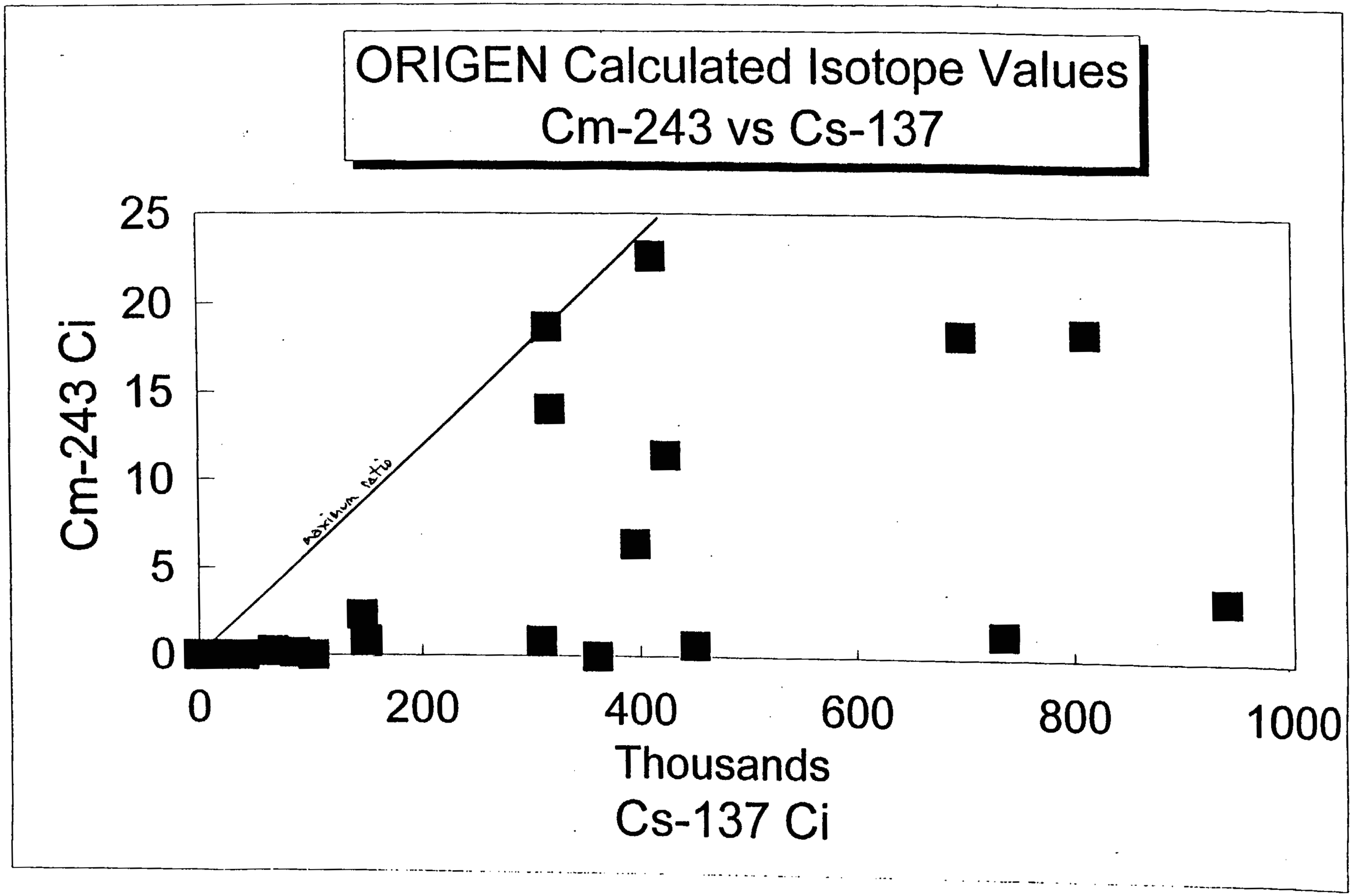

ORIGEN Calculated Isotope Values
Pu-241 vs Cs-137
Pu-241 Ci
Thousands
400
300
200
100
0
0
200
400
600
800
1000
Thousands
Cs-137 Ci
maximum ratio


ORIGEN Calculated Isotope Values
Am-241 vs Cs-137
Am-241 Ci
Thousands
40
30
20
10
0
maximum ratio
0
200
400
600
800
1000
Thousands
Cs-137 Ci



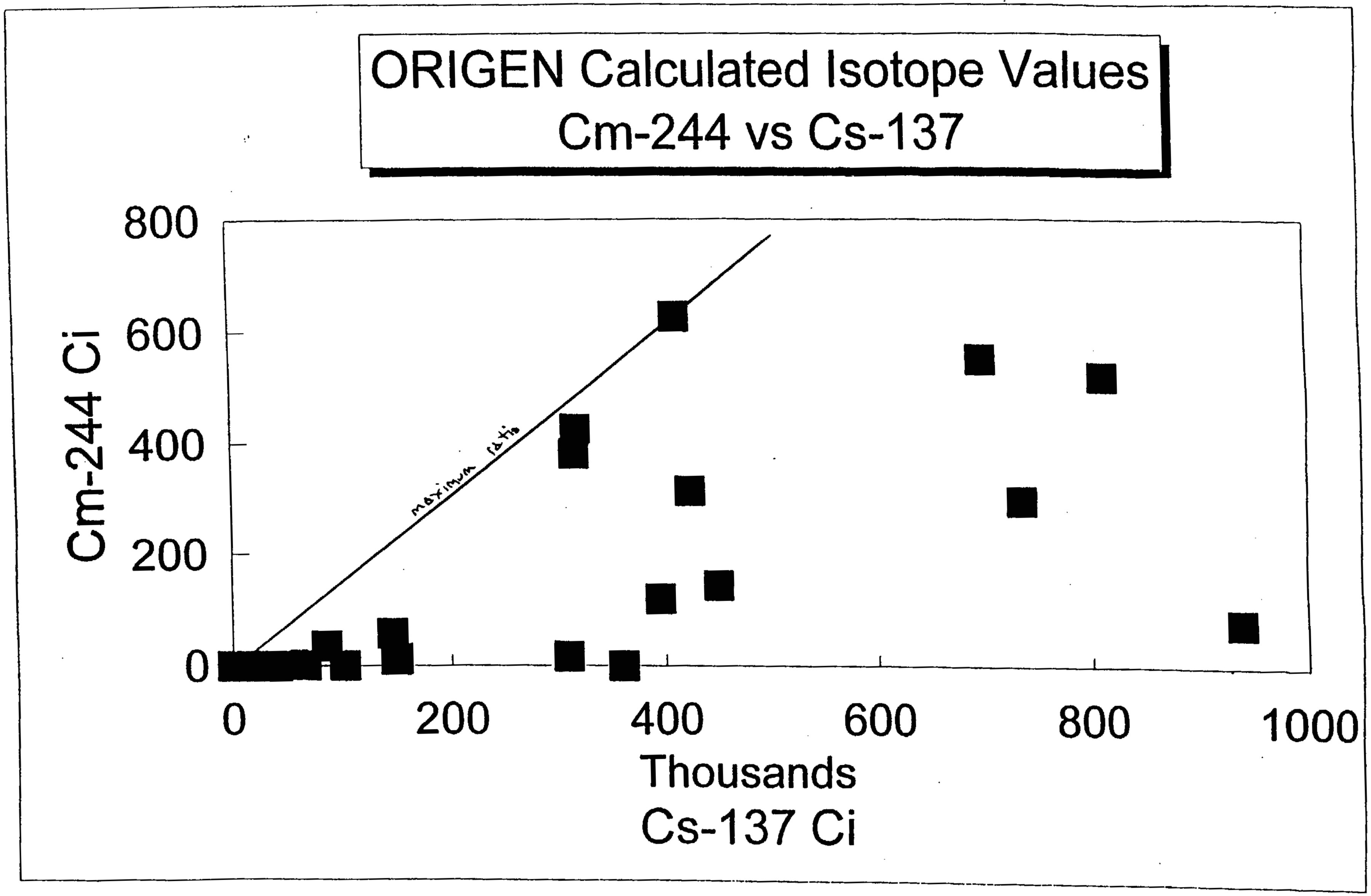
Attachment B

FI:2002:0003



Attachment B

FI:2002:0003


ORIGEN Calculated Isotope Values
Cm-244 vs Cs-137
Cm-244 Ci
800
600
400
200
0
0
200
400
600
800
1000
Thousands
Cs-137 Ci
maximum ratio

Attachment C

Calculation of Spent Fuel Uranium Isotopic Ratios

While many of the key isotopes in spent fuel debris can be readily calculated via ratios to ORIGEN-generated cesium-137 values, the uranium isotopes require a different approach. NFS processed a set of fuel assemblies from Hanford that had not been run through a reactor operating cycle (campaign #14). Other campaigns used very low burn-up fuel; also, depleted uranium material was used with the NFS process. As noted in the graph in Attachment B for U-238 versus Cs-137, there is no clear bounding ratio.

This section provides the data which supports the ratios calculated for the uranium isotopic ratios. The basis for the calculations begins with the NFS accountability for recovered uranium and accounted losses. In the attached printout from the spreadsheet, each campaign was tracked for the uranium that came in, the uranium noted as losses to liquid waste, and the losses associated with the hulls. The difference between these values, is the unaccounted mass of uranium material (some of which exists as residual contamination in the process building).

For each of the campaigns, the ORIGEN calculated uranium isotopic mixture was used to calculate the kilograms of each isotope that constitues the unaccounted uranium. Also, using the ORIGEN calculated Cs-137 values, the amount of Cs-137 associated with the unaccounted mass of uranium material was computed. The actual ratio of Cs-137 [Ci] per kilogram of uranium ranges from 0 to as high as 342 for the ThO2/UO2 fuel.

In the work to quantify the residual curies in the process building, a cesium value will be derived usually from dose-to-curie models. What is needed is a U-235 and U-238 ratio to Cs-137 to cover the wide range of fuels processed by NFS. The lower portion of the spreadsheet presents the calculations for uranium accountablility for U-238 and U-235. By trail-and-error selection, a ratio was found which accounts for 95% of the uranium unaccounted by NFS. Each campaign was included in the calculation weighted in proportion to that amount of uranium unaccounted by NFS. For campaigns in which the unaccounted uranium mass was less than zero (NFS accounted for more uranium than came in with that fuel), its contribution to the weighting was set to zero.

These ratios provide confidence such that, if all of the curies of Cs-137 associated with the unaccounted spent fuels were to be found, 95% of the total mass of uranium would be assigned to be present at the same time. For particular fuel pieces, this would over-predict the uranium; while for others, it would under-predict.

The contribution of the SEFOR uranium unaccounted losses was set to zero for these calculations since the SEFOR material was received as liquid solutions which were delivered to the extraction process. This material would not be present as fuel fines or residual fuel pieces in the process building.

Also of note, the unusual uranium isotopes of U-232, U-233, and U-234 were generated during the reactor life cycle of the ThO2/UO2 fuel (NFS campaign #11). Compared to a normal uranium-based fuel, the relative amounts of these isotopes from the THOREX fuel is thousands to billions of times higher.

The same methodology was initially tried for calculating the residual mass of U-232, U-233, and U-234 that was unaccounted by NFS. Unfortnuately, the accounted losses of uranium for campaign 11 added to the accounted recovery of uranium is greater than the amount of uranium that came in with these fuels. Manual adjustment in the spreadsheet of the uranium unaccounted losses for campaign 11 was done to provide sufficient U-232, U-233, and U-234 mass to yield ratios that have been found recent plant samples.

A value was selected such that the relative proportion of U-232 to (U-235+U-236) matched a high value from the recent ARPR job (sample RC-1). The presence of U-232, U-233, & U-234 in the ARPR samples in-fact show that not all the uranium from the campaign 11 (ThO2 fuel) has been accounted. The specific isotope ratios were calcuated relative to U-238 and are in the last section of the attached spreadsheet printout (and in Table 2 of the memo).

Campaign #	1	2	3	4	5	6	7	8	9	10	11
U Input [kg]	19716	28814	46681	50017	49759	26618	26116	42396	38837	55330	1049
U Product [kg]	19252	28714	46322	49567	49448	26052	26031	42221	38440	53991	1039
total losses	464	100	359	450	311	566	85	175	397	1339	10
Accounted losses [kg]											
liquid	36	24	136	200	316	193	65	204	143	315	8
hulls	52	14	106	58	50	27	46	121	118	268	11
total accounted	88	38	242	258	366	220	111	325	261	583	19
Net unaccounted losses [kg]	376	62	117	192	-55	346	-26	-150	136	756	0.9
Isotope gram per gram of uranium											
U-232	2.9E-15	2.9E-15	2.7E-12	5.3E-11	7.5E-11	1.3E-11	1.3E-11	1.3E-11	1.5E-11	1.5E-11	0.000041
U-233	6.8E-12	6.8E-12	1.2E-10	7.1E-10	1.0E-09	2.5E-10	2.5E-10	2.5E-10	2.6E-10	2.6E-10	0.186023
U-234	7.3E-09	7.3E-09	1.2E-07	2.3E-06	2.1E-06	4.1E-07	4.1E-07	4.1E-07	4.5E-07	4.5E-07	0.013557
U-235	0.009886	0.009886	0.008751	0.011242	0.024692	0.007617	0.007617	0.007617	0.007504	0.007504	0.70217
U-236	0.000015	0.000015	0.000229	0.001116	0.002094	0.000427	0.000427	0.000427	0.000448	0.000448	0.044882
U-238	0.990099	0.990099	0.99102	0.987639	0.973212	0.991956	0.991956	0.991956	0.992048	0.992048	0.053328
Campaign #	1	2	3	4	5	6	7	8	9	10	11
kg of isotopes in unaccounted											
U-232	1.1E-12	1.8E-13	3.2E-10	1.0E-08	-4.1E-09	4.4E-09	-3.3E-10	-1.9E-09	2.0E-09	1.1E-08	0.000036
U-233	2.6E-09	4.2E-10	1.4E-08	1.4E-07	-5.6E-08	8.6E-08	-6.5E-09	-3.7E-08	3.5E-08	1.9E-07	0.161468
U-234	2.7E-06	4.5E-07	0.000014	0.000441	-0.00012	0.000143	-1.1E-05	-6.2E-05	0.000061	0.00034	0.011767
U-235	3.717164	0.612937	1.023873	2.158545	-1.35806	2.635317	-0.19803	-1.14248	1.020509	5.672832	0.609483
U-236	0.005669	0.000935	0.026802	0.214242	-0.11515	0.147841	-0.01111	-0.06409	0.060883	0.338436	0.038957
U-238	372.2772	61.38613	115.9493	189.6268	-53.5267	343.2167	-25.7909	-148.793	134.9185	749.9884	0.046289
Cs-137 Ci/kg U [ORIGEN {aged to 1/1/93}	0.126	0.126	2.194	12.454	19.238	4.753	4.753	4.753	5.172	5.172	341.781
Ci Cs-137 in unaccountec	4.74E+01	7.82E+00	2.57E+02	2.39E+03	-1.06E+03	1.64E+03	-1.24E+02	-7.13E+02	7.03E+02	3.91E+03	2.97E+02
Ci Ratio: U-238/Cs-137	**2.6E-05**	95.0%									
Ci U-238 est.	1.25E-03	2.05E-04	6.75E-03	6.28E-02	0.00E+00	4.32E-02	0.00E+00	0.00E+00	1.85E-02	1.03E-01	7.80E-03
g U-238 est.	3.7E+03	6.1E+02	2.0E+04	1.9E+05	0.0E+00	1.3E+05	0.0E+00	0.0E+00	5.5E+04	3.1E+05	2.3E+04
cum unaccnt U-238 gms	3.7E+03	4.3E+03	2.4E+04	2.1E+05	2.1E+05	3.4E+05	3.4E+05	3.4E+05	3.9E+05	7.0E+05	7.2E+05
Ci Ratio: U-235/Cs-137	**1.5E-06**	95.0%									
Ci U-235 est.	6.92E-05	1.14E-05	3.75E-04	3.49E-03	0.00E+00	2.40E-03	0.00E+00	0.00E+00	1.03E-03	5.71E-03	4.33E-04
g U-235 est.	3.2E+01	5.3E+00	1.7E+02	1.6E+03	0.0E+00	1.1E+03	0.0E+00	0.0E+00	4.7E+02	2.6E+03	2.0E+02
cum unaccnt U-235 gms	3.2E+01	3.7E+01	2.1E+02	1.8E+03	1.8E+03	2.9E+03	2.9E+03	2.9E+03	3.4E+03	6.0E+03	6.2E+03

12	13	14	15	16	17	18	19	20	21	22	23	24
48882	19571	30295	21544	15563	9280	9591	18410	7575	15841	4140	20796	9472
48475	19251	30022	21392	15346	9184	9599	18267	7500	15472	4255	20637	9404
407	320	273	152	217	96	-8	143	75	369	-115	159	68
55	78	82	31	99	46	46	112	35	22	16	31	54
63	40	7	28	23	25	14	28	3	159	4	41	30
118	118	89	59	122	71	60	140	38	181	20	72	84
289	202	184	93	95	25	-68	3	37	188	-135	87	-16
1.5E-11	2.9E-10	0	1.1E-10	2.1E-10	3.5E-10	1.9E-12	3.8E-11	4.1E-10	1.5E-11	2.9E-12	7.3E-11	3.5E-10
2.6E-10	2.1E-09	0	9.8E-10	1.6E-09	2.4E-09	1.2E-10	6.3E-10	2.4E-09	2.4E-10	1.2E-10	8.2E-10	2.4E-09
4.5E-07	7.3E-06	3.6E-09	4.0E-06	5.4E-06	8.0E-06	1.3E-07	1.2E-06	9.9E-06	4.2E-07	1.5E-07	2.3E-06	8.0E-06
0.007504	0.02095	0.017722	0.008162	0.016769	0.025899	0.019644	0.023405	0.019457	0.007495	0.024666	0.015489	0.025899
0.000448	0.003549	0	0.001394	0.002562	0.004393	0.000449	0.001749	0.003957	0.000448	0.000527	0.001749	0.004393
0.992048	0.975494	0.982278	0.99044	0.980663	0.9697	0.979907	0.974845	0.976576	0.992057	0.974807	0.98276	0.9697
12	13	14	15	16	17	18	19	20	21	22	23	24
4.2E-09	5.9E-08	0	1.0E-08	2.0E-08	8.7E-09	-1.3E-10	1.1E-10	1.5E-08	2.8E-09	-4.0E-10	6.4E-09	-5.5E-09
7.4E-08	4.3E-07	0	9.1E-08	1.5E-07	5.9E-08	-8.3E-09	1.9E-09	9.0E-08	4.5E-08	-1.7E-08	7.1E-08	-3.8E-08
0.00013	0.001477	6.7E-07	0.000373	0.000514	0.000201	-8.5E-06	3.6E-06	0.000368	0.00008	-2.0E-05	0.000198	-0.00013
2.168583	4.231883	3.260897	0.759057	1.593044	0.647468	-1.33578	0.070214	0.719915	1.408971	-3.3299	1.347502	-0.41438
0.129376	0.716896	0	0.129648	0.243417	0.109828	-0.03056	0.005246	0.146394	0.084299	-0.07119	0.152147	-0.07029
286.7019	197.0497	180.7391	92.11092	93.16303	24.2425	-66.6336	2.924536	36.13332	186.5066	-131.599	85.50015	-15.5152
5.172	36.709	0.000	19.503	27.814	44.602	4.103	17.006	43.179	5.436	4.700	19.293	44.602
1.49E+03	7.42E+03	0.00E+00	1.81E+03	2.64E+03	1.12E+03	-2.79E+02	5.10E+01	1.60E+03	1.02E+03	-6.34E+02	1.68E+03	-7.14E+02
3.93E-02	1.95E-01	0.00E+00	4.77E-02	6.94E-02	2.93E-02	0.00E+00	1.34E-03	4.20E-02	2.69E-02	0.00E+00	4.41E-02	0.00E+00
1.2E+05	5.8E+05	0.0E+00	1.4E+05	2.1E+05	8.7E+04	0.0E+00	4.0E+03	1.2E+05	8.0E+04	0.0E+00	1.3E+05	0.0E+00
8.4E+05	1.4E+06	1.4E+06	1.6E+06	1.8E+06	1.9E+06	1.9E+06	1.9E+06	2.0E+06	2.1E+06	2.1E+06	2.2E+06	2.2E+06
2.18E-03	1.08E-02	0.00E+00	2.65E-03	3.86E-03	1.63E-03	0.00E+00	7.45E-05	2.33E-03	1.49E-03	0.00E+00	2.45E-03	0.00E+00
1.0E+03	5.0E+03	0.0E+00	1.2E+03	1.8E+03	7.5E+02	0.0E+00	3.4E+01	1.1E+03	6.9E+02	0.0E+00	1.1E+03	0.0E+00
7.3E+03	1.2E+04	1.2E+04	1.3E+04	1.5E+04	1.6E+04	1.6E+04	1.6E+04	1.7E+04	1.8E+04	1.8E+04	1.9E+04	1.9E+04

25	26	27	Maint & Flus	TOTAL
3517	5815	9929	0	635554
3311	5945	3267	0	622404
206	-130	6662	0	13150
30	57	46	113	2593
5	9	0	0	1350
35	66	46	113	3943
171	-196	0	-113	2601

7.3E-12	1.0E-10	0	7.0E-08
2.9E-10	1.1E-09	0	0.000316
6.2E-07	3.1E-06	3.6E-09	0.000025
0.008767	0.018247	0.017722	0.013615
0.001548	0.002349	0	0.001073
0.989684	0.979401	0.982278	0.984971

Ratio
U-232 / (U-235+U-236)
3.54

25	26	27	Maint & Flus	TOTAL kg total	Ci total	g/Ci
1.3E-09	-2.0E-08	0	-7.9E-06	2.8E-05	5.97E-01	4.67E-02
5.0E-08	-2.1E-07	0	-0.03573	0.13	1.21E+00	1.04E+02
0.000106	-0.0006	0	-0.00278	0.01	7.81E-02	1.60E+02
1.499212	-3.57643	0	-1.53851	22	4.82E-02	4.62E+05
0.264782	-0.46041	0	-0.12128	1.9	1.21E-01	1.55E+04
169.2359	-191.963	0	-111.302	2577	8.67E-01	2.97E+06
19.053	25.729	0	11.188			
3.26E+03	-5.04E+03	0.00E+00	-1.26E+03	2.15E+04	5.6E-06	

Ci ratio to U-238

0.69	**U-232**
1.40	**U-233**
0.090	**U-234**
0.139	**U-236**

8.56E-02	0.00E+00	0.00E+00	0.00E+00		Total U-238 unaccounted
2.5E+05	0.0E+00	0.0E+00	0.0E+00	total kg	2577 kg
2.4E+06	2.4E+06	2.4E+06	2.4E+06	2448	<-- % of above
					95%

4.76E-03	0.00E+00	0.00E+00	0.00E+00		Total U-235 unaccounted
2.2E+03	0.0E+00	0.0E+00	0.0E+00	total kg	22 kg
2.1E+04	2.1E+04	2.1E+04	2.1E+04	21	<-- % of above
					95%

Ref: "Updated Analytical Data on 8D 2 Supernatant," memo WD 84 0401 L. E. Hykken to W. H. Hannum, July 12, 1984
Table, "NFS Process Performance Summary," pg 21

		INPUT		PRODUCT		RECOVERY		MEASURED LOSSES Liquid Waste LOSSES		Hull LOSSES		LOSSES		INVENTORY DISCREPANCY			
Campaign Number	Processing Lot Number	U kg	Pu g	U kg	Pu g	U %	Pu %	U kg	Pu g	U kg	Pu g	U %	Pu %	U kg	Pu g	U %	Pu %
1	NPH	19716	1739	19252	1199	97.8	68.9	30	28	52	3	0.45	1.78	130	315	0.66	18.1
2	NPH II	28814	2297	28714	2455	99.7	106.9	24	24	14	1	0.13	1.09	159	-118	0.55	-5.1
3	NPH III	46681	50881	46322	50235	99.2	98.7	136	191	106	118	0.52	0.61	256	110	0.55	0.2
4	Dresden IV	50017	191016	49567	182269	99.1	95.4	200	5485	56	183	0.51	2.96	194	373	0.39	0.
5	Yankee V	49759	285067	49448	278818	99.4	97.7	310	3763	50	285	0.74	1.42	-63	4021	-0.13	1.4
6	NPH VI	26618	52625	26052	50438	97.9	95.8	193	1717	27	52	0.83	3.36	123	-532	0.46	-1.0
7	NPH VII	26116	47376	26031	46898	99.7	99	65	505	46	83	0.43	1.24	140	327	0.54	0.6
8	NPH VIII	42398	75441	42221	76952	99.6	102	204	1123	121	216	0.77	1.77	-210	-1328	-0.5	-1.7
9	NPH IX	38837	79118	38440	78039	99	98.6	143	799	118	240	0.67	1.31	33	-579	0.08	-0.7
10	NPH X	55330	115692	53891	114367	97.6	98.9	315	2584	268	561	1.05	2.7	878	-1154	1.59	.
11	Con Ed "A"	1049	2698	1039	237	99	8.8	8	1832	11	21	1.82	68.68	7	631	0.87	23.3
12	NPH XII	48882	102528	48475	98564	99.2	96.1	55	2325	63	132	0.24	2.4	25	1499	0.05	1.4
13	Yankee XIII	19571	176039	19251	171827	98.4	97.5	78	1013	40	348	0.6	0.77	196	2459	1	1.
14	Cold NPR	30295	0	30022	0	99.1		82	1198	7	0	0.29	0	177	-1198	0.58	
15	Dresden XV	21544	104640	21392	102260	99.3	97.7	31	509	28	136	0.27	0.62	71	1742	0.33	1.6
16	Con Ed "B"	15583	107579	15346	104249	98.6	96.9	99	1405	23	161	0.78	1.48	96	1168	0.63	1.0
17	Yankee XVII	9280	95599	9184	91478	99	95.7	48	1244	25	250	0.77	1.56	19	1080	0.2	1.1
18	NSP	9591	7053	9599	7038	100.1	99.8	48	757	14	11	0.63	10.89	-49	197	-0.51	2.7
18A	NFS Maint							58	735	0	0	0	0	-74	-779	0	
19	Consumers	18410	72792	18267	72741	99.2	99.9	112	443	26	109	0.78	0.78	36	112	0.2	0.1
20	Con Ed "B"	7575	68082	7500	62982	99	92.5	35	559	3	26	0.5	0.86	33	4243	0.44	6.2
21	NPH	15841	25442	15472	25551	97.7	100.4	22	769	159	269	1.14	4.18	84	-1800	0.53	-7.0
22	Bonus	4140	4939	4255	6459	102.8	130.8	16	259	4	5	0.48	5.35	-49	-1120	-1.18	-22.6
23	PG&E	20798	87167	20637	85951	99.2	98.6	31	579	41	172	0.35	0.86	-31	715	-0.15	0.8
24	Yankee	9472	95744	9404	91032	99.3	95.1	54	1378	30	303	0.89	1.76	5	1003	0.05	1.0
25	CVNPA	3517	11616	3311	11770	94.1	101.3	30	458	5	18	1	4.1	174	925	4.95	7.9
26	Consumers	5815	27894	5945	28388	102.2	101.8	57	521	9	42	1.13	2.02	-84	31	-1.44	0.1
27	SEFOR	9929	85483	3287	85241	78.5	99.8	46	996	0	0	0.46	1.04	798	-505	8.04	-0.5
27A	Flushout							55	1646	0	0	0	0	-55	1646	0	
	TOTALS	835554	1966523	822404	1937054			2538	33179	1350	3743			3077	11836		

C-6

Attachment C

Appendix J

Peer Reviewed Results of Scaling Factors and Sample Results for the Melter Cavity

Melter Bottom Sample Results and Scaling Factors

	Melter Sludge Samples						Batch 10 Samples	
	Sample 1F	Sample 2F	Sample 3F	Geometric mean	Calculated Value Based on Batch 10 Relationship	Scaling factors aged to 1/1/03	Scaling Factors aged to 1/1/03	
Am-241	1.95E+01	2.86E+01	2.21E+01	2.31E+01		2.42E-03	Am-241	**1.28E-02**
C-14							C-14	**1.96E-07**
Cm-243	<9.44E+00	<7.47E+00	<9.80E+00		0.191	1.91E-05	Cm-243	**8.98E-05**
							Cm-244	**2.16E-03**
Cs-137	1.05E+04	9.13E+03	1.02E+04	9.93E+03		1.00E+00	Cs-137	**1.00E+00**
I-129							I-129	**1.56E-10**
Np-237	<3.70E+00	<6.04E+00	<6.84E+00		1.5E-02	1.6E-06	Np-237	**8.01E-06**
Pu-238	3.55E+00	2.83E+00	3.18E+00	3.17E+00		3.29E-04	Pu-238	**1.51E-03**
Pu239/240	1.53E+00	1.26E+00	1.37E+00	1.38E+00			Pu 239/240	
Pu-239	8.68E-01	7.14E-01	7.77E-01	7.84E-01		8.24E-05	Pu-239	**4.35E-04**
Pu-240	6.62E-01	5.46E-01	5.93E-01	5.99E-01		6.29E-05	Pu-240	**3.09E-04**
Pu-241							Pu-241	**1.04E-02**
Sr-90	5.65E+04	5.45E+04	5.58E+04	5.56E+04		**5.59E+00**	Sr-90	9.58E-01
Tc-99							Tc-99	**3.37E-05**
U-232							U-232	**3.78E-06**
U-233						4.25E-09	U-233	**1.44E-06**
U-234						1.73E-09	U-234	**5.44E-07**
U-235	<3.80E+00	<2.64E+00	<3.18E+00		2.82E-05	2.96E-09	U-235	**1.52E-08**
U-238							U-238	**1.36E-07**

Decay and Scaling Factor Originator _[signature] / E. Lachapelle / 2/4/03_
Signature/Print Name/Date

Decay and Scaling Factor Peer Reviewer _[signature] / L. Michalak / 2/4/03_
Signature/Print Name/Date

WVNSCO
West Valley Nuclear Services Company

Department	:	Analytical & Process Chemistry
Ext/MS	:	4761 / WV-301
Memo #	:	IF:2002:0054
Date	:	August 15, 2002
Subject	:	Recalculation of Sr-90 Results
To	:	AQAC File WV-301
cc	:	See Attachment B

This memo documents notification that the Sr-90 and Y-90 efficiencies and efficiency uncertainties for the time period of 12-May-2000 to 08-August-2002 were found to be incorrect. The error resulted in a slight underestimate of Sr-90 results for the same time period.

The CPM (counts per minute) of the calibration standard was background subtracted twice resulting in an incorrect Y-90 efficiency. The independent review did not assume error due to the slight affect on the efficiency, the difference was assumed to be attributed to rounding error. The Sr-90 efficiency is calculated from the Y-90 efficiency, hence, the Sr-90 efficiency was also affected. Identification of this error has resulted in a more prudent review when minor discrepancies are recognized during independent review of calculations.

Both efficiencies were corrected by recalculating with only one background subtraction applied to the calibration standard CPM. The efficiencies for Sr-90 and Y-90 changed from 0.906 to 0.903 and 0.917 to 0.920, respectively. The Sr-90 and Y-90 efficiency uncertainties changed also, from 0.010 to 007 and 0.018 to 0.017, respectively. The end affect of the error on Sr-90 results are shown in Attachment A.

Since the affect is minimal (less than 0.5%), the original A&PC Reports of Analysis will not be modified to include the corrected result at this time.

F. H. Barber, Scientist
Analytical & Process Chemistry

D. M. Perkins, Manager
Analytical & Process Chemistry

FHB:SL

Attachment A - ^{90}Sr Results

VAST ID	Department	Customer ID	Report Recipients		Reported Sr90	Uncertainity		Corrected Sr90	Uncertainity	% Difference
00-1055	APC	JZC-2Q2000-09R	CHRISTOPHER,		1.41E-04	5.50E-06		1.41E-04	5.13E-06	0.28
00-1055	APC	JZC-2Q2000-09R	CHRISTOPHER,		1.50E-04	5.90E-06		1.50E-04	5.46E-06	0.32
00-1125	APC	BATCH 1	J.Z.CHRISTOPHER, F.H. BARBER		1.32E-02	5.50E-04		1.32E-02	5.14E-04	0.32
00-1125	APC	BATCH 1	J.Z.CHRISTOPHER, F.H. BARBER		3.21E-02	9.53E-04		3.22E-02	8.23E-04	0.32
00-1125	APC	BATCH 1	J.Z.CHRISTOPHER, F.H. BARBER		3.40E-02	9.91E-04		3.41E-02	8.51E-04	0.31
00-1125	APC	BATCH 1	J.Z.CHRISTOPHER, F.H. BARBER		3.17E-02	9.41E-04		3.18E-02	8.14E-04	0.31
00-1125	APC	BATCH 1	J.Z.CHRISTOPHER, F.H. BARBER		3.10E-02	9.21E-04		3.11E-02	7.98E-04	0.31
00-1125	APC	BATCH 1	J.Z.CHRISTOPHER, F.H. BARBER		3.30E-02	9.72E-04		3.31E-02	8.41E-04	0.31
00-1125	APC	BATCH 1	J.Z.CHRISTOPHER, F.H. BARBER	<	3.63E-04		<	3.64E-04		0.30
00-1128	APC	LTP 000661 BATCH 2	CHRISTOPHER,J.Z. / BARBER F. H.		3.55E-04	2.57E-04		3.56E-04	2.58E-04	0.30
00-1128	APC	LTP 000661 BATCH 2	CHRISTOPHER,J.Z. / BARBER F. H.		3.03E-02	8.97E-04		3.04E-02	7.80E-04	0.30
00-1128	APC	LTP 000661 BATCH 2	CHRISTOPHER,J.Z. / BARBER F. H.		2.97E-02	8.78E-04		2.97E-02	7.64E-04	0.30
00-1128	APC	LTP 000661 BATCH 2	CHRISTOPHER,J.Z. / BARBER F. H.		2.75E-02	8.16E-04		2.76E-02	7.11E-04	0.30
00-1128	APC	LTP 000661 BATCH 2	CHRISTOPHER,J.Z. / BARBER F. H.		3.03E-02	9.04E-04		3.04E-02	7.90E-04	0.30
00-1128	APC	LTP 000661 BATCH 2	CHRISTOPHER,J.Z. / BARBER F. H.		3.03E-02	9.03E-04		3.04E-02	7.90E-04	0.30
00-1131	APC	CLNG BLK BATCH 1	J.Z. CHRISTOPHER, F.H. BARBER	<	3.80E-04		<	3.81E-04		0.31
00-1131	APC	CLNG BLK BATCH 1	J.Z. CHRISTOPHER, F.H. BARBER	<	3.79E-04		<	3.80E-04		0.31
00-1131	APC	CLNG BLK BATCH 1	J.Z. CHRISTOPHER, F.H. BARBER	<	3.78E-04		<	3.79E-04		0.31
00-1131	APC	CLNG BLK BATCH 1	J.Z. CHRISTOPHER, F.H. BARBER	<	3.77E-04		<	3.78E-04		0.31
00-1131	APC	CLNG BLK BATCH 1	J.Z. CHRISTOPHER, F.H. BARBER	<	3.76E-04		<	3.77E-04		0.31
00-1131	APC	CLNG BLK BATCH 1	J.Z. CHRISTOPHER, F.H. BARBER	<	3.75E-04		<	3.76E-04		0.31
00-1148	APC	CLNG BATCH 2 G-L	J.Z. CHRISTOPHER, F.H. BARBER	<	3.69E-04		<	3.70E-04		0.29
00-1148	APC	CLNG BATCH 2 G-L	J.Z. CHRISTOPHER, F.H. BARBER	<	3.69E-04		<	3.70E-04		0.29
00-1148	APC	CLNG BATCH 2 G-L	J.Z. CHRISTOPHER, F.H. BARBER	<	3.68E-04		<	3.69E-04		0.29
00-1148	APC	CLNG BATCH 2 G-L	J.Z. CHRISTOPHER, F.H. BARBER	<	3.67E-04		<	3.68E-04		0.28
00-1148	APC	CLNG BATCH 2 G-L	J.Z. CHRISTOPHER, F.H. BARBER	<	3.66E-04		<	3.67E-04		0.28
00-1148	APC	CLNG BATCH 2 G-L	J.Z. CHRISTOPHER, F.H. BARBER	<	3.65E-04		<	3.66E-04		0.28
00-1618	APC	WO 0001028	D.V. WALLON , J.Z. CHRISTOPHER		1.23E-02	1.56E-03		1.24E-02	1.55E-03	0.32
00-1618	APC	WO 0001028	D.V. WALLON , J.Z. CHRISTOPHER		9.60E-03	1.48E-03		9.63E-03	1.48E-03	0.31
00-1621	APC	Q3002A0004 SPIKE	CHRISTOPHER,J.Z.		1.49E-03	3.00E-04		1.49E-03	3.01E-04	0.31
00-1621	APC	Q3002A0004 SPIKE	CHRISTOPHER,J.Z.		1.55E-03	2.93E-04		1.56E-03	2.93E-04	0.31
00-1621	APC	Q3002A0004 SPIKE	CHRISTOPHER,J.Z.		1.48E-03	3.09E-04		1.49E-03	3.09E-04	0.31
00-1621	APC	Q3002A0004 SPIKE	CHRISTOPHER,J.Z.		1.55E-03	2.96E-04		1.55E-03	2.96E-04	0.31
00-1621	APC	Q3002A0004 SPIKE	CHRISTOPHER,J.Z.		1.45E-03	2.89E-04		1.46E-03	2.89E-04	0.31
00-1621	APC	Q3002A0004 SPIKE	CHRISTOPHER,J.Z.	<	4.13E-04		<	4.14E-04		0.30
00-1651	APC	WO 0001028 STEP 4.23	D.V.WALLON/J.Z. CHRISTOPHER		4.84E-03	1.14E-04		4.85E-03	8.92E-05	0.30
00-1651	APC	WO 0001028 STEP 4.23	D.V.WALLON/J.Z. CHRISTOPHER		4.94E-03	1.16E-04		4.96E-03	9.06E-05	0.30
00-1651	APC	WO 0001028 STEP 4.23	D.V.WALLON/J.Z. CHRISTOPHER		1.08E-02	3.64E-04		1.09E-02	3.28E-04	0.31
00-1651	APC	WO 0001028 STEP 4.23	D.V.WALLON/J.Z. CHRISTOPHER		1.93E-02	5.44E-04		1.94E-02	4.63E-04	0.31
00-1651	APC	WO 0001028 STEP 4.23	D.V.WALLON/J.Z. CHRISTOPHER		4.31E-03	2.22E-04		4.32E-03	2.13E-04	0.30
00-1651	APC	WO 0001028 STEP 4.23	D.V.WALLON/J.Z. CHRISTOPHER		4.71E-03	2.31E-04		4.72E-03	2.20E-04	0.30
00-1749	APC	LTP 000669	F. BARBER		1.21E-03	1.52E-04		1.22E-03	1.51E-04	0.31
00-1749	APC	LTP 000669	F. BARBER		1.88E-03	5.20E-05		1.89E-03	4.40E-05	0.31
00-1780	APC	SPIKE W/ Q3002A0004	CHRISTOPHER,		1.54E-02	2.26E-03		1.55E-02	2.26E-03	0.30
00-1956	APC	A13589-226/JZC-3Q2000-03R	J. Z. CHRISTOPHER, D. M. PERKINS		2.02E-04	7.76E-06		2.02E-04	7.15E-06	0.32
00-1994	APC	LTP 000671	F. BARBER		1.46E-03	4.42E-05		1.46E-03	4.17E-05	0.11
00-1994	APC	LTP 000671	F. BARBER		1.92E-03	3.07E-05		1.92E-03	2.38E-05	0.10
00-2006	APC	LTP 000672	F. BARBER		1.62E+02	5.68E+00		1.63E+02	5.14E+00	0.32
00-2006	APC	LTP 000672	F. BARBER		3.55E+02	8.64E+00		3.56E+02	6.82E+00	0.31
00-2279	APC	SR90 QCS	FHB		1.50E-03	4.52E-05		1.51E-03	3.95E-05	0.30
00-2279	APC	SR90 QCS	FHB		1.43E-03	4.36E-05		1.44E-03	3.83E-05	0.30
00-2291	APC	Q3002A0004	SUPERVISOR		1.65E-03	4.86E-05		1.65E-03	4.21E-05	0.31
00-2291	APC	Q3002A0004	SUPERVISOR		1.79E-03	5.15E-05		1.79E-03	4.42E-05	0.31
00-2291	APC	Q3002A0004	SUPERVISOR		1.66E-03	4.86E-05		1.66E-03	4.20E-05	0.31
00-2291	APC	Q3002A0004	SUPERVISOR		1.67E-03	4.87E-05		1.67E-03	4.21E-05	0.31
00-2395	APC	JZC-4Q2000-05R	CHRISTOPHER, PERKINS		4.49E-04	1.62E-05		4.50E-04	1.48E-05	0.31
01-0008	APC	2 REPS OF Q3002A0004	A&PC SUPERVIS		1.54E-03	4.68E-05		1.55E-03	4.07E-05	0.32
01-0008	APC	2 REPS OF Q3002A0004	A&PC SUPERVIS		1.58E-03	4.75E-05		1.58E-03	4.12E-05	0.32
01-0470	APC	1Q01-01R (A14215-226)	J.Z.CHRISTOPHER, D.M.PERKINS		2.88E-04	1.96E-05		2.89E-04	1.92E-05	0.32
01-0979	APC	2Q01-01R	CHRISTOPHER, PERKINS		2.73E-04	1.90E-05		2.74E-04	1.86E-05	0.31
01-1683	APC	3Q01-01R	CHRISTOPHER,		1.39E-04	1.55E-05		1.40E-04	1.54E-05	0.32
01-1683	APC	3Q01-01R	CHRISTOPHER,		1.45E-04	5.85E-06		1.46E-04	5.44E-06	0.32
01-1683	APC	3Q01-01R	CHRISTOPHER,		1.43E-04	5.82E-06		1.44E-04	5.42E-06	0.32
01-2147	APC	S1906D0000	CHRISTOPHER,		2.19E-01	4.93E-03		2.20E-01	3.73E-03	0.30
01-2147	APC	S1906D0000	CHRISTOPHER,		4.01E-01	8.77E-03		4.03E-01	6.41E-03	0.31
01-2147	APC	S1906D0000	CHRISTOPHER,		4.01E-01	7.93E-03		4.02E-01	5.82E-03	0.25
01-2214	APC	S1906D0000	CHRISTOPHER,		3.86E-01	7.56E-03		3.87E-01	5.76E-03	0.21

Attachment A - ^{90}Sr Results

VAST ID	Department	Customer ID	Report Recipients	Reported Sr90	Uncertainty	Corrected Sr90	Uncertainty	% Difference
01-2225	APC	SPK W/SET "J" S1906D0000	CHRISTOPHER,	4.15E-01	9.20E-03	4.16E-01	6.95E-03	0.29
01-2268	APC	S1906D0000	CHRISTOPHER,	3.79E-01	1.00E-02	3.79E-01	9.40E-03	0.06
01-2322	APC	ASP010098 S1906D	CHRISTOPHER,	4.02E-01	9.11E-03	4.04E-01	6.88E-03	0.31
01-2350	APC	ASP010099 S1906D	CHRISTOPHER,	3.89E-01	8.66E-03	3.90E-01	6.58E-03	0.29
01-2679	APC	4Q01R1	CHRISTOPHER,	2.11E-04	7.22E-06	2.12E-04	6.50E-06	0.32
02-0008	APC	BLANK SPIKE W/ 01-1076	CHRISTOPHER,	3.59E-01	1.15E-02	3.60E-01	1.02E-02	0.30
02-0067	APC	SPIKE W/ 01-1140 -01-1142	F. BARBER	1.62E+01	3.41E-01	1.63E+01	2.40E-01	0.31
02-0067	APC	SPIKE W/ 01-1140 -01-1142	F. BARBER	3.52E-01	1.07E-02	3.54E-01	9.34E-03	0.31
02-0068	APC	BLANK W/ 01-1140-01-1142	F. BARBER	3.30E+00	7.05E-02	3.31E+00	5.06E-02	0.31
02-0068	APC	BLANK W/ 01-1140-01-1142	F. BARBER	< 3.54E-04		< 3.56E-04		0.31
02-0119	APC	SPIKE W/ 02-0107- 02-0112	MADDIGAN, C	3.67E-01	7.70E-03	3.68E-01	5.44E-03	0.31
02-0120	APC	BLANK W/ 02-0107-0112	MADDIGAN, C	< 3.61E-04		< 3.62E-04		0.31
02-0178	APC	BLANK W 02-0113 TO 0118	MADDIGAN, C	< 3.89E-04		< 3.90E-04		0.31
02-0179	APC	SPIKE W02-0113 TO 02-0118	MADDIGAN, C	3.64E-01	8.24E-03	3.65E-01	6.24E-03	0.31
02-0202	APC	BLANK W/ 02-0093 ETC	MADDIGAN, C	< 3.72E-04		< 3.73E-04		0.30
02-0203	APC	SPIKE W/02-0093 ETC	MADDIGAN, C	9.32E+00	2.06E-01	9.35E+00	1.53E-01	0.30
02-0227	APC	BLK W/0095, 0099, 0101	C.J. MADDIGAN	4.95E-03	1.96E-04	4.97E-03	1.82E-04	0.31
02-0227	APC	BLK W/0095, 0099, 0101	C.J. MADDIGAN	< 3.62E-04		< 3.63E-04		0.31
02-0338	APC	ASP020105 H20 FOR RAD ACT	FHB	6.40E-01	5.71E-02	6.42E-01	5.65E-02	0.30
02-0420	APC	BLANK ASP 020113	CHRISTOPHER,	< 3.50E-04		< 3.51E-04		0.29
02-0421	APC	S1906D0000	CHRISTOPHER,	3.95E-01	8.91E-03	3.96E-01	6.83E-03	0.29
02-0732	APC	LCS/SPIKE S1906D0000	CHRISTOPHER,	3.97E-01	8.51E-03	3.98E-01	6.47E-03	0.27
02-0825	APC	S1906D0000 LCS	ASP020121/FHB	8.17E-02	7.67E-03	8.20E-02	7.59E-03	0.30
02-0903	APC	1Q02R1/A15372-226	J. Z. CHRISTOPHER	4.07E-04	1.14E-05	4.08E-04	9.63E-06	0.31
02-0908	APC	2Q02R1 /A15744-226	CHRISTOPHER,	2.98E-04	9.03E-06	2.98E-04	7.88E-06	0.31
C3002A00 01	APC		A. Arakali	1.75E-03	5.26E-05	1.76E-03	4.56E-05	0.32
C3002A00 01	APC		A. Arakali	1.74E-03	5.22E-05	1.75E-03	4.53E-05	0.32
C3002A00 01	APC		A. Arakali	1.73E-03	5.20E-05	1.74E-03	4.51E-05	0.31
C3002A00 01	APC		A. Arakali	1.72E-03	5.16E-05	1.72E-03	4.48E-05	0.31
C3002A00 01	APC		A. Arakali	1.74E-03	5.17E-05	1.74E-03	4.49E-05	0.31
C3002A00 01	APC		A. Arakali	1.73E-03	5.15E-05	1.73E-03	4.47E-05	0.31
C3002A00 01	APC		A. Arakali	1.89E-03	5.33E-05	1.90E-03	4.54E-05	0.30
C3003A00 00	APC		A. Arakali	1.90E-03	5.68E-05	1.91E-03	4.92E-05	0.32
C3003A00 00	APC		A. Arakali	1.77E-03	5.18E-05	1.78E-03	4.44E-05	0.32
CALCTES T0138	APC	N/A	N/A	2.80E-02	1.39E-03	2.81E-02	1.33E-03	0.33
CALCTES T0138	APC	N/A	N/A	< 1.21E-04		< 1.21E-04		0.33
CALCTES T0138	APC	N/A	N/A	2.80E-02	1.39E-03	2.81E-02	1.33E-03	0.33
CALCTES T0142	APC	N/A	N/A	6.16E-04	2.38E-05	6.18E-04	2.20E-05	0.33
CALCTES T0177	APC	N/A	N/A	4.94E-05	1.05E-05	4.96E-05	1.05E-05	0.33
CALCTES T0177	APC	N/A	N/A	< 2.06E-04		< 2.07E-04		0.33
CALCTES T0177	APC	N/A	N/A	< 2.06E-04		< 2.07E-04		0.33
Q3002A00 05	APC		FILE	1.84E-03	5.16E-05	1.85E-03	4.37E-05	0.31
S1901D00 00	APC		FILE	4.27E-02	9.23E-04	4.29E-02	6.58E-04	0.32
S1901D00 00	APC		FILE	4.37E-02	9.44E-04	4.38E-02	6.73E-04	0.32
S1906D00 00	APC		FILE	4.06E-01	5.90E-03	4.06E-01	4.23E-03	0.10
02-1116	D & D OPS	FRS POOL SURFACE FILM	J. JABLONSKI , J. MOOREHEAD	1.26E-02	4.04E-04	1.26E-02	3.58E-04	0.32
00-0860	D&D	FRSCT-3A	TJ JONES WV-TSB/X2413	< 4.01E-04		< 4.02E-04		0.31
00-0861	D&D	FRSCT-1	TJ JONES WV-TSB/X2413	< 4.00E-04		< 4.01E-04		0.31
00-0862	D&D	FRSCT-2	TJ JONES WV-TSB/X2413	< 3.99E-04		< 4.00E-04		0.31
00-0863	D&D	FRSCT-4A	TJ JONES WV-TSB/X2413	< 3.98E-04		< 3.99E-04		0.30
00-1281	D&D	12-1512-D-R	JOHN RIZZO	1.36E+00	6.35E-02	1.36E+00	6.02E-02	0.32
00-1281	D&D	12-1512-D-R	JOHN RIZZO	< 3.86E-04		< 3.87E-04		0.30
00-1282	D&D	12-2717-C-R	JOHN RIZZO	2.93E-01	1.87E-02	2.94E-01	1.82E-02	0.32
00-1282	D&D	12-2717-C-R	JOHN RIZZO	< 3.85E-04		< 3.86E-04		0.30
00-1562	D&D	LLWT/SURGE	VLAD (WV-TSB)	< 3.80E-04		< 3.81E-04		0.30
00-1582	D&D	ANTHRACITE TANK	T. PIECZYNSKI/M. WEBB	< 3.79E-04		< 3.80E-04		0.29
00-1583	D&D	LLWT/RECYCLE	T. PIECZYNSKI/M. WEBB	< 3.78E-04		< 3.79E-04		0.29

Attachment A - ^{90}Sr Results

VAST ID	Department	Customer ID	Report Recipients		Reported Sr90	Uncertainity		Corrected Sr90	Uncertainity	% Difference
00-1584	D&D	LLWT/CLARIFIER	T. PIECZYNSKI/M. WEBB		2.37E-03	1.25E-03		2.37E-03	1.25E-03	0.29
00-2056	D&D	CPC.001	L. KRIEGER, T. PIECZYNSKI, D. DOMBROWSKI		4.32E-02	1.58E-03		4.33E-02	1.45E-03	0.30
00-2056	D&D	CPC.001	L. KRIEGER, T. PIECZYNSKI, D. DOMBROWSKI		5.55E-03	7.54E-04		5.57E-03	7.52E-04	0.30
00-2200	D&D	GCREXT #3	SCOTT CHASE (B1F)	<	4.04E-04		<	4.05E-04		0.29
00-2201	D&D	GCREXT #4	SCOTT CHASE (F1B)	<	4.03E-04		<	4.04E-04		0.29
00-2203	D&D	GCRPAR #3	SCOTT CHASE (F1B)		3.47E-01	7.78E-03		3.48E-01	5.94E-03	0.29
00-2204	D&D	GCRPAR #4	SCOTT CHASE (F1B)		6.91E-02	2.10E-03		6.93E-02	1.85E-03	0.29
01-2191	D&D	GW1	WF SCOTT II(fax 4442)/TJ JONES(fax)	<	3.33E-04		<	3.34E-04		0.22
01-2192	D&D	GW2	WF SCOTT II(fax 4442)/TJ JONES(fax)	<	3.32E-04		<	3.33E-04		0.22
01-2193	D&D	GW3	WF SCOTT II(fax 4442)/TJ JONES(fax)		2.82E-04	2.13E-04		2.82E-04	2.13E-04	0.22
01-2194	D&D	GW4	WF SCOTT II(fax 4442)/TJ JONES(fax)		3.82E-04	2.03E-04		3.83E-04	2.04E-04	0.21
02-0989	D&D/FRS	DIGESTED SOLIDS TEST #1	T. WHELAN PSE FAX 2257		2.49E-01	1.43E-02		2.50E-01	1.38E-02	0.31
00-0966	ELAB	2000-03619	M. Reagan, ENV LAB		3.57E-04	8.99E-06		3.58E-04	7.22E-06	0.32
00-0967	ELAB	2000-03620	M. Reagan		4.09E-05	2.20E-06		4.10E-05	2.11E-06	0.31
00-1229	ELAB	WP20D	M. Reagan		5.20E-05	2.43E-06		5.21E-05	2.31E-06	0.31
00-1230	ELAB	WP20S	M. Reagan, ENV LAB		2.97E-04	7.66E-06		2.98E-04	6.25E-06	0.31
00-1486	ELAB	2000-05440	Env Lab		3.04E-04	7.41E-06		3.05E-04	5.82E-06	0.32
00-1508	ELAB	2000-05441	Env Lab		7.61E-05	2.55E-06		7.64E-05	2.28E-06	0.32
00-1747	ELAB	2000-06286	Env Lab		7.37E-05	2.45E-06		7.39E-05	2.20E-06	0.30
00-1748	ELAB	2000-06284	Env Lab		2.37E-04	5.85E-06		2.38E-04	4.71E-06	0.30
00-1937	ELAB	2000-07631	Env Lab		2.76E-04	6.72E-06		2.77E-04	5.33E-06	0.31
00-1938	ELAB	2000-07633	Env Lab		1.90E-05	1.27E-06		1.90E-05	1.24E-06	0.30
00-2188	ELAB	2000-08640	Env Lab		8.20E-06	2.67E-06		8.23E-06	2.68E-06	0.32
00-2188	ELAB	2000-08640	Env Lab		5.92E-06	2.58E-06		5.94E-06	2.58E-06	0.30
00-2189	ELAB	2000-08638	Env Lab		3.95E-04	1.12E-05		3.96E-04	9.46E-06	0.32
00-2189	ELAB	2000-08638	Env Lab		3.35E-04	9.68E-06		3.36E-04	8.36E-06	0.30
00-2314	ELAB	2000-09542	Env Lab		2.83E-06	1.26E-06		2.84E-06	1.26E-06	0.29
00-2315	ELAB	2000-09540	Env Lab		1.41E-04	4.26E-06		1.42E-04	3.74E-06	0.29
00-2453	ELAB	2000-10446	Env Lab		2.86E-04	6.89E-06		2.87E-04	5.45E-06	0.30
00-2453	ELAB	2000-10446	Env Lab		2.55E-04	6.73E-06		2.55E-04	5.58E-06	0.31
00-2454	ELAB	2000-10448	Env Lab		6.46E-05	2.25E-06		6.48E-05	2.04E-06	0.30
00-2454	ELAB	2000-10448	Env Lab		6.32E-05	2.67E-06		6.34E-05	2.51E-06	0.30
01-0167	ELAB	2001-00298	Env Lab		1.84E-05	1.27E-06		1.85E-05	1.24E-06	0.31
01-0168	ELAB	2001-00291	Env Lab		2.91E-04	7.08E-06		2.92E-04	5.59E-06	0.31
01-0307	ELAB	WP20D	Env Lab		3.97E-05	1.76E-06		3.98E-05	1.66E-06	0.32
01-0309	ELAB	WP20S	Env Lab		1.89E-04	6.80E-06		1.90E-04	6.19E-06	0.31
01-0549	ELAB	2001-02331	Env Lab		3.33E-05	2.04E-06		3.34E-05	1.99E-06	0.32
01-0550	ELAB	2001-02329	Env Lab		1.72E-04	5.03E-06		1.72E-04	4.33E-06	0.31
01-0762	ELAB	2001-03991	Env Lab		2.30E-04	5.83E-06		2.31E-04	4.70E-06	0.32
01-0763	ELAB	2001-03993	Env Lab		1.45E-05	1.19E-06		1.45E-05	1.17E-06	0.32
01-1037	ELAB	2001-04829	Env Lab		6.45E-04	1.43E-05		6.47E-04	1.07E-05	0.30
01-1038	ELAB	2001-04827	Env Lab		3.86E-04	8.92E-06		3.88E-04	6.90E-06	0.30
01-1263	ELAB	WP20D 2001-05941	Env Lab		5.77E-04	1.32E-05		5.79E-04	9.90E-06	0.32
01-1264	ELAB	WP20S 2001-05939	Env Lab		3.63E-04	8.62E-06		3.65E-04	6.68E-06	0.31
01-1461	ELAB	2001-06834	Env Lab		5.86E-04	1.53E-05		5.88E-04	1.25E-05	0.32
01-1462	ELAB	2001-06832	Env Lab		3.57E-04	1.04E-05		3.58E-04	8.87E-06	0.32
01-1739	ELAB	2001-07537	Env Lab		2.33E-04	7.73E-06		2.34E-04	6.91E-06	0.31
01-1739	ELAB	2001-07537	Env Lab		3.41E-04	1.01E-05		3.43E-04	8.68E-06	0.32
01-1740	ELAB	2001-07539	Env Lab		4.98E-04	1.33E-05		4.99E-04	1.11E-05	0.31
01-1740	ELAB	2001-07539	Env Lab		5.06E-04	1.36E-05		5.07E-04	1.12E-05	0.32
01-1992	ELAB	2001-08761	Env Lab		4.97E-04	1.07E-05		4.98E-04	8.14E-06	0.27
01-1993	ELAB	WP20S 2001-08759	Env Lab		3.09E-04	7.00E-06		3.10E-04	5.52E-06	0.27
01-2278	ELAB	2001-09586	Env Lab		4.08E-05	2.17E-06		4.09E-05	2.09E-06	0.31
01-2279	ELAB	2001-09588	Env Lab		9.50E-05	3.35E-06		9.53E-05	3.05E-06	0.31
01-2684	ELAB	2001-11794	Env Lab		1.64E-05	1.16E-06		1.64E-05	1.15E-06	0.27
01-2685	ELAB	2001-11796	Env Lab		3.42E-04	7.61E-06		3.43E-04	5.96E-06	0.27
02-0431	ELAB	2002-02821	Env Lab		1.12E-04	3.29E-06		1.13E-04	2.84E-06	0.30
02-0432	ELAB	2002-02823	Env Lab		2.20E-04	5.55E-06		2.21E-04	4.50E-06	0.31
02-1031	ELAB	2002-06087	Env Lab		1.60E-04	4.34E-06		1.60E-04	3.60E-06	0.32
02-1032	ELAB	2002-06089	Env Lab		2.17E-04	5.54E-06		2.17E-04	4.48E-06	0.32
99-0354	ELAB	NA	MARK HERMANN/R. HILBERT	<	1.01E-03		<	1.01E-03		0.32
02-0307	FACILITY CHA	VALVE AISLE SUMP #1A	FAX 4504 ROWELL, MEESS, FAZIO		1.54E+01	3.28E-01		1.54E+01	2.32E-01	0.32
02-0307	FACILITY CHA	VALVE AISLE SUMP #1A	FAX 4504 ROWELL, MEESS, FAZIO		1.53E+01	3.19E-01		1.53E+01	2.25E-01	0.30
02-0307	FACILITY CHA	VALVE AISLE SUMP #1A	FAX 4504 ROWELL, MEESS, FAZIO		1.54E+01	3.19E-01		1.55E+01	2.24E-01	0.30
02-0308	FACILITY CHA	VALVE AISLE SUMP 1B	FAX 4505 ROWELL, MEESS, FAZIO		5.73E+00	1.24E-01		5.75E+00	8.93E-02	0.32
02-0308	FACILITY	VALVE AISLE SUMP 1B	FAX 4505 ROWELL, MEESS, FAZIO		5.79E+00	1.22E-01		5.81E+00	8.80E-02	0.30

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VAST ID	Department	Customer ID	Report Recipients	Reported Sr90	Uncertainity	Corrected Sr90	Uncertainity	% Difference
02-0308	CHA FACILITY	VALVE AISLE SUMP 1B	FAX 4505 ROWELL, MEESS, FAZIO	3.15E-01	6.78E-03	3.16E-01	4.96E-03	0.30
02-0845	CHA FACILITY	PPC SMEAR #2	J. CHOROSER, T. PIECZYNSKI	1.73E-02	5.05E-04	1.73E-02	4.34E-04	0.32
02-1018	CHA FACILITY	PPC-SMEAR-04	J.CHOROSER/ T.PIECZYNSKI	1.86E-02	5.41E-04	1.87E-02	4.64E-04	0.32
02-1019	CHA FACILITY	PPC-SMEAR-05	J.CHOROSER/ T.PIECZYNSKI	2.30E+00	4.86E-02	2.30E+00	3.42E-02	0.31
02-1020	CHA FACILITY	PPC-SMEAR-06	J.CHOROSER/ T.PIECZYNSKI	7.29E-04	1.34E-04	7.31E-04	1.34E-04	0.31
02-0366	CHA FRS PROJECT	FRS FILTER MESH	TJ JONES, TODD PIECZYNSKI	2.12E-02	6.14E-04	2.13E-02	5.30E-04	0.30
02-0366	FRS PROJECT	FRS FILTER MESH	TJ JONES, TODD PIECZYNSKI	3.22E-02	8.38E-04	3.23E-02	6.94E-04	0.30
02-0623	FRS PROJECT	NFS VACUUM HOSE WIPE	PIECYNSKI (2444), JONES (4442)	1.16E-02	2.01E-03	1.16E-02	2.00E-03	0.27
02-0638	HEC PROJ	PMC-FA-001A	J. Choroser/T. Pieczynski	2.45E+01	5.77E-01	2.46E+01	4.47E-01	0.31
02-0639	HEC PROJ	PMC-FA-002A	J. Choroser/T. Pieczynski	1.77E+00	1.28E-01	1.77E+00	1.26E-01	0.31
02-0640	HEC PROJ	PMC-FA-003	J. Choroser/T. Pieczynski	1.70E+01	4.71E-01	1.71E+01	3.99E-01	0.31
02-0654	HEC PROJ	PMC-CE-001A	J.CHOROSER, TODD PIECZYNSKI	1.06E+00	2.55E-02	1.06E+00	2.01E-02	0.30
02-0655	HEC PROJ	PMC-CE-002A	J.CHOROSER, TODD PIECZYNSKI	4.55E+00	1.00E-01	4.56E+00	7.46E-02	0.30
02-0657	HEC PROJ	PMC-CE-004	J.CHOROSER, TODD PIECZYNSKI	1.97E+01	4.25E-01	1.98E+01	3.03E-01	0.32
02-0657	HEC PROJ	PMC-CE-004	J.CHOROSER, TODD PIECZYNSKI	2.09E+01	4.51E-01	2.10E+01	3.23E-01	0.32
02-0727	HEC PROJ	PMC-LW-003	J.CHOROSER, T.PIECZYNSKI	1.64E+00	4.37E-02	1.65E+00	3.60E-02	0.32
02-0728	HEC PROJ	PMC-LW-004	J.CHOROSER, T.PIECZYNSKI	3.58E-02	1.28E-03	3.59E-02	1.17E-03	0.31
02-0878	HEC PROJ	PMC-LW-001	J. CHOROSER, T. PIECZYNSKI	3.60E-01	9.09E-03	3.62E-01	7.35E-03	0.31
02-0879	HEC PROJ	PMC-LW-002	T. PIECZNSKI, J. CHOROSER	1.76E+00	3.71E-02	1.76E+00	2.64E-02	0.31
02-1071	HEC PROJ	PMC-LH-001A	J. CHOROSER/T. PIECZYNSKI	1.39E+02	3.69E+00	1.39E+02	3.04E+00	0.32
02-1072	HEC PROJ	PMC-LH-002A	J. CHOROSER/ T. PIECZYNSKI	1.22E+02	3.27E+00	1.22E+02	2.72E+00	0.32
02-1073	HEC PROJ	PMC-LH-003	J. CHOROSER/ T. PIECZYNSKI	1.45E+02	3.57E+00	1.46E+02	2.83E+00	0.31
01-0335	HLW PROJ	BS-2	L. ROWELL, D. MEESS	1.48E+03	6.57E+01	1.48E+03	6.20E+01	0.31
01-0336	HLW PROJ	BS #3	L. ROWELL, D. MEESS	1.13E+03	5.68E+01	1.13E+03	5.45E+01	0.31
01-0337	HLW PROJ	BS #4	L. ROWELL, D. MEESS	3.66E+03	1.45E+02	3.67E+03	1.34E+02	0.31
01-0342	HLW PROJ	BS-5	L.ROWELL, D. MEESS	1.61E+03	6.81E+01	1.62E+03	6.39E+01	0.31
01-0432	HLW PROJ	BS-6	L. ROWELL FAX 4504, D. MEESS FAX 4301	8.53E+03	2.05E+02	8.56E+03	1.59E+02	0.32
01-0433	HLW PROJ	BS-7	L. ROWELL FAX 4504, D. MEESS FAX 4424	5.95E+03	1.40E+02	5.97E+03	1.10E+02	0.31
01-0434	HLW PROJ	BS-8	L. ROWELL FAX 4504, D. MEESS FAX 4301	5.94E+03	1.38E+02	5.96E+03	1.07E+02	0.30
01-0436	HLW PROJ	BS-10	L. ROWELL FAX 4504, D. MEESS FAX 4424	1.78E+00	5.49E-02	1.79E+00	4.73E-02	0.32
01-0437	HLW PROJ	BS-11	L. ROWELL FAX 4504, D. MEESS FAX 4424	2.40E+00	6.66E-02	2.40E+00	5.61E-02	0.31
01-0439	HLW PROJ	BS-13	L. ROWELL(FAX4504), D. MEESSFAX(4301)	7.27E+03	1.66E+02	7.30E+03	1.27E+02	0.30
01-0440	HLW PROJ	BS-14	L.ROWELL FAX 4504, D.MEESS FAX 4301	1.24E+04	2.73E+02	1.25E+04	2.03E+02	0.30
01-0441	HLW PROJ	BS-15	L.ROWELL FAX 4504, D.MEESS FAX 4301	6.23E+03	1.53E+02	6.24E+03	1.21E+02	0.32
01-0443	HLW PROJ	BS-1B	L.ROWELL FAX 4504, D.MEESS FAX 4424	9.73E-02	5.08E-03	9.76E-02	4.88E-03	0.31
01-0449	HLW PROJ	BS1A	L. ROWELL (FAX 4504), D. MEESS (FAX 4301)	3.19E+01	6.91E-01	3.20E+01	4.95E-01	0.32
01-0450	HLW PROJ	BS-17	L. ROWELL (FAX 4504), D. MEESS (FAX 4301)	2.02E+02	5.83E+00	2.02E+02	4.99E+00	0.31
01-0460	HLW PROJ	BS-18	L.ROWELL FAX 4504, DAN MEESS FAX 4301	1.22E+02	4.05E+00	1.22E+02	3.63E+00	0.31
01-0461	HLW PROJ	BS-19	L.ROWELL FAX 4504, DAN MEESS FAX 4301	2.04E+02	5.96E+00	2.05E+02	5.13E+00	0.31
01-0478	HLW PROJ	BS-20	L.ROWELL FAX 4504, D.MEESS FAX 4301	3.23E+02	7.00E+00	3.24E+02	5.05E+00	0.31
01-0479	HLW PROJ	BS-21	L.ROWELL FAX 4504, D.MEESS FAX 4301	2.43E+02	6.81E+00	2.43E+02	5.52E+00	0.32
01-0480	HLW PROJ	BS-22	L.ROWELL FAX 4504, D.MEESS FAX 4301	9.56E+01	2.20E+00	9.59E+01	1.67E+00	0.31
01-0632	HLW PROJ	MAG-1	L. Rowell (fax 4504)/D. Meess (fax 4301)	8.02E+01	1.85E+00	8.05E+01	1.39E+00	0.32
01-0632	HLW PROJ	MAG-1	L. Rowell (fax 4504)/D. Meess (fax 4301)	3.84E+00	9.53E-02	3.85E+00	7.56E-02	0.32
01-0633	HLW PROJ	MAG-2	L. Rowell (fax 4504)/D. Meess (fax 4301)	8.48E+01	1.94E+00	8.50E+01	1.47E+00	0.32
01-0633	HLW PROJ	MAG-2	L. Rowell (fax 4504)/D. Meess (fax 4301)	1.92E+01	4.19E-01	1.92E+01	3.04E-01	0.32
01-1676	HLW PROJ	BS-27	L. Rowell (fax 4504)/D. Meess (fax 4301)	2.86E+03	6.19E+01	2.86E+03	4.47E+01	0.31
01-1677	HLW PROJ	BS-28	L. Rowell (fax 4504)/D. Meess (fax 4301)	7.82E+01	1.98E+00	7.84E+01	1.59E+00	0.32
01-1677	HLW PROJ	BS-28	L. Rowell (fax 4504)/D. Meess (fax 4301)	7.76E+01	1.95E+00	7.79E+01	1.57E+00	0.31
01-1677	HLW PROJ	BS-28	L. Rowell (fax 4504)/D. Meess (fax 4301)	7.74E+01	1.78E+00	7.76E+01	1.45E+00	0.25
01-1680	HLW PROJ	BS-29	L. Rowell (fax 4504)/D. Meess (fax 4301)	6.02E+03	1.30E+02	6.04E+03	9.33E+01	0.31
01-1681	HLW PROJ	BS-30	L. Rowell (fax 4504)/D. Meess (fax 4301)	5.15E+03	1.11E+02	5.16E+03	8.01E+01	0.31
01-1682	HLW PROJ	BS-31	L. Rowell (fax 4504)/D. Meess (fax 4301)	1.50E+03	3.34E+01	1.51E+03	2.47E+01	0.31
01-1705	HLW PROJ	BS-32	L. Rowell (fax 4504)/D. Meess (fax 4301)	2.36E+01	8.08E-01	2.36E+01	7.28E-01	0.32
01-1705	HLW PROJ	BS-32	L. Rowell (fax 4504)/D. Meess (fax 4301)	2.27E+01	7.84E-01	2.28E+01	7.09E-01	0.31
01-1705	HLW PROJ	BS-32	L. Rowell (fax 4504)/D. Meess (fax 4301)	2.34E+01	7.43E-01	2.34E+01	6.75E-01	0.25
01-1706	HLW PROJ	BS-33	L. Rowell (fax 4504)/D. Meess (fax 4301)	4.74E+03	1.02E+02	4.75E+03	7.39E+01	0.31
01-1709	HLW PROJ	BS-34	L. Rowell (fax 4504)/D. Meess (fax 4301)	5.75E+03	1.22E+02	5.77E+03	8.72E+01	0.31
01-1726	HLW PROJ	BS-35	L. Rowell (fax 4504)/D. Meess (fax 4301)	4.37E+01	1.26E+00	4.39E+01	1.08E+00	0.31
01-1726	HLW PROJ	BS-35	L. Rowell (fax 4504)/D. Meess (fax 4301)	4.32E+01	1.23E+00	4.33E+01	1.06E+00	0.31
01-1726	HLW PROJ	BS-35	L. ROWELL (FAX 4504)/D. MEESS (FAX 4301)	4.31E+01	1.14E+00	4.32E+01	9.86E-01	0.24
01-1733	HLW PROJ	BS-37	L. Rowell (fax 4504)/D. Meess (fax 4301)	2.43E+03	5.24E+01	2.44E+03	3.80E+01	0.31
01-1734	HLW PROJ	BS-38	L. Rowell (fax 4504)/D. Meess (fax 4301)	6.15E+03	1.32E+02	6.17E+03	9.46E+01	0.31
01-1982	HLW PROJ	B75WH98-102	L.ROWELL'D.MEESS.SAE	3.30E+02	7.25E+00	3.31E+02	5.26E+00	0.32

Attachment A - ^{90}Sr Results

VAST ID	Department	Customer ID	Report Recipients	Reported Sr90	Uncertainity	Corrected Sr90	Uncertainity	% Difference
01-1982	HLW PROJ	B75WH98-102	L.ROWELL/D.MEESS,SAE	3.40E+02	7.44E+00	3.42E+02	5.37E+00	0.32
01-1982	HLW PROJ	B75WH98-102	L.ROWELL/D.MEESS,SAE	3.33E+02	7.27E+00	3.34E+02	5.26E+00	0.32
01-2098	HLW PROJ	BS-39	L. Rowell (fax 4504)/D. Meess (fax 4301)	8.92E+01	2.21E+00	8.94E+01	1.77E+00	0.31
01-2098	HLW PROJ	BS-39	L. Rowell (fax 4504)/D. Meess (fax 4301)	8.98E+01	2.20E+00	9.01E+01	1.76E+00	0.30
01-2098	HLW PROJ	BS-39	L. Rowell (fax 4504)/D. Meess (fax 4301)	8.89E+01	2.00E+00	8.91E+01	1.61E+00	0.24
01-2099	HLW PROJ	BS-40	L. Rowell (fax 4504)/D. Meess (fax 4301)	6.09E+03	1.27E+02	6.11E+03	8.90E+01	0.31
01-2100	HLW PROJ	BS-42	L. Rowell (fax 4504)/D. Meess (fax 4301)	7.31E+03	1.52E+02	7.33E+03	1.07E+02	0.30
01-2110	HLW PROJ	BS-41	L.ROWELL(4504),D.MEESS(4301)	7.42E+03	1.54E+02	7.44E+03	1.08E+02	0.30
01-2111	HLW PROJ	BS-43	L.ROWELL(4504),D.MEESS(4301)	3.49E+03	4.46E+01	3.49E+03	3.13E+01	0.06
01-2112	HLW PROJ	BS-44	L.ROWELL(4504),D.MEESS(4301)	2.40E+03	3.07E+01	2.40E+03	2.16E+01	0.06
01-2123	HLW PROJ	BS-45	L.ROWELL(4504),D.MEESS(4301)	1.39E+03	3.24E+01	1.39E+03	2.51E+01	0.30
01-2123	HLW PROJ	BS-45	L.ROWELL(4504),D.MEESS(4301)	1.39E+03	3.23E+01	1.39E+03	2.50E+01	0.30
01-2123	HLW PROJ	BS-45	L.ROWELL(4504),D.MEESS(4301)	1.36E+03	2.91E+01	1.37E+03	2.27E+01	0.24
01-2124	HLW PROJ	BS-46	L.ROWELL(4504),D.MEESS(4301)	9.99E+03	2.07E+02	1.00E+04	1.46E+02	0.30
01-2125	HLW PROJ	BS-47	L.ROWELL(4504),D.MEESS(4301)	9.53E+03	1.97E+02	9.56E+03	1.39E+02	0.30
01-2126	HLW PROJ	BS-48	L.ROWELL(4504),D.MEESS(4301)	8.59E+02	1.78E+01	8.61E+02	1.26E+01	0.30
01-2140	HLW PROJ	BS-49	L. Rowell (fax 4504)/D. Meess (fax 4301)	4.22E+01	6.83E-01	4.22E+01	5.65E-01	0.06
01-2141	HLW PROJ	BS-50	L. Rowell (fax 4504)/D. Meess (fax 4301)	1.70E+01	4.99E-01	1.70E+01	4.75E-01	0.06
01-2177	HLW PROJ	BS-57	L. Rowell (fax 4504)/D. Meess (fax 4301)	1.18E+02	2.61E+00	1.19E+02	1.94E+00	0.30
01-2178	HLW PROJ	BS-58	L. Rowell (fax 4504)/D. Meess (fax 4301)	2.99E+03	5.23E+01	3.00E+03	3.67E+01	0.20
01-2179	HLW PROJ	BS-59	L. Rowell (fax 4504)/D. Meess (fax 4301)	2.09E+02	3.79E+00	2.09E+02	2.77E+00	0.20
01-2180	HLW PROJ	BS-60	L. Rowell (fax 4504)/D. Meess (fax 4301)	1.33E+02	2.47E+00	1.33E+02	1.85E+00	0.20
01-2195	HLW PROJ	BS #52	L. Rowell (fax 4504)/D. Meess (fax 4301)	9.49E+03	1.65E+02	9.51E+03	1.16E+02	0.20
01-2196	HLW PROJ	BS #61	L. Rowell (fax 4504)/D. Meess (fax 4301)	1.10E+02	2.45E+00	1.11E+02	1.84E+00	0.30
01-2197	HLW PROJ	BS #62	L. Rowell (fax 4504)/D. Meess (fax 4301)	7.82E+01	1.78E+00	7.85E+01	1.37E+00	0.30
01-2210	HLW PROJ	BS-51	L. Rowell (fax 4504)/D. Meess (fax 4301)	1.22E+02	2.93E+00	1.22E+02	2.29E+00	0.31
01-2211	HLW PROJ	B.S.#53	L. Rowell (fax 4504)/D. Meess (fax 4301)	1.50E+03	2.58E+01	1.50E+03	1.81E+01	0.20
01-2212	HLW PROJ	B.S #54	L. Rowell (fax 4504)/D. Meess (fax 4301)	2.50E+03	4.33E+01	2.51E+03	3.05E+01	0.20
01-2213	HLW PROJ	B.S.#55	L. Rowell (fax 4504)/D. Meess (fax 4301)	1.35E+03	1.74E+01	1.36E+03	1.23E+01	0.06
01-2228	HLW PROJ	BS #56	L. Rowell (fax 4504)/D. Meess (fax 4301)	1.32E+03	1.69E+01	1.32E+03	1.20E+01	0.06
01-2229	HLW PROJ	BS #63	L. Rowell (fax 4504)/D. Meess (fax 4301)	2.58E+03	5.66E+01	2.58E+03	4.23E+01	0.30
01-2230	HLW PROJ	BS #64	L. Rowell (fax 4504)/D. Meess (fax 4301)	6.52E+00	2.69E-01	6.54E+00	2.53E-01	0.29
01-2231	HLW PROJ	BS #65	L. Rowell (fax 4504)/D. Meess (fax 4301)	1.60E+02	3.75E+00	1.61E+02	2.88E+00	0.31
00-0893	HLWO (VIT)	71WH120-71WH123	SAE(fax 4169)	1.08E+03	2.52E+01	1.08E+03	1.94E+01	0.32
00-0893	HLWO (VIT)	71WH120-71WH123	SAE(fax 4169)	1.28E+03	2.89E+01	1.28E+03	2.18E+01	0.31
00-0893	HLWO (VIT)	71WH120-71WH123	SAE(fax 4169)	1.34E+03	3.16E+01	1.34E+03	2.43E+01	0.32
00-0893	HLWO (VIT)	71WH120-71WH123	SAE(fax 4169)	1.40E+03	3.21E+01	1.40E+03	2.43E+01	0.32
00-0927	HLWO (VIT)	ABTCH 71TK 8D-2	FAX 4169,SAE(MS-48)	1.37E+03	3.20E+01	1.38E+03	2.44E+01	0.32
00-0927	HLWO (VIT)	ABTCH 71TK 8D-2	FAX 4169,SAE(MS-48)	1.43E+03	3.26E+01	1.43E+03	2.46E+01	0.32
00-0927	HLWO (VIT)	ABTCH 71TK 8D-2	FAX 4169,SAE(MS-48)	1.44E+03	3.27E+01	1.44E+03	2.45E+01	0.31
00-0927	HLWO (VIT)	ABTCH 71TK 8D-2	FAX 4169,SAE(MS-48)	1.41E+03	3.19E+01	1.41E+03	2.40E+01	0.31
00-0972	HLWO (VIT)	BATCH 71 WH	SAE(fax 4189)	1.64E+03	3.69E+01	1.65E+03	2.73E+01	0.32
00-0972	HLWO (VIT)	BATCH 71 WH	SAE(fax 4169)	1.45E+03	3.29E+01	1.46E+03	2.45E+01	0.32
00-0972	HLWO (VIT)	BATCH 71 WH	SAE(fax 4169)	1.54E+03	3.46E+01	1.54E+03	2.58E+01	0.31
00-0972	HLWO (VIT)	BATCH 71 WH	SAE(fax 4169)	1.44E+03	3.29E+01	1.45E+03	2.48E+01	0.31
00-0972	HLWO (VIT)	BATCH 71 WH	SAE(fax 4169)	1.47E+03	3.30E+01	1.48E+03	2.46E+01	0.31
00-0972	HLWO (VIT)	BATCH 71 WH	SAE(fax 4169)	1.61E+03	3.64E+01	1.61E+03	2.71E+01	0.32
00-0972	HLWO (VIT)	BATCH 71 WH	SAE(fax 4169)	1.39E+03	3.19E+01	1.40E+03	2.41E+01	0.32
00-0972	HLWO (VIT)	BATCH 71 WH	SAE(fax 4169)	1.43E+03	3.26E+01	1.43E+03	2.45E+01	0.32
00-0972	HLWO (VIT)	BATCH 71 WH	SAE(fax 4169)	1.42E+03	3.19E+01	1.42E+03	2.38E+01	0.31
00-1048	HLWO (VIT)	SBS INITIAL #21-23	fax to 4169	9.74E+01	4.24E+00	9.77E+01	3.99E+00	0.31
00-1048	HLWO (VIT)	SBS INITIAL #21-23	fax to 4169	1.03E+02	4.08E+00	1.03E+02	3.79E+00	0.31
00-1048	HLWO (VIT)	SBS INITIAL #21-23	fax to 4169	9.59E+01	4.08E+00	9.62E+01	3.84E+00	0.31
00-1154	HLWO (VIT)	71WI02-0918.19	SAE(WV-48);SAE FAX 4169	6.18E+01	3.06E+00	6.20E+01	2.95E+00	0.24
00-1154	HLWO (VIT)	71WI02-0918.19	SAE(WV-48);SAE FAX 4169	5.44E+01	2.85E+00	5.46E+01	2.76E+00	0.24
00-1154	HLWO (VIT)	71WI02-0918.19	SAE(WV-48);SAE FAX 4169	8.13E+01	3.51E+00	8.15E+01	3.35E+00	0.24
00-1154	HLWO (VIT)	71WI02-0918.19	SAE(WV-48);SAE FAX 4169	4.97E+01	2.76E+00	4.99E+01	2.69E+00	0.24
00-1154	HLWO (VIT)	71WI02-0918.19	SAE(WV-48);SAE FAX 4169	8.29E+01	3.51E+00	8.31E+01	3.35E+00	0.24
00-1154	HLWO (VIT)	71WI02-0918.19	SAE(WV-48);SAE FAX 4169	5.45E+01	2.79E+00	5.46E+01	2.70E+00	0.23
00-1154	HLWO (VIT)	71WI02-0918.19	SAE(WV-48);SAE FAX 4169	4.54E+01	2.70E+00	4.55E+01	2.64E+00	0.23
00-1154	HLWO (VIT)	71WI02-0918.19	SAE(WV-48);SAE FAX 4169	5.76E+01	2.94E+00	5.78E+01	2.85E+00	0.23
00-1154	HLWO (VIT)	71WI02-0918.19	SAE(WV-48);SAE FAX 4169	4.64E+01	2.77E+00	4.65E+01	2.71E+00	0.23
00-1154	HLWO (VIT)	71WI02-0918.19	SAE(WV-48);SAE FAX 4169	1.42E+03	2.99E+01	1.43E+03	2.12E+01	0.31
00-1154	HLWO (VIT)	71WI02-0918.19	SAE(WV-48);SAE FAX 4169	1.36E+03	2.84E+01	1.36E+03	2.01E+01	0.31
00-1154	HLWO (VIT)	71WI02-0918.19	SAE(WV-48);SAE FAX 4169	1.41E+03	2.95E+01	1.41E+03	2.09E+01	0.30
00-1154	HLWO (VIT)	71WI02-0918.19	SAE(WV-48);SAE FAX 4169	1.23E+03	2.58E+01	1.24E+03	1.82E+01	0.30
00-1154	HLWO (VIT)	71WI02-0918.19	SAE(WV-48);SAE FAX 4169	1.38E+03	2.87E+01	1.38E+03	2.03E+01	0.30

Attachment A - ^{90}Sr Results

VAST ID	Department	Customer ID	Report Recipients	Reported Sr90	Uncertainity	Corrected Sr90	Uncertainity	% Difference
00-1154	HLWO (VIT)	71WI02-0918,19	SAE(WV-48);SAE FAX 4169	1.22E+03	2.53E+01	1.22E+03	1.79E+01	0.30
00-1154	HLWO (VIT)	71WI02-0918,19	SAE(WV-48);SAE FAX 4169	1.36E+03	2.83E+01	1.37E+03	2.00E+01	0.30
00-1154	HLWO (VIT)	71WI02-0918,19	SAE(WV-48);SAE FAX 4169	1.40E+03	2.89E+01	1.40E+03	2.04E+01	0.30
00-1154	HLWO (VIT)	71WI02-0918,19	SAE(WV-48);SAE FAX 4169	1.41E+03	2.90E+01	1.41E+03	2.05E+01	0.30
00-1327	HLWO (VIT)	B71 SF 16 - B71 SF 20	FAX TO 4169; SAE (MS-48)	8.38E+01	2.04E+00	8.40E+01	1.60E+00	0.32
00-1327	HLWO (VIT)	B71 SF 16 - B71 SF 20	FAX TO 4169; SAE (MS-48)	8.38E+01	2.02E+00	8.40E+01	1.58E+00	0.32
00-1327	HLWO (VIT)	B71 SF 16 - B71 SF 20	FAX TO 4169; SAE (MS-48)	8.58E+01	2.05E+00	8.61E+01	1.60E+00	0.31
00-1327	HLWO (VIT)	B71 SF 16 - B71 SF 20	FAX TO 4169; SAE (MS-48)	8.58E+01	2.05E+00	8.61E+01	1.60E+00	0.31
00-1534	HLWO (VIT)	72WH10-72WH18	SAE(fax 4169)	3.51E+01	7.67E-01	3.52E+01	5.54E-01	0.32
00-1534	HLWO (VIT)	72WH10-72WH18	SAE(fax 4169)	3.55E+01	7.79E-01	3.56E+01	5.66E-01	0.32
00-1534	HLWO (VIT)	72WH10-72WH18	SAE(fax 4169)	3.50E+01	7.66E-01	3.51E+01	5.55E-01	0.32
00-1534	HLWO (VIT)	72WH10-72WH18	SAE(fax 4169)	3.59E+01	7.83E-01	3.60E+01	5.67E-01	0.32
00-1534	HLWO (VIT)	72WH10-72WH18	SAE(fax 4169)	3.19E+01	6.94E-01	3.20E+01	5.04E-01	0.31
00-1534	HLWO (VIT)	72WH10-72WH18	SAE(fax 4169)	3.46E+01	7.48E-01	3.47E+01	5.41E-01	0.31
00-1534	HLWO (VIT)	72WH10-72WH18	SAE(fax 4169)	3.20E+01	6.94E-01	3.21E+01	5.04E-01	0.31
00-1534	HLWO (VIT)	72WH10-72WH18	SAE(fax 4169)	3.51E+01	7.54E-01	3.52E+01	5.45E-01	0.31
00-1534	HLWO (VIT)	72WH10-72WH18	SAE(fax 4169)	3.61E+01	7.74E-01	3.62E+01	5.60E-01	0.31
00-1653	HLWO (VIT)	B72WH 19-22,26	SAE (FAX 4169);SAE (MS-48)	1.15E+02	2.42E+00	1.15E+02	1.71E+00	0.31
00-1653	HLWO (VIT)	B72WH 19-22,26	SAE (FAX 4169);SAE (MS-48)	1.25E+02	2.61E+00	1.25E+02	1.85E+00	0.30
00-1653	HLWO (VIT)	B72WH 19-22,26	SAE (FAX 4169);SAE (MS-48)	9.34E+01	1.95E+00	9.37E+01	1.38E+00	0.30
00-1653	HLWO (VIT)	B72WH 19-22,26	SAE (FAX 4169);SAE (MS-48)	1.10E+02	2.29E+00	1.10E+02	1.63E+00	0.30
00-1653	HLWO (VIT)	B72WH 19-22,26	SAE (FAX 4169);SAE (MS-48)	1.09E+02	2.27E+00	1.09E+02	1.61E+00	0.30
00-1653	HLWO (VIT)	B72WH 19-22,26	SAE (FAX 4169);SAE (MS-48)	1.13E+02	2.42E+00	1.14E+02	1.72E+00	0.31
00-1653	HLWO (VIT)	B72WH 19-22,26	SAE (FAX 4169);SAE (MS-48)	1.23E+02	2.60E+00	1.23E+02	1.85E+00	0.31
00-1653	HLWO (VIT)	B72WH 19-22,26	SAE (FAX 4169);SAE (MS-48)	9.21E+01	1.95E+00	9.24E+01	1.38E+00	0.31
00-1653	HLWO (VIT)	B72WH 19-22,26	SAE (FAX 4169);SAE (MS-48)	1.10E+02	2.31E+00	1.10E+02	1.64E+00	0.31
00-1653	HLWO (VIT)	B72WH 19-22,26	SAE (FAX 4169);SAE (MS-48)	1.08E+02	2.27E+00	1.08E+02	1.61E+00	0.31
00-1751	HLWO (VIT)	72WH28 - 31	SAE(fax 4169)	1.79E+02	3.77E+00	1.80E+02	2.66E+00	0.31
00-1751	HLWO (VIT)	72WH28 - 31	SAE(fax 4169)	1.68E+02	3.52E+00	1.68E+02	2.49E+00	0.31
00-1751	HLWO (VIT)	72WH28 - 31	SAE(fax 4169)	2.26E+02	4.73E+00	2.27E+02	3.34E+00	0.31
00-1751	HLWO (VIT)	72WH28 - 31	SAE(fax 4169)	1.64E+02	3.43E+00	1.65E+02	2.43E+00	0.30
00-1766	HLWO (VIT)	B1	SAE(fax 4169)	1.34E+00	4.33E-02	1.35E+00	3.84E-02	0.31
00-1766	HLWO (VIT)	B1	SAE(fax 4169)	< 4.08E-04		< 4.09E-04		0.31
00-1767	HLWO (VIT)	B2	SAE(fax 4169)	2.23E+00	6.11E-02	2.23E+00	5.14E-02	0.31
00-1768	HLWO (VIT)	B3	SAE(fax 4169)	1.73E-01	1.72E-02	1.73E-01	1.70E-02	0.31
00-1769	HLWO (VIT)	P1	SAE(fax 4169)	6.44E-01	2.67E-02	6.46E-01	2.50E-02	0.31
00-1770	HLWO (VIT)	P2	SAE(fax 4169)	7.09E-02	1.37E-02	7.11E-02	1.37E-02	0.31
00-1781	HLWO (VIT)	FACE OF DETECTOR	L. KRIEGER (WV-53), S. BARNES(WV-48), D. MEESS(WV-54)	2.73E+01	5.95E-01	2.74E+01	4.28E-01	0.32
00-1854	HLWO (VIT)	72WH 36 - 40	SAE(fax 4169)	1.98E+02	4.41E+00	1.98E+02	3.26E+00	0.32
00-1854	HLWO (VIT)	72WH 36 - 40	SAE(fax 4169)	2.04E+02	4.50E+00	2.04E+02	3.30E+00	0.31
00-1854	HLWO (VIT)	72WH 36 - 40	SAE(fax 4169)	1.97E+02	4.34E+00	1.98E+02	3.19E+00	0.31
00-1854	HLWO (VIT)	72WH 36 - 40	SAE(fax 4169)	2.01E+02	4.43E+00	2.02E+02	3.26E+00	0.31
00-1887	HLWO (VIT)	WALL SMEAR #1	L. KRIEGER,S. BARNES,D. MEESS	2.55E+02	5.39E+00	2.56E+02	3.80E+00	0.31
00-1888	HLWO (VIT)	WALL SMEAR #1A	L. KRIEGER,S. BARNES,D. MEESS	4.76E+02	1.00E+01	4.77E+02	7.04E+00	0.31
00-1935	HLWO (VIT)	72WH44-72WH48	SAE,MS-48,FAX 4169	2.53E+02	5.61E+00	2.54E+02	4.12E+00	0.32
00-1935	HLWO (VIT)	72WH44-72WH48	SAE,MS-48,FAX 4169	2.35E+02	5.19E+00	2.35E+02	3.81E+00	0.31
00-1935	HLWO (VIT)	72WH44-72WH48	SAE,MS-48,FAX 4169	2.33E+02	5.14E+00	2.34E+02	3.77E+00	0.31
00-1935	HLWO (VIT)	72WH44-72WH48	SAE,MS-48,FAX 4169	2.29E+02	5.02E+00	2.29E+02	3.68E+00	0.31
00-1935	HLWO (VIT)	72WH44-72WH48	SAE,MS-48,FAX 4169	2.21E+02	4.83E+00	2.21E+02	3.54E+00	0.31
00-2048	HLWO (VIT)	72WH 52 - 56	SAE(fax 4169)	2.78E+02	6.38E+00	2.79E+02	4.81E+00	0.32
00-2048	HLWO (VIT)	72WH 52 - 56	SAE(fax 4169)	2.80E+02	6.36E+00	2.81E+02	4.78E+00	0.31
00-2048	HLWO (VIT)	72WH 52 - 56	SAE(fax 4169)	2.94E+02	6.63E+00	2.95E+02	4.96E+00	0.31
00-2048	HLWO (VIT)	72WH 52 - 56	SAE(fax 4169)	2.88E+02	6.54E+00	2.89E+02	4.93E+00	0.31
00-2076	HLWO (VIT)	72HR1-72HR9,72HR17,72HR18	SAE FAX 4169,SAE MS-48,KRIEGER MS-53	2.68E+02	5.67E+00	2.69E+02	4.00E+00	0.31
00-2076	HLWO (VIT)	72HR1-72HR9,72HR17,72HR18	SAE FAX 4169,SAE MS-48,KRIEGER MS-53	2.60E+02	5.49E+00	2.61E+02	3.87E+00	0.31
00-2076	HLWO (VIT)	72HR1-72HR9,72HR17,72HR18	SAE FAX 4169,SAE MS-48,KRIEGER MS-53	2.66E+02	5.60E+00	2.67E+02	3.95E+00	0.31
00-2076	HLWO (VIT)	72HR1-72HR9,72HR17,72HR18	SAE FAX 4169,SAE MS-48,KRIEGER MS-53	2.64E+02	5.54E+00	2.65E+02	3.91E+00	0.31
00-2076	HLWO (VIT)	72HR1-72HR9,72HR17,72HR18	SAE FAX 4169,SAE MS-48,KRIEGER MS-53	2.60E+02	5.44E+00	2.61E+02	3.84E+00	0.31
00-2076	HLWO (VIT)	72HR1-72HR9,72HR17,72HR18	SAE FAX 4169,SAE MS-48,KRIEGER MS-53	2.57E+02	5.36E+00	2.58E+02	3.78E+00	0.31
00-2076	HLWO (VIT)	72HR1-72HR9,72HR17,72HR18	SAE FAX 4169,SAE MS-48,KRIEGER MS-53	2.60E+02	5.42E+00	2.61E+02	3.82E+00	0.30
00-2076	HLWO (VIT)	72HR1-72HR9,72HR17,72HR18	SAE FAX 4169,SAE MS-48,KRIEGER MS-53	2.63E+02	5.45E+00	2.63E+02	3.85E+00	0.30
00-2076	HLWO (VIT)	72HR1-72HR9,72HR17,72HR18	SAE FAX 4169,SAE MS-48,KRIEGER MS-53	2.59E+02	5.37E+00	2.60E+02	3.79E+00	0.30
00-2149	HLWO (VIT)	B72WI	SAE(WV-48);SAE FAX 4169	3.42E+02	7.43E+00	3.43E+02	5.38E+00	0.31
00-2149	HLWO (VIT)	B72WI	SAE(WV-48);SAE FAX 4169	3.39E+02	7.33E+00	3.40E+02	5.29E+00	0.31

Attachment A - ^{90}Sr Results

VAST ID	Department	Customer ID	Report Recipients		Reported Sr90	Uncertainty		Corrected Sr90	Uncertainty	% Difference
00-2149	HLWO (VIT)	B72WI	SAE(WV-48);SAE FAX 4169		3.44E+02	7.43E+00		3.45E+02	5.38E+00	0.31
00-2149	HLWO (VIT)	B72WI	SAE(WV-48);SAE FAX 4169		3.42E+02	7.36E+00		3.43E+02	5.33E+00	0.31
00-2149	HLWO (VIT)	B72WI	SAE(WV-48);SAE FAX 4169		3.57E+02	7.65E+00		3.58E+02	5.53E+00	0.31
00-2149	HLWO (VIT)	B72WI	SAE(WV-48);SAE FAX 4169		3.40E+02	7.26E+00		3.41E+02	5.25E+00	0.30
00-2149	HLWO (VIT)	B72WI	SAE(WV-48);SAE FAX 4169		3.30E+02	7.02E+00		3.31E+02	5.06E+00	0.30
00-2149	HLWO (VIT)	B72WI	SAE(WV-48);SAE FAX 4169		3.24E+02	6.90E+00		3.25E+02	4.98E+00	0.30
00-2149	HLWO (VIT)	B72WI	SAE(WV-48);SAE FAX 4169		3.63E+02	7.69E+00		3.64E+02	5.54E+00	0.30
00-2153	HLWO (VIT)	SBS	fax to 4169, SAE (B-48)	<	3.92E-04		<	3.93E-04		0.30
00-2153	HLWO (VIT)	SBS	fax to 4169, SAE (B-48)	<	3.91E-04		<	3.92E-04		0.30
00-2153	HLWO (VIT)	SBS	fax to 4169, SAE (B-48)	<	3.90E-04		<	3.91E-04		0.30
00-2154	HLWO (VIT)	SBS	fax to 4169, SAE (B-48)	<	3.89E-04		<	3.91E-04		0.29
00-2154	HLWO (VIT)	SBS	fax to 4169, SAE (B-48)	<	3.88E-04		<	3.90E-04		0.29
00-2154	HLWO (VIT)	SBS	fax to 4169, SAE (B-48)	<	3.87E-04		<	3.89E-04		0.29
00-2155	HLWO (VIT)	SBS	fax to 4169, SAE (B-48)	<	3.87E-04		<	3.88E-04		0.29
00-2155	HLWO (VIT)	SBS	fax to 4169, SAE (B-48)		7.47E+00	2.16E+00		7.49E+00	2.16E+00	0.29
00-2155	HLWO (VIT)	SBS	fax to 4169, SAE (B-48)		8.91E+00	2.16E+00		8.94E+00	2.17E+00	0.29
00-2368	HLWO (VIT)	W.O 1731-1	SAE (FAX 4169),R. PALMER		1.47E+03	5.41E+01		1.48E+03	4.95E+01	0.32
00-2368	HLWO (VIT)	W.O 1731-1	SAE (FAX 4169),R. PALMER		1.56E+03	5.87E+01		1.57E+03	5.40E+01	0.31
00-2368	HLWO (VIT)	W.O 1731-1	SAE (FAX 4169),R. PALMER		1.47E+03	5.43E+01		1.47E+03	4.98E+01	0.31
00-2369	HLWO (VIT)	W.O.1731-2	SAE (FAX 4169),R. PALMER		2.01E+03	6.66E+01		2.02E+03	5.96E+01	0.31
00-2369	HLWO (VIT)	W.O.1731-2	SAE (FAX 4169),R. PALMER		2.09E+03	6.84E+01		2.10E+03	6.10E+01	0.31
00-2369	HLWO (VIT)	W.O.1731-2	SAE (FAX 4169),R. PALMER		2.18E+03	6.63E+01		2.19E+03	5.80E+01	0.31
00-2411	HLWO (VIT)	NMS-01	CS FEUZ, SM BARNES		4.24E+03	8.93E+01		4.25E+03	6.32E+01	0.31
00-2411	HLWO (VIT)	NMS-01	CS FEUZ, SM BARNES		4.42E+03	9.29E+01		4.43E+03	6.58E+01	0.31
00-2411	HLWO (VIT)	NMS-01	CS FEUZ, SM BARNES		4.44E+03	9.31E+01		4.45E+03	6.60E+01	0.31
00-2411	HLWO (VIT)	NMS-01	CS FEUZ, SM BARNES		4.29E+03	9.90E+01		4.30E+03	7.50E+01	0.32
00-2411	HLWO (VIT)	NMS-01	CS FEUZ, SM BARNES		3.75E+03	8.91E+01		3.76E+03	6.91E+01	0.31
00-2411	HLWO (VIT)	NMS-01	CS FEUZ, SM BARNES		4.38E+03	1.04E+02		4.39E+03	8.08E+01	0.31
00-2412	HLWO (VIT)	NMS-02, NMS-03	CS FEUZ, SM BARNES		3.31E+03	6.94E+01		3.32E+03	4.91E+01	0.30
00-2412	HLWO (VIT)	NMS-02, NMS-03	CS FEUZ, SM BARNES		2.51E+03	5.23E+01		2.51E+03	3.70E+01	0.30
00-2412	HLWO (VIT)	NMS-02, NMS-03	CS FEUZ, SM BARNES		2.61E+03	5.44E+01		2.62E+03	3.85E+01	0.30
00-2412	HLWO (VIT)	NMS-02, NMS-03	CS FEUZ, SM BARNES		4.84E+03	1.00E+02		4.86E+03	7.10E+01	0.30
00-2412	HLWO (VIT)	NMS-02, NMS-03	CS FEUZ, SM BARNES		4.96E+03	1.03E+02		4.98E+03	7.23E+01	0.30
00-2412	HLWO (VIT)	NMS-02, NMS-03	CS FEUZ, SM BARNES		4.56E+03	9.41E+01		4.58E+03	6.65E+01	0.30
00-2412	HLWO (VIT)	NMS-02, NMS-03	CS FEUZ, SM BARNES		4.00E+03	8.97E+01		4.01E+03	6.70E+01	0.31
00-2412	HLWO (VIT)	NMS-02, NMS-03	CS FEUZ, SM BARNES		4.14E+03	9.39E+01		4.15E+03	7.08E+01	0.31
00-2412	HLWO (VIT)	NMS-02, NMS-03	CS FEUZ, SM BARNES		3.90E+03	8.91E+01		3.91E+03	6.77E+01	0.31
00-2412	HLWO (VIT)	NMS-02, NMS-03	CS FEUZ, SM BARNES		3.94E+03	9.14E+01		3.95E+03	7.04E+01	0.31
00-2412	HLWO (VIT)	NMS-02, NMS-03	CS FEUZ, SM BARNES		3.88E+03	8.92E+01		3.89E+03	6.84E+01	0.30
00-2412	HLWO (VIT)	NMS-02, NMS-03	CS FEUZ, SM BARNES		3.92E+03	8.97E+01		3.93E+03	6.87E+01	0.30
01-0175	HLWO (VIT)	73WI 1-9	L. KRIEGER, D. MEESS, SAE FAX 4169 - MS-WV-48		2.75E+01	1.18E+00		2.76E+01	1.11E+00	0.31
01-0175	HLWO (VIT)	73WI 1-9	L. KRIEGER, D. MEESS, SAE FAX 4169 - MS-WV-48		2.55E+01	1.07E+00		2.55E+01	1.01E+00	0.31
01-0175	HLWO (VIT)	73WI 1-9	L. KRIEGER, D. MEESS, SAE FAX 4169 - MS-WV-48		2.67E+01	1.08E+00		2.68E+01	1.00E+00	0.31
01-0175	HLWO (VIT)	73WI 1-9	L. KRIEGER, D. MEESS, SAE FAX 4169 - MS-WV-48		2.61E+01	1.00E+00		2.62E+01	9.27E-01	0.30
01-0175	HLWO (VIT)	73WI 1-9	L. KRIEGER, D. MEESS, SAE FAX 4169 - MS-WV-48		2.66E+01	1.07E+00		2.67E+01	9.98E-01	0.30
01-0175	HLWO (VIT)	73WI 1-9	L. KRIEGER, D. MEESS, SAE FAX 4169 - MS-WV-48		3.11E+01	1.27E+00		3.12E+01	1.19E+00	0.30
01-0175	HLWO (VIT)	73WI 1-9	L. KRIEGER, D. MEESS, SAE FAX 4169 - MS-WV-48		2.70E+01	1.05E+00		2.71E+01	9.73E-01	0.30
01-0175	HLWO (VIT)	73WI 1-9	L. KRIEGER, D. MEESS, SAE FAX 4169 - MS-WV-48		2.62E+01	1.04E+00		2.63E+01	9.67E-01	0.30
01-0175	HLWO (VIT)	73WI 1-9	L. KRIEGER, D. MEESS, SAE FAX 4169 - MS-WV-48		2.91E+01	1.15E+00		2.91E+01	1.07E+00	0.30
01-0324	HLWO (VIT)	NMS-06	C FEUZ, R PALMER, L PETKUS		5.63E+04	1.67E+03		5.65E+04	1.45E+03	0.31
01-0324	HLWO (VIT)	NMS-06	C FEUZ, R PALMER, L PETKUS		5.43E+04	1.41E+03		5.45E+04	1.16E+03	0.30
01-0324	HLWO (VIT)	NMS-06	C FEUZ, R PALMER, L PETKUS		5.56E+04	1.49E+03		5.58E+04	1.25E+03	0.30
01-0612	HLWO (VIT)	73CB 1-9	L. ROWELL(4504), J. FAZIO, F. DAMEROW		1.08E+02	2.61E+00		1.08E+02	2.05E+00	0.31
01-0612	HLWO (VIT)	73CB 1-9	L. ROWELL(4504), J. FAZIO, F. DAMEROW		1.06E+02	2.56E+00		1.06E+02	2.01E+00	0.31
01-0612	HLWO (VIT)	73CB 1-9	L. ROWELL(4504), J. FAZIO, F. DAMEROW		1.06E+02	2.56E+00		1.07E+02	2.02E+00	0.31
01-0612	HLWO (VIT)	73CB 1-9	L. ROWELL(4504), J. FAZIO, F. DAMEROW		1.17E+02	2.76E+00		1.17E+02	2.14E+00	0.31
01-0612	HLWO (VIT)	73CB 1-9	L. ROWELL(4504), J. FAZIO, F. DAMEROW		1.11E+02	2.63E+00		1.12E+02	2.05E+00	0.31
01-0612	HLWO (VIT)	73CB 1-9	L. ROWELL(4504), J. FAZIO, F. DAMEROW		1.08E+02	2.59E+00		1.09E+02	2.03E+00	0.30
01-0612	HLWO (VIT)	73CB 1-9	L. ROWELL(4504), J. FAZIO, F. DAMEROW		1.06E+02	2.60E+00		1.07E+02	2.08E+00	0.30
01-0612	HLWO (VIT)	73CB 1-9	L. ROWELL(4504), J. FAZIO, F. DAMEROW		1.08E+02	2.54E+00		1.08E+02	2.00E+00	0.30
01-0612	HLWO (VIT)	73CB 1-9	L. ROWELL(4504), J. FAZIO, F. DAMEROW		1.09E+02	2.57E+00		1.09E+02	2.02E+00	0.30
01-1029	HLWO (VIT)	B74WH#4-6	FAX 4169, 4301,4504		1.20E+01	4.75E-01		1.20E+01	4.41E-01	0.31
01-1029	HLWO (VIT)	B74WH#4-6	FAX 4169, 4301,4504		1.25E+01	4.82E-01		1.25E+01	4.46E-01	0.31
01-1029	HLWO (VIT)	B74WH#4-6	FAX 4169, 4301,4504		1.24E+01	5.16E-01		1.24E+01	4.83E-01	0.31

Attachment A - ^{90}Sr Results

VAST ID	Department	Customer ID	Report Recipients	Reported Sr90	Uncertainity	Corrected Sr90	Uncertainity	% Difference
01-1031	HLWO (VIT)	74WH20-74WH22	SAE(fax 4169)	2.81E+01	8.19E-01	2.82E+01	7.07E-01	0.31
01-1031	HLWO (VIT)	74WH20-74WH22	SAE(fax 4169)	2.45E+01	7.75E-01	2.46E+01	6.87E-01	0.30
01-1031	HLWO (VIT)	74WH20-74WH22	SAE(fax 4169)	2.70E+01	7.90E-01	2.71E+01	6.84E-01	0.30
01-1088	HLWO (VIT)	74WH28-74WH30	FAX 4504, 4301	3.81E+01	1.03E+00	3.82E+01	8.61E-01	0.31
01-1088	HLWO (VIT)	74WH28-74WH30	FAX 4504, 4301	4.04E+01	1.05E+00	4.05E+01	8.66E-01	0.31
01-1088	HLWO (VIT)	74WH28-74WH30	FAX 4504, 4301	4.23E+01	1.14E+00	4.25E+01	9.57E-01	0.31
01-1090	HLWO (VIT)	74WH36-74WH38	SAE(fax 4169)	5.97E+01	1.49E+00	5.99E+01	1.19E+00	0.31
01-1090	HLWO (VIT)	74WH36-74WH38	SAE(fax 4169)	5.63E+01	1.37E+00	5.65E+01	1.09E+00	0.31
01-1090	HLWO (VIT)	74WH36-74WH38	SAE(fax 4169)	5.83E+01	1.42E+00	5.85E+01	1.13E+00	0.30
01-1161	HLWO (VIT)	B74WH	SAE(fax 4169)	8.47E+01	1.97E+00	8.49E+01	1.52E+00	0.31
01-1161	HLWO (VIT)	B74WH	SAE(fax 4169)	7.95E+01	1.88E+00	7.97E+01	1.47E+00	0.30
01-1161	HLWO (VIT)	B74WH	SAE(fax 4169)	8.63E+01	2.01E+00	8.66E+01	1.56E+00	0.30
01-1195	HLWO (VIT)	74WI1-74WI9,WI18,WI19	SAE(WV-48);SAE FAX 4169	1.07E+02	2.45E+00	1.07E+02	1.87E+00	0.30
01-1195	HLWO (VIT)	74WI1-74WI9,WI18,WI19	SAE(WV-48);SAE FAX 4169	1.07E+02	2.43E+00	1.07E+02	1.85E+00	0.30
01-1195	HLWO (VIT)	74WI1-74WI9,WI18,WI19	SAE(WV-48);SAE FAX 4169	1.05E+02	2.38E+00	1.06E+02	1.81E+00	0.30
01-1195	HLWO (VIT)	74WI1-74WI9,WI18,WI19	SAE(WV-48);SAE FAX 4169	1.02E+02	2.31E+00	1.02E+02	1.77E+00	0.30
01-1199	HLWO (VIT)	74WH50-74WH52	SAE(fax 4169)	9.49E+01	2.27E+00	9.52E+01	1.75E+00	0.32
01-1199	HLWO (VIT)	74WH50-74WH52	SAE(fax 4169)	9.54E+01	2.27E+00	9.57E+01	1.75E+00	0.32
01-1199	HLWO (VIT)	74WH50-74WH52	SAE(fax 4169)	9.53E+01	2.22E+00	9.56E+01	1.69E+00	0.32
01-1281	HLWO (VIT)	74WI1-74WI9, 74WI18-74WI1	L. ROWELL, J. FAZIO(FAX 4504)	9.90E+01	2.34E+00	9.94E+01	1.81E+00	0.32
01-1281	HLWO (VIT)	74WI1-74WI9, 74WI18-74WI1	L. ROWELL, J. FAZIO(FAX 4504)	1.02E+02	2.38E+00	1.02E+02	1.81E+00	0.32
01-1281	HLWO (VIT)	74WI1-74WI9, 74WI18-74WI1	L. ROWELL, J. FAZIO(FAX 4504)	1.07E+02	2.46E+00	1.07E+02	1.86E+00	0.32
01-1281	HLWO (VIT)	74WI1-74WI9, 74WI18-74WI1	L. ROWELL, J. FAZIO(FAX 4504)	1.02E+02	2.37E+00	1.02E+02	1.81E+00	0.31
01-1281	HLWO (VIT)	74WI1-74WI9, 74WI18-74WI1	L. ROWELL, J. FAZIO(FAX 4504)	9.13E+01	2.12E+00	9.16E+01	1.65E+00	0.30
01-1281	HLWO (VIT)	74WI1-74WI9, 74WI18-74WI1	L. ROWELL, J. FAZIO(FAX 4504)	8.88E+01	2.04E+00	8.90E+01	1.58E+00	0.30
01-1281	HLWO (VIT)	74WI1-74WI9, 74WI18-74WI1	L. ROWELL, J. FAZIO(FAX 4504)	1.04E+02	2.33E+00	1.04E+02	1.77E+00	0.30
01-1281	HLWO (VIT)	74WI1-74WI9, 74WI18-74WI1	L. ROWELL, J. FAZIO(FAX 4504)	9.94E+01	2.25E+00	9.96E+01	1.73E+00	0.30
01-1281	HLWO (VIT)	74WI1-74WI9, 74WI18-74WI1	L. ROWELL, J. FAZIO(FAX 4504)	1.00E+02	2.27E+00	1.01E+02	1.74E+00	0.29
01-1281	HLWO (VIT)	74WI1-74WI9, 74WI18-74WI1	L. ROWELL, J. FAZIO(FAX 4504)	1.02E+02	2.36E+00	1.02E+02	1.81E+00	0.31
01-1392	HLWO (VIT)	B75WH	SAE(FAX 4169), L. ROWELL, D. MEESS	1.80E+01	5.11E-01	1.81E+01	4.34E-01	0.32
01-1392	HLWO (VIT)	B75WH	SAE(FAX 4169), L. ROWELL, D. MEESS	2.08E+01	6.11E-01	2.08E+01	5.27E-01	0.31
01-1392	HLWO (VIT)	B75WH	SAE(FAX 4169), L. ROWELL, D. MEESS	2.50E+01	7.19E-01	2.51E+01	6.16E-01	0.31
01-1392	HLWO (VIT)	B75WH	SAE(FAX 4169), L. ROWELL, D. MEESS	1.93E+01	6.23E-01	1.94E+01	5.54E-01	0.31
01-1392	HLWO (VIT)	B75WH	SAE(FAX 4169), L. ROWELL, D. MEESS	1.87E+01	5.73E-01	1.88E+01	5.03E-01	0.31
01-1392	HLWO (VIT)	B75WH	SAE(FAX 4169), L. ROWELL, D. MEESS	2.11E+01	6.35E-01	2.12E+01	5.53E-01	0.31
01-1392	HLWO (VIT)	B75WH	SAE(FAX 4169), L. ROWELL, D. MEESS	1.65E+01	5.31E-01	1.66E+01	4.73E-01	0.30
01-1392	HLWO (VIT)	B75WH	SAE(FAX 4169), L. ROWELL, D. MEESS	2.03E+01	6.14E-01	2.04E+01	5.37E-01	0.30
01-1392	HLWO (VIT)	B75WH	SAE(FAX 4169), L. ROWELL, D. MEESS	1.63E+01	5.45E-01	1.63E+01	4.91E-01	0.30
01-1440	HLWO (VIT)	75WH21-75WH23	L. ROWELL, D. MEESS	4.91E+01	1.23E+00	4.92E+01	9.99E-01	0.29
01-1440	HLWO (VIT)	75WH21-75WH23	L. ROWELL, D. MEESS	6.12E+01	1.49E+00	6.14E+01	1.20E+00	0.29
01-1440	HLWO (VIT)	75WH21-75WH23	L. ROWELL, D. MEESS	4.75E+01	1.20E+00	4.76E+01	9.82E-01	0.29
01-1470	HLWO (VIT)	SHD-WV-394-02	SAE(WV-48);SAE FAX 4169	3.65E+02	7.89E+00	3.67E+02	5.62E+00	0.32
01-1470	HLWO (VIT)	SHD-WV-394-02	SAE(WV-48);SAE FAX 4169	3.65E+02	7.88E+00	3.66E+02	5.62E+00	0.32
01-1470	HLWO (VIT)	SHD-WV-394-02	SAE(WV-48);SAE FAX 4169	3.54E+02	7.61E+00	3.55E+02	5.41E+00	0.32
01-1501	HLWO (VIT)	B75WH24-B75WH26	SAE(fax 4169)	8.83E+01	2.11E+00	8.86E+01	1.63E+00	0.32
01-1501	HLWO (VIT)	B75WH24-B75WH26	SAE(fax 4169)	9.98E+01	2.37E+00	1.00E+02	1.83E+00	0.32
01-1501	HLWO (VIT)	B75WH24-B75WH26	SAE(fax 4169)	9.31E+01	2.20E+00	9.34E+01	1.70E+00	0.31
01-1501	HLWO (VIT)	B75WH24-B75WH26	SAE(fax 4169)	8.77E+01	2.04E+00	8.80E+01	1.59E+00	0.30
01-1501	HLWO (VIT)	B75WH24-B75WH26	SAE(fax 4169)	9.16E+01	2.12E+00	9.18E+01	1.65E+00	0.29
01-1501	HLWO (VIT)	B75WH24-B75WH26	SAE(fax 4169)	8.42E+01	1.96E+00	8.44E+01	1.54E+00	0.29
01-1557	HLWO (VIT)	75WH32-75WH34	SAE(fax 4169)	1.09E+02	2.50E+00	1.09E+02	1.90E+00	0.31
01-1557	HLWO (VIT)	75WH32-75WH34	SAE(fax 4169)	1.07E+02	2.47E+00	1.07E+02	1.89E+00	0.31
01-1557	HLWO (VIT)	75WH32-75WH34	SAE(fax 4169)	1.02E+02	2.35E+00	1.02E+02	1.80E+00	0.31
01-1621	HLWO (VIT)	75WH38-75WH40	L.ROWELL(4504),G.RHODES(4301)	1.31E+02	2.99E+00	1.31E+02	2.26E+00	0.31
01-1621	HLWO (VIT)	75WH38-75WH40	L.ROWELL(4504),G.RHODES(4301)	1.25E+02	2.86E+00	1.25E+02	2.17E+00	0.31
01-1621	HLWO (VIT)	75WH38-75WH40	L.ROWELL(4504),G.RHODES(4301)	1.42E+02	3.22E+00	1.42E+02	2.42E+00	0.31
01-1656	HLWO (VIT)	B75WH # 43 - 45	L. ROWELL(FAX 4504), D. MEESS(FAX4301)	1.80E+02	4.07E+00	1.80E+02	3.03E+00	0.32
01-1656	HLWO (VIT)	B75WH # 43 - 45	L. ROWELL(FAX 4504), D. MEESS(FAX4301)	1.75E+02	3.96E+00	1.76E+02	2.96E+00	0.32
01-1656	HLWO (VIT)	B75WH # 43 - 45	L. ROWELL(FAX 4504), D. MEESS(FAX4301)	1.69E+02	3.86E+00	1.70E+02	2.91E+00	0.31
01-1722	HLWO (VIT)	75WH46,47,48,52,53	SAE(fax 4169)	1.93E+02	4.29E+00	1.93E+02	3.17E+00	0.31
01-1722	HLWO (VIT)	75WH46,47,48,52,53	SAE(fax 4169)	1.95E+02	4.30E+00	1.95E+02	3.16E+00	0.31
01-1722	HLWO (VIT)	75WH46,47,48,52,53	SAE(fax 4169)	1.95E+02	4.28E+00	1.96E+02	3.14E+00	0.31
01-1778	HLWO (VIT)	75WH62-64	L. ROWELL(4504), D. MEESS(4301)	2.42E+02	5.29E+00	2.42E+02	3.88E+00	0.31
01-1778	HLWO (VIT)	75WH62-64	L. ROWELL(4504), D. MEESS(4301)	2.42E+02	5.27E+00	2.42E+02	3.86E+00	0.31

Attachment A - ^{90}Sr Results

VAST ID	Department	Customer ID	Report Recipients	Reported Sr90	Uncertainity	Corrected Sr90	Uncertainity	% Difference
01-1778	HLWO (VIT)	75WH62-64	L. ROWELL(4504), D. MEESS(4301)	2.46E+02	5.34E+00	2.47E+02	3.91E+00	0.31
01-1778	HLWO (VIT)	75WH62-64	L. ROWELL(4504), D. MEESS(4301)	1.84E+02	4.00E+00	1.84E+02	2.95E+00	0.30
01-1778	HLWO (VIT)	75WH62-64	L. ROWELL(4504), D. MEESS(4301)	2.49E+02	5.31E+00	2.49E+02	3.87E+00	0.30
01-1778	HLWO (VIT)	75WH62-64	L. ROWELL(4504), D. MEESS(4301)	2.60E+02	5.56E+00	2.61E+02	4.08E+00	0.30
01-1892	HLWO (VIT)	75WH80- 75WH84	SAE(fax 4169)	2.72E+02	5.82E+00	2.72E+02	4.21E+00	0.31
01-1892	HLWO (VIT)	75WH80- 75WH84	SAE(fax 4169)	2.57E+02	5.50E+00	2.58E+02	3.98E+00	0.30
01-1892	HLWO (VIT)	75WH80- 75WH84	SAE(fax 4169)	2.87E+02	6.15E+00	2.88E+02	4.48E+00	0.30
01-1918	HLWO (VIT)	B75WH	SAE(fax 4169)	3.31E+02	7.23E+00	3.32E+02	5.21E+00	0.32
01-1918	HLWO (VIT)	B75WH	SAE(fax 4169)	3.09E+02	6.75E+00	3.10E+02	4.87E+00	0.32
01-1918	HLWO (VIT)	B75WH	SAE(fax 4169)	3.10E+02	6.74E+00	3.11E+02	4.86E+00	0.32
01-2026	HLWO (VIT)	B75WH108-112	L.ROWELL/D.MEESS/SAE	3.24E+02	7.09E+00	3.25E+02	5.15E+00	0.32
01-2026	HLWO (VIT)	B75WH108-112	L.ROWELL/D.MEESS/SAE	3.11E+02	6.75E+00	3.12E+02	4.89E+00	0.31
01-2026	HLWO (VIT)	B75WH108-112	L.ROWELL/D.MEESS/SAE	3.80E+02	8.17E+00	3.81E+02	5.87E+00	0.31
01-2026	HLWO (VIT)	B75WH108-112	L.ROWELL/D.MEESS/SAE	3.37E+02	7.26E+00	3.38E+02	5.26E+00	0.31
01-2498	HLWO (VIT)	B75WI01 - 09	SAE(WV-48);SAE FAX 4169	8.98E+02	1.85E+01	9.01E+02	1.31E+01	0.30
01-2498	HLWO (VIT)	B75WI01 - 09	SAE(WV-48);SAE FAX 4169	8.69E+02	1.80E+01	8.72E+02	1.28E+01	0.30
01-2498	HLWO (VIT)	B75WI01 - 09	SAE(WV-48);SAE FAX 4169	8.22E+02	1.69E+01	8.24E+02	1.20E+01	0.29
01-2498	HLWO (VIT)	B75WI01 - 09	SAE(WV-48);SAE FAX 4169	9.65E+02	1.98E+01	9.68E+02	1.40E+01	0.29
01-2498	HLWO (VIT)	B75WI01 - 09	SAE(WV-48);SAE FAX 4169	8.11E+02	1.66E+01	8.14E+02	1.18E+01	0.29
01-2498	HLWO (VIT)	B75WI01 - 09	SAE(WV-48);SAE FAX 4169	9.04E+02	1.84E+01	9.06E+02	1.30E+01	0.29
01-2498	HLWO (VIT)	B75WI01 - 09	SAE(WV-48);SAE FAX 4169	8.55E+02	1.74E+01	8.58E+02	1.23E+01	0.29
01-2498	HLWO (VIT)	B75WI01 - 09	SAE(WV-48);SAE FAX 4169	8.33E+02	1.70E+01	8.36E+02	1.21E+01	0.29
01-2498	HLWO (VIT)	B75WI01 - 09	SAE(WV-48);SAE FAX 4169	8.70E+02	1.77E+01	8.72E+02	1.25E+01	0.28
01-2620	HLWO (VIT)	SHD-WV-397-02/03	SAE(WV-48);SAE FAX 4169	3.04E+02	4.66E+00	3.04E+02	3.61E+00	0.09
01-2620	HLWO (VIT)	SHD-WV-397-02/03	SAE(WV-48);SAE FAX 4169	3.33E+02	5.07E+00	3.34E+02	3.92E+00	0.08
01-2620	HLWO (VIT)	SHD-WV-397-02/03	SAE(WV-48);SAE FAX 4169	3.21E+02	4.91E+00	3.21E+02	3.80E+00	0.08
02-0009	HLWO (VIT)	B76WH1 - B76WH5	SAE(fax 4169)	4.52E+01	1.00E+00	4.53E+01	7.29E-01	0.32
02-0009	HLWO (VIT)	B76WH1 - B76WH5	SAE(fax 4169)	4.68E+01	1.02E+00	4.70E+01	7.47E-01	0.30
02-0009	HLWO (VIT)	B76WH1 - B76WH5	SAE(fax 4169)	4.82E+01	1.06E+00	4.84E+01	7.76E-01	0.32
02-0009	HLWO (VIT)	B76WH1 - B76WH5	SAE(fax 4169)	4.78E+01	1.05E+00	4.80E+01	7.68E-01	0.31
02-0127	HLWO (VIT)	76WH6-76WH14	SAE MS-48, FAX 4169, J. FAZIO 4504, D. MEESS 4301	1.06E+02	2.26E+00	1.06E+02	1.60E+00	0.32
02-0127	HLWO (VIT)	76WH6-76WH14	SAE MS-48, FAX 4169, J. FAZIO 4504, D. MEESS 4301	1.07E+02	2.28E+00	1.07E+02	1.62E+00	0.32
02-0127	HLWO (VIT)	76WH6-76WH14	SAE MS-48, FAX 4169, J. FAZIO 4504, D. MEESS 4301	1.08E+02	2.30E+00	1.09E+02	1.63E+00	0.31
02-0127	HLWO (VIT)	76WH6-76WH14	SAE MS-48, FAX 4169, J. FAZIO 4504, D. MEESS 4301	1.12E+02	2.37E+00	1.12E+02	1.68E+00	0.31
02-0127	HLWO (VIT)	76WH6-76WH14	SAE MS-48, FAX 4169, J. FAZIO 4504, D. MEESS 4301	1.07E+02	2.27E+00	1.07E+02	1.60E+00	0.31
02-0127	HLWO (VIT)	76WH6-76WH14	SAE MS-48, FAX 4169, J. FAZIO 4504, D. MEESS 4301	1.07E+02	2.26E+00	1.07E+02	1.60E+00	0.31
02-0127	HLWO (VIT)	76WH6-76WH14	SAE MS-48, FAX 4169, J. FAZIO 4504, D. MEESS 4301	1.08E+02	2.27E+00	1.08E+02	1.60E+00	0.31
02-0127	HLWO (VIT)	76WH6-76WH14	SAE MS-48, FAX 4169, J. FAZIO 4504, D. MEESS 4301	1.05E+02	2.21E+00	1.05E+02	1.56E+00	0.31
02-0127	HLWO (VIT)	76WH6-76WH14	SAE MS-48, FAX 4169, J. FAZIO 4504, D. MEESS 4301	1.06E+02	2.23E+00	1.07E+02	1.58E+00	0.31
02-0270	HLWO (VIT)	76WH15-76WH18	FAX 4169, ED LACHAPELLE WV-51	7.16E+01	1.55E+00	7.18E+01	1.11E+00	0.31
02-0270	HLWO (VIT)	76WH15-76WH18	FAX 4169, ED LACHAPELLE WV-51	7.75E+01	1.67E+00	7.77E+01	1.21E+00	0.31
02-0270	HLWO (VIT)	76WH15-76WH18	FAX 4169, ED LACHAPELLE WV-51	7.83E+01	1.69E+00	7.85E+01	1.22E+00	0.31
02-0411	HLWO (VIT)	76WI 1-9	L. ROWELL	4.92E+01	1.05E+00	4.94E+01	7.68E-01	0.29
02-0411	HLWO (VIT)	76WI 1-9	L. ROWELL	4.85E+01	1.03E+00	4.86E+01	7.58E-01	0.29
02-0411	HLWO (VIT)	76WI 1-9	L. ROWELL	2.21E+01	4.96E-01	2.21E+01	3.81E-01	0.29
02-0411	HLWO (VIT)	76WI 1-9	L. ROWELL	2.31E+01	5.23E-01	2.32E+01	4.00E-01	0.30
02-0428	HLWO (VIT)	B76WH19-B76WH24	FAX 4169, 4504	8.85E+01	1.82E+00	8.87E+01	1.31E+00	0.29
02-0428	HLWO (VIT)	B76WH19-B76WH24	FAX 4169, 4504	4.23E+01	8.96E-01	4.24E+01	6.61E-01	0.28
02-0428	HLWO (VIT)	B76WH19-B76WH24	FAX 4169, 4504	8.95E+01	1.84E+00	8.98E+01	1.32E+00	0.28
02-0428	HLWO (VIT)	B76WH19-B76WH24	FAX 4169, 4504	9.14E+01	1.89E+00	9.17E+01	1.36E+00	0.29
02-0428	HLWO (VIT)	B76WH19-B76WH24	FAX 4169, 4504	1.07E+02	2.21E+00	1.07E+02	1.59E+00	0.29
02-0428	HLWO (VIT)	B76WH19-B76WH24	FAX 4169, 4504	8.92E+01	1.84E+00	8.94E+01	1.32E+00	0.29
02-0466	HLWO (VIT)	76WH31-76WH36	SAE(fax 4169)	6.99E+01	1.31E+00	7.00E+01	9.36E-01	0.23
02-0466	HLWO (VIT)	76WH31-76WH36	SAE(fax 4169)	6.85E+01	1.28E+00	6.87E+01	9.16E-01	0.23
02-0466	HLWO (VIT)	76WH31-76WH36	SAE(fax 4169)	6.69E+01	1.24E+00	6.71E+01	8.88E-01	0.23
02-0531	HLWO (VIT)	76WH37-76WH42	SAE(fax 4169)	1.37E+02	2.90E+00	1.37E+02	2.06E+00	0.31
02-0531	HLWO (VIT)	76WH37-76WH42	SAE(fax 4169)	1.39E+02	2.93E+00	1.39E+02	2.09E+00	0.31
02-0531	HLWO (VIT)	76WH37-76WH42	SAE(fax 4169)	1.40E+02	2.94E+00	1.40E+02	2.09E+00	0.31
02-0545	HLWO (VIT)	B76WH #43-48	SAE(fax 4169)	6.94E+01	1.49E+00	6.96E+01	1.06E+00	0.32
02-0545	HLWO (VIT)	B76WH #43-48	SAE(fax 4169)	6.86E+01	1.47E+00	6.88E+01	1.04E+00	0.32
02-0545	HLWO (VIT)	B76WH #43-48	SAE(fax 4169)	6.67E+01	1.43E+00	6.69E+01	1.02E+00	0.32
02-0552	HLWO (VIT)	B76WH #49-54	SAE(fax 4169)	1.90E+02	4.02E+00	1.91E+02	2.83E+00	0.31
02-0552	HLWO (VIT)	B76WH #49-54	SAE(fax 4169)	1.84E+02	3.88E+00	1.85E+02	2.74E+00	0.31
02-0552	HLWO (VIT)	B76WH #49-54	SAE(fax 4169)	1.96E+02	4.12E+00	1.97E+02	2.91E+00	0.31

Attachment A - ^{90}Sr Results

VAST ID	Department	Customer ID	Report Recipients	Reported Sr90	Uncertainity	Corrected Sr90	Uncertainity	% Difference
02-1015	HLWO (VIT)	77WH7-77WH11	SAE MS-48 FAX 4169, FAX TO 2259 L.ROWELL/E.LACHAPELLE	3.61E+01	8.02E-01	3.62E+01	5.92E-01	0.31
02-1015	HLWO (VIT)	77WH7-77WH11	SAE MS-48 FAX 4169, FAX TO 2259 L.ROWELL/E.LACHAPELLE	3.51E+01	7.73E-01	3.53E+01	5.68E-01	0.31
02-1015	HLWO (VIT)	77WH7-77WH11	SAE MS-48 FAX 4169, FAX TO 2259 L.ROWELL/E.LACHAPELLE	3.48E+01	7.69E-01	3.49E+01	5.68E-01	0.31
02-1106	HLWO (VIT)	77WH12-77WH19	SAE(fax 4169)	4.60E+01	1.02E+00	4.62E+01	7.48E-01	0.32
02-1106	HLWO (VIT)	77WH12-77WH19	SAE(fax 4169)	4.65E+01	1.03E+00	4.66E+01	7.58E-01	0.31
02-1106	HLWO (VIT)	77WH12-77WH19	SAE(fax 4169)	4.73E+01	1.05E+00	4.75E+01	7.72E-01	0.31
02-1130	HLWO (VIT)	B77WI1-B77WI3	SAE(WV-48);SAE FAX 4169	4.29E+01	9.44E-01	4.30E+01	6.94E-01	0.31
02-1130	HLWO (VIT)	B77WI1-B77WI3	SAE(WV-48);SAE FAX 4169	4.20E+01	9.19E-01	4.21E+01	6.74E-01	0.31
02-1130	HLWO (VIT)	B77WI1-B77WI3	SAE(WV-48);SAE FAX 4169	4.33E+01	9.45E-01	4.35E+01	6.93E-01	0.31
00-1141	HLWO (WTF)	S-007 #11 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	6.48E-01	1.38E-02	6.50E-01	9.78E-03	0.31
00-1141	HLWO (WTF)	S-007 #11 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	7.22E-01	1.53E-02	7.24E-01	1.09E-02	0.31
00-1141	HLWO (WTF)	S-007 #11 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	7.27E-01	1.54E-02	7.29E-01	1.09E-02	0.31
00-1141	HLWO (WTF)	S-007 #11 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	8.00E-01	1.68E-02	8.02E-01	1.19E-02	0.31
00-1141	HLWO (WTF)	S-007 #11 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	7.88E-01	1.65E-02	7.91E-01	1.17E-02	0.31
00-1141	HLWO (WTF)	S-007 #11 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	8.09E-01	1.69E-02	8.11E-01	1.20E-02	0.30
00-1144	HLWO (WTF)	S-007 #7 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	3.27E+00	6.94E-02	3.28E+00	4.95E-02	0.31
00-1144	HLWO (WTF)	S-007 #7 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	3.48E+00	7.38E-02	3.49E+00	5.28E-02	0.31
00-1144	HLWO (WTF)	S-007 #7 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	3.58E+00	7.54E-02	3.59E+00	5.37E-02	0.31
00-1144	HLWO (WTF)	S-007 #7 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	3.78E+00	7.96E-02	3.79E+00	5.68E-02	0.30
00-1144	HLWO (WTF)	S-007 #7 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	3.55E+00	7.46E-02	3.56E+00	5.33E-02	0.30
00-1144	HLWO (WTF)	S-007 #7 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	3.52E+00	7.39E-02	3.53E+00	5.27E-02	0.30
00-1145	HLWO (WTF)	S-007 #8	STS,S.BARNES,D.MEESS,L.KRIEGER	6.15E-01	1.45E-02	6.17E-01	1.12E-02	0.32
00-1146	HLWO (WTF)	S-007 #10	STS,S.BARNES,D.MEESS,L.KRIEGER	6.62E-01	1.54E-02	6.64E-01	1.18E-02	0.32
00-1146	HLWO (WTF)	S-007 #10	STS,S.BARNES,D.MEESS,L.KRIEGER	6.85E-01	2.05E-02	6.88E-01	1.78E-02	0.32
00-1147	HLWO (WTF)	S-007 #9 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	2.65E+00	5.49E-02	2.66E+00	3.87E-02	0.30
00-1147	HLWO (WTF)	S-007 #9 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	2.26E+00	4.67E-02	2.27E+00	3.29E-02	0.30
00-1147	HLWO (WTF)	S-007 #9 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	5.34E+00	1.10E-01	5.36E+00	7.71E-02	0.30
00-1147	HLWO (WTF)	S-007 #9 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	2.58E+00	5.29E-02	2.59E+00	3.72E-02	0.30
00-1147	HLWO (WTF)	S-007 #9 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	3.34E+00	6.83E-02	3.35E+00	4.81E-02	0.29
00-1147	HLWO (WTF)	S-007 #9 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	2.60E+00	5.31E-02	2.61E+00	3.74E-02	0.29
00-1170	HLWO (WTF)	S-007 #12	STS FAX 4795	6.01E-01	1.07E-02	6.02E-01	8.43E-03	0.14
00-1170	HLWO (WTF)	S-007 #12	STS FAX 4795	6.70E-01	1.92E-02	6.73E-01	1.64E-02	0.31
00-1171	HLWO (WTF)	S-007 #13 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	9.04E+00	1.88E-01	9.07E+00	1.32E-01	0.31
00-1171	HLWO (WTF)	S-007 #13 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	1.03E+01	2.15E-01	1.04E+01	1.51E-01	0.30
00-1171	HLWO (WTF)	S-007 #13 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	9.45E+00	1.96E-01	9.48E+00	1.38E-01	0.30
00-1171	HLWO (WTF)	S-007 #13 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	7.93E+00	1.64E-01	7.96E+00	1.15E-01	0.30
00-1171	HLWO (WTF)	S-007 #13 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	8.85E+00	1.83E-01	8.88E+00	1.28E-01	0.30
00-1171	HLWO (WTF)	S-007 #13 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	8.84E+00	1.82E-01	8.87E+00	1.28E-01	
00-1171	HLWO (WTF)	S-007 #13 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	1.02E+00	2.29E-02	1.02E+00	1.71E-02	0.32
00-1171	HLWO (WTF)	S-007 #13 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	9.87E-01	2.24E-02	9.90E-01	1.69E-02	0.32
00-1171	HLWO (WTF)	S-007 #13 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	1.11E+00	2.49E-02	1.11E+00	1.85E-02	0.31
00-1171	HLWO (WTF)	S-007 #13 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	1.25E+00	2.77E-02	1.25E+00	2.05E-02	0.31
00-1171	HLWO (WTF)	S-007 #13 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	1.01E+00	2.27E-02	1.01E+00	1.69E-02	0.31
00-1171	HLWO (WTF)	S-007 #13 A-F	STS,S.BARNES,D.MEESS,L.KRIEGER	9.74E-01	2.18E-02	9.77E-01	1.62E-02	0.31
00-1191	HLWO (WTF)	S-007 #14 A-F	WTF SS, L. KRIEGER, S. BARNES, D. MEESS	8.85E-01	2.00E-02	8.88E-01	1.49E-02	0.32
00-1191	HLWO (WTF)	S-007 #14 A-F	WTF SS, L. KRIEGER, S. BARNES, D. MEESS	8.28E-01	1.91E-02	8.31E-01	1.45E-02	0.32
00-1191	HLWO (WTF)	S-007 #14 A-F	WTF SS, L. KRIEGER, S. BARNES, D. MEESS	8.31E-01	1.90E-02	8.34E-01	1.43E-02	0.31
00-1191	HLWO (WTF)	S-007 #14 A-F	WTF SS, L. KRIEGER, S. BARNES, D. MEESS	8.50E-01	1.95E-02	8.53E-01	1.47E-02	0.31
00-1191	HLWO (WTF)	S-007 #14 A-F	WTF SS, L. KRIEGER, S. BARNES, D. MEESS	8.13E-01	1.85E-02	8.15E-01	1.40E-02	0.31
00-1191	HLWO (WTF)	S-007 #14 A-F	WTF SS, L. KRIEGER, S. BARNES, D. MEESS	8.10E-01	1.85E-02	8.13E-01	1.40E-02	0.31
00-1520	HLWO (WTF)	STAND OFF SMEAR #1	KRIEGER X-4504/ BARNES X-4169/ MEESS X-4301	3.84E+02	8.14E+00	3.85E+02	5.72E+00	0.32
00-1521	HLWO (WTF)	STAND OFF SMEAR #2	KRIEGER X-4504/ BARNES X-4169/ MEESS X-4301	2.18E+00	4.73E-02	2.19E+00	3.42E-02	0.31

Attachment A - ^{90}Sr Results

VAST ID	Department	Customer ID	Report Recipients	Reported Sr90	Uncertainity	Corrected Sr90	Uncertainity	% Difference
00-2012	HLWO (WTF)	8D-2 WALL SAMPLE	D. C. MEESS; WV-54	1.02E+01	2.10E-01	1.02E+01	1.47E-01	0.30
00-2012	HLWO (WTF)	8D-2 WALL SAMPLE	D. C. MEESS; WV-54	1.07E+01	2.28E-01	1.07E+01	1.61E-01	0.32
00-2206	HLWO (WTF)	S-007 #20	HLWO S/S	5.27E-01	2.80E-02	5.29E-01	2.69E-02	0.31
00-2206	HLWO (WTF)	S-007 #20	HLWO S/S	5.34E-01	3.14E-02	5.36E-01	3.04E-02	0.32
00-2206	HLWO (WTF)	S-007 #20	HLWO S/S	4.83E-01	1.04E-02	4.84E-01	7.46E-03	0.31
00-2206	HLWO (WTF)	S-007 #20	HLWO S/S	5.41E-01	1.49E-02	5.43E-01	1.25E-02	0.31
00-2261	HLWO (WTF)	S-007 #21 A-F	HLWO S/S (fax 4836)	5.73E-01	1.43E-02	5.75E-01	1.14E-02	0.32
00-2261	HLWO (WTF)	S-007 #21 A-F	HLWO S/S (fax 4836)	5.67E-01	1.37E-02	5.69E-01	1.08E-02	0.32
00-2261	HLWO (WTF)	S-007 #21 A-F	HLWO S/S (fax 4836)	5.66E-01	1.34E-02	5.67E-01	1.04E-02	0.31
00-2261	HLWO (WTF)	S-007 #21 A-F	HLWO S/S (fax 4836)	5.71E-01	1.41E-02	5.72E-01	1.12E-02	0.31
00-2261	HLWO (WTF)	S-007 #21 A-F	HLWO S/S (fax 4836)	5.71E-01	1.38E-02	5.73E-01	1.09E-02	0.31
00-2261	HLWO (WTF)	S-007 #21 A-F	HLWO S/S (fax 4836)	5.97E-01	1.50E-02	5.99E-01	1.19E-02	0.33
00-2276	HLWO (WTF)	S-001 #30	L. KRIEGER(FAX 4504) R. MARCELLIN(FAX 4424)HLW OPS	2.17E-02	5.86E-04	2.17E-02	4.94E-04	0.30
00-2302	HLWO (WTF)	S-001 #31	HLWO S/S, R. MARCELLIN	2.08E-02	5.67E-04	2.09E-02	4.80E-04	0.30
00-2354	HLWO (WTF)	S-007 #24 (1-6)	HLWO S/S (fax 4836)	8.74E-01	2.10E-02	8.77E-01	1.63E-02	0.32
00-2354	HLWO (WTF)	S-007 #24 (1-6)	HLWO S/S (fax 4836)	8.51E-01	2.01E-02	8.53E-01	1.55E-02	0.32
00-2354	HLWO (WTF)	S-007 #24 (1-6)	HLWO S/S (fax 4836)	8.92E-01	2.13E-02	8.95E-01	1.66E-02	0.31
00-2354	HLWO (WTF)	S-007 #24 (1-6)	HLWO S/S (fax 4836)	8.34E-01	1.95E-02	8.37E-01	1.50E-02	0.31
00-2354	HLWO (WTF)	S-007 #24 (1-6)	HLWO S/S (fax 4836)	8.68E-01	2.03E-02	8.70E-01	1.57E-02	0.31
00-2354	HLWO (WTF)	S-007 #24 (1-6)	HLWO S/S (fax 4836)	8.83E-01	2.07E-02	8.86E-01	1.61E-02	0.31
00-2378	HLWO (WTF)	S-001 #32	HLW TF S/S, R. MARCELLIN	3.05E-01	6.14E-03	3.06E-01	4.32E-03	0.28
00-2427	HLWO (WTF)	S007#26 A-F (ORIG 00-2389	L KRIEGER/ S. BARNES/ D. MEESS	5.31E-01	1.15E-02	5.33E-01	8.22E-03	0.32
00-2427	HLWO (WTF)	S007#26 A-F (ORIG 00-2389	L KRIEGER/ S. BARNES/ D. MEESS	5.28E-01	1.14E-02	5.30E-01	8.11E-03	0.32
00-2427	HLWO (WTF)	S007#26 A-F (ORIG 00-2389	L KRIEGER/ S. BARNES/ D. MEESS	5.28E-01	1.14E-02	5.30E-01	8.18E-03	0.31
00-2427	HLWO (WTF)	S007#26 A-F (ORIG 00-2389	L KRIEGER/ S. BARNES/ D. MEESS	5.12E-01	1.11E-02	5.14E-01	7.98E-03	0.31
00-2427	HLWO (WTF)	S007#26 A-F (ORIG 00-2389	L KRIEGER/ S. BARNES/ D. MEESS	5.24E-01	1.13E-02	5.25E-01	8.09E-03	0.31
00-2427	HLWO (WTF)	S007#26 A-F (ORIG 00-2389	L KRIEGER/ S. BARNES/ D. MEESS	5.36E-01	1.15E-02	5.38E-01	8.27E-03	0.31
00-2428	HLWO (WTF)	S007#27 A-F(DURING 00-15	L. KRIEGER/ S. BARNES/ D. MEESS	5.05E-01	1.07E-02	5.06E-01	7.65E-03	0.30
00-2428	HLWO (WTF)	S007#27 A-F(DURING 00-15	L. KRIEGER/ S. BARNES/ D. MEESS	5.51E-01	1.16E-02	5.53E-01	8.29E-03	0.30
00-2428	HLWO (WTF)	S007#27 A-F(DURING 00-15	L. KRIEGER/ S. BARNES/ D. MEESS	5.27E-01	1.11E-02	5.29E-01	7.92E-03	0.30
00-2428	HLWO (WTF)	S007#27 A-F(DURING 00-15	L. KRIEGER/ S. BARNES/ D. MEESS	5.26E-01	1.10E-02	5.28E-01	7.88E-03	0.30
00-2428	HLWO (WTF)	S007#27 A-F(DURING 00-15	L. KRIEGER/ S. BARNES/ D. MEESS	5.04E-01	1.05E-02	5.05E-01	7.54E-03	0.30
00-2428	HLWO (WTF)	S007#27 A-F(DURING 00-15	L. KRIEGER/ S. BARNES/ D. MEESS	4.68E-01	9.80E-03	4.70E-01	7.02E-03	0.30
00-2428	HLWO (WTF)	S007#27 A-F(DURING 00-15	L. KRIEGER/ S. BARNES/ D. MEESS	5.25E-01	1.13E-02	5.27E-01	8.06E-03	0.31
00-2428	HLWO (WTF)	S007#27 A-F(DURING 00-15	L. KRIEGER/ S. BARNES/ D. MEESS	5.34E-01	1.14E-02	5.36E-01	8.16E-03	0.31
00-2428	HLWO (WTF)	S007#27 A-F(DURING 00-15	L. KRIEGER/ S. BARNES/ D. MEESS	9.80E-03	2.09E-04	9.83E-03	1.50E-04	0.31
00-2428	HLWO (WTF)	S007#27 A-F(DURING 00-15	L. KRIEGER/ S. BARNES/ D. MEESS	1.06E-02	2.26E-04	1.06E-02	1.61E-04	0.31
00-2428	HLWO (WTF)	S007#27 A-F(DURING 00-15	L. KRIEGER/ S. BARNES/ D. MEESS	1.07E-02	2.28E-04	1.08E-02	1.63E-04	0.31
00-2428	HLWO (WTF)	S007#27 A-F(DURING 00-15	L. KRIEGER/ S. BARNES/ D. MEESS	5.32E-01	1.13E-02	5.33E-01	8.04E-03	0.30
00-2428	HLWO (WTF)	S007#27 A-F(DURING 00-15	L. KRIEGER/ S. BARNES/ D. MEESS	5.83E-01	1.25E-02	5.84E-01	8.93E-03	0.31
00-2428	HLWO (WTF)	S007#27 A-F(DURING 00-15	L. KRIEGER/ S. BARNES/ D. MEESS	5.84E-01	1.25E-02	5.86E-01	8.92E-03	0.31
00-2428	HLWO (WTF)	S007#27 A-F(DURING 00-15	L. KRIEGER/ S. BARNES/ D. MEESS	5.57E-01	1.19E-02	5.58E-01	8.48E-03	0.31
00-2428	HLWO (WTF)	S007#27 A-F(DURING 00-15	L. KRIEGER/ S. BARNES/ D. MEESS	5.76E-01	1.23E-02	5.78E-01	8.75E-03	0.31
00-2428	HLWO (WTF)	S007#27 A-F(DURING 00-15	L. KRIEGER/ S. BARNES/ D. MEESS	5.57E-01	1.18E-02	5.59E-01	8.45E-03	0.31
00-2428	HLWO (WTF)	S007#27 A-F(DURING 00-15	L. KRIEGER/ S. BARNES/ D. MEESS	5.64E-01	1.20E-02	5.66E-01	8.54E-03	0.31
01-0349	HLWO (WTF)	S-007 #2 A-F (DAP)	HLWO S/S (fax 4836)	5.39E-01	1.15E-02	5.41E-01	8.24E-03	0.31
01-0349	HLWO (WTF)	S-007 #2 A-F (DAP)	HLWO S/S (fax 4836)	5.39E-01	1.15E-02	5.41E-01	8.25E-03	0.31
01-0349	HLWO (WTF)	S-007 #2 A-F (DAP)	HLWO S/S (fax 4836)	5.17E-01	1.10E-02	5.18E-01	7.85E-03	0.30
01-0349	HLWO (WTF)	S-007 #2 A-F (DAP)	HLWO S/S (fax 4836)	5.03E-01	1.06E-02	5.05E-01	7.61E-03	0.30
01-0349	HLWO (WTF)	S-007 #2 A-F (DAP)	HLWO S/S (fax 4836)	5.25E-01	1.11E-02	5.26E-01	7.93E-03	0.30
01-0349	HLWO	S-007 #2 A-F (DAP)	HLWO S/S (fax 4836)	5.32E-01	1.12E-02	5 33E-01	8.02E-03	0.30

Attachment A - ^{90}Sr Results

VAST ID	Department	Customer ID	Report Recipients		Reported Sr90	Uncertainity		Corrected Sr90	Uncertainity	% Difference
	(WTF)									
02-0234	HLWO (WTF)	S-001 #4A & 4B	ROWELL, FAZIO(4504), MEESS(4301)		9.09E+00	1.89E-01		9.11E+00	1.33E-01	0.30
02-0438	HLWO (WTF)	5D-15B A-B-C	HLWO S/S(4795),G.RHODES(4504),R.DUNN(2485)		1.07E-03	3.63E-05		1.07E-03	3.28E-05	0.30
02-0438	HLWO (WTF)	5D-15B A-B-C	HLWO S/S(4795),G.RHODES(4504),R.DUNN(2485)		9.74E-04	3.43E-05		9.77E-04	3.12E-05	0.30
02-0438	HLWO (WTF)	5D-15B A-B-C	HLWO S/S(4795),G.RHODES(4504),R.DUNN(2485)		9.87E-04	3.45E-05		9.90E-04	3.14E-05	0.30
02-0474	HLWO (WTF)	5D-15A2 #4	HLWO S/S (FAX 4795, 2485, 4504)		5.78E+00	1.44E-01		5.80E+00	1.16E-01	0.31
02-0474	HLWO (WTF)	5D-15A2 #4	HLWO S/S (FAX 4795, 2485, 4504)		5.87E+00	1.46E-01		5.89E+00	1.17E-01	0.31
02-0503	HLWO (WTF)	S-007 #3	HLWO S/S (FAX 4795, 2485, 4504)		5.83E-01	1.07E-02		5.84E-01	7.53E-03	0.23
02-0505	HLWO (WTF)	5D-15A2 #2	MEESS(4301), DUNN(2485)		6.48E+01	1.39E+00		6.50E+01	1.01E+00	0.30
02-0505	HLWO (WTF)	5D-15A2 #2	MEESS(4301), DUNN(2485)		6.40E+01	1.37E+00		6.42E+01	9.98E-01	0.30
02-0506	HLWO (WTF)	5D-15A2 #3	MEESS(4301), DUNN(2485)		6.03E+01	1.29E+00		6.05E+01	9.41E-01	0.30
02-0506	HLWO (WTF)	5D-15A2 #3	MEESS(4301), DUNN(2485)		5.81E+01	1.24E+00		5.82E+01	9.07E-01	0.30
02-0507	HLWO (WTF)	5D-15A2 #5 A&B	HLWO S/S/ G RHODES (FAX 4301)/FAX 2247		2.94E+00	1.05E-01		2.95E+00	9.65E-02	0.30
02-0507	HLWO (WTF)	5D-15A2 #5 A&B	HLWO S/S/ G RHODES (FAX 4301)/FAX 2247		3.00E+00	1.07E-01		3.01E+00	9.74E-02	0.30
02-0507	HLWO (WTF)	5D-15A2 #5 A&B	HLWO S/S/ G RHODES (FAX 4301)/FAX 2247		2.92E+00	1.05E-01		2.93E+00	9.59E-02	0.29
02-0507	HLWO (WTF)	5D-15A2 #5 A&B	HLWO S/S/ G RHODES (FAX 4301)/FAX 2247		2.76E+00	1.01E-01		2.76E+00	9.29E-02	0.29
02-0507	HLWO (WTF)	5D-15A2 #5 A&B	HLWO S/S/ G RHODES (FAX 4301)/FAX 2247		4.37E+00	1.35E-01		4.38E+00	1.19E-01	0.29
02-0507	HLWO (WTF)	5D-15A2 #5 A&B	HLWO S/S/ G RHODES (FAX 4301)/FAX 2247		4.27E+00	1.32E-01		4.29E+00	1.17E-01	0.29
02-0682	HLWO (WTF)	S-007#4	HLWO S/S, G. RHODES, R. DUNN		5.88E-01	1.16E-02		5.89E-01	8.26E-03	0.27
02-0860	HLWO (WTF)	S-007 #5	HLWO SS(4795), R. DUNN(2485), D. MEESS(4301)		5.55E-01	1.17E-02		5.56E-01	8.21E-03	0.31
00-0854	MPO	C-205 SPENT RESIN	MPO S/S(FAX 4045)/OTS (FAX 2257)		6.16E-03	1.80E-04		6.18E-03	1.55E-04	0.31
00-0854	MPO	C-205 SPENT RESIN	MPO S/S(FAX 4045)/OTS (FAX 2257)		6.57E-03	1.62E-04		6.58E-03	1.45E-04	0.15
00-0854	MPO	C-205 SPENT RESIN	MPO S/S(FAX 4045)/OTS (FAX 2257)		6.63E-03	1.61E-04		6.64E-03	1.43E-04	0.15
00-0855	MPO	C-206 SPENT RESIN	MPO S/S(FAX 4045)/OTS (FAX 2257)		2.18E-02	5.07E-04		2.18E-02	3.90E-04	0.31
00-0855	MPO	C-206 SPENT RESIN	MPO S/S(FAX 4045)/OTS (FAX 2257)		2.30E-02	4.31E-04		2.30E-02	3.47E-04	0.15
00-1013	MPO	C-204 RESIN, OP-276	MPO SS (WV-208)		2.82E-02	6.27E-04		2.82E-02	4.76E-04	0.29
00-1013	MPO	C-204 RESIN, OP-276	MPO SS (WV-208)		3.01E-02	6.89E-04		3.02E-02	5.21E-04	0.31
00-1014	MPO	C-205 RESIN, OP-276	MPO S/S, OTS		1.74E-02	4.09E-04		1.74E-02	3.24E-04	0.29
00-1014	MPO	C-205 RESIN, OP-276	MPO S/S, OTS		1.87E-02	4.51E-04		1.88E-02	3.53E-04	0.31
00-1060	MPO	C-104 B-25 BOX #288	MPO S/S(FAX 4045)/OTS (FAX 2257)		1.49E-02	2.82E-04		1.49E-02	2.28E-04	0.14
00-1061	MPO	C-105 B-25 BOX#288	MPO S/S(FAX 4045)/OTS (FAX 2257)		1.46E-02	2.73E-04		1.46E-02	2.20E-04	0.15
00-1135	MPO	C-205 SPENT RESIN	MPO S/S FAX 4045, OTS FAX 2257		1.89E-02	4.53E-04		1.89E-02	3.59E-04	0.30
00-1136	MPO	C-206 SPENT RESIN	MPO S/S FAX 4045, OTS FAX 2257		3.30E-02	7.37E-04		3.31E-02	5.56E-04	0.30
00-1152	MPO	NDA SINKHOLE	MPO S/S(FAX 4045)/OTS (FAX 2257)		2.55E-05	1.42E-06		2.56E-05	1.37E-06	0.31
00-1472	MPO	IX C-204 B-25 BOX #264	MPO S/S(FAX 4045)/OTS (FAX 2257)		2.97E-02	6.82E-04		2.98E-02	5.17E-04	0.31
00-1473	MPO	IX C-104 B-25 BOX #262	MPO S/S(FAX 4045)/OTS (FAX 2257)		3.20E-02	7.24E-04		3.21E-02	5.45E-04	0.31
00-1474	MPO	IX C-105 B-25 BOX #262	MPO S/S(FAX 4045)/OTS (FAX 2257)		3.44E-03	1.36E-04		3.45E-03	1.27E-04	0.31
00-1475	MPO	IX C-205 B-25 BOX #264	MPO S/S(FAX 4045)/OTS (FAX 2257)		2.43E-04	4.77E-05		2.43E-04	4.77E-05	0.31
00-1611	MPO	C-206 SPENT RESIN	MPO SS (WV-208)		2.87E-02	6.44E-04		2.88E-02	4.84E-04	0.30
00-1612	MPO	C-205 SPENT RESIN	MPO SS (WV-208)		7.63E-03	2.02E-04		7.65E-03	1.68E-04	0.30
00-1708	MPO	OP 252 C-205 SPENT RESIN	MPO S/S(FAX 4045)/OTS (FAX 2257)		3.41E-03	1.26E-04		3.42E-03	1.16E-04	0.30
00-1709	MPO	OP-252 C-204 SPENT RESIN	MPO S/S(FAX 4045)/OTS (FAX 2257)		1.90E-02	4.41E-04		1.91E-02	3.41E-04	0.30
00-1802	MPO	C-104 SPENT RESIN	MPO S/S(FAX 4045)/OTS (FAX 2257)		1.71E-02	4.04E-04		1.72E-02	3.16E-04	0.30
00-1803	MPO	C-105 SPENT RESIN	MPO S/S(FAX 4045)/OTS (FAX 2257)		2.00E-02	4.57E-04		2.01E-02	3.52E-04	0.30
01-0014	MPO	Skid B Influent	MPO S/S		4.62E-05	2.30E-06		4.63E-05	2.20E-06	0.32
01-0826	MPO	Skid B Influent	MPO S/S 4045, PSE 2257		5.22E-05	2.03E-06		5.24E-05	1.88E-06	0.32
01-2324	MPO	A1, C1, D1	MPO S/S(FAX 4045)/OTS (FAX 2257), BOB SCHARF		1.48E-04	5.10E-06		1.49E-04	4.78E-06	0.20
01-2402	MPO	15D-6 VALVE PIT	MPO S/S (4045),D.J.PLOETZ(WV-AA7)		2.86E-06	1.28E-06		2.87E-06	1.28E-06	0.30
01-2618	MPO	WH7100001 DEMIN INLET	MPO SS FAX 4045 ELAB FAX 2245		2.33E-05	1.38E-06		2.33E-05	1.34E-06	0.32
01-2618	MPO	WH7100001 DEMIN INLET	MPO SS FAX 4045 ELAB FAX 2245		1.70E-05	1.27E-06		1.70E-05	1.24E-06	0.32
02-0174	MPO	SC-1	MPOSS fax - 4045	<	3.50E-04		<	3.51E-04		0.27
02-0174	MPO	SC-1	MPOSS fax - 4045	<	3.71E-04		<	3.72E-04		0.32
02-0175	MPO	SC-2	MPOSS fax - 4045	<	3.49E-04		<	3.50E-04		0.27
02-0175	MPO	SC-2	MPOSS fax - 4045		1.45E-06	8.38E-07		1.46E-06	8.40E-07	0.31
02-0176	MPO	SC-3	MPOSS fax - 4045	<	3.48E-04		<	3.49E-04		0.27
02-0176	MPO	SC-3	MPOSS fax - 4045	<	3.69E-04		<	3.71E-04		0.31
02-0177	MPO	SC-4	MPOSS fax - 4045	<	3.47E-04		<	3.48E-04		0.27
02-0177	MPO	SC-4	MPOSS fax - 4045		1.45E-06	8.34E-07		1.46E-06	8.36E-07	0.31
02-0205	MPO	SC-4	MPOSS fax - 4045/T. Whelan fax 2257		1.21E-06	8.18E-07		1.21E-06	8.20E-07	0.32

Attachment A - ^{90}Sr Results

VAST ID	Department	Customer ID	Report Recipients		Reported Sr90	Uncertainty		Corrected Sr90	Uncertainty	% Difference
02-0206	MPO	SC-3	MPOSS fax - 4045/T. Whelan fax 2257	<	3.55E-04		<	3.56E-04		0.32
02-0220	MPO	SC-3	MPOSS fax - 4045/T. Whelan fax 2257	<	3.81E-04		<	3.82E-04		0.31
02-0221	MPO	SC-4	MPOSS fax - 4045/T. Whelan fax 2257	<	3.80E-04		<	3.81E-04		0.31
00-1782	NEW	COMPOSITE	D.V. WALLON, J.Z. CHRISTOPHER		1.34E-03	1.57E-04		1.34E-03	1.56E-04	0.32
00-1782	NEW	COMPOSITE	D.V. WALLON, J.Z. CHRISTOPHER		1.56E-03	1.62E-04		1.57E-03	1.61E-04	0.31
02-0972	PSE	#1	T. WHELAN FAX 2257		9.43E-06	1.46E-06		9.46E-06	1.46E-06	0.31
02-0972	PSE	#1	T. WHELAN FAX 2257		7.24E-06	1.35E-06		7.26E-06	1.35E-06	0.32
02-0973	PSE	#2	T. WHELAN FAX 2257		3.18E-05	1.98E-06		3.19E-05	1.93E-06	0.31
02-0974	PSE	#3	T. WHELAN FAX 2257		3.26E-05	1.99E-06		3.27E-05	1.94E-06	0.31
02-0974	PSE	#3	T. WHELAN FAX 2257		7.46E-06	1.43E-06		7.48E-06	1.43E-06	0.31
02-0975	PSE	#4	T. WHELAN FAX 2257		3.28E-05	1.99E-06		3.29E-05	1.94E-06	0.31
02-0976	PSE	BASELINE #5	T. WHELAN FAX 2257		2.88E-05	1.90E-06		2.88E-05	1.85E-06	0.30
02-0976	PSE	BASELINE #5	T. WHELAN FAX 2257	<	3.97E-04		<	3.98E-04		0.31
00-1106	Rad Prot	LXA STEAM PIPE SMEAR	D. THARNISH		1.58E-02	6.01E-04		1.58E-02	5.55E-04	0.31
00-2293	Rad Prot	PTW SOIL 70-2236	SCOTT LONCHAR		8.21E-05	1.98E-06		8.22E-05	1.80E-06	0.10
00-2293	Rad Prot	PTW SOIL 70-2236	SCOTT LONCHAR	<	3.80E-04		<	3.81E-04		0.28
00-2294	Rad Prot	PTW SOIL 70-2236	SCOTT LONCHAR		1.67E-04	3.23E-06		1.67E-04	2.76E-06	0.10
00-2294	Rad Prot	PTW SOIL 70-2236	SCOTT LONCHAR	<	3.77E-04		<	3.78E-04		0.28
00-2295	Rad Prot	PTW SOIL 70-2236	SCOPTT LONCHAR		6.27E-06	7.60E-07		6.28E-06	7.58E-07	0.10
00-2295	Rad Prot	PTW SOIL 70-2236	SCOPTT LONCHAR	<	3.77E-04		<	3.78E-04		0.27
00-2296	Rad Prot	PTW SOIL 70-2236	SCOTT LONCHAR		8.29E-05	1.99E-06		8.30E-05	1.81E-06	0.10
00-2296	Rad Prot	PTW SOIL 70-2236	SCOTT LONCHAR	<	3.76E-04		<	3.77E-04		0.27
00-2349	Rad Prot	SKID B INF	S. LONCHAR X2449		4.92E-05	1.47E-06		4.92E-05	1.38E-06	0.10
00-2350	Rad Prot	C-205 EFF	SCOTT LONCHAR	<	2.78E-04		<	2.78E-04		0.10
01-2452	Rad Prot	N/A	R. HAZARD		7.85E-04	1.02E-04		7.87E-04	1.02E-04	0.32
01-2453	Rad Prot	N/A	R. HAZARD		7.56E-03	2.53E-04		7.59E-03	2.26E-04	0.32
02-1001	Rad Prot	N/A	B. MURRAY, J. GUIDO FAX 4128	<	3.52E-04		<	3.53E-04		0.31
00-2262	STS	S007 #22 A-F	L. KRIEGER/S.BARNES/D.MEESS		5.65E-01	1.21E-02		5.67E-01	8.71E-03	0.31
00-2262	STS	S007 #22 A-F	L. KRIEGER/S.BARNES/D.MEESS		5.38E-01	1.15E-02		5.39E-01	8.22E-03	0.31
00-2262	STS	S007 #22 A-F	L. KRIEGER/S.BARNES/D.MEESS		6.40E-01	1.36E-02		6.42E-01	9.69E-03	0.31
00-2262	STS	S007 #22 A-F	L. KRIEGER/S.BARNES/D.MEESS		5.16E-01	1.10E-02		5.18E-01	7.87E-03	0.31
00-2262	STS	S007 #22 A-F	L. KRIEGER/S.BARNES/D.MEESS		4.99E-01	1.06E-02		5.01E-01	7.60E-03	0.30
00-2262	STS	S007 #22 A-F	L. KRIEGER/S.BARNES/D.MEESS		4.78E-01	1.01E-02		4.79E-01	7.19E-03	0.30
00-2262	STS	S007 #22 A-F	L. KRIEGER/S.BARNES/D.MEESS		6.43E-01	1.35E-02		6.45E-01	9.64E-03	0.30
00-2262	STS	S007 #22 A-F	L. KRIEGER/S.BARNES/D.MEESS		6.58E-01	1.38E-02		6.60E-01	9.84E-03	0.30
00-2262	STS	S007 #22 A-F	L. KRIEGER/S.BARNES/D.MEESS		6.59E-01	1.38E-02		6.61E-01	9.82E-03	0.30
00-2262	STS	S007 #22 A-F	L. KRIEGER/S.BARNES/D.MEESS		6.34E-01	1.32E-02		6.36E-01	9.44E-03	0.30
00-2262	STS	S007 #22 A-F	L. KRIEGER/S.BARNES/D.MEESS		6.43E-01	1.34E-02		6.45E-01	9.56E-03	0.30
00-2262	STS	S007 #22 A-F	L. KRIEGER/S.BARNES/D.MEESS		6.89E-01	1.44E-02		6.91E-01	1.03E-02	0.30
00-2262	STS	S007 #22 A-F	L. KRIEGER/S.BARNES/D.MEESS		6.48E-01	1.57E-02		6.50E-01	1.23E-02	0.31
00-2262	STS	S007 #22 A-F	L. KRIEGER/S.BARNES/D.MEESS		6.66E-01	1.61E-02		6.68E-01	1.26E-02	0.31
00-2262	STS	S007 #22 A-F	L. KRIEGER/S.BARNES/D.MEESS		6.74E-01	1.62E-02		6.77E-01	1.27E-02	0.31
00-2262	STS	S007 #22 A-F	L. KRIEGER/S.BARNES/D.MEESS		6.45E-01	1.54E-02		6.47E-01	1.21E-02	0.31
00-2262	STS	S007 #22 A-F	L. KRIEGER/S.BARNES/D.MEESS		6.48E-01	1.56E-02		6.50E-01	1.23E-02	0.31
00-2262	STS	S007 #22 A-F	L. KRIEGER/S.BARNES/D.MEESS		6.95E-01	1.72E-02		6.97E-01	1.38E-02	0.31
00-0568	WMO/RWSO	PVU-05	J. LAUBER		1.33E-04	8.63E-05		1.33E-04	8.65E-05	0.31
00-2209	WMO/WCS	PVU-014-R	WAWRZYNEK T.	<	4.02E-04		<	4.03E-04		0.31
00-2209	WMO/WCS	PVU-014-R	WAWRZYNEK T.	<	4.00E-04		<	4.01E-04		0.30
00-2209	WMO/WCS	PVU-014-R	WAWRZYNEK T.	<	4.22E-04		<	4.24E-04		0.32
01-0203	WMO/WCS	WTF.002	T. PIECZYNSKI		1.71E+00	3.93E-02		1.72E+00	2.95E-02	0.32
01-0578	WMO/WCS	VWR FLOOR-2	TJ JONES, T. PIECZYNSKI - 2444, D. STEVENS WV-BIE		9.53E-03	6.53E-04		9.56E-03	6.39E-04	0.32
01-0579	WMO/WCS	VWR FLOOR-1	TJ JONES, T. PIECZYNSKI - 2444, D. STEVENS WV-BIE		1.50E-01	4.60E-03		1.51E-01	4.01E-03	0.32
01-0850	WMO/WCS	VWR SOUTH PLENUM	TJ JONES/ T. PIECZYNSKI FAX 2444, D. STEVENS B1-E		1.95E-01	2.24E-02		1.95E-01	2.23E-02	0.31
01-0877	WMO/WCS	VWR WASHER BASIN	TJ JONES, TODD PIECZYNSKI, DAN STEVENS		1.52E+02	8.68E+00		1.52E+02	8.41E+00	0.30
01-0877	WMO/WCS	VWR WASHER BASIN	TJ JONES, TODD PIECZYNSKI, DAN STEVENS		1.86E-01	5.36E-03		1.86E-01	4.57E-03	0.32
01-1076	WMO/WCS	CELL #4 GHOST WIPES	TODD PIECZYNSKI (WV-TSB) & PEGGY LOOP		2.96E+00	9.71E-02		2.97E+00	8.67E-02	0.31
01-1076	WMO/WCS	CELL #4 GHOST WIPES	TODD PIECZYNSKI (WV-TSB) & PEGGY LOOP		3.80E+00	1.20E-01		3.82E+00	1.06E-01	0.31
01-1076	WMO/WCS	CELL #4 GHOST WIPES	TODD PIECZYNSKI (WV-TSB) & PEGGY LOOP		1.01E+01	2.48E-01		1.01E+01	1.98E-01	0.31
01-1111	WMO/WCS	C4	FAX - 4442, 2444		3.16E+01	6.82E-01		3.17E+01	4.84E-01	0.32
01-1111	WMO/WCS	C4	FAX - 4442, 2444		2.37E+00	5.77E-02		2.38E+00	4.52E-02	0.32
01-1112	WMO/WCS	GS3	FAX - 4442, 2444		2.30E-01	6.22E-03		2.31E-01	5.17E-03	0.32
01-1140	WMO/WCS	R1	TM PIECYNSKI		1.68E+00	3.70E-02		1.68E+00	2.70E-02	0.32
01-1140	WMO/WCS	R1	TM PIECYNSKI		1.59E+00	4.05E-02		1.60E+00	3.28E-02	0.32
01-1141	WMO/WCS	R2	TM PIECZYNSKI		4.39E+00	9.42E-02		4.40E+00	6.71E-02	0.32
01-1141	WMO/WCS	R2	TM PIECZYNSKI		4.06E+00	9.22E-02		4.07E+00	6.93E-02	0.31
01-1142	WMO/WCS	R3	TM PIECZTNSKI		6.81E-01	1.57E-02		6.84E-01	1.19E-02	0.31

Attachment A - ^{90}Sr Results

VAST ID	Department	Customer ID	Report Recipients		Reported Sr90	Uncertainty		Corrected Sr90	Uncertainty	% Difference
01-1142	WMO/WCS	R3	TM PIECZTNSKI		3.36E+01	7.75E-01		3.37E+01	5.89E-01	0.31
01-1472	WMO/WCS	FRS SLUDGE-CUP	TJ JONES FAX 4442, T. PIECZYNSKI FAX 2444		1.09E-02	5.88E-04		1.09E-02	5.67E-04	0.31
01-1472	WMO/WCS	FRS SLUDGE-CUP	TJ JONES FAX 4442, T. PIECZYNSKI FAX 2444		1.03E-02	5.49E-04		1.03E-02	5.28E-04	0.31
01-1473	WMO/WCS	FRS SLUDGE-POOL	TJ JONES FAX 4442, T PIECZYNSKI FAX 2444		5.77E-03	4.77E-04		5.79E-03	4.71E-04	0.31
01-1473	WMO/WCS	FRS SLUDGE-POOL	TJ JONES FAX 4442, T PIECZYNSKI FAX 2444		6.26E-03	4.35E-04		6.28E-03	4.26E-04	0.31
01-1522	WMO/WCS	ARC072601-1	TJJ (FAX 4442), TP (FAX 2444)		3.59E-02	3.37E-03		3.60E-02	3.33E-03	0.30
01-1523	WMO/WCS	ARC072601-2	TJJ (FAX 4442), TP (FAX 2444)		1.25E-01	5.30E-03		1.25E-01	4.99E-03	0.30
01-1524	WMO/WCS	ARC072601-3	TJJ (FAX 4442), TP (FAX 2444)		1.71E-01	9.57E-03		1.72E-01	9.26E-03	0.30
01-1525	WMO/WCS	ARC072601-4	TJJ (FAX 4442), TP (FAX2444)		2.40E-02	4.85E-03		2.41E-02	4.65E-03	0.30
01-1526	WMO/WCS	ARC072601-5	TJJ (FAX 4442), TP (FAX 2444)		5.40E-02	4.77E-03		5.41E-02	4.72E-03	0.30
01-1527	WMO/WCS	ARC072601-6	TJJ (FAX 4442), TP (FAX 2444)		6.38E-02	5.27E-03		6.40E-02	5.20E-03	0.29
01-1528	WMO/WCS	ARC072601-7	TJJ (FAX4442), TP (FAX 2444)		8.35E-02	6.85E-03		8.37E-02	6.76E-03	0.29
01-1651	WMO/WCS	HAC-01	TJ JONES FAX 4442, TODD PIECZYNSKI FAX 2444		1.28E-02	7.92E-04		1.28E-02	7.71E-04	0.31
01-1652	WMO/WCS	HAC-02	TJ JONES FAX 4442, TODD PIECZYNSKI FAX 2444		6.34E-02	1.99E-03		6.36E-02	1.76E-03	0.31
01-1653	WMO/WCS	HAC-03	TJ JONES FAX 4442, TODD PIECZYNSKI FAX 2444		3.31E-02	1.23E-03		3.32E-02	1.13E-03	0.30
01-1654	WMO/WCS	HAC-04	TJ JONES FAX 4442, TODD PIECZYNSKI FAX 2444		1.89E-03	5.35E-04		1.89E-03	5.36E-04	0.30
01-1655	WMO/WCS	HAC-05	TJ JONES FAX 4442, TODD PIECZYNSKI FAX 2444		3.43E-03	5.71E-04		3.44E-03	5.70E-04	0.30
01-1710	WMO/WCS	FRS RACK 1	FAX 4442, 2444	<	3.73E-04		<	3.74E-04		0.31
01-1710	WMO/WCS	FRS RACK 1	FAX 4442, 2444		4.05E-04	6.19E-05		4.06E-04	6.18E-05	0.28
01-1711	WMO/WCS	FRS RACK 2	FAX 4442, 2444		9.83E-03	5.38E-04		9.86E-03	5.19E-04	0.31
01-1870	WMO/WCS	FRS SLUDGE - POOL	JONES (2444), PIECZYNSKI (4442)		1.38E-02	4.54E-04		1.38E-02	4.11E-04	0.27
01-1870	WMO/WCS	FRS SLUDGE - POOL	JONES (2444), PIECZYNSKI (4442)		8.68E-03	3.54E-04		8.70E-03	3.33E-04	0.27
01-1871	WMO/WCS	FRS SLUDGE - CUP	T.J. JONES (4442), TODD PIECZYNSKI (2444)		1.12E-02	4.46E-04		1.12E-02	4.18E-04	0.27
01-1871	WMO/WCS	FRS SLUDGE - CUP	T.J. JONES (4442), TODD PIECZYNSKI (2444)		2.44E-02	6.60E-04		2.45E-02	5.65E-04	0.27
01-1894	WMO/WCS	GOA WINDOW PAPER SMEAR	TJ JONES FAX 4442, TODD PIECZYNSKI FAX 2444		2.38E-02	1.78E-03		2.39E-02	1.75E-03	0.31
01-2137	WMO/WCS	HEV 01	TJ JONES, TODD PIECZYNSKI, R. METZGER		6.33E-02	2.01E-03		6.35E-02	1.78E-03	0.31
01-2137	WMO/WCS	HEV 01	TJ JONES, TODD PIECZYNSKI, R. METZGER		6.34E-03	7.66E-04		6.36E-03	7.63E-04	0.32
01-2137	WMO/WCS	HEV 01	TJ JONES, TODD PIECZYNSKI, R. METZGER		6.85E-03	7.28E-04		6.86E-03	7.24E-04	0.25
01-2138	WMO/WCS	HEV 02	TJ JONES, TODD PIECZYNSKI, R. METZGER		1.57E-03	6.30E-04		1.57E-03	6.32E-04	0.31
01-2138	WMO/WCS	HEV 02	TJ JONES, TODD PIECZYNSKI, R. METZGER		1.10E-03	6.30E-04		1.10E-03	6.32E-04	0.32
01-2138	WMO/WCS	HEV 02	TJ JONES, TODD PIECZYNSKI, R. METZGER	<	3.79E-04		<	3.80E-04		0.25
01-2139	WMO/WCS	HEV 03	TJ JONES, TODD PIECZYNSKI, R. METZGER		2.17E-01	5.22E-03		2.17E-01	4.12E-03	0.31
01-2139	WMO/WCS	HEV 03	TJ JONES, TODD PIECZYNSKI, R. METZGER		5.87E-03	7.52E-04		5.89E-03	7.49E-04	0.31
01-2139	WMO/WCS	HEV 03	TJ JONES, TODD PIECZYNSKI, R. METZGER		1.84E-03	6.17E-04		1.84E-03	6.18E-04	0.25
02-0093	WMO/WCS	XC-2 FLOOR DEBRIS #1	TODD PIECCZYNSKI,LAURENE ROWELL		2.06E-01	1.94E-02		2.07E-01	1.92E-02	0.32
02-0094	WMO/WCS	XC-2 FLOOR DEBRIS #2	TODD PIECZYNSKI,LAURENE ROWELL		3.24E-01	1.59E-02		3.25E-01	1.52E-02	0.31
02-0095	WMO/WCS	XC-2 FLOOR DEBRIS#3	TODD PIECZYNSKI,LAURENE ROWELL		7.77E+00	2.83E-01		7.79E+00	2.58E-01	0.31
02-0095	WMO/WCS	XC-2 FLOOR DEBRIS#3	TODD PIECZYNSKI,LAURENE ROWELL		2.81E+00	7.13E-02		2.82E+00	5.80E-02	0.31
02-0096	WMO/WCS	XC-2 FLOOR DEBRIS#4	TODD PIECZYNSKI,LAURENE ROWELL		3.89E-01	2.39E-01		3.90E-01	2.40E-01	0.31
02-0097	WMO/WCS	XC-2 FLOOR DEBRIS#8	TODD PIECZYNSKI,LAURENE ROWELL		1.34E+00	5.18E-02		1.34E+00	4.79E-02	0.31
02-0098	WMO/WCS	XC-2 FLOOR DEBRIS#9	TODD PIECZYNSKI,LAURENE ROWELL		3.35E+00	8.81E-02		3.36E+00	7.27E-02	0.31
02-0099	WMO/WCS	XC-2 FLOOR DEBRIS#5	TODD PIECZYNSKI,LAURENE ROWELL		1.62E+00	2.17E-01		1.62E+00	2.17E-01	0.31
02-0099	WMO/WCS	XC-2 FLOOR DEBRIS#5	TODD PIECZYNSKI,LAURENE ROWELL		5.76E-01	3.09E-02		5.78E-01	2.98E-02	0.30
02-0100	WMO/WCS	XC-2 FLOOR DEBRIS#6	TODD PIECZYNSKI,LAURENE ROWELL		2.76E+00	6.70E-02		2.77E+00	5.30E-02	0.31
02-0101	WMO/WCS	XC-2 FLOOR DEBRIS#7	TODD PIECZYNSKI,LAURENE ROWELL		6.06E-01	1.31E-01		6.08E-01	1.31E-01	0.31
02-0101	WMO/WCS	XC-2 FLOOR DEBRIS#7	TODD PIECZYNSKI,LAURENE ROWELL		7.68E-01	2.89E-02		7.70E-01	2.67E-02	0.30
02-0222	WMO/WCS	S-001 #1	FAX TO 4504		5.84E-02	1.52E-03		5.86E-02	1.24E-03	0.32
02-0223	WMO/WCS	S-001 #2A, 2B	FAX TO 4504		1.10E+01	2.33E-01		1.10E+01	1.64E-01	0.32
02-0224	WMO/WCS	S-001 #3A & 3B	FAX TO 4504		7.10E+00	1.50E-01		7.12E+00	1.06E-01	0.32
02-0261	WMO/WCS	PVS PLENUM N. SIDE INTAKE	T. PIECZYNSKI / DAN MEESS FAX 4301		2.33E-01	9.57E-03		2.34E-01	8.95E-03	0.31
00-1041	WMO/WMS	HATCH-1	T.J.. JONES/WV-TBS/X2413		3.26E-03	1.58E-04		3.27E-03	1.51E-04	0.31
00-1041	WMO/WMS	HATCH-1	T.J.. JONES/WV-TBS/X2413		3.25E-03	1.54E-04		3.26E-03	1.47E-04	0.29
00-1041	WMO/WMS	HATCH-1	T.J.. JONES/WV-TBS/X2413		4.69E-03	1.88E-04		4.71E-03	1.75E-04	0.31
00-1042	WMO/WMS	HATCH -2	TJ JONES/WV-TBS/X2413		3.88E-04	9.29E-05		3.89E-04	9.30E-05	0.31
00-1042	WMO/WMS	HATCH -2	TJ JONES/WV-TBS/X2413		5.19E-04	9.24E-05		5.21E-04	9.24E-05	0.28
00-1042	WMO/WMS	HATCH -2	TJ JONES/WV-TBS/X2413		5.78E-04	9.41E-05		5.79E-04	9.40E-05	0.31
02-0107	WMS	XC-2 SMEAR # NW-1	TODD PIECZYNSKI, LAURENE ROWELL		5.12E-04	1.02E-04		5.14E-04	1.02E-04	0.32
02-0108	WMS	XC-2 SMEAR # NW-2	TODD PIECZYNSKI, LAURENE ROWELL	<	3.68E-04		<	3.69E-04		0.32
02-0109	WMS	XC-2 SMEAR # PIPING - 1	TODD PIECZYNSKI, LAURENE ROWELL	<	3.67E-04		<	3.68E-04		0.31
02-0110	WMS	XC-2 SMEAR # PIPING - 2	TODD PIECZYNSKI, LAURENE ROWELL		4.40E-02	1.03E-03		4.42E-02	7.97E-04	0.31
02-0111	WMS	XC-2 SMEAR # TANK -1	TODD PIECZYNSKI, LAURENE ROWELL		5.11E-04	9.95E-05		5.12E-04	9.95E-05	0.31
02-0112	WMS	XC-2 SMEAR # TANK -2	TODD PIECZYNSKI, LAURENE ROWELL		3.95E-03	1.75E-04		3.96E-03	1.65E-04	0.31
02-0113	WMS	XC-2 SMEAR # SW-1	TODD PIECZYNSKI, LAURENE ROWELL	<	3.96E-04		<	3.97E-04		0.32
02-0114	WMS	XC-2 SMEAR # SW-2	TODD PIECZYNSKI, LAURENE ROWELL		3.06E-04	1.25E-04		3.07E-04	1.25E-04	0.32

Attachment A - ^{90}Sr Results

VAST ID	Department	Customer ID	Report Recipients		Reported Sr90	Uncertainity		Corrected Sr90	Uncertainity	% Difference
02-0115	WMS	XC-2 SMEAR # EW -1	TODD PIECZYNSKI, LAURENE ROWELL		3.07E-04	1.28E-04		3.08E-04	1.28E-04	0.32
02-0116	WMS	XC-2 SMEAR # EW -2	TODD PIECZYNSKI, LAURENE ROWELL		3.54E-04	1.24E-04		3.55E-04	1.24E-04	0.31
02-0117	WMS	XC-2 SMEAR # WW -1	TODD PIECZYNSKI, LAURENE ROWELL	<	3.92E-04		<	3.93E-04		0.31
02-0118	WMS	XC-2 SMEAR # WW -2	TODD PIECZYNSKI, LAURENE ROWELL		8.56E-04	1.37E-04		8.59E-04	1.37E-04	0.31

V. J. Andriaccio	WV-TSB
Applicable Data Packages (see Attachment A)	WV-301
A&PC Supervisors	WV-301
S. W. Chase	WV-B1B
J. A. Choroser	WV-B1A
J. Z. Christopher	WV-301
J. M. Fazio	WV-B1A
HLW Tank Farm Shift Supervisor	WV-VH-3
R. L. Hoffman	WV-Z26
IF Letter Log	WV-301
J. F. Jablonski	WV-B1B
T. J. Jones	WV-B1H
E. B. Lachapelle	WV-B1A
L. M. Lund	WV-AA3
C. J. Maddigan	WV-301
D. C. Meess	WV-52
P. N. Mehra	WV-B1C
J. D. Moorehead	WV-B1F
MPO Shift Supervisor	WV-208
B. L. Murray	WV-61
ORIGINAL	AOC-21
R. A. Palmer	WV-48
J. Paul	WV-48
L. L. Petkus	WV-48
T. Pieczynski	WV-TSB
W. J. Potts	WV-205
M. P. Regan	WV-47
G. M. Rhodes	WV-52
J. M. Rizzo	WV-TSB
L. E. Rowell	WV-B1A
D. M. Scalise	WV-47
D. C. Tharnish	WV-209
P. M. Vlad	WV-B1B
T. M. Wawrzynek	WV-TSB
T. E. Whelan	WV-205
W. M. Wierzbicki	WV-50

A&PC Report of Analysis

Report Recipients: C FEUZ, R PALMER, L PETKUS

Copied for Recipients [X] **FAXed to Recipients** [ ] **Copied for File** [X]

package page 1 *of* 69

Login Date: *27-Feb-01* ***VAST Sample ID:*** *01-0324*

Sample Point:	NOBLE METALS SAMPLER
Sample Type:	NEW
Collected:	2/23/2001 1600

Department	HLWO (VIT)
Customer's ID:	NMS-06

* Re-issued report KMM 4/5/01

Analysis	Result ***		Uncertainty	Lab Use Only
Al	5.77E+4	ug/g		Rep1 (NMS-06 1F): U1
Al	4.98E+4	ug/g		Rep2 (NMS-06 2F): U1
Al	5.36E+4	ug/g		Rep3 (NMS-06 3F): U1
B	2.68E+4	ug/g		Rep1 (NMS-06 1F): U1
B	2.57E+4	ug/g		Rep2 (NMS-06 2F): U1
B	2.60E+4	ug/g		Rep3 (NMS-06 3F): U1
Ba	<1.11E+3	ug/g		Rep1 (NMS-06 1F): no flags
Ba	<6.09E+2	ug/g		Rep2 (NMS-06 2F): no flags
Ba	<7.38E+2	ug/g		Rep3 (NMS-06 3F): no flags
Ca	5.04E+3	ug/g		Rep1 (NMS-06 1F): U1
Ca	3.87E+3	ug/g		Rep2 (NMS-06 2F): U1
Ca	4.27E+3	ug/g		Rep3 (NMS-06 3F): U1
Ce	<2.77E+3	ug/g		Rep1 (NMS-06 1F): no flags
Ce	1.92E+3	ug/g		Rep2 (NMS-06 2F): U1
Ce	1.97E+3	ug/g		Rep3 (NMS-06 3F): U1
Cr	<1.11E+3	ug/g		Rep1 (NMS-06 1F): no flags
Cr	1.22E+3	ug/g		Rep2 (NMS-06 2F): U1
Cr	8.37E+2	ug/g		Rep3 (NMS-06 3F): U1
Fe	4.86E+4	ug/g		Rep1 (NMS-06 1F): U1
Fe	4.92E+4	ug/g		Rep2 (NMS-06 2F): U1

Approved By

Kevin McCarthy 4/5/01 1035
Name **Date & Time**

Login Date: 27-Feb-01 **VAST Sample ID:** 01-0324

Sample Point:	NOBLE METALS SAMPLER	**Department**	HLWO (VIT)
Sample Type:	NEW	**Customer's ID:**	NMS-06
Collected:	2/23/2001 1600		

* Re-issued report KMM 4/5/01

Analysis	Result ***		Uncertainty	Lab Use Only
Fe	4.57E+4	ug/g		Rep3 (NMS-06 3F): U1
K	4.00E+4	ug/g		Rep1 (NMS-06 1F): U1
K	3.22E+4	ug/g		Rep2 (NMS-06 2F): U1
K	3.47E+4	ug/g		Rep3 (NMS-06 3F): U1
Li	1.25E+4	ug/g		Rep1 (NMS-06 1F): U1
Li	1.16E+4	ug/g		Rep2 (NMS-06 2F): U1
Li	1.18E+4	ug/g		Rep3 (NMS-06 3F): U1
Mg	3.08E+3	ug/g		Rep1 (NMS-06 1F): U1
Mg	3.34E+3	ug/g		Rep2 (NMS-06 2F): U1
Mg	3.17E+3	ug/g		Rep3 (NMS-06 3F): U1
Mn	3.35E+3	ug/g		Rep1 (NMS-06 1F): U1
Mn	3.55E+3	ug/g		Rep2 (NMS-06 2F): U1
Mn	3.23E+3	ug/g		Rep3 (NMS-06 3F): U1
Na	Not Measured	ug/g		Rep1 (NMS-06 1F): U1
Na	Not Measured	ug/g		Rep2 (NMS-06 2F): U1
Na	Not Measured	ug/g		Rep3 (NMS-06 3F): U1
Nd	<2.77E+3	ug/g		Rep1 (NMS-06 1F): no flags
Nd	<1.52E+3	ug/g		Rep2 (NMS-06 2F): no flags
Nd	<1.85E+3	ug/g		Rep3 (NMS-06 3F): no flags
Ni	<1.11E+3	ug/g		Rep1 (NMS-06 1F): no flags
Ni	1.21E+3	ug/g		Rep2 (NMS-06 2F): U1
Ni	8.52E+2	ug/g		Rep3 (NMS-06 3F): U1
P	<5.55E+3	ug/g		Rep1 (NMS-06 1F): no flags
P	<3.04E+3	ug/g		Rep2 (NMS-06 2F): no flags
P	<3.69E+3	ug/g		Rep3 (NMS-06 3F): no flags
Pd	<2.15E+2	ug/g		Rep4 (NMS-06 1F): no flags
Pd	1.53E+2	ug/g		Rep5 (NMS-06 2F): U1

Approved By

Kevin McCarthy 4/5/01 1035

Name Date & Time

Login Date: 27-Feb-01 **VAST Sample ID:** 01-0324

Sample Point:	NOBLE METALS SAMPLER	**Department**	HLWO (VIT)
Sample Type:	NEW	**Customer's ID:**	NMS-06
Collected:	2/23/2001 1600		

☆ Re-issued report Kam 4/5/01

Analysis	Result ***		Uncertainty	Lab Use Only
Pd	1.60E+2	ug/g		Rep6 (NMS-06 3F): U1
Rh	3.22E+3	ug/g		Rep1 (NMS-06 1F): U1
Rh	2.77E+3	ug/g		Rep2 (NMS-06 2F): U1
Rh	2.98E+3	ug/g		Rep3 (NMS-06 3F): U1
Ru	3.57E+4	ug/g		Rep1 (NMS-06 1F): U1
Ru	2.93E+4	ug/g		Rep2 (NMS-06 2F): U1
Ru	3.41E+4	ug/g		Rep3 (NMS-06 3F): U1
S	<5.55E+3	ug/g		Rep1 (NMS-06 1F): no flags
S	<3.04E+3	ug/g		Rep2 (NMS-06 2F): no flags
S	<3.69E+3	ug/g		Rep3 (NMS-06 3F): no flags
Si	1.63E+5	ug/g		Rep1 (NMS-06 1F): U1
Si	1.57E+5	ug/g		Rep2 (NMS-06 2F): U1
Si	1.59E+5	ug/g		Rep3 (NMS-06 3F): U1
Sr	<2.77E+3	ug/g		Rep1 (NMS-06 1F): no flags
Sr	<1.52E+3	ug/g		Rep2 (NMS-06 2F): no flags
Sr	<1.85E+3	ug/g		Rep3 (NMS-06 3F): no flags
Th	1.35E+4	ug/g		Rep1 (NMS-06 1F): U1
Th	1.23E+4	ug/g		Rep2 (NMS-06 2F): U1
Th	1.20E+4	ug/g		Rep3 (NMS-06 3F): U1
Ti	3.08E+3	ug/g		Rep1 (NMS-06 1F): U1
Ti	3.07E+3	ug/g		Rep2 (NMS-06 2F): U1
Ti	2.87E+3	ug/g		Rep3 (NMS-06 3F): U1
U	<2.77E+3	ug/g		Rep1 (NMS-06 1F): no flags
U	2.22E+3	ug/g		Rep2 (NMS-06 2F): U1
U	2.22E+3	ug/g		Rep3 (NMS-06 3F): U1
Zn	<2.77E+3	ug/g		Rep1 (NMS-06 1F): no flags
Zn	<1.52E+3	ug/g		Rep2 (NMS-06 2F): no flags

Approved By

Kevin McCarthy
Name

4/5/01 1035
Date & Time

Report Date: 05-Apr-01

Login Date: 27-Feb-01 **VAST Sample ID: 01-0324**

Sample Point:	NOBLE METALS SAMPLER
Sample Type:	NEW
Collected:	2/23/2001 1600

Department	HLWO (VIT)
Customer's ID:	NMS-06

* Re-issued report KM 4/5/01

Analysis	Result ***		Uncertainty	Lab Use Only
Zn	<1.85E+3	ug/g		Rep3 (NMS-06 3F): no flags
Zr	Not Measured	ug/g		Rep1 (NMS-06 1F): U1
Zr	Not Measured	ug/g		Rep2 (NMS-06 2F): U1
Zr	Not Measured	ug/g		Rep3 (NMS-06 3F): no flags
Sr 90	5.63E+4	uCi/g	1.67E+3	Rep1 (NMS-06#1): no flags
Sr 90	5.43E+4	uCi/g	1.41E+3	Rep2 (NMS-06#2): no flags
Sr 90	5.56E+4	uCi/g	1.49E+3	Rep3 (NMS-06#3): no flags
Pu-238	3.55E+0	uCi/g	1.08E-1	Rep1 (1F): no flags
Pu-238	2.83E+0	uCi/g	6.34E-2	Rep2 (2F): no flags
Pu-238	3.18E+0	uCi/g	8.07E-2	Rep3 (3F): no flags
Pu-239+240	1.53E+0	uCi/g	5.55E-2	Rep1 (1F): no flags
Pu-239+240	1.26E+0	uCi/g	3.26E-2	Rep2 (2F): no flags
Pu-239+240	1.37E+0	uCi/g	4.09E-2	Rep3 (3F): no flags
TotAlphaPu	5.08E+0	uCi/g	1.63E-1	Rep1 (1F): no flags
TotAlphaPu	4.08E+0	uCi/g	9.60E-2	Rep2 (2F): no flags
TotAlphaPu	4.55E+0	uCi/g	1.22E-1	Rep3 (3F): no flags
Cs-137	1.05E+4	uCi/g	6.58E+2	Rep1 (NMS-06 - 1): no flags
Cs-137	9.13E+3	uCi/g	4.12E+2	Rep2 (NMS-06 - 2): no flags
Cs-137	1.02E+4	uCi/g	6.39E+2	Rep3 (NMS-06 - 3): no flags

NOTES: (Contact the A&PC Supervisor if you have questions.)

The uncertainty, if provided, pertains to the 95% confidence level on counting statistics.

*** The instrument used to determine gamma measurements is calibrated for samples of a specified matrix. The density associated with oil samples is not consistent with that of the specified sample matrix. Therefore, due to matrix of the sample and the unknown accuracy in which the sample was prepared, gamma results associated with oil samples are approximate.

'Lab Use Only' Flags: A0 - unknown approval error; A1 - approval not defined; A2 - approval not entered; A3 - result rejected

U0 - unknown uncertainty error; U1 - uncertainty not defined; U2 - uncertainty not entered

Approved By

Kim McCarthy
Name

4/5/01 1035
Date & Time

Report Date: 05-Apr-01

WVNSCO
West Valley Nuclear Services Company

Department	:	Analytical & Process Chemistry		
Ext/MS	:	4053 / WV-301		
Memo #	:	IF:2002:0076		
Date	:	November 6, 2002		
Subject	:	Response to Request for Supplemental Data from Previously Analyzed Samples		
To	:	E. B. LaChapelle	WV-B1A	
cc	:	J. A. Hoffman IF Letter Log	WV-301 WV-301	**ORIGINAL** AOC-21

A&PC has received a request from you for supplemental data from Sample ID NMS-06 Noble Metals Sampler, Analytical Request #02-0324. Below are the results that are reportable for samples #1F, 2F, and 3F. The result units are uCi/g.

SAMPLE #1F

Pu-238	not available	Pu-239/240	not available
Pu-241	not available	I-129	not available
AM-241	(1.95+/-.052)E+1	Cm-243	≤9.44E+0
Np-237	≤3.70E+0	U-232	not available
U-233/234	not available	U-235	≤3.80E+0
U-238	not available	Cs-137	See original report
C-14	not available	Tc-99	not available
Sr-90	not available	Pb-212	≤5.40E+0

SAMPLE #2F

Pu-238	not available	Pu-239/240	not available
Pu-241	not available	I-129	not available
AM-241	(2.86+/-0.37)E+1	Cm-243	≤7.47E+0
Np-237	≤6.04E+0	U-232	not available
U-233/234	not available	U-235	≤2.64E+0
U-238	not available	Cs-137	See original report
C-14	not available	Tc-99	not available
Sr-90	not available	Pb-212	≤4.77E+0

SAMPLE #3F

Pu-238	not available	Pu-239/240	not available
Pu-241	not available	I-129	not available
AM-241	(2.21+/-0.46)E+1	Cm-243	<9.80E+0
Np-237	<6.84E+0	U-232	not available
U-233/234	not available	U-235	<3.18E+0
U-238	not available	Cs-137	See original report
C-14	not available	Tc-99	not available
Sr-90	not available	Pb-212	<4.70E+0

If you have any questions, please contact me at extension 4053.

C. J. Maddigan, ~~Sr. Scientist~~
Analytical & Process Chemistry

F. H. Barber (Independent Review)
Analytical & Process Chemistry

CJM:SL

Appendix K

Peer Reviewed MicroShield™ Computer Model Results for the Melter and Vitrified Glass Custom Material Composition

Component or area: Melter

Model geometry used: Rectangular volume

Given/Facts:

1. An unshielded probe was used internal to the melter.
2. The curie content was based on the probe measurement taken at Nozzle "A". This centered the probe directly over the melter cavity and residual glass.

Assumptions made:

1. The melter level was at 10" of glass. This established the probe at a distance of 54.7" from the bottom of the melter. This also established a width and length of residual glass of 44.9" by 34.6"
2. A rectangular volume was used. The melter cavity is an inverted truncated pyramid. The largest dimensions in the north/south and east/west directions were used in the model.
3. The top ten constituents of HLW glass (by weight percent) were used in construction of a custom material.
4. All radioactivity was assumed to be coming from the mass of glass at the bottom of the melter.
5. Two models were run, one assuming an 8" residual melter level, and one assuming a 10" residual melter level. The more conservative (i.e., the one that yielded a higher curie content) was used in the radionuclide inventory.

Calculation:

Input into the model

Distance of the detector to the melter floor: 54.7" (See Note 1)
Dimensions of the rectangular volume: 44.9" x 34.6" x 10"
Reading modeled/measured: 750 R/hr
Source material: See attached for material input

Drawings/References: PNL-009-01, Sheet 1
900D-2780, Sheets 2 and 3
PNL-009-02, Sheet 2

Work Documents/Surveys: Work Order 75653

Notes: 1. Nozzle A is centered over the mass of glass. The top of the nozzle is at an elevation of 109' 11", and the bottom electrode is at an elevation of 102' 9 3/4". The radiation probe holder extends 28" plus ½ the diameter of the particular nozzle into the melter. (The probe holder was constructed per work request 74414.) Therefore, because Nozzle A is 5.19" in diameter, the probe extends 28" + .5(5.19)" or 30.6" into the melter, making it a distance of 54.7" from the bottom electrode. (109' 11"-30.6" -102' 9 3/4" = 54.7")

Explanation of the Melter model

After the melter was "emptied" using the evacuated canister, an evaluation was performed, and based on the sludge probe, canister weight (preliminary) and the thermocouple responses during the evolution, it was estimated that there was about 300 kg of glass left in the Melter or an 8 inch level left in the melter cavity.

Based on the visual inspection of the melter, the residual glass was seen to be below the entry of the melter's pour spout, which is at the 10 inch level.

The radiation reading used to determine the curie content of the melter was taken using a specialized holder, which automatically centered the probe in a nozzle, extending the probe into the melter cavity. To model the residual glass in Microshield^{TM}, a rectangular volume was used. In addition, a custom material of glass was constructed for the source, using the top 10 glass constituents. Two computer model runs were constructed, using the 8 inch residual level, and the 10 inch residual level, and these were scaled to the actual reading taken through nozzle "A." The conservative curie content, from the 10 inch level was chosen.

Resulting Curie content: 8700 Ci of Cs-137

Model prepared by: ________ / E. Lachapelle / 1/27/03
Signature/Print name/Date

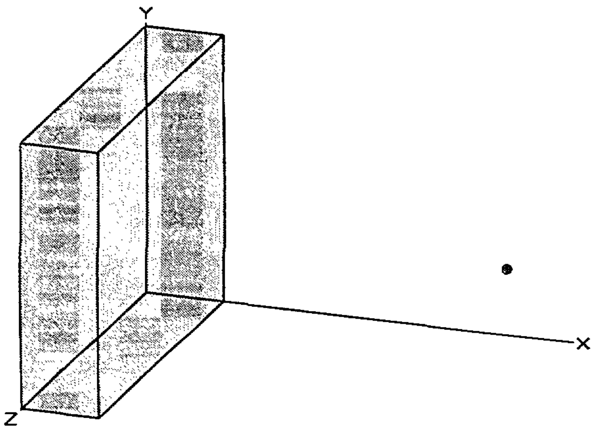
Model peer reviewed by: ________ / R. A. Gonzalez 1/28/03
Signature/Print name/Date

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: 10LEVEL.MS5
Run Date: January 27, 2003
Run Time: 1:10:59 PM
Duration: 00:00:04

File Ref: N/A
Date: 1/27/03
By: [illegible]
Checked: KAG

Case Title: Melter
Description: Melter residuals based on 10" level and 750 R/hr in Nozzle A
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	25.4 cm	10.0 in
Width	114.046 cm	3 ft 8.9 in
Height	87.884 cm	2 ft 10.6 in

Dose Points

	X	Y	Z
# 1	139.065 cm	43.942 cm	57.023 cm
	4 ft 6.7 in	1 ft 5.3 in	1 ft 10.5 in

Shields

Shield Name	Dimension	Material	Density
Source	2.55e+05 cm³	Vitrified Glass	2.6
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	8.2302e+003	3.0452e+014	3.2329e+004	1.1962e+009
Cs-137	8.7000e+003	3.2190e+014	3.4174e+004	1.2644e+009

Buildup
The material reference is : Source

Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	6.304e+12	1.168e+04	1.668e+04	9.726e+01	1.390e+02
0.0322	1.163e+13	2.263e+04	3.248e+04	1.821e+02	2.614e+02
0.0364	4.233e+12	1.318e+04	2.002e+04	7.491e+01	1.137e+02
0.6616	2.740e+14	1.721e+08	3.871e+08	3.337e+05	7.504e+05
TOTALS:	2.962e+14	1.722e+08	3.871e+08	3.341e+05	7.509e+05

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project
Custom Material : Best Vitrified Glass
Glass based on top 10 constituents from the article
Density : 2.6 g/cm³
Average Atomic Number : 13.65 (based on average elements Z)
Effective Atomic Number : 11.6 (for Buildup Factor Interpolation)
Effective Atomic Weight : 19.8

	Al2O3 6.358%	B2O3 13.659%	Fe2O3 12.737%	Na2O 8.477%	SiO2 43.425%	K2O 5.298%	Li2O 3.931%	MgO 0.943%	ThO 3.772%	ZrO2 1.399%
Lithium							2			
Boron		2								
Oxygen	3	3	3	1	2	1	1	1	2	2
Sodium				2						
Magnesium								1		
Aluminum	2									
Silicon					1					
Potassium						2				
Iron			2			2				
Zirconium										1
Thallium									1	

Appendix L

Peer Reviewed MicroShield™ Computer Model Results for the Melter Discharge Cavities

Component or area: Melter - Discharge Cavities

Model geometry used: Rectangular volume

Given/Facts:

1. An unshielded probe was used, and measurements were taken at the southernmost lip of each cavity, centered east/west on each cavity.

Assumptions made:

1. The discharge cavities were assumed to be filled with glass.
2. The top ten constituents of glass (by weight percent) were used in construction of a custom material.
3. Some dimensions used in the computer model were actually greater than the actual dimensions of the discharge cavities, resulting in greater source volume and overestimating curie content. (The actual discharge cavities are irregularly shaped, and the dimensions used were the maximum dimensions in each direction.)
4. All the radiation was assumed to be coming exclusively from the discharge cavities, even though there were other radiation sources in the area (e.g.., the off gas system).

Calculation:

Input into the model

Distance of the detector to the source: 2"
Dimensions of the rectangular volume: 4' 1.7" x 2' x 1' 9.7"
Reading measured at that point: 40 R/hr (west discharge cavity) and 6 R/hr (east discharge cavity)
Source material: See attached for material input

Drawings/References: PNL-011-02, Sheet 2

Work Documents/Surveys: Work Order 76851

Explanation of the Melter Discharge Cavities model

The radiation reading from the east and west melter discharge cavities were taken at a position in contact with the southernmost lip of each cavity, centered (east/west) on each cavity. (The discharge lid had been removed, exposing the glass that had hardened in each cavity.) The computer model used was a rectangular volume, and assumed each discharge cavity was filled with theoretical glass. Additional conservatism was inherent by the following conditions.

1. Some of the dimensions used in the computer model were actually greater than the actual dimensions of the discharge cavities, resulting in a greater source volume, overestimating curie content. (The actual discharge cavities are irregularly shaped, and the dimensions used were the maximum dimensions in each direction.)

2. The reading was taken with an unshielded probe. In determination of the Curie content, all the radiation was assumed to be coming exclusively from the cavity, even though there were other radiation sources in the area. This made the determination of the Curie content conservatively high.

Resulting Curie contents (Ci of Cs-137):

West discharge cavity	160
East discharge cavity	24

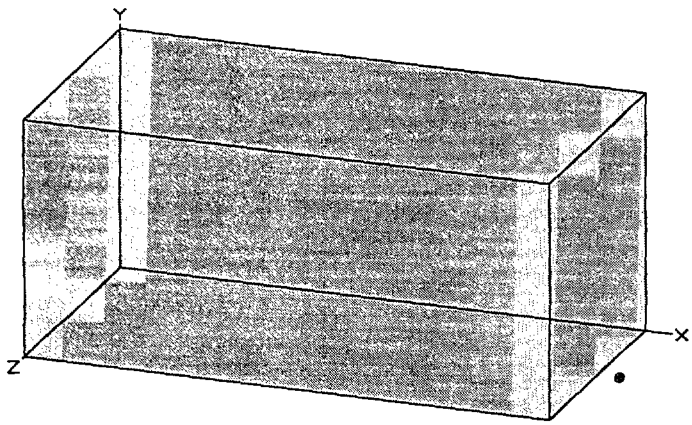
Model prepared by: E. Lachapelle / E. Lachapelle / 1/14/03
Signature/Print name/Date

Model peer reviewed by: [signature] / R. A. Gonzalez 1/14/03
Signature/Print name/Date

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page :	1	File Ref:	N/A
DOS File:	WDCH1.MS5	Date:	1/14/03
Run Date:	January 14, 2003	By:	[signature]
Run Time:	9:27:35 AM	Checked:	[signature]
Duration:	00:00:04		

Case Title: Melter Disch. Cavity
Description: West cavity, based on a 40 R/hr reading
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	121.285 cm	3 ft 11.8 in
Width	60.96 cm	2 ft
Height	55.245 cm	1 ft 9.7 in

Dose Points

	X	Y	Z
# 1	126.365 cm	0 cm	30.48 cm
	4 ft 1.7 in	0.0 in	1 ft

Shields

Shield Name	Dimension	Material	Density
Source	2.49e+04 cm³	Best Vitrified Glass	2.6
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	1.5136e+002	5.6003e+012	3.7057e+002	1.3711e+007
Cs-137	1.6000e+002	5.9200e+012	3.9172e+002	1.4494e+007

Buildup
The material reference is : Source

Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results

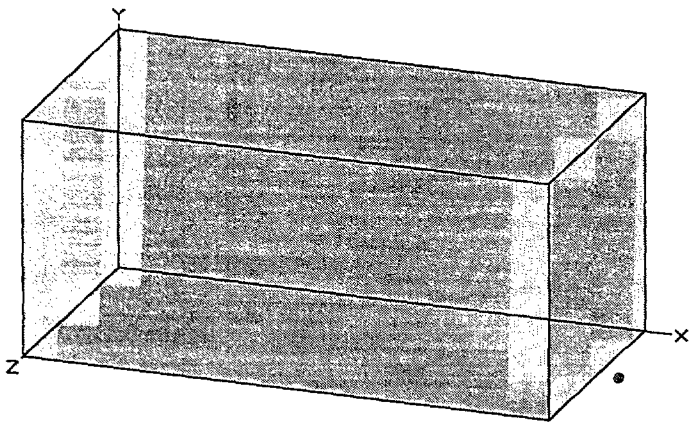
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.159e+11	1.027e+01	2.072e+01	8.555e-02	1.726e-01
0.0322	2.139e+11	2.290e+01	4.679e+01	1.843e-01	3.765e-01
0.0364	7.784e+10	4.486e+01	1.056e+02	2.549e-01	5.998e-01
0.6616	5.039e+12	8.432e+06	2.072e+07	1.635e+04	4.017e+04
TOTALS:	5.447e+12	8.432e+06	2.072e+07	1.635e+04	4.017e+04

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: EDCH1.MS5
Run Date: January 14, 2003
Run Time: 9:33:21 AM
Duration: 00:00:05

File Ref: N/A
Date: 1/14/03
By: CJ
Checked: KAG

Case Title: Melter Disch. Cavity
Description: East cavity, based on a 6 R/hr reading
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	121.285 cm	3 ft 11.8 in
Width	60.96 cm	2 ft
Height	55.245 cm	1 ft 9.7 in

Dose Points

	X	Y	Z
# 1	126.365 cm	0 cm	30.48 cm
	4 ft 1.7 in	0.0 in	1 ft

Shields

Shield Name	Dimension	Material	Density
Source	4.08e+05 cm³	Vitrified Glass	2.6
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	2.2704e+001	8.4005e+011	5.5585e+001	2.0566e+006
Cs-137	2.4000e+001	8.8800e+011	5.8758e+001	2.1740e+006

Buildup
The material reference is : Source

Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.739e+10	1.541e+00	3.107e+00	1.283e-02	2.588e-02
0.0322	3.209e+10	3.435e+00	7.018e+00	2.764e-02	5.648e-02
0.0364	1.168e+10	6.729e+00	1.584e+01	3.823e-02	8.997e-02
0.6616	7.559e+11	1.265e+06	3.108e+06	2.452e+03	6.025e+03
TOTALS:	8.170e+11	1.265e+06	3.108e+06	2.452e+03	6.026e+03

Appendix M

Peer Reviewed MicroShield™ Computer Model Results for the Concentrator Feed Makeup Tank (CFMT)

Component or area: CFMT

Model geometry used: Cylindrical volume

Given/Facts: The radiation reading was taken with an unshielded radiation probe at a position with the hook block of the crane in contact with the tank, and the block on contact with the uppermost seam, approximately 4' 7" from the bottom of the tank. Adding on at least 20 inches for the block, clevis and probe length, this made the vertical position of the probe approximately 35 inches from the bottom.

Assumptions made:

1. The tank was "filled" with contaminated water. Although the actual liquid level at the time of the radiation readings was 31 inches, the model assumed that the tank was filled. This was done not only for ease of computer modeling, but also to add conservatism in the model. It should be noted that two models were initially run, one with the internals of the CFMT contaminated and the other with the CFMT full of contaminated liquid. Radiation attenuation from the water resulted in a higher, and more conservative, Cs-137 value.

2. Because the crane block was in contact with the tank a distance of 9" was used, which is the full width of the block. (The probe would be at a distance no greater than 9".)

3. The reading was taken with an unshielded probe. All the radiation was assumed to be coming exclusively from the tank, even though there were other radiation sources in the area (e.g., the SBS, MFHT and process piping).

Calculation:

Input into the model

Distance of the detector to the CFMT wall: 9"
Dimensions of the tank: 13 ft, 10.2" height x 5 ft, 9.1" radius
Reading modeled: 32 R/hr
Source Material: Water
Custom material used: Hastelloy
Drawings/References: 900D-4782
Work Documents/Surveys: Work Order 76851

Explanation of the CFMT model

The radiation reading from the CFMT was taken at a position with the hook block of the crane in contact with the tank, and the block on contact with the uppermost seam, approximately 4' 7" from the bottom of the tank. Adding on at least 20 inches for the block, clevis and probe length, this makes the vertical position of the probe approximately 35 inches from the bottom. Because the block was in contact with the tank a distance of 9" was used, which is the full width of the block. (It should be noted that this is a conservative measurement, because the probe was hanging at a distance no greater than the diameter of the block.) For the computer model itself, a cylindrical volume was used, and the computer model was based on the assumption that this tank was "filled" with contaminated water. The tank was also clad with theoretical "hastelloy-C." Additional conservatism was inherent by the following conditions.

1. Some of the dimensions used in the computer model were actually greater than the actual dimensions of the tank, resulting in a greater source volume, overestimating curie content.

2. The reading was taken with an unshielded probe. In determination of the Curie content, all the radiation was assumed to be coming exclusively from the tank, even though there were other radiation sources in the area. This made the determination of the Curie content conservatively high.

3. The tank was theoretically filled with contaminated water, instead of the actual level at the time of the radiation readings of 21".

Resulting Curie content: 5600 Ci of Cs-137

Model prepared by: [signature] / E. Lachapelle / 2/6/03
Signature/Print name/Date

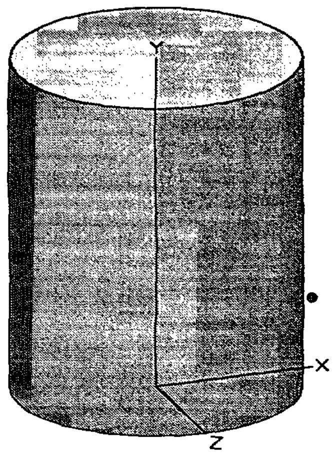
Model peer reviewed by: [signature] / R. A. Gonzalez / 2/6/03
Signature/Print name/Date

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: CFMT.MS5
Run Date: February 6, 2003
Run Time: 12:39:16 PM
Duration: 00:00:03

File Ref: N/A
Date: 2/6/03
By: [illegible]
Checked: [illegible]

Case Title: CFMT
Description: Based on 32 R/hr reading
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	422.275 cm	13 ft 10.2 in
Radius	175.578 cm	5 ft 9.1 in

Dose Points

	X	Y	Z
# 1	199.39 cm	88.9 cm	0 cm
	6 ft 6.5 in	2 ft 11.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	4.09e+07 cm³	Water	1
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Hastelloy C	8.947

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	5.2976e+003	1.9601e+014	1.2954e+002	4.7929e+006
Cs-137	5.6000e+003	2.0720e+014	1.3693e+002	5.0665e+006

Buildup
The material reference is : Source

Integration Parameters

Radial	10
Circumferential	10
Y Direction (axial)	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	4.058e+12	5.943e-42	1.988e-19	4.951e-44	1.656e-21
0.0322	7.487e+12	3.000e-40	4.021e-19	2.415e-42	3.236e-21
0.0364	2.725e+12	2.138e-28	3.840e-19	1.215e-30	2.182e-21
0.6616	1.764e+14	3.811e+06	1.649e+07	7.388e+03	3.196e+04
TOTALS:	1.906e+14	3.811e+06	1.649e+07	7.388e+03	3.196e+04

Appendix N

Peer Reviewed MicroShield™ Computer Model Results for the
Melter Feed Hold Tank (MFHT)

Component or area: MFHT

Model geometry used: Cylindrical volume

Given/Facts:
The radiation reading was taken with an unshielded radiation probe on contact with the uppermost seam, approximately 54 inches from the bottom of the tank.

Assumptions made:

1. The tank was "filled" with contaminated water. It should be noted that the indicated liquid level at the time of the radiation readings was zero. However, there is residual heel in the MFHT not accounted for by level indication. The model assumed that the tank was filled. This was done not only for ease of computer modeling, but also to add conservatism in the model. Radiation attenuation from the water resulted in a higher, and more conservative, Cs-137 value.

2. The reading was taken with an unshielded probe. All the radiation was assumed to be coming exclusively from the tank, even though there were other radiation sources in the area (e.g., the CFMT, SBS and process piping).

Calculation:

Input into the model

Distance of the detector to the MFHT wall: 2"
Dimensions of the tank: 10 ft height x 4 ft, 11.6" radius
Reading modeled: 35 R/hr
Source Material: Water
Tank Material: Iron
Drawings/References: 900D-4781
Work Documents/Surveys: Work Order 76851

Explanation of the MFHT model

The radiation reading from the MFHT was taken at a position with on contact with the uppermost seam, approximately 54" from the bottom of the tank. For the computer model itself, a cylindrical volume was used, and the computer model was based on the assumption that this tank was "filled" with contaminated water. Additional conservatism was inherent by the following conditions.

1. Some of the dimensions used in the computer model were actually greater than the actual dimensions of the tank, resulting in a greater source volume, overestimating curie content.

2. The reading was taken with an unshielded probe. In determination of the Curie content, all the radiation was assumed to be coming exclusively from the tank, even though there were other radiation sources in the area. This made the determination of the Curie content conservatively high.

3. The tank was theoretically filled with contaminated water, instead of the actual level at the time of the radiation readings of zero. It should be noted, however, that there is residual heel in the MFHT, not accounted for by level indication.

Resulting Curie content: 2500 Ci of Cs-137

Model prepared by: E. Lachapelle / E. Lachapelle / 1/14/03
Signature/Print name/Date

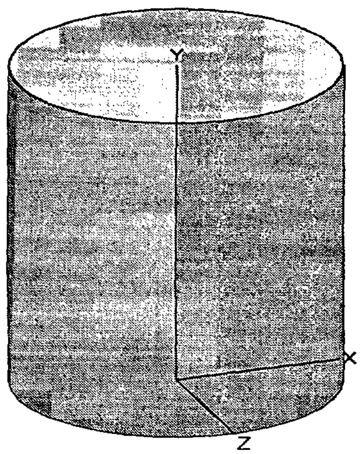
Model peer reviewed by: R. A. Gonzalez / R. A. Gonzalez / 1/14/03
Signature/Print name/Date

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: MFHT.MS5
Run Date: January 2, 2003
Run Time: 3:45:48 PM
Duration: 00:00:03

File Ref: N/A
Date: 1/14/03
By: EL
Checked: [illegible]

Case Title: MFHT
Description: Based on 35 R/hr reading
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	304.8 cm	10 ft 0.0 in
Radius	151.448 cm	4 ft 11.6 in

Dose Points

	X	Y	Z
# 1	157.48 cm	138.1125 cm	0 cm
	5 ft 2.0 in	4 ft 6.4 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	2.20e+07 cm³	Water	1
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	2.3650e+003	8.7505e+013	1.0768e+002	3.9842e+006
Cs-137	2.5000e+003	9.2500e+013	1.1383e+002	4.2117e+006

Buildup
The material reference is : Source

Integration Parameters

Radial	10
Circumferential	10
Y Direction (axial)	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.812e+12	3.615e-24	1.819e-19	3.011e-26	1.515e-21
0.0322	3.342e+12	4.552e-23	3.689e-19	3.663e-25	2.969e-21
0.0364	1.216e+12	2.923e-16	4.408e-14	1.661e-18	2.505e-16
0.6616	7.874e+13	3.708e+06	1.806e+07	7.188e+03	3.502e+04
TOTALS:	8.511e+13	3.708e+06	1.806e+07	7.188e+03	3.502e+04

Appendix O

Peer Reviewed MicroShield™ Computer Model Results for the Submerged Bed Scrubber (SBS) and Hastelly-C Custom Material Composition

Component or area: SBS

Model geometry used: Cylindrical volume

Given/Facts:

The radiation reading was taken with an unshielded radiation probe 55 inches up from the bottom of the tank and approximately nine inches away from the external surface of the tank.

Assumptions made:

1. In order for the model to consider the internal structures of the SBS, consisting of two concentric cylinders made of Hastelloy-C and the ceramic spheres, a custom material (based on Hastelloy-C) was constructed in MicroShield™ .

2. Because the actual internals are not made of solid Hastelloy-C, a density had to be assigned for the internal structure. To determine the density of the internals, a density of 1.05 g/cm^3* was calculated using data from the maximum operating weight of the SBS.

3. The model incorporated outside cladding constructed of Hastelloy-C 22. The custom material was used as the source media yielding a more conservative radiation attenuation versus other tank contents such as residual liquid and the ceramic spheres.

4. The reading was taken with an unshielded probe. All the radiation was assumed to be coming exclusively from the tank, even though there were other radiation sources in the area (e.g., the CFMT, MFHT and process piping).

Calculation:

Input into the model

Distance of the detector to the SBS wall: 9"
Dimensions of the tank: 11 ft 6" height x 4 ft 1" radius
Reading measured/modeled: 38 R/hr
Source/Custom Material: Custom material Hastelloy-C, density of 1.05 g/cm^3
Drawings/References: 1990E31
Work Documents/Surveys: Work Order 76851

*From Drawing 2990E32, sheet 1, the maximum operating weight is 38,600 lbs (1.75 x 10^7 g). Assuming the tank is a cylinder with 11 ft 6" height x 4 ft .375", radius, the resulting volume is 590 ft^3 (1.67 x 10^7 cm^3). Dividing the mass by volume yields the density.

Explanation of the SBS model

The radiation reading from the SBS was taken at a position with the crane block on contact with the uppermost seam, approximately 75" from the bottom of the tank. Adding on at least 20 inches for the block, clevis and probe length, this makes the vertical position of the probe approximately 55 inches from the bottom. To determine the distance of the probe from the wall of the SBS, the fact that the crane block was in contact with the tank was used. The full width of the crane block is 9" and this distance was used as a distance from the tank in the computer model. It should be noted that this is a conservative measurement, because the probe was hanging at a distance no greater than the diameter of the block.

The other determination to conservatively computer model the SBS was to take into consideration any internal structures of the SBS that consists of Hastelloy C-22, elsewhere described in this report, and the scrubbing bed. It was decided that the internals should be modeled using a custom made material of Hastelloy C-22. (This choice of material will give a conservative radiation attenuation.) To determine the density of the internals, a density of 1.05 g/cm^3 was calculated using data from Drawing 2990E32 for the maximum operating weight and dimensions to determine volume from Drawing 1990E31. The outside cladding was also constructed of Hastelloy C-22.

Resulting Curie content: 4300 Ci of Cs-137

Model prepared by: [signature] / F. Lachapelle / 2/6/03
Signature/Print name/Date

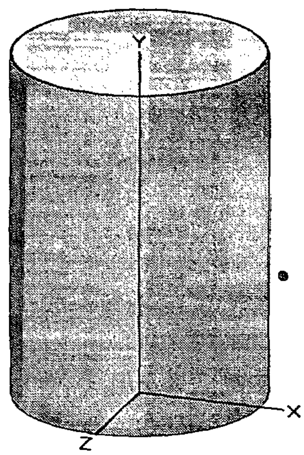
Model peer reviewed by: [signature] / R. A. Gonzalez / 2/6/03
Signature/Print name/Date

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: SBS.MS5
Run Date: February 6, 2003
Run Time: 9:21:33 AM
Duration: 00:00:03

File Ref: N/A
Date: 2/6/03
By: EL
Checked: PAC

Case Title: SBS
Description: Based on 38 R/hour radiation reading
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	350.545 cm	11 ft 6.0 in
Radius	123.508 cm	4 ft 0.6 in

Dose Points

	X	Y	Z
# 1	147.32 cm	139.7 cm	0 cm
	4 ft 10.0 in	4 ft 7.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.03e+06 in³	Hastelloy C	1.05
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.375 in	Hastelloy C	8.947

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	4.0678e+003	1.5051e+014	2.4215e+002	8.9594e+006
Cs-137	4.3000e+003	1.5910e+014	2.5597e+002	9.4709e+006

Buildup
The material reference is : Source
This buildup reference material is a mixed material with a high atomic number element (42). Buildup Factors less than and somewhat greater than 20 keV may be incorrect. Please understand your results.

Integration Parameters

Radial	10
Circumferential	10
Y Direction (axial)	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	3.116e+12	5.887e-50	2.110e-19	4.904e-52	1.758e-21
0.0322	5.749e+12	5.892e-48	3.066e-19	4.742e-50	2.467e-21
0.0364	2.092e+12	1.277e-33	1.197e-20	7.253e-36	6.798e-23
0.6616	1.354e+14	6.841e+06	1.975e+07	1.326e+04	3.829e+04
TOTALS:	1.464e+14	6.841e+06	1.975e+07	1.326e+04	3.829e+04

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project
Custom Material : Hastelloy C
Chemical Engineers' Handbook
Density : 8.947 g/cm³
Average Atomic Number : 38.8 (based on average elements Z)
Effective Atomic Number : 31.34 (for Buildup Factor Interpolation)
Effective Atomic Weight : 62.9

	1 59.000%	2 16.000%	3 16.000%	4 5.000%	5 4.000%
Chromium			1		
Iron				1	
Nickel	1				
Molybdenum		1			
Tungsten					1

Appendix P

Peer Reviewed MicroShield™ Computer Model Results for the High-Efficiency Mist Eliminators (HEMEs)

Component or area: HEMEs

Model geometry used: Cylindrical volume

Given/Facts:

The radiation reading from the HEMEs were taken no greater than nine inches from the tank and approximately 67 inches from the bottom of the HEMEs with an unshielded radiation probe.

Assumptions made:

1. A density of 1.7 g/cm^3 was used to approximate the density of the HEMEs. In order to conservatively model these components, a density and material had to be selected for input into the model. The internals of the HEMEs is analogous to the materials generated from the Vitrification Expended Materials Program (VEMP). The VEMP was a program that size reduced spent vitrification components and packaged them into steel containers. The internal structure of the HEMEs would be no more dense than the most dense container processed by the VEMP. (The VEMP material is closely packed into containers minimizing the available air space so is a conservative predictor of the density of a piped infrastructure.) From the VEMP, the maximum weight of one of the 30-gallon drums of cut up expended material is 225 kilograms. This translates to a density of 1.7 g/cm^3.

2. Iron was selected as a source material. Iron was used because of its conservative radiation attenuation property.

3. All the radiation was assumed to be coming exclusively from the HEMEs, even though there were other radiation sources in the area (e.g., other off-gas components and piping).

Calculation:

Input into the model

Distance of the detector to the HEME wall: 9"
Dimensions of the HEME: 14 ft 3.9" height x 2 ft, 4.5" radius
Reading measured at that point: 63 and 18 R/hr
Source Material: Iron at a density of 1.7 g/cm^3
Drawings/References: 27304
Work Documents/Surveys: Work Order 76851

Explanation of the HEME models

The radiation reading from the HEMEs were taken at a position with the crane block on contact with the HEMEs, parallel to a seam that is approximately 67 inches from the bottom of the HEMEs. To determine the distance of the probe from the wall of the HEMEs, the fact that the crane block was in contact with the tank was used. The full width of the crane block is 9" and this distance was used as a distance from the tank in the computer model. It should be noted that this is a conservative measurement, because the probe was hanging at a distance no greater than the diameter of the block.

The other determination to conservatively computer model the HEMEs was to take into consideration any internal structures of the HEMEs. It was decided that the internals should be modeled using iron as the source media. (This choice of material will give a conservative radiation attenuation.) Because the actual internals are not made of solid iron, a density had to be determined for the internal structure. It was decided that data from the Vitrification Expended Material Program (VEMP) could be used to estimate a density. VEMP was a program that consisted of size reducing spent Vitrification components and packaging them into steel containers. To first order, the internal structure of a component, such as a HEME would be no more dense than the most dense container processed by VEMP. From the Vitrification Expended Material Program, the maximum weight of one of the 30 gallon drums of cut up expended material is 225 kg. This translates to a density of 1.7 g/cm^3. Using this data, a cylindrical volume was used to determine the Curie content. Additional conservatism was inherent because the reading was taken with an unshielded probe. In determination of the Curie content, all the radiation was assumed to be coming exclusively from the HEME, even though there were other radiation sources in the area. This made the determination of the Curie content conservatively high.

Resulting Curie contents (Ci of Cs-137):

HEME T-033	790
HEME T-036	2800

Model prepared by: *[signature]* / E. Lachapelle / 1/16/03
Signature/Print name/Date

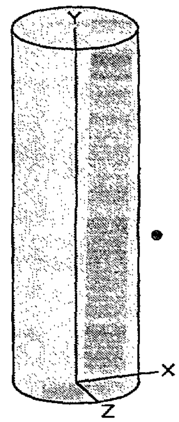
Model peer reviewed by: *[signature]* / R. A. Gonzalez 1/17/03
Signature/Print name/Date

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: T-033-1.MS5
Run Date: January 14, 2003
Run Time: 12:39:10 PM
Duration: 00:00:03

File Ref: N/A
Date: 1/14/03
By: EL
Checked: MC

Case Title: HEME T-033
Description: Based on 18 R/hr reading
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	436.563 cm	14 ft 3.9 in
Radius	72.39 cm	2 ft 4.5 in

Dose Points

	X	Y	Z
# 1	100.33 cm	170.9674 cm	0 cm
	3 ft 3.5 in	5 ft 7.3 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	7.19e+06 cm³	Iron	1.7
Transition		Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	7.4734e+002	2.7652e+013	1.0398e+002	3.8474e+006
Cs-137	7.9000e+002	2.9230e+013	1.0992e+002	4.0670e+006

Buildup
The material reference is : Source

Integration Parameters

Radial	10
Circumferential	10
Y Direction (axial)	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	5.725e+11	4.738e-03	5.137e-03	3.947e-05	4.279e-05
0.0322	1.056e+12	1.304e-02	1.416e-02	1.049e-04	1.140e-04
0.0364	3.844e+11	1.566e-01	1.724e-01	8.895e-04	9.798e-04
0.6616	2.488e+13	4.639e+06	9.289e+06	8.994e+03	1.801e+04
TOTALS:	2.689e+13	4.639e+06	9.289e+06	8.994e+03	1.801e+04

MicroShield v5.03 (5.03-00241)
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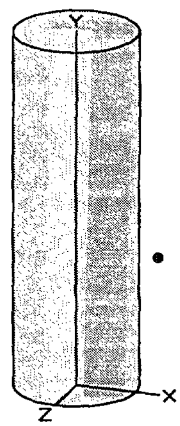
Page : 1
DOS File: T-036-1.MS5
Run Date: January 14, 2003
Run Time: 12:40:19 PM
Duration: 00:00:03

File Ref: N/A
Date: 1/14/03
By: [illegible]
Checked: [illegible]

Case Title: HEME T-036
Description: Based on 63 R/hr reading
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	436.563 cm	14 ft 3.9 in
Radius	72.39 cm	2 ft 4.5 in

Dose Points

	X	Y	Z
# 1	100.33 cm	170.9674 cm	0 cm
	3 ft 3.5 in	5 ft 7.3 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	4.39e+05 in³	Iron	1.7
Transition		Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	2.6488e+003	9.8006e+013	3.6855e+002	1.3636e+007
Cs-137	2.8000e+003	1.0360e+014	3.8959e+002	1.4415e+007

Buildup
The material reference is : Source

Integration Parameters

Radial	10
Circumferential	10
Y Direction (axial)	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	2.029e+12	1.679e-02	1.821e-02	1.399e-04	1.516e-04
0.0322	3.744e+12	4.621e-02	5.019e-02	3.719e-04	4.039e-04
0.0364	1.362e+12	5.549e-01	6.112e-01	3.153e-03	3.473e-03
0.6616	8.819e+13	1.644e+07	3.292e+07	3.188e+04	6.383e+04
TOTALS:	9.532e+13	1.644e+07	3.292e+07	3.188e+04	6.383e+04

Appendix Q

Peer Reviewed MicroShield™ Computer Model Results for the Off-Gas Jumper

Component or area: Off Gas Jumper

Model geometry used: Cylindrical surface

Given/Facts:

The radiation reading from the off-gas jumper was taken with an unshielded radiation probe at a position on contact with the jumper, approximately four feet from the end that extends into the melter. (The estimate of radiation probe positioning was based on what was observed during the measurement and comparison with drawing 900D-5736.)

Assumptions made:

All the radiation was assumed to be coming exclusively from the jumper, even though there were other radiation sources in the area (e.g., process tanks and other process piping).

Calculation:

Input into the model

Distance of the detector to the jumper wall: 2"
Dimensions of the jumper: 16 ft long x 3.0325" radius *
Reading modeled: 20 R/hr
Cladding Material: Iron at a density of 7.86 g/cm^3 and thickness of .28"*
Drawings/References: 900D-5736, sheets 1 and 2
Work Documents/Surveys: Work Order 76851

*The jumper is made of 6" schedule 40 piping, which has a wall thickness of 0.28" and an ID of 6.065"

Explanation of the Off Gas Jumper model

The radiation reading from the Off Gas jumper was taken at a position on contact with the jumper, approximately 4' from the end that extends into the melter. A cylindrical volume was used. Additional conservatism was inherent in this model because the reading was taken with an unshielded probe that includes other sources contributing to the reading.

Resulting Curie content: 20 Ci of Cs-137

Model prepared by: [signature] / E. Lachapelle / 1/16/03
Signature/Print name/Date

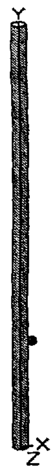
Model peer reviewed by: [signature] / R. A. Gonzalez 1/16/03
Signature/Print name/Date

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: GASJUMP.MS5
Run Date: January 3, 2003
Run Time: 9:18:34 AM
Duration: 00:00:01

File Ref: N/A
Date: 1/16/03
By: CJ
Checked: RAO

Case Title: Off gas jumper
Description: Based on 20 R/hr reading approx 4' from upper end
Geometry: 10 - Cylinder Surface - External Dose Point



Source Dimensions

Height	487.68 cm	16 ft
Radius	7.703 cm	3.0 in

Dose Points

	X	Y	Z
# 1	13.49375 cm	121.92 cm	0 cm
	5.3 in	4 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Cyl. Core	7.703 cm²	Air	0.00122
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.711 cm	Iron	7.86

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	µCi/cm²	Bq/cm²
Ba-137m	1.8920e+001	7.0004e+011	8.0163e+002	2.9660e+007
Cs-137	2.0000e+001	7.4000e+011	8.4738e+002	3.1353e+007

Buildup
The material reference is : Wall Clad

Integration Parameters

Y Direction (axial)	20
Circumferential	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.449e+10	1.116e-14	1.235e-14	9.298e-17	1.029e-16
0.0322	2.674e+10	7.553e-14	8.381e-14	6.079e-16	6.745e-16
0.0364	9.731e+09	2.284e-09	2.602e-09	1.298e-11	1.478e-11
0.6616	6.299e+11	5.802e+06	1.034e+07	1.125e+04	2.004e+04
TOTALS:	6.809e+11	5.802e+06	1.034e+07	1.125e+04	2.004e+04

Appendix R

Peer Reviewed MicroShield™ Computer Model Results for the High-Efficiency Mist Eliminator (HEME) Preheater E-032

Component or area: HEME Preheater

Model geometry used: Rectangular volume

Given/Facts:

The radiation reading from the preheater was taken at a position approximately centered on contact with the east side of the preheater with an unshielded radiation probe.

Assumptions made:

1. A density of 1.7 g/cm^3 was used to approximate the density of the HEME Preheater. In order to model this component, a density and material had to be selected for input into the model. The internals of the preheater is analogous to the materials generated from the Vitrification Expended Materials Program (VEMP). The VEMP was a program that size reduced spent vitrification components and packaged them into steel containers. The internal structure of the preheater would be no more dense than the most dense container processed by the VEMP. (The VEMP material is closely packed into containers minimizing the available air space so is a conservative predictor of the density of a piped infrastructure.) From the VEMP, the maximum weight of one of the 30-gallon drums of cut up expended material is 225 kilograms. This translates to a density of 1.7 g/cm^3.

2. Iron was selected as a source material. Iron was used because of its conservative radiation attenuation property.

3. All the radiation was assumed to be coming exclusively from the preheater, even though there were other radiation sources in the area (e.g., other off-gas components and piping).

Calculation:

<u>Input into the model</u>

Distance of the detector to the preheater wall: 2"
Dimensions of the preheater: 3' 11.8" x 3' 1" x 1' 9.9"
Reading measured at that point: 26 R/hr
Source Material: Iron at a density of 1.7 g/cm^3
Drawings/References: 27401
Work Documents/Surveys: Work Order 76851

Explanation of the HEME Preheater E-032 model

The radiation reading from the preheater was taken at a position approximately centered on contact with the east side of the preheater.

Because a rectangular volume model was used, the only determination to conservatively computer model the preheater was to take into consideration any internal structures of the preheater. It was decided that the internals should be modeled using iron as the source media. (This choice of material will give a conservative radiation attenuation.) Because the actual internals are not made of solid iron, a density had to be determined for the internal structure. It was decided that data from the Vitrification Expended Material Program (VEMP) could be used to estimate a density. VEMP was a program that consisted of size reducing spent Vitrification components and packaging them into steel containers. To first order, the internal structure of a component, such as a preheater would be no more dense than the most dense container processed by VEMP. From the Vitrification Expended Material Program, the maximum weight of one of the 30 gallon drums of cut up expended material is 225 kg. This translates to a density of 1.7 g/cm^3. Additional conservatism was inherent because the reading was taken with an unshielded probe. In determination of the Curie content, all the radiation was assumed to be coming exclusively from the preheater, even though there were other radiation sources in the area. This made the determination of the Curie content conservatively high.

Resulting Curie content: 65 Ci of Cs-137

Model prepared by: [signature] / E. Lachapelle / 1/16/03
Signature/Print name/Date

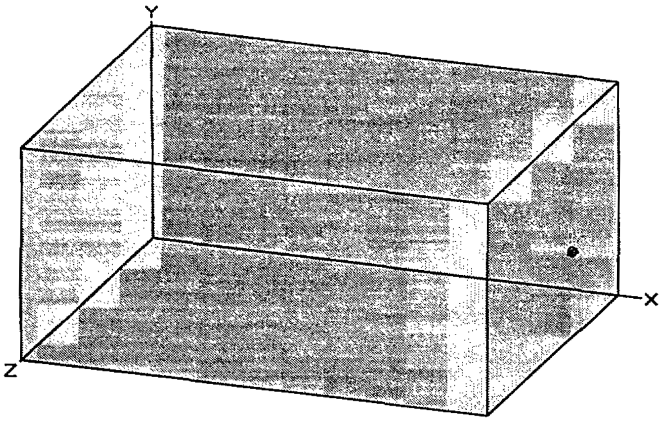
Model peer reviewed by: [signature] / R. A. Gonzalez / 1/17/03
Signature/Print name/Date

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: PHTR032.MS5
Run Date: January 2, 2003
Run Time: 11:15:23 AM
Duration: 00:00:05

File Ref: N/A
Date: 1/16/03
By: EL
Checked: AAO

Case Title: HEME preheater E032
Description: Based on 26 R/hr reading on east face of component
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	121.285 cm	3 ft 11.8 in
Width	93.98 cm	3 ft 1.0 in
Height	55.702 cm	1 ft 9.9 in

Dose Points

	X	Y	Z
# 1	126.365 cm	27.8511 cm	46.99 cm
	4 ft 1.7 in	11.0 in	1 ft 6.5 in

Shields

Shield Name	Dimension	Material	Density
Source	6.35e+05 cm³	Iron	1.7
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	6.1490e+001	2.2751e+012	9.6848e+001	3.5834e+006
Cs-137	6.5000e+001	2.4050e+012	1.0238e+002	3.7879e+006

Buildup
The material reference is : Source

Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	4.710e+10	3.664e-06	3.992e-06	3.052e-08	3.325e-08
0.0322	8.690e+10	1.287e-05	1.404e-05	1.036e-07	1.130e-07
0.0364	3.162e+10	1.314e-03	1.471e-03	7.463e-06	8.356e-06
0.6616	2.047e+12	6.923e+06	1.343e+07	1.342e+04	2.603e+04
TOTALS:	2.213e+12	6.923e+06	1.343e+07	1.342e+04	2.603e+04

Appendix S

Peer Reviewed MicroShield™ Computer Model Results for Prefilters

Component or area: Prefilter T-038

Model geometry used: Rectangular volume

Given/Facts:

The radiation readings were taken centered on the east face of the prefilter using an unshielded general area probe.

Assumptions made:

1. A density of 1.7 g/cm^3 was used to approximate the density of the prefilter. In order to conservatively model this component, a density and material had to be selected for input into the model. The internals of the prefilter is analogous to the materials generated from the Vitrification Expended Materials Program (VEMP). The VEMP was a program that size reduced spent vitrification components and packaged them into steel containers. The internal structure of the prefilter would be no more dense than the most dense container processed by the VEMP. (The VEMP material is closely packed into containers minimizing the available air space so is a conservative predictor of the density of a piped infrastructure.) From the VEMP, the maximum weight of one of the 30-gallon drums of cut up expended material is 225 kilograms. This translates to a density of 1.7 g/cm^3.

2. Iron was selected as a source material. Iron was used because of its conservative radiation attenuation property.

3. All the radiation was assumed to be coming exclusively from the prefilter, even though there were other radiation sources in the area (e.g., other off-gas components and piping).

Calculation:

Input into the model

Distance of the detector to the prefilter wall: 2"
Dimensions of the prefilter: 2' 2" x 6' 11" x 2' 2"
Reading measured at that point: 70 R/hr
Source Material: Iron at a density of 1.7 g/cm^3
Drawings/References: PNL-276-01, sheet 1
Work Documents/Surveys: Work Order 76851

Explanation of the Prefilter T-038 model

The radiation reading from the prefilter was taken at a position approximately centered on contact with the east face of the prefilter.

Because a rectangular volume model was used, the only determination to conservatively computer model the prefilter was to take into consideration any internal structures of the prefilter. It was decided that the internals should be modeled using iron as the source media. (This choice of material will give a conservative radiation attenuation.) Because the actual internals are not made of solid iron, a density had to be determined for the internal structure. It was decided that data from the Vitrification Expended Material Program (VEMP) could be used to estimate a density. VEMP was a program that consisted of size reducing spent Vitrification components and packaging them into steel containers. To first order, the internal structure of a component, such as a prefilter would be no more dense than the most dense container processed by VEMP. From the Vitrification Expended Material Program, the maximum weight of one of the 30 gallon drums of cut up expended material is 225 kg. This translates to a density of 1.7 g/cm^3. Additional conservatism was inherent because the reading was taken with an unshielded probe. In determination of the Curie content, all the radiation was assumed to be coming exclusively from the prefilter, even though there were other radiation sources in the area. This made the determination of the Curie content conservatively high.

Resulting Curie content: 240 Ci of Cs-137

Model prepared by: [signature] / E. Lachapelle / 1/16/03
Signature/Print name/Date

Model peer reviewed by: [signature] / R. A. Gonzales 1/17/03
Signature/Print name/Date

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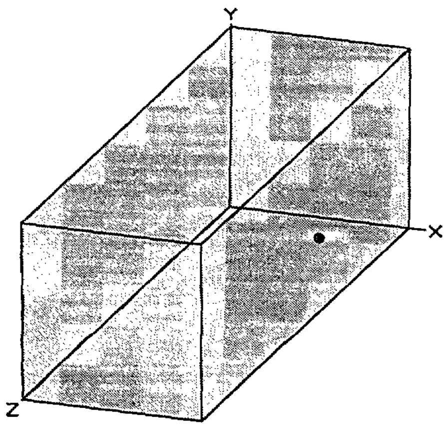
Page : 1
DOS File: PLTR038.MS5
Run Date: January 2, 2003
Run Time: 10:30:06 AM
Duration: 00:00:05

File Ref: N/A
Date: 1/16/03
By: EL
Checked: RAB

Case Title: Prefilter T-038
Description: Based on centered reading on the east face (70 R/hr)
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	66.04 cm	2 ft 2.0 in
Width	210.82 cm	6 ft 11.0 in
Height	66.04 cm	2 ft 2.0 in

Dose Points

	X	Y	Z
# 1	71.12 cm	33.02 cm	105.41 cm
	2 ft 4.0 in	1 ft 1.0 in	3 ft 5.5 in

Shields

Shield Name	Dimension	Material	Density
Source	9.19e+05 cm³	Iron	1.7
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	2.2704e+002	8.4005e+012	2.4693e+002	9.1365e+006
Cs-137	2.4000e+002	8.8800e+012	2.6103e+002	9.6580e+006

Buildup
The material reference is : Source

Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.739e+11	3.866e-02	4.182e-02	3.220e-04	3.484e-04
0.0322	3.209e+11	1.025e-01	1.110e-01	8.252e-04	8.935e-04
0.0364	1.168e+11	9.090e-01	1.002e+00	5.165e-03	5.693e-03
0.6616	7.559e+12	1.894e+07	3.720e+07	3.671e+04	7.211e+04
TOTALS:	8.170e+12	1.894e+07	3.720e+07	3.671e+04	7.211e+04

Component or area: Prefilter T-035

Model geometry used: Rectangular volume

Given/Facts:

The radiation readings were taken centered on the east face of the prefilter using an unshielded general area probe.

Assumptions made:

1. A density of 1.7 g/cm^3 was used to approximate the density of the prefilter. In order to conservatively model this component, a density and material had to be selected for input into the model. The internals of the prefilter is analogous to the materials generated from the Vitrification Expended Materials Program (VEMP). The VEMP was a program that size reduced spent vitrification components and packaged them into steel containers. The internal structure of the prefilter would be no more dense than the most dense container processed by the VEMP. (The VEMP material is closely packed into containers minimizing the available air space so is a conservative predictor of the density of a piped infrastructure.) From the VEMP, the maximum weight of one of the 30-gallon drums of cut up expended material is 225 kilograms. This translates to a density of 1.7 g/cm^3.

2. Iron was selected as a source material. Iron was used because of its conservative radiation attenuation property.

3. All the radiation was assumed to be coming exclusively from the prefilter, even though there were other radiation sources in the area (e.g., other off-gas components and piping).

Calculation:

Input into the model

Distance of the detector to the prefilter wall: 2"
Dimensions of the prefilter: 2' 2" x 6' 11" x 2' 2"
Reading measured at that point: 40 R/hr
Source Material: Iron at a density of 1.7 g/cm^3
Drawings/References: PNL-276-01, sheet 1
Work Documents/Surveys: Work Order 76851

Explanation of the Prefilter T-035 model

The radiation reading from the prefilter was taken at a position approximately centered on contact with the east face of the prefilter.

Because a rectangular volume model was used, the only determination to conservatively computer model the prefilter was to take into consideration any internal structures of the prefilter. It was decided that the internals should be modeled using iron as the source media. (This choice of material will give a conservative radiation attenuation.) Because the actual internals are not made of solid iron, a density had to be determined for the internal structure. It was decided that data from the Vitrification Expended Material Program (VEMP) could be used to estimate a density. VEMP was a program that consisted of size reducing spent Vitrification components and packaging them into steel containers. To first order, the internal structure of a component, such as a prefilter would be no more dense than the most dense container processed by VEMP. From the Vitrification Expended Material Program, the maximum weight of one of the 30 gallon drums of cut up expended material is 225 kg. This translates to a density of 1.7 g/cm^3. Additional conservatism was inherent because the reading was taken with an unshielded probe. In determination of the Curie content, all the radiation was assumed to be coming exclusively from the prefilter, even though there were other radiation sources in the area. This made the determination of the Curie content conservatively high.

Resulting Curie content: 140 Ci of Cs-137

Model prepared by: [signature] / E. Lachapelle / 1/16/03
Signature/Print name/Date

Model peer reviewed by: [signature] / R. A. Gonzalez 1/17/03
Signature/Print name/Date

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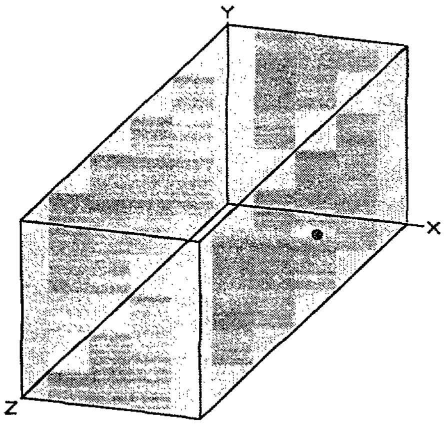
Page : 1
DOS File: PLTR035.MS5
Run Date: January 2, 2003
Run Time: 10:26:55 AM
Duration: 00:00:05

File Ref: N/A
Date: 1/16/03
By: [illegible]
Checked: [illegible]

Case Title: Prefilter T-035
Description: Based on centered reading on the east face (40 R/hr)
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	66.04 cm	2 ft 2.0 in
Width	210.82 cm	6 ft 11.0 in
Height	66.04 cm	2 ft 2.0 in

Dose Points

	X	Y	Z
# 1	71.12 cm	33.02 cm	105.41 cm
	2 ft 4.0 in	1 ft 1.0 in	3 ft 5.5 in

Shields

Shield Name	Dimension	Material	Density
Source	9.19e+05 cm³	Iron	1.7
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	1.3244e+002	4.9003e+012	1.4404e+002	5.3296e+006
Cs-137	1.4000e+002	5.1800e+012	1.5227e+002	5.6338e+006

Buildup
The material reference is : Source

Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.015e+11	2.255e-02	2.440e-02	1.878e-04	2.032e-04
0.0322	1.872e+11	5.981e-02	6.476e-02	4.814e-04	5.212e-04
0.0364	6.811e+10	5.302e-01	5.845e-01	3.013e-03	3.321e-03
0.6616	4.409e+12	1.105e+07	2.170e+07	2.142e+04	4.206e+04
TOTALS:	4.766e+12	1.105e+07	2.170e+07	2.142e+04	4.206e+04

Appendix T

Peer Reviewed MicroShield™ Computer Model Results for Post-heater E-039

Component or area: Post Heater E-039

Model geometry used: Rectangular volume

Given/Facts:

The radiation readings were taken centered on contact with the top of the post-heater using an unshielded general area probe.

Assumptions made:

1. A density of 1.7 g/cm^3 was used to approximate the density of the post heater. In order to conservatively model this component, a density and material had to be selected for input into the model. The internals of the post heater is analogous to the materials generated from the Vitrification Expended Materials Program (VEMP). The VEMP was a program that size reduced spent vitrification components and packaged them into steel containers. The internal structure of the post heater would be no more dense than the most dense container processed by the VEMP. (The VEMP material is closely packed into containers minimizing the available air space so is a conservative predictor of the density of a piped infrastructure.) From the VEMP, the maximum weight of one of the 30-gallon drums of cut up expended material is 225 kilograms. This translates to a density of 1.7 g/cm^3.

2. Iron was selected as a source material. Iron was used because of its conservative radiation attenuation property.

3. All the radiation was assumed to be coming exclusively from the post heater, even though there were other radiation sources in the area (e.g., other off-gas components and piping).

Calculation:

Input into the model

Distance of the detector to the post heater wall: 2"
Dimensions of the post heater: 2' 4.4" x 6' 1.3" x 5' 0.5"
Reading measured at that point: 18.5 R/hr
Source Material: Iron at a density of 1.7 g/cm^3
Drawings/References: PNL-277-01, sheet 1
PNL-277-03, sheet 3
Work Documents/Surveys: Work Order 76851

Explanation of the Post Heater E-039 model

The radiation reading from the post heater was taken at a position approximately centered on contact with the top of the post heater.

Because a rectangular volume model was used, the only determination to conservatively computer model the post heater was to take into consideration any internal structures of the post heater. It was decided that the internals should be modeled using iron as the source media. (This choice of material will give a conservative radiation attenuation.) Because the actual internals are not made of solid iron, a density had to be determined for the internal structure. It was decided that data from the Vitrification Expended Material Program (VEMP) could be used to estimate a density. VEMP was a program that consisted of size reducing spent Vitrification components and packaging them into steel containers. To first order, the internal structure of a component, such as a post heater would be no more dense than the most dense container processed by VEMP. From the Vitrification Expended Material Program, the maximum weight of one of the 30 gallon drums of cut up expended material is 225 kg. This translates to a density of 1.7 g/cm^3. Additional conservatism was inherent because the reading was taken with an unshielded probe. In determination of the Curie content, all the radiation was assumed to be coming exclusively from the post heater, even though there were other radiation sources in the area. This made the determination of the Curie content conservatively high.

Resulting Curie content: 130 Ci of Cs-137

Model prepared by: ~~signature~~ / E. Lachapelle / 1/16/03
Signature/Print name/Date

Model peer reviewed by: ~~signature~~ / R. A. Gonzalez 1/17/03
Signature/Print name/Date

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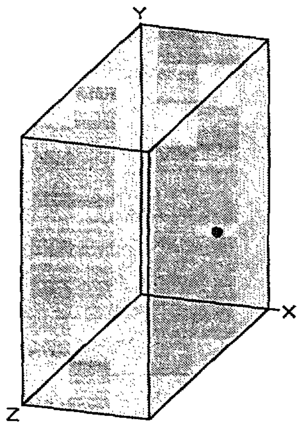
Page : 1
DOS File: PSTHR039.MS5
Run Date: January 2, 2003
Run Time: 10:59:05 AM
Duration: 00:00:05

File Ref: N/A
Date: 1/16/03
By: EL
Checked: RAG

Case Title: Post Heater E-039
Description: Based on centered contact top reading of 18.5 R/hr
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	72.111 cm	2 ft 4.4 in
Width	186.284 cm	6 ft 1.3 in
Height	153.822 cm	5 ft 0.6 in

Dose Points

	X	Y	Z
# 1	77.1906 cm	77.1652 cm	93.1418 cm
	2 ft 6.4 in	2 ft 6.4 in	3 ft 0.7 in

Shields

Shield Name	Dimension	Material	Density
Source	2.07e+06 cm³	Iron	1.7
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	1.2298e+002	4.5503e+012	5.9517e+001	2.2021e+006
Cs-137	1.3000e+002	4.8100e+012	6.2914e+001	2.3278e+006

Buildup
The material reference is : Source

Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	9.420e+10	3.769e-03	4.084e-03	3.139e-05	3.402e-05
0.0322	1.738e+11	1.025e-02	1.112e-02	8.248e-05	8.951e-05
0.0364	6.325e+10	1.146e-01	1.264e-01	6.508e-04	7.179e-04
0.6616	4.094e+12	4.917e+06	1.003e+07	9.533e+03	1.944e+04
TOTALS:	4.426e+12	4.917e+06	1.003e+07	9.533e+03	1.944e+04

Appendix U

Peer Reviewed MicroShield™ Computer Model Results for the Condenser

Component or area: Condenser

Model geometry used: Cylindrical volume

Given/Facts:

The radiation reading was taken approximately 67 inches from the bottom of the Condenser and no more than nine inches from the condenser wall with an unshielded radiation probe.

Assumptions made:

1. A density of 1.7 g/cm^3 was used to approximate the density of the Condenser. In order to conservatively model this component, a density and material had to be selected for input into the model. The internals of the condenser is analogous to the materials generated from the Vitrification Expended Materials Program (VEMP). The VEMP was a program that size reduced spent vitrification components and packaged them into steel containers. The internal structure of the condenser would be no more dense than the most dense container processed by the VEMP. (The VEMP material is closely packed into containers minimizing the available air space so is a conservative predictor of the density of a piped infrastructure.) From the VEMP, the maximum weight of one of the 30-gallon drums of cut up expended material is 225 kilograms. This translates to a density of 1.7 g/cm^3.

2. Iron was selected as a source material. Iron was used because of its conservative radiation attenuation property.

3. All the radiation was assumed to be coming exclusively from the Condenser, even though there were other radiation sources in the area (e.g., other off-gas components and piping).

Calculation:

<u>Input into the model</u>

Distance of the detector to the condenser wall: 9"
Dimensions of the condenser: 15 ft 4.6" height x 1 ft, 3" radius
Reading measured at that point: 70 R/hr
Source Material: Iron at a density of 1.7 g/cm^3
Drawings/References: PNL-290-01
Work Documents/Surveys: Work Order 76851

Explanation of the Condenser model

The radiation reading from the condenser was taken at a position with the crane block on contact with the condenser, parallel to a seam that is approximately 67 inches from the bottom of the HEMEs. To determine the distance of the probe from the wall of the condenser, the fact that the crane block was in contact with the side of the condenser was used. The full width of the crane block is 9" and this distance was used as a distance from the condenser in the computer model. It should be noted that this is a conservative measurement, because the probe was hanging at a distance no greater than the diameter of the block.

The other determination to conservatively computer model the condenser was to take into consideration any internal structures of the condenser. It was decided that the internals should be modeled using iron as the source media. (This choice of material will give a conservative radiation attenuation.) Because the actual internals are not made of solid iron, a density had to be determined for the internal structure. It was decided that data from the Vitrification Expended Material Program (VEMP) could be used to estimate a density. VEMP was a program that consisted of size reducing spent Vitrification components and packaging them into steel containers. To first order, the internal structure of a component, such as a HEME would be no more dense than the most dense container processed by VEMP. From the Vitrification Expended Material Program, the maximum weight of one of the 30 gallon drums of cut up expended material is 225 kg. This translates to a density of 1.7 g/cm^3. Using this data, a cylindrical volume was used to determine the Curie content. Additional conservatism was inherent because the reading was taken with an unshielded probe. In determination of the Curie content, all the radiation was assumed to be coming exclusively from the condenser, even though there were other radiation sources in the area. This made the determination of the Curie content conservatively high.

Resulting Curie content: 1100 Ci of Cs-137

Model prepared by: [signature] / E. Lachapelle / 1/16/03
Signature/Print name/Date

Model peer reviewed by: [signature] / R. A. Gonzalez 1/17/03
Signature/Print name/Date

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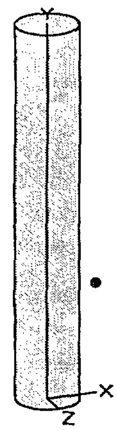
Page : 1
DOS File: COND-015.MS5
Run Date: January 14, 2003
Run Time: 3:08:35 PM
Duration: 00:00:03

File Ref: N/A
Date: 1/14/03
By: [illegible]
Checked: [illegible]

Case Title: Condenser E-015
Description: Condenser reading based on 70 R/hr reading
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	468.948 cm	15 ft 4.6 in
Radius	38.1 cm	1 ft 3.0 in

Dose Points

	X	Y	Z
# 1	60.96 cm	138.7475 cm	0 cm
	2 ft	4 ft 6.6 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.31e+05 in³	Iron	1.7
Transition		Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	1.0406e+003	3.8502e+013	4.8659e+002	1.8004e+007
Cs-137	1.1000e+003	4.0700e+013	5.1436e+002	1.9031e+007

Buildup
The material reference is : Source

Integration Parameters

Radial	10
Circumferential	10
Y Direction (axial)	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	7.971e+11	2.365e+00	2.529e+00	1.970e-02	2.106e-02
0.0322	1.471e+12	5.454e+00	5.834e+00	4.389e-02	4.695e-02
0.0364	5.352e+11	1.461e+01	1.583e+01	8.302e-02	8.992e-02
0.6616	3.464e+13	1.786e+07	3.609e+07	3.462e+04	6.997e+04
TOTALS:	3.745e+13	1.786e+07	3.609e+07	3.463e+04	6.997e+04

Appendix V

Peer Reviewed MicroShield™ Computer Model Results for Filter Preheaters

Component or area: Filter Preheater E-037

Model geometry used: Rectangular volume

Given/Facts:

The radiation readings were taken centered on contact with the north face of the preheater using an unshielded general area probe.

Assumptions made:

1. A density of 1.7 g/cm^3 was used to approximate the density of the preheater. In order to conservatively model this component, a density and material had to be selected for input into the model. The internals of the preheater is analogous to the materials generated from the Vitrification Expended Materials Program (VEMP). The VEMP was a program that size reduced spent vitrification components and packaged them into steel containers. The internal structure of the preheater would be no more dense than the most dense container processed by the VEMP. (The VEMP material is closely packed into containers minimizing the available air space so is a conservative predictor of the density of a piped infrastructure.) From the VEMP, the maximum weight of one of the 30-gallon drums of cut up expended material is 225 kilograms. This translates to a density of 1.7 g/cm^3.

2. Iron was selected as a source material. Iron was used because of its conservative radiation attenuation property.

3. All the radiation was assumed to be coming exclusively from the preheater, even though there were other radiation sources in the area (e.g., other off-gas components and piping).

Calculation:

Input into the model

Distance of the detector to the preheater wall: 2"
Dimensions of the preheater: 4' 8.4" x 3' 1" x 2' 4.5"
Reading measured at that point: 50 R/hr
Source Material: Iron at a density of 1.7 g/cm^3
Drawings/References: PNL-275-01, sheet 1
Work Documents/Surveys: Work Order 76851

Explanation of the Filter Preheater E-037 model

The radiation reading from the filter preheater was taken at a position approximately centered on contact with the north face of the preheater.

Because a rectangular volume model was used, the only determination to conservatively computer model the preheater was to take into consideration any internal structures of the preheater. It was decided that the internals should be modeled using iron as the source media. (This choice of material will give a conservative radiation attenuation.) Because the actual internals are not made of solid iron, a density had to be determined for the internal structure. It was decided that data from the Vitrification Expended Material Program (VEMP) could be used to estimate a density. VEMP was a program that consisted of size reducing spent Vitrification components and packaging them into steel containers. To first order, the internal structure of a component, such as a preheater would be no more dense than the most dense container processed by VEMP. From the Vitrification Expended Material Program, the maximum weight of one of the 30 gallon drums of cut up expended material is 225 kg. This translates to a density of 1.7 g/cm^3. Additional conservatism was inherent because the reading was taken with an unshielded probe. In determination of the Curie content, all the radiation was assumed to be coming exclusively from the preheater, even though there were other radiation sources in the area. This made the determination of the Curie content conservatively high.

Resulting Curie content: 180 Ci of Cs-137

Model prepared by: [signature] / E. Lachapelle / 1/16/03
Signature/Print name/Date

Model peer reviewed by: [signature] / R. A. Gonzalez 1/17/03
Signature/Print name/Date

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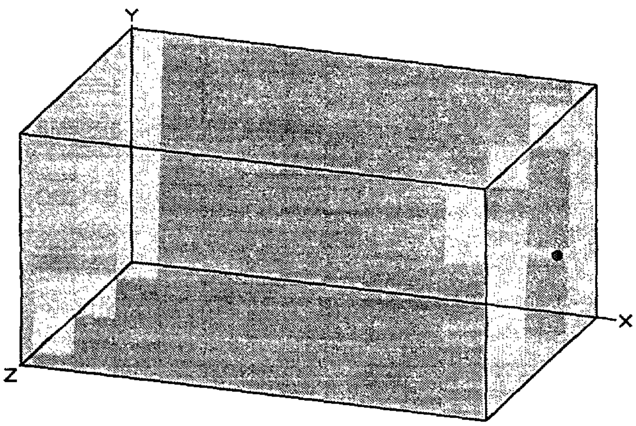
Page : 1
DOS File: HTR037.MS5
Run Date: January 2, 2003
Run Time: 10:18:36 AM
Duration: 00:00:05

File Ref: N/A
Date: 1/16/03
By: [illegible]
Checked: [illegible]

Case Title: Prefilter heater
Description: Prefilter heater E-037 based on 50 R/hr contact reading
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	143.281 cm	4 ft 8.4 in
Width	93.98 cm	3 ft 1.0 in
Height	72.39 cm	2 ft 4.5 in

Dose Points

	X	Y	Z
# 1	148.3614 cm	36.195 cm	46.99 cm
	4 ft 10.4 in	1 ft 2.3 in	1 ft 6.5 in

Shields

Shield Name	Dimension	Material	Density
Source	9.75e+05 cm^3	Iron	1.7
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	$\mu Ci/cm^3$	Bq/cm^3
Ba-137m	1.7028e+002	6.3004e+012	1.7469e+002	6.4634e+006
Cs-137	1.8000e+002	6.6600e+012	1.8466e+002	6.8324e+006

Buildup
The material reference is : Source

Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate $MeV/cm^2/sec$ No Buildup	Fluence Rate $MeV/cm^2/sec$ With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.304e+11	2.503e-07	2.736e-07	2.085e-09	2.279e-09
0.0322	2.407e+11	9.814e-07	1.075e-06	7.898e-09	8.653e-09
0.0364	8.758e+10	2.589e-04	2.905e-04	1.471e-06	1.651e-06
0.6616	5.669e+12	1.293e+07	2.585e+07	2.506e+04	5.011e+04
TOTALS:	6.128e+12	1.293e+07	2.585e+07	2.506e+04	5.011e+04

Component or area: Filter Preheater E-034

Model geometry used: Rectangular volume

Given/Facts:

The radiation readings were taken centered on contact with a flange on the east face of the preheater using an unshielded general area probe.

Assumptions made:

1. A density of 1.7 g/cm^3 was used to approximate the density of the preheater. In order to conservatively model this component, a density and material had to be selected for input into the model. The internals of the preheater is analogous to the materials generated from the Vitrification Expended Materials Program (VEMP). The VEMP was a program that size reduced spent vitrification components and packaged them into steel containers. The internal structure of the preheater would be no more dense than the most dense container processed by the VEMP. (The VEMP material is closely packed into containers minimizing the available air space so is a conservative predictor of the density of a piped infrastructure.) From the VEMP, the maximum weight of one of the 30-gallon drums of cut up expended material is 225 kilograms. This translates to a density of 1.7 g/cm^3.

2. Iron was selected as a source material. Iron was used because of its conservative radiation attenuation property.

3. All the radiation was assumed to be coming exclusively from the preheater, even though there were other radiation sources in the area (e.g., other off-gas components and piping).

Calculation:

Input into the model

Distance of the detector to the preheater wall: 2"
Dimensions of the preheater: 5' 6" x 3' 1" x 2' 4.5"
Reading measured at that point: 90 R/hr
Source Material: Iron at a density of 1.7 g/cm^3
Drawings/References: PNL-275-01, sheet 1
Work Documents/Surveys: Work Order 76851

Explanation of the Filter Preheater E-034 model

The radiation reading from the filter preheater was taken at a position approximately centered on contact with a flange on the east face of the preheater.

Because a rectangular volume model was used, the only determination to conservatively computer model the preheater was to take into consideration any internal structures of the preheater. It was decided that the internals should be modeled using iron as the source media. (This choice of material will give a conservative radiation attenuation.) Because the actual internals are not made of solid iron, a density had to be determined for the internal structure. It was decided that data from the Vitrification Expended Material Program (VEMP) could be used to estimate a density. VEMP was a program that consisted of size reducing spent Vitrification components and packaging them into steel containers. To first order, the internal structure of a component, such as a preheater would be no more dense than the most dense container processed by VEMP. From the Vitrification Expended Material Program, the maximum weight of one of the 30 gallon drums of cut up expended material is 225 kg. This translates to a density of 1.7 g/cm^3. Additional conservatism was inherent because the reading was taken with an unshielded probe. In determination of the Curie content, all the radiation was assumed to be coming exclusively from the preheater, even though there were other radiation sources in the area. This made the determination of the Curie content conservatively high.

Resulting Curie content: 370 Ci of Cs-137

Model prepared by: [signature] / E. Lachapelle / 1/16/03
Signature/Print name/Date

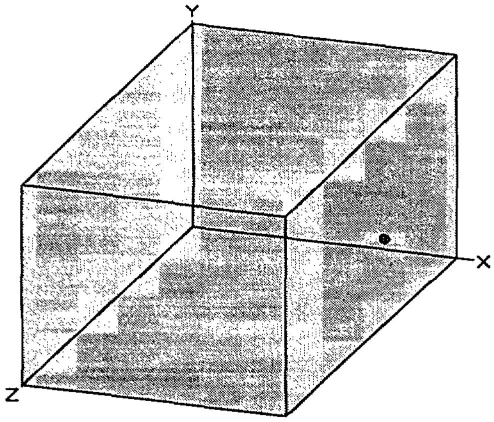
Model peer reviewed by: [signature] / R. A. Gonzalez 1/17/03
Signature/Print name/Date

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: HTR034.MS5
Run Date: January 2, 2003
Run Time: 10:05:58 AM
Duration: 00:00:05

File Ref: N/A
Date: 1/6/03
By: [illegible]
Checked: RAB

Case Title: Prefilter heater
Description: Prefilter heater 034 based on 90 R/hr reading on side
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	93.98 cm	3 ft 1.0 in
Width	167.64 cm	5 ft 6.0 in
Height	72.39 cm	2 ft 4.5 in

Dose Points

	X	Y	Z
# 1	99.06 cm	36.195 cm	83.82 cm
	3 ft 3.0 in	1 ft 2.3 in	2 ft 9.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.14e+06 cm³	Iron	1.7
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	3.5002e+002	1.2951e+013	3.0690e+002	1.1355e+007
Cs-137	3.7000e+002	1.3690e+013	3.2442e+002	1.2004e+007

Buildup
The material reference is : Source

Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	2.681e+11	7.382e-04	7.993e-04	6.149e-06	6.657e-06
0.0322	4.947e+11	2.249e-03	2.442e-03	1.810e-05	1.965e-05
0.0364	1.800e+11	6.654e-02	7.390e-02	3.781e-04	4.199e-04
0.6616	1.165e+13	2.364e+07	4.705e+07	4.584e+04	9.120e+04
TOTALS:	1.260e+13	2.364e+07	4.705e+07	4.584e+04	9.120e+04

Appendix W

Peer Reviewed MicroShield™ Computer Model Results for the Decontamination Station

Component or area: Decon Station

Model geometry used: Cylindrical volume

Given/Facts:

The radiation readings were taken with an unshielded radiation probe at no more than nine inches from the Decontamination Station tanks at a distance about half way up the height of the tanks.

Assumptions made:

1. The tank was assumed "filled" with contaminated water.

2. All the radiation was assumed to be coming exclusively from the tank, even though there were other radiation sources in the area (e.g., the off gas system.) This made the determination of the curie content conservatively high.

Calculation:

Input into the model

Distance of the detector to the Decon Tank Wall: 9"
Dimensions of the tank: 11 ft 0.3 "height x 1 ft, 2.6" radius
Reading measured at that point: 13 R/hr (north tank) and 9.5 R/hr (south tank)
Source Material: Water
Tank Material: Titanium
Drawings/References: PNL-413, sheets 3 and 6
Work Documents/Surveys: Work Order 76851

Explanation of the Decon Station models

The radiation readings from the decon station tanks were taken at a position with the hook block of the crane in contact with the tanks, with the probe approximately centered vertically on the tanks. The block was in contact with the tank. Therefore a distance of 9" was used that is the full width of the block. It should be noted that this is a conservative measurement, because the probe was hanging at a distance no greater than the diameter of the block. For the computer model, a cylindrical volume was used and was based on the assumption that this tank was "filled" with contaminated water. In addition, a custom made "titanium" material was used for the wall cladding. Additional conservatism was inherent because the readings were taken with an unshielded probe. In determination of the Curie content, all the radiation was assumed to be coming exclusively from the tank, even though there were other radiation sources in the area. This made the determination of the Curie content conservatively high.

Resulting Curie contents (Ci of Cs-137):

South Decon Station Tank	74
North Decon Station Tank	100

Model prepared by: [signature] / E. Lachapelle 1/14/03
Signature/Print name/Date

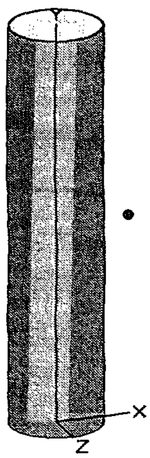
Model peer reviewed by: [signature] / R. A. Gonzalez 1/14/03
Signature/Print name/Date

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: NORTH.MS5
Run Date: January 14, 2003
Run Time: 8:10:08 AM
Duration: 00:00:03

File Ref: N/A
Date: 1/14/03
By: CL
Checked: RAG

Case Title: North Decon Station
Description: Tank based on 13 R/hr reading
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	335.915 cm	11 ft 0.3 in
Radius	37.148 cm	1 ft 2.6 in

Dose Points

	X	Y	Z
# 1	60.96 cm	167.9575 cm	0 cm
	2 ft	5 ft 6.1 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.89e+04 in³	Water	1
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.375 in	Titanium	4.54

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	9.4600e+001	3.5002e+012	6.4961e+001	2.4036e+006
Cs-137	1.0000e+002	3.7000e+012	6.8669e+001	2.5408e+006

Buildup
The material reference is : Source

Integration Parameters

Radial	10
Circumferential	10
Y Direction (axial)	20

Results

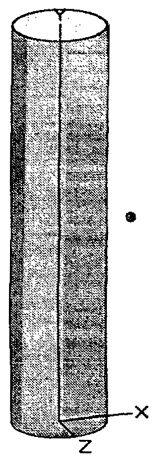
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	7.246e+10	2.259e-06	5.102e-05	1.882e-08	4.250e-07
0.0322	1.337e+11	7.878e-06	1.838e-04	6.340e-08	1.480e-06
0.0364	4.865e+10	7.251e-04	2.310e-02	4.120e-06	1.312e-04
0.6616	3.149e+12	1.912e+06	6.655e+06	3.706e+03	1.290e+04
TOTALS:	3.404e+12	1.912e+06	6.655e+06	3.706e+03	1.290e+04

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: SOUTH.MS5
Run Date: January 14, 2003
Run Time: 8:08:01 AM
Duration: 00:00:03

File Ref: N/A
Date: 1/14/03
By: EL
Checked: KAG

Case Title: South Decon Station
Description: Tank based on 9.5 R/hr reading
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	335.915 cm	11 ft 0.3 in
Radius	37.148 cm	1 ft 2.6 in

Dose Points

	X	Y	Z
# 1	60.96 cm	167.9575 cm	0 cm
	2 ft	5 ft 6.1 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.89e+04 in³	Water	1
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.375 in	Titanium	4.54

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	7.0004e+001	2.5901e+012	4.8071e+001	1.7786e+006
Cs-137	7.4000e+001	2.7380e+012	5.0815e+001	1.8802e+006

Buildup
The material reference is : Source

Integration Parameters

Radial	10
Circumferential	10
Y Direction (axial)	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	5.362e+10	1.672e-06	3.776e-05	1.393e-08	3.145e-07
0.0322	9.894e+10	5.830e-06	1.360e-04	4.692e-08	1.095e-06
0.0364	3.600e+10	5.366e-04	1.709e-02	3.049e-06	9.711e-05
0.6616	2.331e+12	1.415e+06	4.925e+06	2.742e+03	9.547e+03
TOTALS:	2.519e+12	1.415e+06	4.925e+06	2.742e+03	9.547e+03

Appendix X

Peer Reviewed MicroShield™ Computer Model Results and Methodology for Readings of the Vitrification Pit

Methodology for Readings of the Vitrification Pit

A series of readings with the shielded probe were taken on January 29, 2003 to collect data to characterize the pit floor. Readings were taken in multiple directions in locations near the CFMT, MFHT and SBS, looking horizontally toward each component, between these components and away from these components. In addition, multiple readings were taken looking horizontally underneath the melter and melter turntable. The shielded probe was then reconfigured to look in the downward direction, and readings were taken over the southwest corner of the pit, the northwest corner near the sample station, and with the 12 inch standoffs in contact with the top of the CFMT, MFHT and SBS.

The Ludlum 133-8 detector has a sensing element 1.5 inches back from the detector's face. The detector's face itself is 7/8 inches. This gives a half angle field of view of 16 degrees.

For the downward readings, a truncated cone geometry was used. The inputs to the model for each view were dependent on the individual physical arrangement (distances, density of the source, if there was a layer of water from a tank in the way, etc.), and will be explained later with each model. Once the number of curies was determined based on the readings, as a conservative measure, all the curies were attributed to the pit floor. In other words, the curies were, in a sense, boiled down from the truncated cone source and distributed onto the floor area. This gave a concentration of curies of Cs-137 per unit area. Once these concentrations were determined, they could then be multiplied by the total area they represent, and the pit floor concentration could be calculated. Figure 1A gives the fields of view that the detector was able to "see" for each of the readings.

Below is the discussion of each model developed from the downward readings:

Model methodology for under the CFMT

The dose from the CFMT was taken with the radiation probe standoffs touching the flange on the top south side of the CFMT. There was 31 inches of water at a density of 1.14 g/cm^3 in the CFMT at the time of the readings. (This was the measured level and density of the CFMT on the day of the radiation readings.) As a conservative measure, this density was entered into the source term of the truncated cone, in effect, filling up the truncated cone with water. To determine the density used for the "Hastelloy -C" source term (a custom material), the actual weight and volume of the CFMT were taken into consideration, resulting in a density of 0.18 g/cm^3 .

Model methodology for under the MFHT

The dose from the MFHT was taken with the radiation probe standoffs touching the flange on the top southwest side of the MFHT, The level indicator of the MFHT was zero, but there is probably a remaining heel of water, where the water drops beneath the level probe of the tank. The maximum heel expected is 4.25 inches of water depth (or 770 liters). As a conservative measure, water was entered into the source term of the truncated cone, in effect, filling up the truncated cone with water. To determine the density used for the "iron" source term, the actual weight and volume of the MFHT were taken into consideration, resulting in a density of 0.47 g/cm^3.

Model methodology for under the SBS

The dose from the SBS was taken with the radiation probe standoffs touching the flange on the top northeast side of the SBS. The density of material that the detector was looking at was calculated using the actual full weight and volume of the SBS, resulting in a density of 1.05 g/cm^3 of Hastelloy C (custom material) in the source term.

Model methodology for under the Northwest Corner of the Pit

Two readings were taken of the northwest corner of the pit, looking downward, to determine the floor contamination levels in that area. Because part of the field of view of the detector encompassed the MFHT, the density and material data from the MFHT was used for the truncated cone. The detector was located at approximately one foot north of the south wall, and three feet east of the west wall. Knowing this was the location of the reading, it was determined that the resulting floor "area" of the pit that could be seen was approximately 45 percent of a whole circle. This was taken into consideration in calculating the concentration. In addition, the resulting number of curies had to be multiplied by a factor of 1/.45 to adjust the source term.

Model methodology for under the Southwest Corner of the Pit

Two readings were taken of the southwest corner of the pit, looking downward, to determine the floor contamination levels in that area. The detector was located at approximately two feet south of the north wall, and one foot east of the west wall. Knowing this was the location of the reading, it was determined that the resulting floor "area" of the pit that could be seen was approximately 45 percent of the a whole circle. This was taken into consideration in calculating the concentration. In addition, the resulting number of curies had to be multiplied by a factor of 1/.45 to adjust the source term.

Analysis and Results: The table below summarizes the results of the computer models:

Location of the Reading	Calculated Floor Areal Concentration (μCi/cm^2)
Over the top of the MFHT looking "down"	1.4×10^4
Over the top of the CFMT looking "down"	1.5×10^4
Over the top of the SBS looking "down"	1.0×10^4
Looking down in the SW corner (at 336 vertical reading, or 274 inches above the pit floor)	2.5×10^4
Looking down in the NW corner (at 275 vertical reading, or 213 inches above the pit floor)	1.3×10^5

Multiple radiation readings were also taken looking underneath the major vessels. These ranged from 7.3 R/hr, looking underneath the SBS to 56 R/hr under the MFHT. These readings are, in a sense, looking through steel understructure of the tanks, but also are getting some radioactive shine from the tanks themselves. Multiple measurements were taken underneath the melter, and in the direction of the canister turntable and storage rack. These readings ranged from 1.2 to 5.6 R/hr. A graphic representation of these readings are shown in Figure 2A.

For these horizontal readings, constructing a MicroShield™ computer model to represent the field of view of the detector in this manner proved to be difficult, especially with trying to determine the interceding steel understructure of the components. To determine the relationship between dose rate and floor surface contamination, a series of models were developed, taking the floor at one foot successive slices. (The area of floor that is seen by the detector is a cross section of a cone, through the detector's field of view. See Figure 3A.) Based on the attached MicroShield™ models, the following table shows the relationship between the dose measured for a section of floor at any given length from the detector, with a curie concentration of 1.3×10^5 μCi/cm^2. (Which is the concentration that will be assigned to the area underneath the MFHT.)

Total floor distance read (feet)	Contribution (mR/hr/μCi)	Scaled Result for 1.3E5 μCi/sq. cm. (R/hr)	Calculated Total Reading (R/hr)
1	7.6E-01	9.8E+01	9.8E+01
2	6.0E-01	7.8E+01	1.8E+02
3	4.6E-01	6.0E+01	2.4E+02
4	3.7E-01	4.8E+01	2.8E+02
5	3.1E-01	4.0E+01	3.2E+02
6	2.6E-01	3.4E+01	3.6E+02
7	2.3E-01	3.0E+01	3.9E+02
8	2.1E-01	2.7E+01	4.2E+02
9	1.8E-01	2.4E+01	4.4E+02
10	1.7E-01	2.2E+01	4.6E+02
11	1.5E-01	2.0E+01	4.8E+02
12	1.4E-01	1.8E+01	5.0E+02
13	1.3E-01	1.7E+01	5.2E+02
14	1.2E-01	1.6E+01	5.3E+02
15	1.2E-01	1.5E+01	5.5E+02
16	1.1E-01	1.4E+01	5.6E+02
17	1.0E-01	1.3E+01	5.8E+02
18	9.7E-02	1.3E+01	5.9E+02

The final column of the table presents a dose rate that would be expected for a horizontal directed dose rate. It can be seen from the above table that the calculated dose rate (590 R/hr) is much greater than the actual field reading of 56 R/hr. This confirms the methodology of using the vertical "looking down" readings as the basis for a conservative estimate for the pit.

To determine the curie content, the pit floor was broken into three sections; a 12'x12' section underneath the CFMT, a 12'x12' section underneath the MFHT, and the rest of the cell. The most conservative floor concentrations were used in calculation, i.e., for the MFHT area, the NW corner concentration was used, because it was higher. In the CFMT area, the SW corner concentration was used, and in the rest of the cell, the "Under SBS" concentration was used. The "Under SBS" concentration is conservative for the rest of the cell, because the readings underneath all other components were less than the SBS. Figure 4A gives a graphic representation of these different areas, and the following summarizes the results:

Under CFMT: 3300 Ci
Under MFHT: 17000 Ci
Rest of the pit floor: 1900 Ci

Resulting Total Curie content: 22,200 Ci of Cs-137*

Model prepared by: E. Lachapelle 3/27/03
Signature/Print name/Date

Model peer reviewed by: E Y LAUBER 27 Mar 03
Signature/Print name/Date

*It should be noted that one glass canister, on average, has about 25,000 Ci of Cs-137. This would equate to about one glass canister of contamination spilled into the pit.

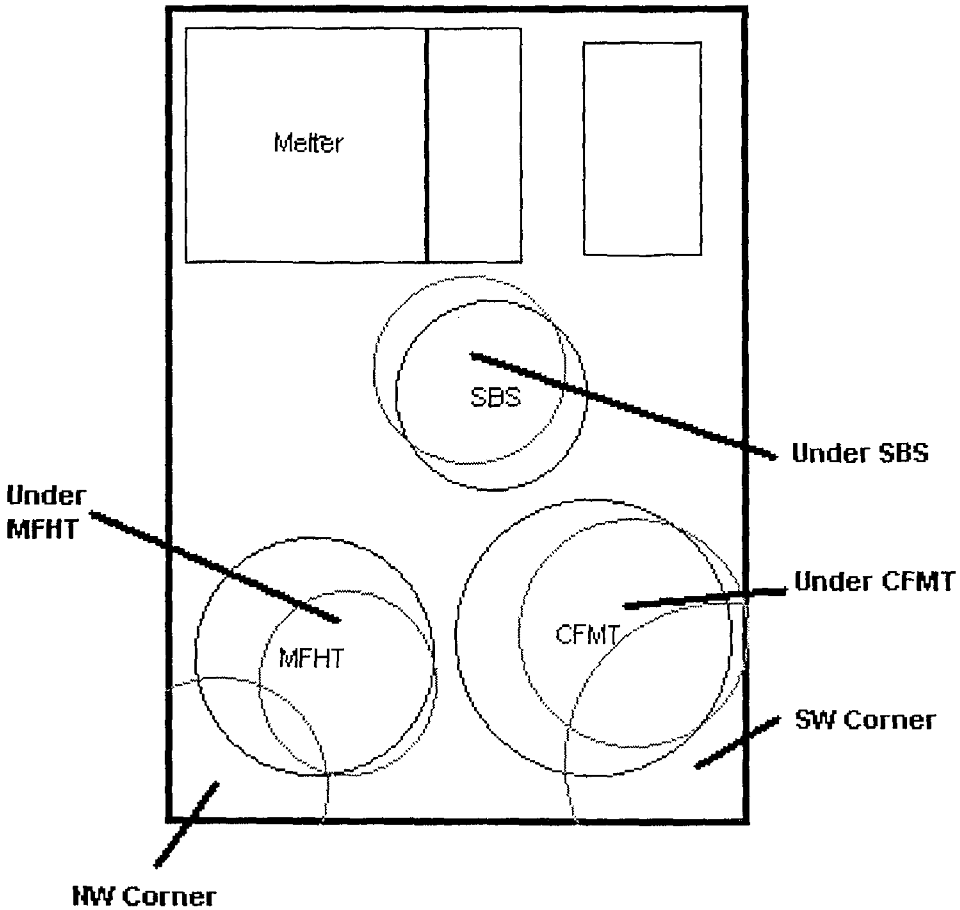


Figure 1A - Fields of View of Various Readings

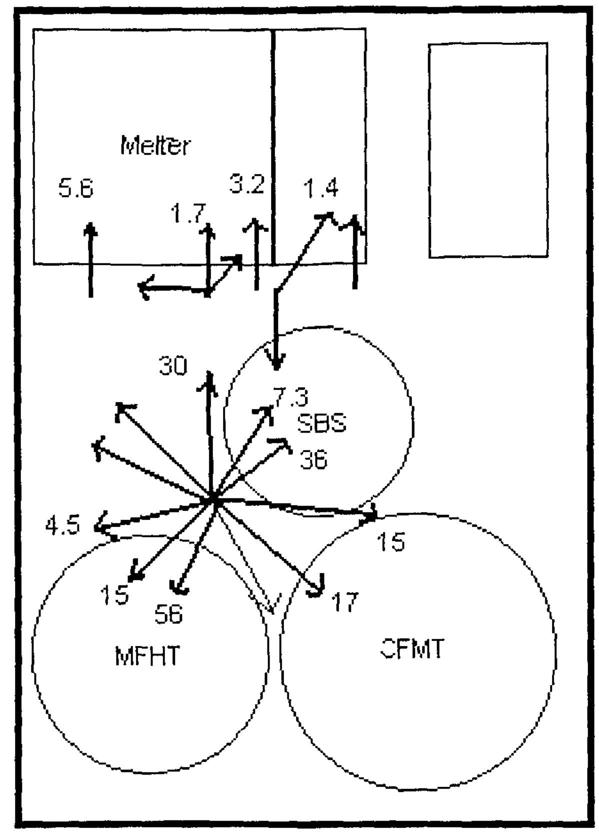


Figure 2A - Directions and Magnitude of Selected Readings Underneath Components (R/hr)

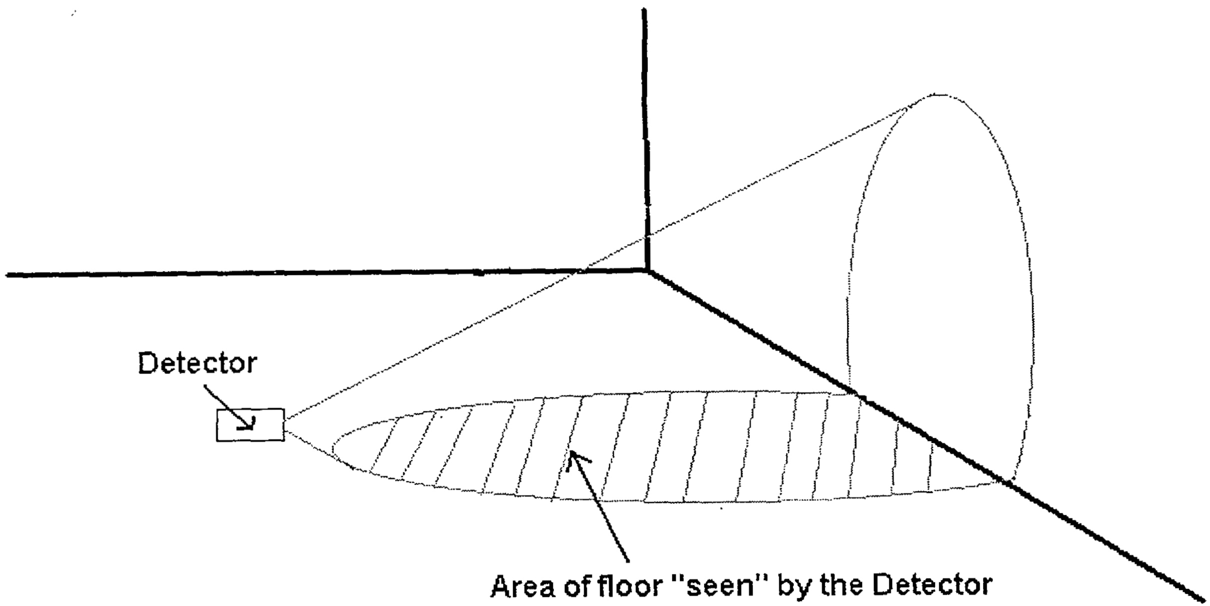


Figure 3A - Cross Sectional View of the Detector

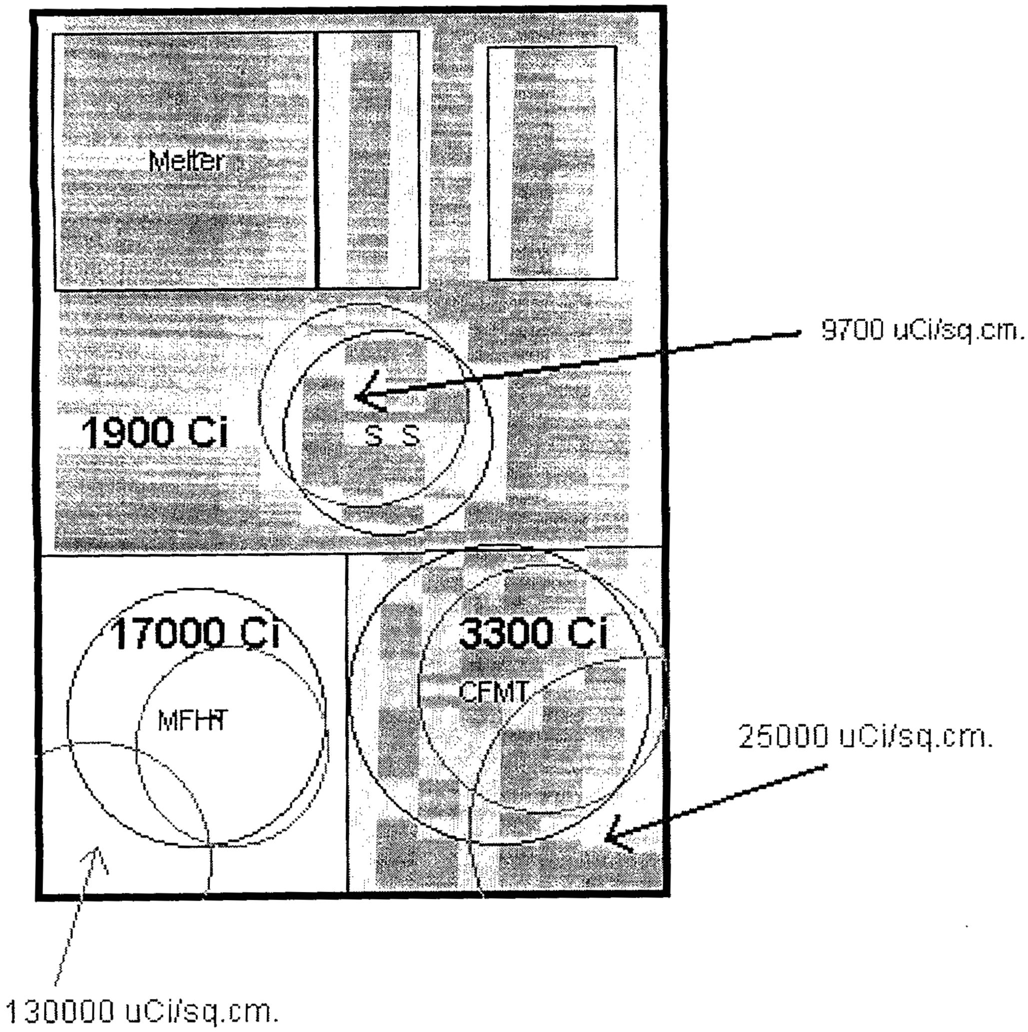


Figure 4A - Sections Considered

Component or area: Vitrification Pit - NW and SW Corners of the Pit

Model geometry used: Truncated Cone

Given/Facts:
1. The "field of view" of the detector probe is at a half angle of 16.3 degrees.
2. The shielded detector was used in measurement.
3. Distances from the pit floor were taken from the crane mounted measuring device.
4. The measurement for the NW corner was taken approximately one foot north of the south wall, and three feet east of the west wall.
5. The measurement for the SW corner was taken approximately two feet south of the north wall, and one foot east of the west wall.

Assumptions made:

1. All the curies in the cone are attributed to the pit floor. This gives a concentration of curies of Cs-137 per unit area.
2. Area concentrations are then multiplied by the total area to determine the number of curies for a section of pit floor. Because the areas that are "seen" by the detector aren't full circles, the areas had to be calculated as follows:

- For the NW corner, the data from the under the MFHT model was used. It was assumed that the "truncated cone" source was half filled with water, so a density of 0.5 g/cm^3 was used instead of 1.0 g/cm^3
- For the SW corner, the data from under the CFMT model was used. It was assumed that the "truncated cone" source was half filled with water, so a density of 0.57 g/cm^3 (half of the actual density of the contents at the time of measurement) was used.
- Floor "area" of the pit that could be seen was approximately 45 percent of the whole circle.*
- The number of curies was multiplied by a factor of 1/.45 to adjust the source term. based on the floor area of the pit that could be seen by the detector.

Example Calculation (for under the SW Corner):

<u>**Input into the model**</u>

Distance of the detector to the pit floor: 274"
Air gap established: 13.5" (12" for the standoffs, and 1.5" for the sensing head recessed into the detector housing)
Water density: 0.57 g/cm^3
Density of intervening metal: 0.18 g/cm^3
Half angle of truncated cone: 16.3 degrees
Reading measured at that point: 920 mR/hr

<u>**Data used to determine the concentration of the floor**</u>

Resulting Curie Content (adjusted to the 920 mR/hr data): 660 Ci = 6.6×10^8 µCi

Resulting Curie Content Adjusted to Reduced area: 6.6×10^8 µCi ÷ 0.45 = 1.5×10^9 µCi

Radius of the floor area "seen" by the detector: [274"] Tan (16.3°) = 80.1" = 203 cm

Adjusted area of floor "seen" by the detector: $0.45\,[\pi(203)^2] = 5.8 \times 10^4$ cm^2

Concentration of radioactivity /surface area = 1.5×10^9 µCi ÷ 5.8×10^4 cm^2 = 2.5×10^4 µci/cm^2

*See "Determination of the Circular Area in the NW Corner of the Pit" and "Determination of the Circular Area in the SW Corner of the Pit", attached.

Determination of the Circular Area in the NW Corner of the Pit

Circle center (2,1) feet

Radius = 5.2 feet (from 213"Tan(16.3°))

Circle equation $x^2 + y^2 = R^2 = 27 \text{ ft}^2$

or $y^2 = 27 - x^2$

$$\text{Area (A)} = 1/4\ (\text{Total Area}) + \int_0^2 (27-x^2)^{1/2}\,dx + [2 \times 1] + [5.2 \times 1] \text{ (See Sketch 1 below)}$$

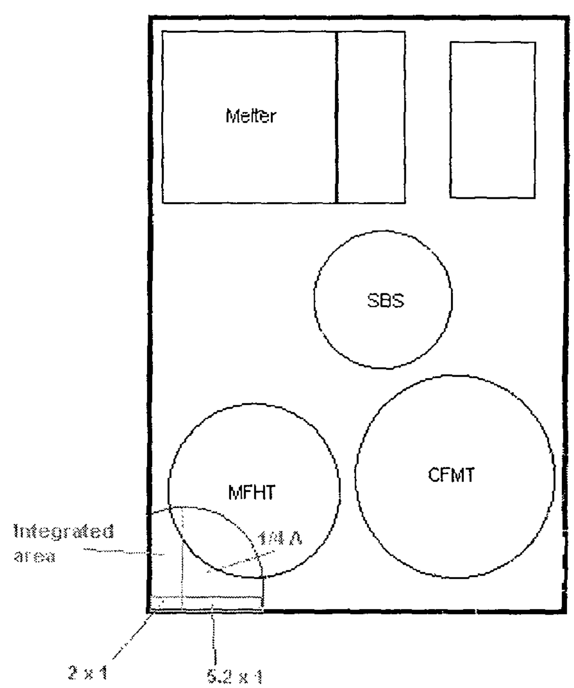
From integration tables, $\int \sqrt{a + bx}\,dx = \frac{2}{3}\sqrt{(a+bx)^3}$ where a = 27, b = -1

$$\therefore\ A = 1/4\,[\pi(5.2)^2] + \left(\frac{-2}{3}\sqrt{(27-x)^3}\right)\Big|_0^2 + 2 + 5.2$$

$$= 21.23 + \frac{2}{3}\left[\sqrt{27^3} - \sqrt{(27-2)^3}\right] + 2 + 5.2$$

$$= 38.4 \text{ ft}^2$$

or $\frac{1}{2.2}$ of the total area



Sketch 1 - NW Corner Area Representation

Determination of the Circular Area in the SW Corner of the Pit

Circle center (3,1) feet

Radius = 6.7 feet (from 274"Tan(16.3°))

Circle equation $x^2 + y^2 = R^2 = 44\ ft^2$

or $y^2 = 44 - x^2$

Area (A) = 1/4 (Total Area) + $\int_0^3 (44-x^2)^{1/2}\,dx + [3 \times 1] + [6.7 \times 1]$ (See Sketch 2 below)

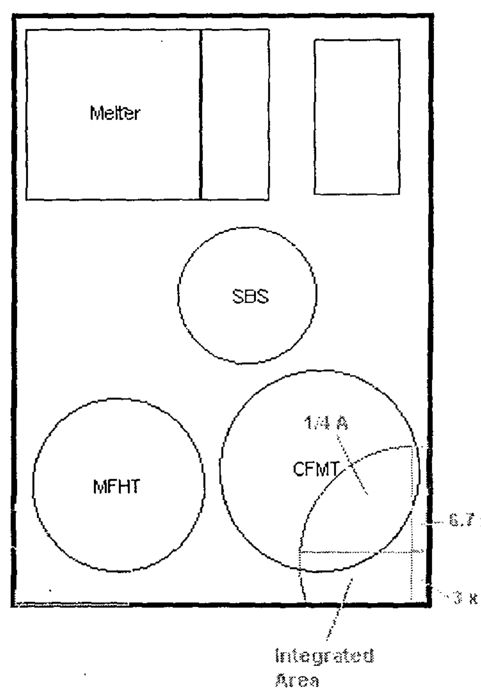
From integration tables, $\int \sqrt{a+bx}\,dx = \frac{2}{3}\sqrt{(a+bx)^3}$ where a = 44, b = -1

$$\therefore\ A = 1/4\,[\pi(6.7)^2] + \left(\frac{-2}{3}\sqrt{(44-x)^3}\right)\Big|_0^3 + 3 + 6.7$$

$$= 35.2 + \frac{2}{3}\left[\sqrt{44^3} - \sqrt{(44-3)^3}\right] + 3 + 6.7$$

$= 64.4\ ft^2$

or $\frac{1}{2.2}$ of the total area



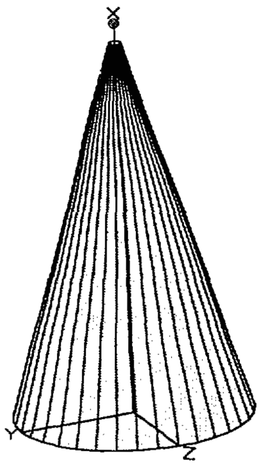
Sketch 2 - SW Corner Area Representation

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: SWCORN.MS5
Run Date: February 10, 2003
Run Time: 7:40:52 AM
Duration: 00:00:01

File Ref: N/A
Date: 2/10/03
By: EL
Checked: RAG

Case Title: Under the SW corner
Description: Based on 920 mR/hr reading
Geometry: 14 - Truncated Cone



Source Dimensions

Length	662.508 cm	21 ft 8.8 in
Angle	16.256°	

Dose Points

	X	Y	Z
# 1	696.7982 cm	0 cm	0 cm
	22 ft 10.3 in	0.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.84e+06 in³	Mixed ->	0.75
		Water	0.57
		Hastelloy C	0.18
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	6.3287e+002	2.3416e+013	2.1013e+001	7.7747e+005
Cs-137	6.6900e+002	2.4753e+013	2.2212e+001	8.2185e+005

Buildup
The material reference is : Source
This buildup reference material is a mixed material with a high atomic number element (42). Buildup Factors less than and somewhat greater than 20 keV may be incorrect. Please understand your results.

Integration Parameters

X Direction	20
Angle	20

Results

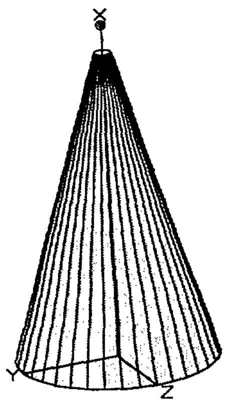
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	4.848e+11	4.633e-01	2.752e+01	3.859e-03	2.293e-01
0.0322	8.944e+11	1.008e+00	5.868e+01	8.112e-03	4.722e-01
0.0364	3.255e+11	1.528e+00	6.833e+01	8.681e-03	3.882e-01
0.6616	2.107e+13	1.482e+05	4.740e+05	2.873e+02	9.189e+02
TOTALS:	2.277e+13	1.482e+05	4.741e+05	2.873e+02	9.200e+02

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: UNSBS.MS5
Run Date: February 6, 2003
Run Time: 10:15:27 AM
Duration: 00:00:01

File Ref: N/A
Date: 2/6/03
By: [illegible]
Checked: [illegible]

Case Title: Under SBS
Description: Based on looking downward on the SBS
Geometry: 14 - Truncated Cone



Source Dimensions

Length	380.568 cm	12 ft 5.8 in
Angle	16.256°	

Dose Points

	X	Y	Z
# 1	414.8582 cm	0 cm	0 cm
	13 ft 7.3 in	0.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.35e+06 cm³	Hastelloy C	1.05
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	4.5124e+002	1.6696e+013	7.1022e+001	2.6278e+006
Cs-137	4.7700e+002	1.7649e+013	7.5076e+001	2.7778e+006

Buildup
The material reference is : Source
This buildup reference material is a mixed material with a high atomic number element (42). Buildup Factors less than and somewhat greater than 20 keV may be incorrect. Please understand your results.

Integration Parameters

X Direction	20
Angle	20

Results

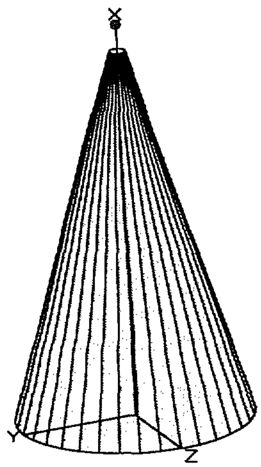
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	3.457e+11	4.016e-05	1.218e-04	3.345e-07	1.015e-06
0.0322	6.377e+11	1.225e-04	3.441e-04	9.856e-07	2.769e-06
0.0364	2.321e+11	3.290e-03	5.606e-03	1.869e-05	3.185e-05
0.6616	1.502e+13	3.983e+05	7.726e+05	7.722e+02	1.498e+03
TOTALS:	1.624e+13	3.983e+05	7.726e+05	7.722e+02	1.498e+03

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: UNCFMT.MS5
Run Date: February 6, 2003
Run Time: 10:50:05 AM
Duration: 00:00:01

File Ref: N/A
Date: 2/6/03
By: [signature]
Checked: [signature]

Case Title: Under CFMT
Description: Based on looking down on the CFMT
Geometry: 14 - Truncated Cone



Source Dimensions

Length	472.008 cm	15 ft 5.8 in
Angle	16.256°	

Dose Points

	X	Y	Z
# 1	506.2982 cm	0 cm	0 cm
	16 ft 7.3 in	0.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.16e+07 cm³	Mixed ->	1.32
		Water	1.14
		Hastelloy C	0.18
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	9.7154e+002	3.5947e+013	8.4103e+001	3.1118e+006
Cs-137	1.0270e+003	3.7999e+013	8.8904e+001	3.2894e+006

Buildup
The material reference is : Source
This buildup reference material is a mixed material with a high atomic number element (42). Buildup Factors less than and somewhat greater than 20 keV may be incorrect. Please understand your results.

Integration Parameters

X Direction	20
Angle	20

Results

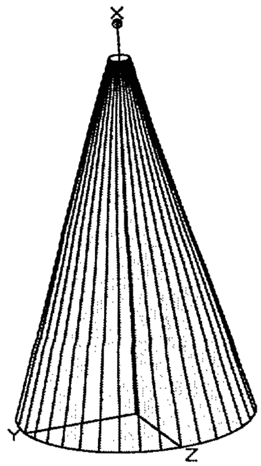
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	7.442e+11	3.963e+00	2.084e+02	3.301e-02	1.736e+00
0.0322	1.373e+12	8.288e+00	4.233e+02	6.670e-02	3.407e+00
0.0364	4.997e+11	8.981e+00	3.288e+02	5.102e-02	1.868e+00
0.6616	3.235e+13	3.323e+05	1.131e+06	6.443e+02	2.193e+03
TOTALS:	3.496e+13	3.324e+05	1.132e+06	6.444e+02	2.200e+03

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: UNMFHT.MS5
Run Date: January 31, 2003
Run Time: 4:07:01 PM
Duration: 00:00:01

File Ref: N/A
Date: 2/3/03
By: EJ
Checked: RAC

Case Title: Under the MFHT
Description: Based on looking down on MFHT
Geometry: 14 - Truncated Cone



Source Dimensions

Length	355.168 cm	11 ft 7.8 in
Angle	16.256°	

Dose Points

	X	Y	Z
# 1	389.4582 cm	0 cm	0 cm
	12 ft 9.3 in	0.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	3.21e+05 in³	Mixed ->	1.47
		Iron	0.47
		Water	1
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	5.4963e+002	2.0336e+013	1.0457e+002	3.8692e+006
Cs-137	5.8100e+002	2.1497e+013	1.1054e+002	4.0900e+006

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Angle	20

Results

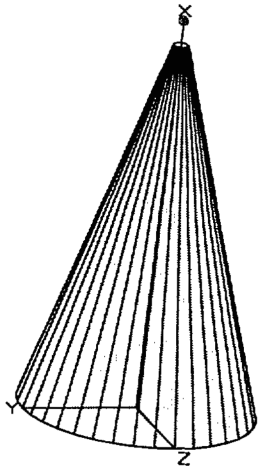
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	4.210e+11	2.142e+00	7.975e+01	1.785e-02	6.643e-01
0.0322	7.768e+11	4.584e+00	1.682e+02	3.689e-02	1.353e+00
0.0364	2.827e+11	6.121e+00	1.801e+02	3.477e-02	1.023e+00
0.6616	1.830e+13	3.830e+05	1.185e+06	7.425e+02	2.297e+03
TOTALS:	1.978e+13	3.830e+05	1.185e+06	7.426e+02	2.300e+03

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: NWCORN.MS5
Run Date: March 26, 2003
Run Time: 4:05:50 PM
Duration: 00:00:01

File Ref: N/A
Date: 3/27/03
By: EL
Checked: EL

Case Title: Northwest corner
Description: Based on 4.2 R/hr reading
Geometry: 14 - Truncated Cone



Source Dimensions

Length	507.568 cm	16 ft 7.8 in
Angle	16.256°	

Dose Points

	X	Y	Z
# 1	541.8582 cm	0 cm	0 cm
	17 ft 9.3 in	0.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	500.112 ft³	Mixed ->	0.97
		Iron	0.47
		Water	0.5
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	1.8506e+003	6.8472e+013	1.3068e+002	4.8350e+006
Cs-137	1.9562e+003	7.2380e+013	1.3814e+002	5.1110e+006

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Angle	20

Results

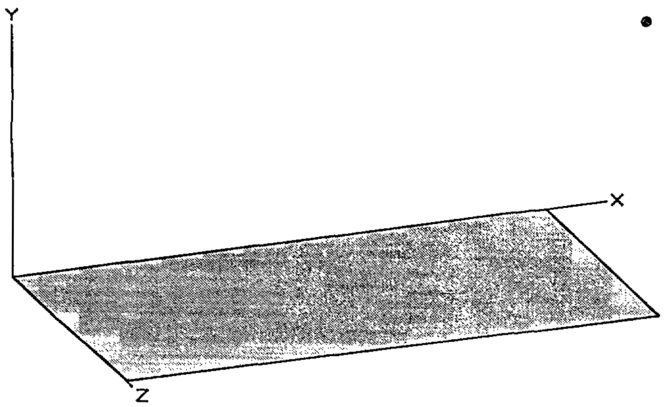
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.418e+12	7.976e-01	2.021e+01	6.644e-03	1.683e-01
0.0322	2.615e+12	1.802e+00	4.601e+01	1.450e-02	3.703e-01
0.0364	9.518e+11	3.839e+00	9.856e+01	2.181e-02	5.600e-01
0.6616	6.161e+13	7.448e+05	2.166e+06	1.444e+03	4.199e+03
TOTALS:	6.660e+13	7.448e+05	2.166e+06	1.444e+03	4.200e+03

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: 1FOOT.MS5
Run Date: January 31, 2003
Run Time: 4:19:35 PM
Duration: 00:00:01

File Ref: N/A
Date: 2/3/03
By: [illegible]
Checked: [illegible]

Case Title: Floor Detector
Description: Floor Detector Modeled at 1' distance and 1 uci/cm2
Geometry: 5 - Rectangular Area - Horizontal



Source Dimensions

Length	30.48 cm	1 ft
Width	17.78 cm	7.0 in

Dose Points

	X	Y	Z
# 1	33.02 cm	13.5382 cm	8.89e+00 cm
	1 ft 1.0 in	5.3 in	3.5 in

Shields

Shield Name	Material	Density
Air Gap	Air	0.00122
Immersion	Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm²	Bq/cm²
Ba-137m	5.1267e-004	1.8969e+007	9.4600e-001	3.5002e+004
Cs-137	5.4193e-004	2.0051e+007	1.0000e+000	3.7000e+004

Buildup
The material reference is : Immersion

Integration Parameters

Z Direction	20
X Direction	20

Results

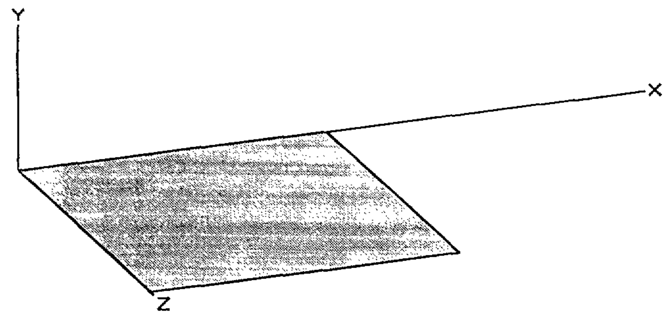
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	3.927e+05	4.187e-01	4.277e-01	3.488e-03	3.563e-03
0.0322	7.245e+05	7.819e-01	7.987e-01	6.292e-03	6.428e-03
0.0364	2.637e+05	3.224e-01	3.294e-01	1.832e-03	1.871e-03
0.6616	1.707e+07	3.833e+02	3.848e+02	7.431e-01	7.460e-01
TOTALS:	1.845e+07	3.848e+02	3.864e+02	7.547e-01	7.579e-01

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: 2FOOT.MS5
Run Date: January 31, 2003
Run Time: 4:23:39 PM
Duration: 00:00:01

File Ref: N/A
Date: 2/3/03
By: [illegible]
Checked: [illegible]

Case Title: Floor Detector
Description: Floor Detector Modeled at 2' distance and 1 uci/cm2
Geometry: 5 - Rectangular Area - Horizontal



Source Dimensions

Length	30.48 cm	1 ft
Width	35.56 cm	1 ft 2.0 in

Dose Points

	X	Y	Z
# 1	60.96 cm	13.5382 cm	1.78e+01 cm
	2 ft	5.3 in	7.0 in

Shields

Shield Name	Material	Density
Air Gap	Air	0.00122
Immersion	Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm²	Bq/cm²
Ba-137m	1.0253e-003	3.7938e+007	9.4600e-001	3.5002e+004
Cs-137	1.0839e-003	4.0103e+007	1.0000e+000	3.7000e+004

Buildup
The material reference is : Immersion

Integration Parameters

Z Direction	20
X Direction	20

Results

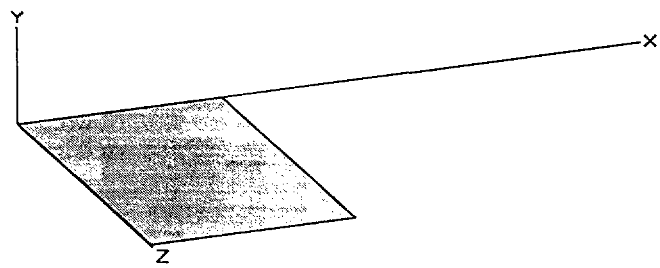
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	7.854e+05	3.292e-01	3.406e-01	2.742e-03	2.837e-03
0.0322	1.449e+06	6.147e-01	6.361e-01	4.947e-03	5.119e-03
0.0364	5.273e+05	2.539e-01	2.627e-01	1.442e-03	1.492e-03
0.6616	3.414e+07	3.037e+02	3.056e+02	5.887e-01	5.924e-01
TOTALS:	3.690e+07	3.049e+02	3.068e+02	5.979e-01	6.018e-01

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: 2FOOT.MS5
Run Date: January 31, 2003
Run Time: 4:42:02 PM
Duration: 00:00:01

File Ref: N/A
Date: 2/3/03
By: [illegible]
Checked: [illegible]

Case Title: Floor Detector
Description: Floor Detector Modeled at 3' distance and 1 uci/cm2
Geometry: 5 - Rectangular Area - Horizontal



Source Dimensions

Length	30.48 cm	1 ft
Width	53.34 cm	1 ft 9.0 in

Dose Points

	X	Y	Z
# 1	91.44 cm	13.5382 cm	26.67 cm
	3 ft	5.3 in	10.5 in

Shields

Shield Name	Material	Density
Air Gap	Air	0.00122
Immersion	Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm²	Bq/cm²
Ba-137m	1.5380e-003	5.6906e+007	9.4600e-001	3.5002e+004
Cs-137	1.6258e-003	6.0155e+007	1.0000e+000	3.7000e+004

Buildup
The material reference is : Immersion

Integration Parameters

Z Direction	20
X Direction	20

Results

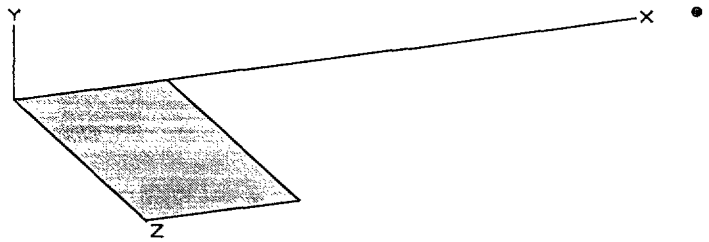
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.178e+06	2.478e-01	2.600e-01	2.064e-03	2.166e-03
0.0322	2.174e+06	4.629e-01	4.857e-01	3.726e-03	3.909e-03
0.0364	7.910e+05	1.915e-01	2.009e-01	1.088e-03	1.141e-03
0.6616	5.120e+07	2.306e+02	2.326e+02	4.470e-01	4.509e-01
TOTALS:	5.535e+07	2.315e+02	2.335e+02	4.539e-01	4.581e-01

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: 4FOOT.MS5
Run Date: January 31, 2003
Run Time: 4:43:18 PM
Duration: 00:00:01

File Ref: N/A
Date: 2/3/03
By: [illegible]
Checked: [illegible]

Case Title: Floor Detector
Description: Floor Detector Modeled at 4' distance and 1 uci/cm2
Geometry: 5 - Rectangular Area - Horizontal



Source Dimensions

Length	30.48 cm	1 ft
Width	71.12 cm	2 ft 4.0 in

Dose Points

	X	Y	Z
# 1	121.92 cm	13.5382 cm	3.56e+01 cm
	4 ft	5.3 in	1 ft 2.0 in

Shields

Shield Name	Material	Density
Air Gap	Air	0.00122
Immersion	Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm²	Bq/cm²
Ba-137m	2.0507e-003	7.5875e+007	9.4600e-001	3.5002e+004
Cs-137	2.1677e-003	8.0206e+007	1.0000e+000	3.7000e+004

Buildup
The material reference is : Air Gap

Integration Parameters

Z Direction	20
X Direction	20

Results

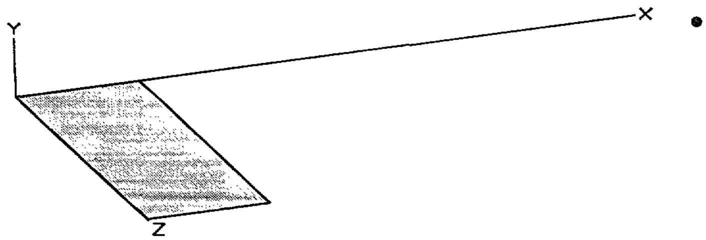
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.571e+06	1.971e-01	2.097e-01	1.642e-03	1.747e-03
0.0322	2.898e+06	3.683e-01	3.918e-01	2.964e-03	3.153e-03
0.0364	1.055e+06	1.526e-01	1.623e-01	8.667e-04	9.219e-04
0.6616	6.827e+07	1.849e+02	1.870e+02	3.585e-01	3.625e-01
TOTALS:	7.380e+07	1.856e+02	1.878e+02	3.640e-01	3.684e-01

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: 5FOOT.MS5
Run Date: January 31, 2003
Run Time: 4:44:23 PM
Duration: 00:00:01

File Ref: N/A
Date: 2/3/03
By: [illegible]
Checked: [illegible]

Case Title: Floor Detector
Description: Floor Detector Modeled at 5' distance and 1 uci/cm2
Geometry: 5 - Rectangular Area - Horizontal



Source Dimensions

Length	30.48 cm	1 ft
Width	88.9 cm	2 ft 11.0 in

Dose Points

	X	Y	Z
# 1	152.4 cm	13.5382 cm	4.44e+01 cm
	5 ft 0.0 in	5.3 in	1 ft 5.5 in

Shields

Shield Name	Material	Density
Air Gap	Air	0.00122
Immersion	Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm²	Bq/cm²
Ba-137m	2.5634e-003	9.4844e+007	9.4600e-001	3.5002e+004
Cs-137	2.7097e-003	1.0026e+008	1.0000e+000	3.7000e+004

Buildup
The material reference is : Air Gap

Integration Parameters

Z Direction	20
X Direction	20

Results

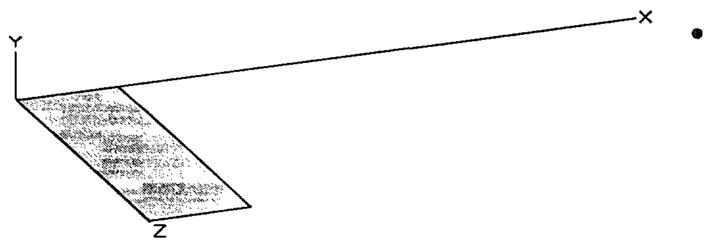
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.964e+06	1.628e-01	1.756e-01	1.356e-03	1.463e-03
0.0322	3.623e+06	3.043e-01	3.282e-01	2.449e-03	2.641e-03
0.0364	1.318e+06	1.262e-01	1.361e-01	7.172e-04	7.734e-04
0.6616	8.534e+07	1.540e+02	1.562e+02	2.986e-01	3.028e-01
TOTALS:	9.225e+07	1.546e+02	1.568e+02	3.032e-01	3.076e-01

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: 6FOOT.MS5
Run Date: January 31, 2003
Run Time: 4:45:37 PM
Duration: 00:00:01

File Ref: N/A
Date: 2/3/03
By: [signature]
Checked: [signature]

Case Title: Floor Detector
Description: Floor Detector Modeled at 6' distance and 1 uci/cm2
Geometry: 5 - Rectangular Area - Horizontal



Source Dimensions

Length	30.48 cm	1 ft
Width	106.68 cm	3 ft 6.0 in

Dose Points

	X	Y	Z
# 1	182.88 cm	13.5382 cm	53.34 cm
	6 ft	5.3 in	1 ft 9.0 in

Shields

Shield Name	Material	Density
Air Gap	Air	0.00122
Immersion	Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm²	Bq/cm²
Ba-137m	3.0760e-003	1.1381e+008	9.4600e-001	3.5002e+004
Cs-137	3.2516e-003	1.2031e+008	1.0000e+000	3.7000e+004

Buildup
The material reference is : Air Gap

Integration Parameters

Z Direction	20
X Direction	20

Results

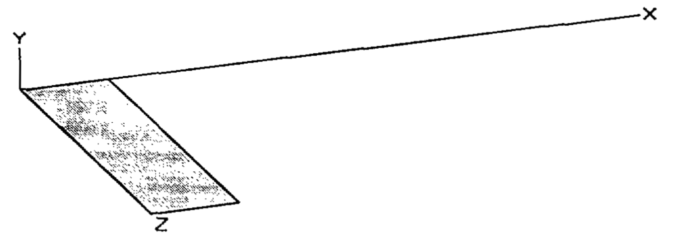
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	2.356e+06	1.382e-01	1.511e-01	1.151e-03	1.259e-03
0.0322	4.347e+06	2.582e-01	2.825e-01	2.078e-03	2.273e-03
0.0364	1.582e+06	1.073e-01	1.173e-01	6.097e-04	6.666e-04
0.6616	1.024e+08	1.318e+02	1.340e+02	2.556e-01	2.597e-01
TOTALS:	1.107e+08	1.323e+02	1.345e+02	2.594e-01	2.639e-01

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: 7FOOT.MS5
Run Date: January 31, 2003
Run Time: 4:46:40 PM
Duration: 00:00:01

File Ref: N/A
Date: 2/3/03
By: [illegible]
Checked: [illegible]

Case Title: Floor Detector
Description: Floor Detector Modeled at 7' distance and 1 uci/cm2
Geometry: 5 - Rectangular Area - Horizontal



Source Dimensions

Length	30.48 cm	1 ft
Width	124.46 cm	4 ft 1.0 in

Dose Points

	X	Y	Z
# 1	213.36 cm	13.5382 cm	6.22e+01 cm
	7 ft 0.0 in	5.3 in	2 ft 0.5 in

Shields

Shield Name	Material	Density
Air Gap	Air	0.00122
Immersion	Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	µCi/cm²	Bq/cm²
Ba-137m	3.5887e-003	1.3278e+008	9.4600e-001	3.5002e+004
Cs-137	3.7935e-003	1.4036e+008	1.0000e+000	3.7000e+004

Buildup
The material reference is : Air Gap

Integration Parameters

Z Direction	20
X Direction	20

Results

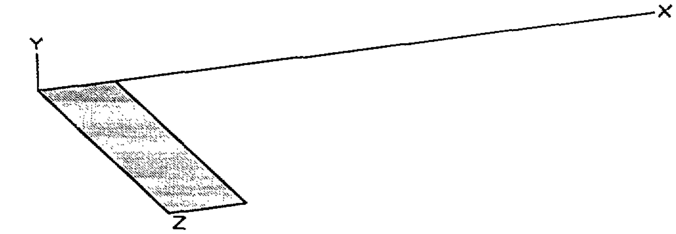
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	2.749e+06	1.196e-01	1.327e-01	9.965e-04	1.105e-03
0.0322	5.072e+06	2.236e-01	2.480e-01	1.800e-03	1.996e-03
0.0364	1.846e+06	9.306e-02	1.032e-01	5.287e-04	5.862e-04
0.6616	1.195e+08	1.151e+02	1.173e+02	2.231e-01	2.273e-01
TOTALS:	1.291e+08	1.155e+02	1.178e+02	2.265e-01	2.310e-01

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: 7FOOT.MS5
Run Date: January 31, 2003
Run Time: 4:47:35 PM
Duration: 00:00:01

File Ref: N/A
Date: 2/3/03
By: [illegible]
Checked: [illegible]

Case Title: Floor Detector
Description: Floor Detector Modeled at 8' distance and 1 uci/cm2
Geometry: 5 - Rectangular Area - Horizontal



Source Dimensions

Length	30.48 cm	1 ft
Width	142.24 cm	4 ft 8.0 in

Dose Points

	X	Y	Z
# 1	243.84 cm	13.5382 cm	7.11e+01 cm
	8 ft	5.3 in	2 ft 4.0 in

Shields

Shield Name	Material	Density
Air Gap	Air	0.00122
Immersion	Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm²	Bq/cm²
Ba-137m	4.1014e-003	1.5175e+008	9.4600e-001	3.5002e+004
Cs-137	4.3355e-003	1.6041e+008	1.0000e+000	3.7000e+004

Buildup
The material reference is : Air Gap

Integration Parameters

Z Direction	20
X Direction	20

Results

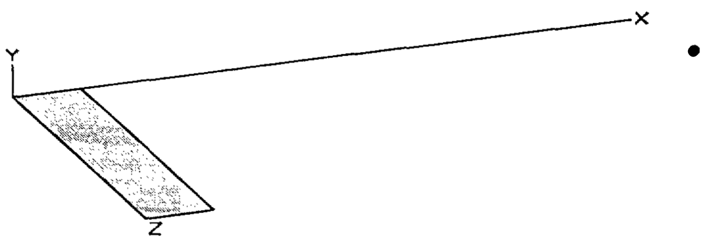
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	3.142e+06	1.052e-01	1.183e-01	8.762e-04	9.854e-04
0.0322	5.796e+06	1.967e-01	2.212e-01	1.583e-03	1.780e-03
0.0364	2.109e+06	8.197e-02	9.214e-02	4.657e-04	5.235e-04
0.6616	1.365e+08	1.021e+02	1.042e+02	1.978e-01	2.021e-01
TOTALS:	1.476e+08	1.024e+02	1.047e+02	2.008e-01	2.054e-01

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: 9FOOT.MS5
Run Date: January 31, 2003
Run Time: 4:48:39 PM
Duration: 00:00:01

File Ref: N/A
Date: 2/3/03
By: [signature]
Checked: [signature]

Case Title: Floor Detector
Description: Floor Detector Modeled at 9' distance and 1 uci/cm2
Geometry: 5 - Rectangular Area - Horizontal



Source Dimensions

Length	30.48 cm	1 ft
Width	160.02 cm	5 ft 3.0 in

Dose Points

	X	Y	Z
# 1	274.32 cm	13.5382 cm	80.01 cm
	9 ft	5.3 in	2 ft 7.5 in

Shields

Shield Name	Material	Density
Air Gap	Air	0.00122
Immersion	Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm²	Bq/cm²
Ba-137m	4.6140e-003	1.7072e+008	9.4600e-001	3.5002e+004
Cs-137	4.8774e-003	1.8046e+008	1.0000e+000	3.7000e+004

Buildup
The material reference is : Air Gap

Integration Parameters

Z Direction	20
X Direction	20

Results

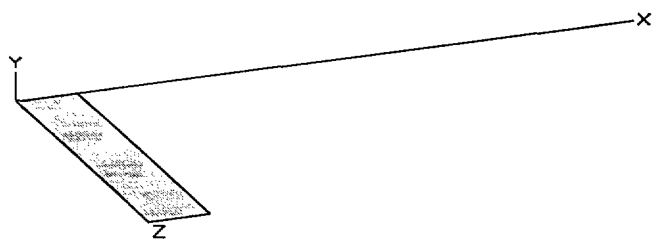
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	3.534e+06	9.364e-02	1.068e-01	7.800e-04	8.894e-04
0.0322	6.521e+06	1.751e-01	1.997e-01	1.409e-03	1.607e-03
0.0364	2.373e+06	7.309e-02	8.330e-02	4.153e-04	4.733e-04
0.6616	1.536e+08	9.161e+01	9.380e+01	1.776e-01	1.818e-01
TOTALS:	1.660e+08	9.195e+01	9.419e+01	1.802e-01	1.848e-01

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: 10FOOT.MS5
Run Date: January 31, 2003
Run Time: 4:49:57 PM
Duration: 00:00:01

File Ref: N/A
Date: 2/3/03
By: SL
Checked: VAG

Case Title: Floor Detector
Description: Floor Detector Modeled at 10' distance and 1 uci/cm2
Geometry: 5 - Rectangular Area - Horizontal



Source Dimensions

Length	30.48 cm	1 ft
Width	177.8 cm	5 ft 10.0 in

Dose Points

	X	Y	Z
# 1	304.8 cm	13.5382 cm	8.89e+01 cm
	10 ft 0.0 in	5.3 in	2 ft 11.0 in

Shields

Shield Name	Material	Density
Air Gap	Air	0.00122
Immersion	Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	µCi/cm²	Bq/cm²
Ba-137m	5.1267e-003	1.8969e+008	9.4600e-001	3.5002e+004
Cs-137	5.4193e-003	2.0052e+008	1.0000e+000	3.7000e+004

Buildup
The material reference is : Air Gap

Integration Parameters

Z Direction	20
X Direction	20

Results

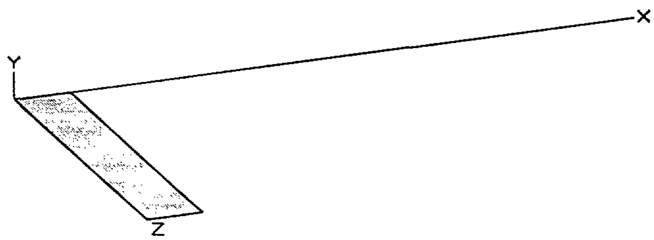
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	3.927e+06	8.419e-02	9.733e-02	7.012e-04	8.108e-04
0.0322	7.246e+06	1.575e-01	1.820e-01	1.267e-03	1.465e-03
0.0364	2.637e+06	6.582e-02	7.606e-02	3.740e-04	4.322e-04
0.6616	1.707e+08	8.305e+01	8.525e+01	1.610e-01	1.653e-01
TOTALS:	1.845e+08	8.336e+01	8.561e+01	1.633e-01	1.680e-01

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: 11FOOT.MS5
Run Date: February 5, 2003
Run Time: 12:45:52 PM
Duration: 00:00:01

File Ref: N/A
Date: 2/5/03
By: [illegible]
Checked: [illegible]

Case Title: Floor Detector
Description: Floor Detector Modeled at 11' distance and 1 uci/cm2
Geometry: 5 - Rectangular Area - Horizontal



Source Dimensions

Length	30.48 cm	1 ft
Width	195.58 cm	6 ft 5.0 in

Dose Points

	X	Y	Z
# 1	335.28 cm	13.5382 cm	97.79 cm
	11 ft	5.3 in	3 ft 2.5 in

Shields

Shield Name	Material	Density
Air Gap	Air	0.00122
Immersion	Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	$\mu Ci/cm^2$	Bq/cm^2
Ba-137m	5.6394e-003	2.0866e+008	9.4600e-001	3.5002e+004
Cs-137	5.9613e-003	2.2057e+008	1.0000e+000	3.7000e+004

Buildup
The material reference is : Air Gap

Integration Parameters

Z Direction	20
X Direction	20

Results

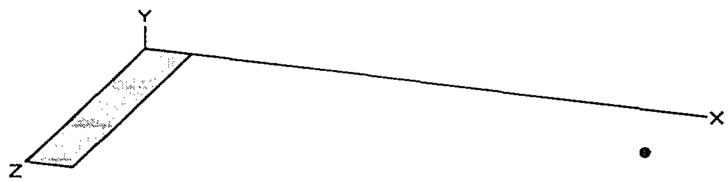
Energy MeV	Activity photons/sec	Fluence Rate $MeV/cm^2/sec$ No Buildup	Fluence Rate $MeV/cm^2/sec$ With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	4.320e+06	7.631e-02	8.946e-02	6.357e-04	7.452e-04
0.0322	7.970e+06	1.428e-01	1.674e-01	1.149e-03	1.347e-03
0.0364	2.900e+06	5.977e-02	7.003e-02	3.396e-04	3.979e-04
0.6616	1.877e+08	7.592e+01	7.813e+01	1.472e-01	1.515e-01
TOTALS:	2.029e+08	7.619e+01	7.845e+01	1.493e-01	1.539e-01

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: 12FOOT.MS5
Run Date: January 31, 2003
Run Time: 4:52:16 PM
Duration: 00:00:01

File Ref: N/A
Date: 2/3/03
By: [illegible]
Checked: [illegible]

Case Title: Floor Detector
Description: Floor Detector Modeled at 12' distance and 1 uci/cm2
Geometry: 5 - Rectangular Area - Horizontal



Source Dimensions

Length	30.48 cm	1 ft
Width	213.36 cm	7 ft 0.0 in

Dose Points

	X	Y	Z
# 1	365.76 cm	13.5382 cm	106.68 cm
	12 ft	5.3 in	3 ft 6.0 in

Shields

Shield Name	Material	Density
Air Gap	Air	0.00122
Immersion	Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	µCi/cm²	Bq/cm²
Ba-137m	6.1520e-003	2.2763e+008	9.4600e-001	3.5002e+004
Cs-137	6.5032e-003	2.4062e+008	1.0000e+000	3.7000e+004

Buildup
The material reference is : Air Gap

Integration Parameters

Z Direction	20
X Direction	20

Results

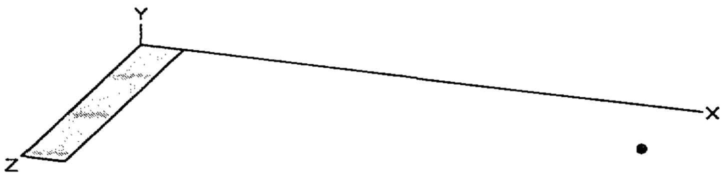
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	4.713e+06	6.966e-02	8.280e-02	5.802e-04	6.897e-04
0.0322	8.695e+06	1.303e-01	1.549e-01	1.049e-03	1.247e-03
0.0364	3.164e+06	5.465e-02	6.492e-02	3.105e-04	3.688e-04
0.6616	2.048e+08	6.988e+01	7.209e+01	1.355e-01	1.398e-01
TOTALS:	2.214e+08	7.013e+01	7.240e+01	1.374e-01	1.421e-01

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: 13FOOT.MS5
Run Date: January 31, 2003
Run Time: 4:53:07 PM
Duration: 00:00:01

File Ref: N/A
Date: 2/3/03
By:
Checked:

Case Title: Floor Detector
Description: Floor Detector Modeled at 13' distance and 1 uci/cm2
Geometry: 5 - Rectangular Area - Horizontal



Source Dimensions

Length	30.48 cm	1 ft
Width	231.14 cm	7 ft 7.0 in

Dose Points

	X	Y	Z
# 1	396.24 cm	13.5382 cm	1.16e+02 cm
	13 ft 0.0 in	5.3 in	3 ft 9.5 in

Shields

Shield Name	Material	Density
Air Gap	Air	0.00122
Immersion	Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm²	Bq/cm²
Ba-137m	6.6647e-003	2.4659e+008	9.4600e-001	3.5002e+004
Cs-137	7.0451e-003	2.6067e+008	1.0000e+000	3.7000e+004

Buildup
The material reference is : Air Gap

Integration Parameters

Z Direction	20
X Direction	20

Results

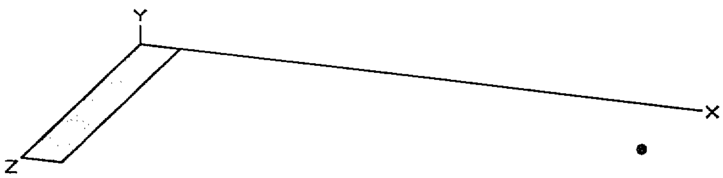
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	5.105e+06	6.396e-02	7.709e-02	5.328e-04	6.421e-04
0.0322	9.419e+06	1.197e-01	1.443e-01	9.633e-04	1.161e-03
0.0364	3.428e+06	5.027e-02	6.054e-02	2.856e-04	3.440e-04
0.6616	2.219e+08	6.470e+01	6.692e+01	1.254e-01	1.297e-01
TOTALS:	2.398e+08	6.493e+01	6.720e+01	1.272e-01	1.319e-01

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: 13FOOT.MS5
Run Date: January 31, 2003
Run Time: 4:54:15 PM
Duration: 00:00:01

File Ref: N/A
Date: 2/3/03
By: [signature]
Checked: [signature]

Case Title: Floor Detector
Description: Floor Detector Modeled at 14' distance and 1 uci/cm2
Geometry: 5 - Rectangular Area - Horizontal



Source Dimensions

Length	30.48 cm	1 ft
Width	248.92 cm	8 ft 2.0 in

Dose Points

	X	Y	Z
# 1	426.72 cm	13.5382 cm	1.24e+02 cm
	14 ft 0.0 in	5.3 in	4 ft 1.0 in

Shields

Shield Name	Material	Density
Air Gap	Air	0.00122
Immersion	Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	µCi/cm²	Bq/cm²
Ba-137m	7.1774e-003	2.6556e+008	9.4600e-001	3.5002e+004
Cs-137	7.5871e-003	2.8072e+008	1.0000e+000	3.7000e+004

Buildup
The material reference is : Air Gap

Integration Parameters

Z Direction	20
X Direction	20

Results

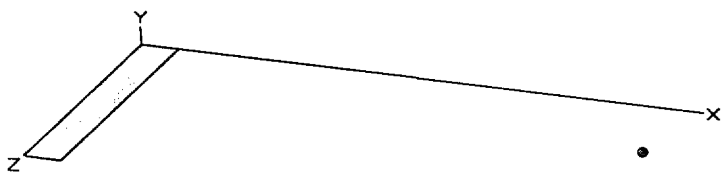
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	5.498e+06	5.903e-02	7.214e-02	4.917e-04	6.009e-04
0.0322	1.014e+07	1.105e-01	1.350e-01	8.892e-04	1.087e-03
0.0364	3.691e+06	4.647e-02	5.675e-02	2.640e-04	3.224e-04
0.6616	2.390e+08	6.021e+01	6.243e+01	1.167e-01	1.210e-01
TOTALS:	2.583e+08	6.043e+01	6.270e+01	1.184e-01	1.230e-01

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: 15FOOT.MS5
Run Date: January 31, 2003
Run Time: 4:55:18 PM
Duration: 00:00:01

File Ref: N/A
Date: 2/3/03
By: [signature]
Checked: [signature]

Case Title: Floor Detector
Description: Floor Detector Modeled at 15' distance and 1 uci/cm2
Geometry: 5 - Rectangular Area - Horizontal



Source Dimensions

Length	30.48 cm	1 ft
Width	266.7 cm	8 ft 9.0 in

Dose Points

	X	Y	Z
# 1	457.2 cm	13.5382 cm	133.35 cm
	15 ft	5.3 in	4 ft 4.5 in

Shields

Shield Name	Material	Density
Air Gap	Air	0.00122
Immersion	Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm²	Bq/cm²
Ba-137m	7.6900e-003	2.8453e+008	9.4600e-001	3.5002e+004
Cs-137	8.1290e-003	3.0077e+008	1.0000e+000	3.7000e+004

Buildup
The material reference is : Air Gap

Integration Parameters

Z Direction	20
X Direction	20

Results

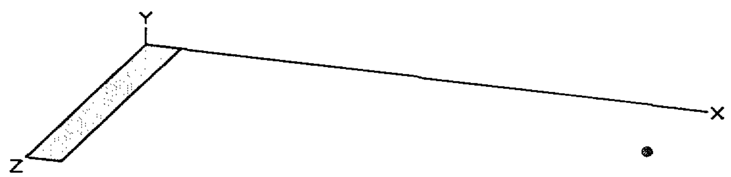
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	5.891e+06	5.472e-02	6.781e-02	4.558e-04	5.648e-04
0.0322	1.087e+07	1.024e-01	1.269e-01	8.244e-04	1.021e-03
0.0364	3.955e+06	4.315e-02	5.343e-02	2.452e-04	3.035e-04
0.6616	2.560e+08	5.629e+01	5.851e+01	1.091e-01	1.134e-01
TOTALS:	2.767e+08	5.649e+01	5.876e+01	1.106e-01	1.153e-01

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: 16FOOT.MS5
Run Date: January 31, 2003
Run Time: 4:56:28 PM
Duration: 00:00:01

File Ref: N/A
Date: 2/3/03
By: GL
Checked: BAG

Case Title: Floor Detector
Description: Floor Detector Modeled at 16' distance and 1 uci/cm2
Geometry: 5 - Rectangular Area - Horizontal



Source Dimensions

Length	30.48 cm	1 ft
Width	284.48 cm	9 ft 4.0 in

Dose Points

	X	Y	Z
# 1	487.68 cm	13.5382 cm	1.42e+02 cm
	16 ft	5.3 in	4 ft 8.0 in

Shields

Shield Name	Material	Density
Air Gap	Air	0.00122
Immersion	Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm²	Bq/cm²
Ba-137m	8.2027e-003	3.0350e+008	9.4600e-001	3.5002e+004
Cs-137	8.6710e-003	3.2083e+008	1.0000e+000	3.7000e+004

Buildup
The material reference is : Air Gap

Integration Parameters

Z Direction	20
X Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	6.283e+06	5.093e-02	6.398e-02	4.242e-04	5.330e-04
0.0322	1.159e+07	9.535e-02	1.198e-01	7.674e-04	9.641e-04
0.0364	4.219e+06	4.023e-02	5.050e-02	2.286e-04	2.869e-04
0.6616	2.731e+08	5.282e+01	5.504e+01	1.024e-01	1.067e-01
TOTALS:	2.952e+08	5.301e+01	5.528e+01	1.038e-01	1.085e-01

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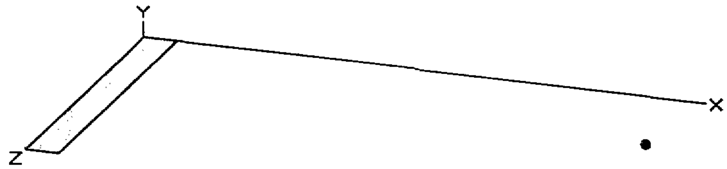
Page : 1
DOS File: 17FOOT.MS5
Run Date: January 31, 2003
Run Time: 4:57:22 PM
Duration: 00:00:01

File Ref: N/A
Date: 2/3/03
By: [illegible]
Checked: [illegible]

Case Title: Floor Detector
Description: Floor Detector Modeled at 17' distance and 1 uci/cm2
Geometry: 5 - Rectangular Area - Horizontal



Source Dimensions

Length	30.48 cm	1 ft
Width	302.26 cm	9 ft 11.0 in

Dose Points

	X	Y	Z
# 1	518.16 cm	13.5382 cm	1.51e+02 cm
	17 ft	5.3 in	4 ft 11.5 in

Shields

Shield Name	Material	Density
Air Gap	Air	0.00122
Immersion	Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm²	Bq/cm²
Ba-137m	8.7154e-003	3.2247e+008	9.4600e-001	3.5002e+004
Cs-137	9.2129e-003	3.4088e+008	1.0000e+000	3.7000e+004

Buildup
The material reference is : Air Gap

Integration Parameters

Z Direction	20
X Direction	20

Results

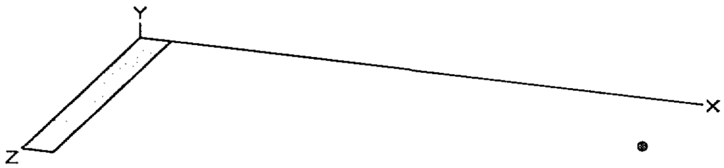
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	6.676e+06	4.756e-02	6.058e-02	3.961e-04	5.046e-04
0.0322	1.232e+07	8.906e-02	1.134e-01	7.168e-04	9.130e-04
0.0364	4.482e+06	3.763e-02	4.789e-02	2.138e-04	2.721e-04
0.6616	2.902e+08	4.974e+01	5.197e+01	9.643e-02	1.007e-01
TOTALS:	3.136e+08	4.992e+01	5.219e+01	9.776e-02	1.024e-01

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: 18FOOT.MS5
Run Date: January 31, 2003
Run Time: 4:58:13 PM
Duration: 00:00:01

File Ref: N/A
Date: 2/3/03
By: [signature]
Checked: [signature]

Case Title: Floor Detector
Description: Floor Detector Modeled at 18' distance and 1 uci/cm2
Geometry: 5 - Rectangular Area - Horizontal



Source Dimensions

Length	30.48 cm	1 ft
Width	320.04 cm	10 ft 6.0 in

Dose Points

	X	Y	Z
# 1	548.64 cm	13.5382 cm	160.02 cm
	18 ft	5.3 in	5 ft 3.0 in

Shields

Shield Name	Material	Density
Air Gap	Air	0.00122
Immersion	Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	µCi/cm²	Bq/cm²
Ba-137m	9.2281e-003	3.4144e+008	9.4600e-001	3.5002e+004
Cs-137	9.7548e-003	3.6093e+008	1.0000e+000	3.7000e+004

Buildup
The material reference is : Air Gap

Integration Parameters

Z Direction	20
X Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	7.069e+06	4.455e-02	5.754e-02	3.711e-04	4.793e-04
0.0322	1.304e+07	8.344e-02	1.078e-01	6.715e-04	8.674e-04
0.0364	4.746e+06	3.531e-02	4.556e-02	2.006e-04	2.589e-04
0.6616	3.072e+08	4.699e+01	4.921e+01	9.109e-02	9.540e-02
TOTALS:	3.321e+08	4.715e+01	4.942e+01	9.233e-02	9.701e-02

Appendix Y

Peer Reviewed MicroShield™ Computer Model Results for Miscellaneous Spent Components

Component or area: Miscellaneous Spent Components

Model geometry used: Rectangular volume

Assumptions made:

1. A density of 1.7 g/cm^3 was used to approximate the density of the pile. In order to conservatively model these components, a density and material had to be selected for input into the model. The pile of spent components is analogous to the materials generated from the Vitrification Expended Materials Program (VEMP). The VEMP was a program that size reduced spent vitrification components and packaged them into steel containers. The density of this pile would be no more dense than the most dense container processed by the VEMP. (The VEMP material is closely packed into containers minimizing the available air space so is a conservative predictor of the density of a piped infrastructure.) From the VEMP, the maximum weight of one of the 30-gallon drums of cut up expended material is 225 kilograms. This translates to a density of 1.7 g/cm^3.

2. Iron was selected as a source material. Iron was used because of its conservative radiation attenuation property.

3. All the radiation was assumed to be coming exclusively from the pile, even though there were other radiation sources in the area (e.g., off-gas components and piping and the decon station).

Calculation:

Input into the model

Distance of the detector to the pile: 2"
Dimensions of the pile: 12' 7" x 22' x 6' 9"
Reading measured at that point: 27 R/hr
Source Material: Iron at a density of 1.7 g/cm^3
Drawings/References: PNL- 500-02, sheet 2
Work Documents/Surveys: Work Order 76851

Explanation of the Miscellaneous Spent Components model

The radiation reading from the miscellaneous spent components was taken with a bare radiation probe at a position approximately centered over the pile. The spent components are located in an area in front of the weld and decon stations, and occupy an area of floor space approximately 6.75 feet by 22 feet. The height that the radiation reading was taken was at the same height as the weld and maintenance stations, or 12 feet, 7 inches above the floor.

Because a rectangular volume model was used, the only determination to conservatively computer model the spent components was to take into consideration the "mixture" of materials that make up the spent components. It was decided that the internals should be modeled using iron as the source media. (This choice of material will give a conservative radiation attenuation.) Because all materials that make up the spent components are not made of solid iron, a density had to be determined for the internal structure. It was decided that data from the Vitrification Expended Material Program (VEMP) could be used to estimate the density. VEMP was a program that consisted of size reducing spent Vitrification components and packaging them into steel containers. To first order, the density of the spent components would be no more dense than the most dense container processed by VEMP. From the Vitrification Expended Material Program, the maximum weight of one of the 30 gallon drums of cut up expended material is 225 kg. This translates to a density of 1.7 g/cm^3. Additional conservatism was introduced because the readings were taken with a bare radiation probe, and all radiation was assumed to be coming from the spent component pile.

Resulting Curie content: 5000 Ci of Cs-137

Model prepared by: [signature] / E. Lachapelle / 1/28/03
Signature/Print name/Date

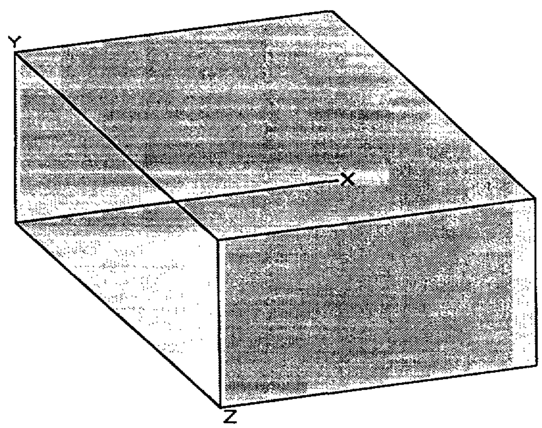
Model peer reviewed by: [signature] / R.A. Gonzalez 1/28/03
Signature/Print name/Date

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: 2MISCOMP.MS5
Run Date: January 28, 2003
Run Time: 4:16:36 PM
Duration: 00:00:05

File Ref: N/A
Date: 1/28/03
By: EL
Checked: RAG

Case Title: Components
Description: Miscellaneous components in cell (based on 27 R/hr reading)
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	383.54 cm	12 ft 7.0 in
Width	670.56 cm	22 ft 0.0 in
Height	205.74 cm	6 ft 9.0 in

Dose Points

	X	Y	Z
# 1	388.62 cm	102.87 cm	335.28 cm
	12 ft 9.0 in	3 ft 4.5 in	11 ft 0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1868.625 ft³	Iron	1.7
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	4.7300e+003	1.7501e+014	8.9391e+001	3.3075e+006
Cs-137	5.0000e+003	1.8500e+014	9.4494e+001	3.4963e+006

Buildup
The material reference is : Source

Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	3.623e+12	1.852e-24	2.330e-21	1.542e-26	1.941e-23
0.0322	6.685e+12	2.767e-23	4.368e-21	2.227e-25	3.515e-23
0.0364	2.433e+12	7.130e-16	8.292e-16	4.051e-18	4.711e-18
0.6616	1.575e+14	5.906e+06	1.407e+07	1.145e+04	2.728e+04
TOTALS:	1.702e+14	5.906e+06	1.407e+07	1.145e+04	2.728e+04

Appendix Z

Peer Reviewed MicroShield™ Computer Model Results for the High-Efficiency Particulate Air (HEPA) Filters

Component or area: HEPA Filters

Model geometry used: Rectangular volume

Given/Facts:

The radiation readings from the HEPA filters were taken at no greater than nine inches away from each filter face with an unshielded radiation probe.

Assumptions made:

1. A density of 1.7 g/cm^3 was used to approximate the density of the HEPA filters. In order to conservatively model these components, a density and material had to be selected for input into the model. The internals of the HEPA filters is analogous to the materials generated from the Vitrification Expended Materials Program (VEMP). The VEMP was a program that size reduced spent vitrification components and packaged them into steel containers. The internal structure of the HEPA filters would be no more dense than the most dense container processed by the VEMP. (The VEMP material is closely packed into containers minimizing the available air space so is a conservative predictor of the density of a piped infrastructure.) From the VEMP, the maximum weight of one of the 30-gallon drums of cut up expended material is 225 kilograms. This translates to a density of 1.7 g/cm^3.

2. Iron was selected as a source material. Iron was used because of its conservative radiation attenuation property.

3. All the radiation was assumed to be coming exclusively from the HEPA filters, even though there were other radiation sources in the area (e.g., other off-gas components and piping).

Calculation:

Input into the model

Distance of the detector to the filter housing wall: 9"
Dimensions of the filter housing: 8' 4" x 3' 3" x 6' 5"
Reading measured at that point: 27, 33 and 28 R/hr
Source Material: Iron at a density of 1.7 g/cm^3
Drawings/References: PNL-411-01, sheet 1
Work Documents/Surveys: Work Order 76851

Explanation of the HEPA filters model

The radiation reading from the HEPA filters was taken at a position approximately centered with the crane hook block on contact with the north faces of each filter housing. To determine the distance of the probe from the wall of the filter housings, the fact that the crane block was in contact with the tank was used. The full width of the crane block is 9" and this distance was used as a distance from the housing in the computer model. It should be noted that this is a conservative measurement, because the probe was hanging at a distance no greater than the diameter of the block.

The other determination to conservatively computer model the HEPA filters was to take into consideration any internal structures of the HEPA filter housings. It was decided that the internals should be modeled using iron as the source media. (This choice of material will give a conservative radiation attenuation.) Because the actual internals are not made of solid iron, a density had to be determined for the internal structure. It was decided that data from the Vitrification Expended Material Program (VEMP) could be used to estimate a density. VEMP was a program that consisted of size reducing spent Vitrification components and packaging them into steel containers. To first order, the internal structure of a component, such as a HEME would be no more dense than the most dense container processed by VEMP. From the Vitrification Expended Material Program, the maximum weight of one of the 30 gallon drums of cut up expended material is 225 kg. This translates to a density of 1.7 g/cm3. Using this data, a rectangular volume was used to determine the Curie content. Additional conservatism was inherent because the reading was taken with an unshielded probe. In determination of the Curie content, all the radiation was assumed to be coming exclusively from each filter housing, even though there were other radiation sources in the area. This made the determination of the Curie content conservatively high.

Resulting Curie contents (Ci of Cs-137):

HEPA Filter T001 C	660
HEPA Filter T001 B	780
HEPA Filter T001 A	630

Model prepared by: [signature] /E. Lachapelle / 1/16/03
Signature/Print name/Date

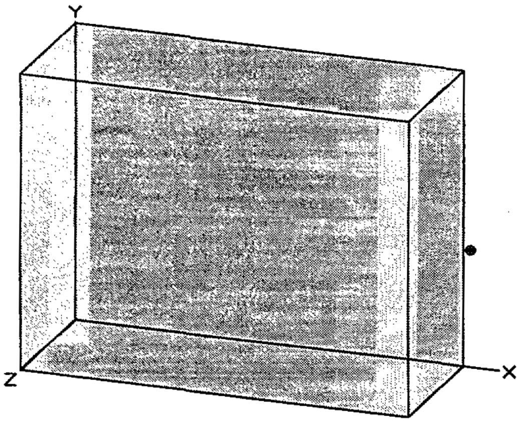
Model peer reviewed by: [signature] /R. A. Gonzalez 1/17/03
Signature/Print name/Date

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: T001A.MS5
Run Date: January 15, 2003
Run Time: 3:12:55 PM
Duration: 00:00:05

File Ref: N/A
Date: 1/15/03
By: [illegible]
Checked: [illegible]

Case Title: HEPA Filter T001A
Description: Based on 27 R/hr radiation reading
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	254.0 cm	8 ft 4.0 in
Width	99.06 cm	3 ft 3.0 in
Height	195.58 cm	6 ft 5.0 in

Dose Points

	X	Y	Z
# 1	276.86 cm	97.79 cm	49.53 cm
	9 ft 1.0 in	3 ft 2.5 in	1 ft 7.5 in

Shields

Shield Name	Dimension	Material	Density
Source	3.00e+05 in³	Iron	1.7
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	$\mu Ci/cm^3$	Bq/cm^3
Ba-137m	5.9598e+002	2.2051e+013	1.2111e+002	4.4810e+006
Cs-137	6.3000e+002	2.3310e+013	1.2802e+002	4.7368e+006

Buildup
The material reference is : Source

Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results

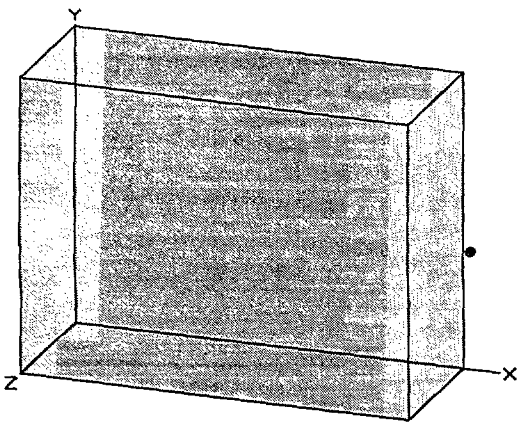
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	4.565e+11	1.305e-14	1.444e-14	1.087e-16	1.203e-16
0.0322	8.423e+11	8.840e-14	9.808e-14	7.114e-16	7.893e-16
0.0364	3.065e+11	2.591e-09	2.951e-09	1.472e-11	1.677e-11
0.6616	1.984e+13	6.851e+06	1.383e+07	1.328e+04	2.682e+04
TOTALS:	2.145e+13	6.851e+06	1.383e+07	1.328e+04	2.682e+04

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: T001B.MS5
Run Date: January 15, 2003
Run Time: 3:16:15 PM
Duration: 00:00:05

File Ref: N/A
Date: 1/15/03
By: EL
Checked: RAG

Case Title: HEPA Filter T001B
Description: Based on 33 R/hr Radiation Reading
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	254.0 cm	8 ft 4.0 in
Width	99.06 cm	3 ft 3.0 in
Height	195.58 cm	6 ft 5.0 in

Dose Points

	X	Y	Z
# 1	276.86 cm	97.79 cm	49.53 cm
	9 ft 1.0 in	3 ft 2.5 in	1 ft 7.5 in

Shields

Shield Name	Dimension	Material	Density
Source	3.00e+05 in³	Iron	1.7
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	7.3788e+002	2.7302e+013	1.4994e+002	5.5479e+006
Cs-137	7.8000e+002	2.8860e+013	1.5850e+002	5.8646e+006

Buildup
The material reference is : Source

Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results

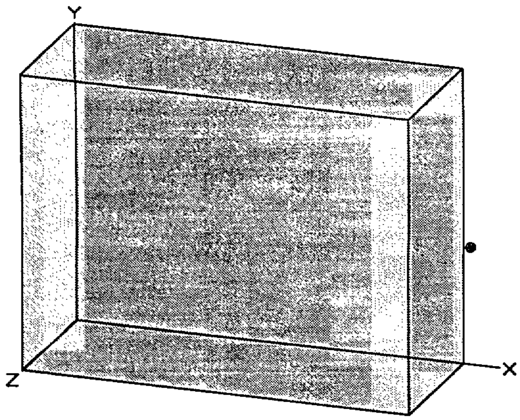
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	5.652e+11	1.616e-14	1.787e-14	1.346e-16	1.489e-16
0.0322	1.043e+12	1.094e-13	1.214e-13	8.808e-16	9.773e-16
0.0364	3.795e+11	3.208e-09	3.654e-09	1.823e-11	2.076e-11
0.6616	2.457e+13	8.482e+06	1.713e+07	1.644e+04	3.320e+04
TOTALS:	2.655e+13	8.482e+06	1.713e+07	1.644e+04	3.320e+04

MicroShield v5.03 (5.03-00241)
West Valley Demonstration Project

Page : 1
DOS File: T001C.MS5
Run Date: January 15, 2003
Run Time: 3:18:33 PM
Duration: 00:00:04

File Ref: N/A
Date: 1/15/03
By: [illegible]
Checked: RAG

Case Title: HEPA Filter T001C
Description: Based on 28 R/hr Radiation Reading
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	254.0 cm	8 ft 4.0 in
Width	99.06 cm	3 ft 3.0 in
Height	195.58 cm	6 ft 5.0 in

Dose Points

	X	Y	Z
# 1	276.86 cm	97.79 cm	49.53 cm
	9 ft 1.0 in	3 ft 2.5 in	1 ft 7.5 in

Shields

Shield Name	Dimension	Material	Density
Source	3.00e+05 in³	Iron	1.7
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	6.2436e+002	2.3101e+013	1.2688e+002	4.6944e+006
Cs-137	6.6000e+002	2.4420e+013	1.3412e+002	4.9624e+006

Buildup
The material reference is : Source

Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	4.783e+11	1.367e-14	1.512e-14	1.139e-16	1.260e-16
0.0322	8.824e+11	9.261e-14	1.027e-13	7.453e-16	8.269e-16
0.0364	3.211e+11	2.715e-09	3.092e-09	1.542e-11	1.757e-11
0.6616	2.079e+13	7.177e+06	1.449e+07	1.391e+04	2.809e+04
TOTALS:	2.247e+13	7.177e+06	1.449e+07	1.391e+04	2.809e+04

Appendix AA

Peer Reviewed Inventory Calculation and Decay

Conservative Curie Estimates for the Components of the Vitrification Cell (Decayed and Ingrown to September 30, 2004)

	Melter (and discharge cavity)	CFMT	MFHT	SBS	Remaining In-Cell Off-Gas Components	Decontamination Station	Vitrification Pit	Miscellaneous Spent Components	HVAC system	Totals
Am-241	1.1e+02	7.2e+01	3.2e+01	5.5e+01	7.5e+01	2.2e+00	2.8e+02	6.4e+01	2.7e+01	7.2e+02
C-14	1.7e-03	1.1e-03	4.9e-04	8.4e-04	1.1e-03	3.4e-05	4.3e-03	9.8e-04	4.0e-04	1.1e-02
Cm-243	7.7e-01	4.8e-01	2.2e-01	3.7e-01	5.0e-01	1.5e-02	1.9e+00	4.3e-01	1.8e-01	4.9e+00
Cm-244	1.8e+01	1.1e+01	5.1e+00	8.7e+00	1.2e+01	3.5e-01	4.4e+01	1.0e+01	4.2e+00	1.1e+02
Cs-137	8.6e+03	5.4e+03	2.4e+03	4.1e+03	5.6e+03	1.7e+02	2.1e+04	4.8e+03	2.0e+03	5.4e+04
I-129	1.4e-06	8.7e-07	3.9e-07	6.7e-07	9.1e-07	2.7e-08	3.5e-06	7.8e-07	3.2e-07	8.9e-06
Np-237	7.1e-02	4.5e-02	2.0e-02	3.4e-02	4.7e-02	1.4e-03	1.8e-01	4.0e-02	1.7e-02	4.6e-01
Pu-238	1.3e+01	8.4e+00	3.7e+00	6.4e+00	8.7e+00	2.6e-01	3.3e+01	7.5e+00	3.1e+00	8.4e+01
Pu-239	3.9e+00	2.4e+00	1.1e+00	1.9e+00	2.5e+00	7.6e-02	9.7e+00	2.2e+00	9.0e-01	2.5e+01
Pu-240	2.7e+00	1.7e+00	7.7e-01	1.3e+00	1.8e+00	5.4e-02	6.9e+00	1.6e+00	6.4e-01	1.7e+01
Pu-241	8.6e+01	5.4e+01	2.4e+01	4.1e+01	5.6e+01	1.7e+00	2.1e+02	4.8e+01	2.0e+01	5.4e+02
Sr-90	4.8e+04	5.2e+03	2.3e+03	4.0e+03	5.4e+03	1.6e+02	2.0e+04	4.6e+03	1.9e+03	9.2e+04
Tc-99	3.0e-01	1.9e-01	8.4e-02	1.5e-01	2.0e-01	5.9e-03	7.5e-01	1.7e-01	7.0e-02	1.9e+00
U-232	3.3e-02	2.1e-02	9.3e-03	1.6e-02	2.2e-02	6.5e-04	8.3e-02	1.9e-02	7.7e-03	2.1e-01
U-233	1.3e-02	8.1e-03	3.6e-03	6.2e-03	8.4e-03	2.5e-04	3.2e-02	7.2e-03	3.0e-03	8.2e-02
U-234	4.9e-03	3.1e-03	1.4e-03	2.4e-03	3.2e-03	9.6e-05	1.2e-02	2.8e-03	1.2e-03	3.1e-02
U-235	1.4e-04	8.5e-05	3.8e-05	6.5e-05	8.9e-05	2.6e-06	3.4e-04	7.6e-05	3.2e-05	8.7e-04
U-238	1.2e-03	7.6e-04	3.4e-04	5.9e-04	7.9e-04	2.4e-05	3.0e-03	6.8e-04	2.8e-04	7.7e-03

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Undecayed Inventory Results

	Am-241	C-14	Cm-243	Cm-244	Cs-137	I-129	Np-237	Pu-238	Pu-239	Pu-240	Pu-241	Sr-90	Tc-99	U-232	U-233	U-234	U-235	U-238
Melter (and discharge cavity)	1.1E+02	1.7E-03	8.0E-01	1.9E+01	8.9E+03	1.4E-06	7.1E-02	1.3E+01	3.9E+00	2.7E+00	9.3E+01	4.9E+04	3.0E-01	3.4E-02	1.3E-02	4.8E-03	1.4E-04	1.2E-03
CFMT	7.2E+01	1.1E-03	5.0E-01	1.2E+01	5.6E+03	8.7E-07	4.5E-02	8.5E+00	2.4E+00	1.7E+00	5.8E+01	5.4E+03	1.9E-01	2.1E-02	8.1E-03	3.0E-03	8.5E-05	7.6E-04
MFHT	3.2E+01	4.9E-04	2.2E-01	5.4E+00	2.5E+03	3.9E-07	2.0E-02	3.8E+00	1.1E+00	7.7E-01	2.6E+01	2.4E+03	8.4E-02	9.5E-03	3.6E-03	1.4E-03	3.8E-05	3.4E-04
SBS	5.5E+01	8.4E-04	3.9E-01	9.3E+00	4.3E+03	6.7E-07	3.4E-02	6.5E+00	1.9E+00	1.3E+00	4.5E+01	4.1E+03	1.5E-01	1.6E-02	6.2E-03	2.3E-03	6.5E-05	5.8E-04
Remaining In-Cell Off-Gas Components	7.5E+01	1.1E-03	5.2E-01	1.3E+01	5.8E+03	9.1E-07	4.7E-02	8.8E+00	2.5E+00	1.8E+00	6.1E+01	5.6E+03	2.0E-01	2.2E-02	8.4E-03	3.2E-03	8.9E-05	7.9E-04
Decontamination Station	2.2E+00	3.4E-05	1.6E-02	3.8E-01	1.7E+02	2.7E-08	1.4E-03	2.6E-01	7.6E-02	5.4E-02	1.8E+00	1.7E+02	5.9E-03	6.6E-04	2.5E-04	9.5E-05	2.6E-06	2.4E-05
Vitrification Pit	2.8E+02	4.3E-03	2.0E+00	4.8E+01	2.2E+04	3.5E-06	1.8E-01	3.4E+01	9.7E+00	6.9E+00	2.3E+02	2.1E+04	7.5E-01	8.4E-02	3.2E-02	1.2E-02	3.4E-04	3.0E-03
Miscellaneous Spent Components	6.4E+01	9.8E-04	4.5E-01	1.1E+01	5.0E+03	7.8E-07	4.0E-02	7.5E+00	2.2E+00	1.5E+00	5.2E+01	4.8E+03	1.7E-01	1.9E-02	7.2E-03	2.7E-03	7.6E-05	6.8E-04
HVAC system	2.7E+01	4.0E-04	1.9E-01	4.5E+00	2.1E+03	3.2E-07	1.7E-02	3.1E+00	9.0E-01	6.4E-01	2.2E+01	2.0E+03	7.0E-02	7.8E-03	3.0E-03	1.1E-03	3.1E-05	2.8E-04
Totals	7.25E+02	1.11E-02	5.08E+00	1.22E+02	5.66E+04	8.81E-06	4.53E-01	8.54E+01	2.46E+01	1.75E+01	5.91E+02	9.45E+04	1.91E+00	2.14E-01	8.13E-02	3.07E-02	8.59E-04	7.68E-03

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WVNSCO RECORD OF REVISION

Rev. No.	Description of Changes	Revision On Page(s)	Dated
0	Original Issue Facility Characterization Project and Regulatory & Compliance Programs are affected by this document.	All	03/27/03
FC1	List of Tables - Corrected typographical error in title of Table 7.	6	04/02/03
	List of Figures - Corrected typographical error in title of Figure 11.	7	
	Corrected typographical error in title of Figure 11.	24	
	Values in Table 5 and Appendix AA have been revised to reflect decay/ingrowth and rounding corrections.	40, 301	
	Table 8 revised to include Cs-137 and Sr-90 and added footnote clarifying the inclusion of these radionuclides. Facility Characterization Project is affected by this document.	49	
1	Modified Batch 10 data validation discussion to include conditional approval of I-129. Facility Characterization Project is affected by this document.	35, 37	06/17/03

WVNSCO RECORD OF REVISION CONTINUATION FORM

Rev. No.	Description of Changes	Revision On Page(s)	Dated