From: "Huston, Thomas E." <Thomas.Huston2@va.gov>
To: <wgs@nrc.gov>
Date: 09/21/2007 11:14:32 AM
Subject: Additional Information for Tucson Request

Bill,

I am sending this e-mail in follow-up to your telephone discussion today with Gary Williams and your request by telephone on July 25, 2007 for additional information for the Tucson site.

The additional information you requested is attached in a PDF file with three enclosures. The first enclosure has responses by the facility Radiation Safety Officer along with additional technical comments by me. The second enclosure has equipment calibration certificates. The third enclosure has incinerator ash sample results.

References in the attached PDF file as follows:
Reference 1: Letter dated June 12, 2007 from E. L. McGuire (DVA) to C.F. Frazier (NRC)
Reference 2: Telephone Communication on July 25, 2007 (W. Snell, NRC and G. Williams, DVA), documented as ADAMS Accession Number ML072060446

<<Tucson information for NRC.pdf>>

Please let me know if you any questions or comments. My contact information is provided below.

Tom

Thomas E. Huston, PhD, CHP
National Health Physics Program (115HP/NLR)
Veterans Health Administration
2200 Fort Roots Drive
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CC: <cff@nrc.gov>, "Williams, Gary E" <Gary.Williams3@va.gov>

Mail Envelope Properties (46F3EDCA.01D : 13 : 53277)

Subject: Additional Information for Tucson Request
Creation Date 09/21/2007 11:13:26 AM
From: "Huston, Thomas E." <Thomas.Huston2@va.gov>

Created By: Thomas.Huston2@va.gov

Recipients
nrc.gov
ch_po.CH_DO
WGS (William Snell)
CFF CC (Cassandra Frazier)

va.gov
Gary.Williams3 CC (Gary E Williams)

Post Office	Route
ch_po.CH_DO	nrc.gov
	va.gov

Files	Size	Date & Time
MESSAGE	1167	09/21/2007 11:13:26 AM
TEXT.htm	3087	
Tucson information for NRC.pdf		347234
Mime.822	481740	

Options
Expiration Date: None
Priority: Standard
ReplyRequested: No
Return Notification: None

Concealed Subject: No
Security: Standard

Junk Mail Handling Evaluation Results
Message is eligible for Junk Mail handling
This message was not classified as Junk Mail

Junk Mail settings when this message was delivered
Junk Mail handling disabled by User
Junk Mail handling disabled by Administrator
Junk List is not enabled

ENCLOSURE 1

Facility's Response to NRC Questions/Comments in Reference 2

NRC Question/Comment 1:

Did not survey drains and sewer lines. "Assuming" they are not contaminated based on dilution is not acceptable. Drains and sewers sometimes contain areas where contamination can accumulate and create "hot spots."

Facility RSO Response:

The technique used for disposal of liquid radioactive waste into the drain involved copious flushing. Before disposing the radioactive liquid, the water was running at maximum strength for 15 seconds. Then disposal of liquids was begun directly into the drain slowly while the flushing water was running. The process ran for several minutes depending on the volume of the disposed liquid. The flushing water was run for about two more minutes to ensure complete removal of the radioactive liquid from the drain to eliminate possible residual contamination that could have been present in the plumbing system. The drains and the sewers are not accessible to members of the general public.

NHPP Reviewer Comment:

Using the "maximum quantity at one time" disposed of by liquid discharge to sinks (see Attachment C in report submitted by Reference 1), allowing for an 8-year decay (last use of sink for disposal was stated as November 1999), and assuming a hold-up of 1% of the discharged activity in disposal lines, the following (conservative) scoping-level hold-up and dose values were estimated for facility sewer lines. Scoping-level results are well below the 25 mrem release level in 10CFR 20.1402.

Scoping –Level Hold-Up Calculations

Nuclide	Maximum Disposed at One Time (uCi)	Hold-up (Assume 1% of Max Disposed) (uCi)	Hold-up After 8-y Decay (uCi)	10CFR20, App. C value (uCi)	Decayed Hold-up vs. 10CFR 20, App. C
H-3	280	2.8	1.8	1000	< App C
C-14	260	2.6	2.6	100	< App C
P-32	20	0.2	0.00	10	< App C
S-35	70	0.7	0.00	100	< App C

Scoping-Level Dose Calculations

Nuclide	Assume: 10% of Hold-up Ingested	Ingestion Dose Conversion Factor* (mrem/uCi)	Ingestion Dose (mrem)	Inhalation Intake (Decayed Holdup x 1E-3) (uCi)	Inhalation Dose Conversion Factor* (mrem/uCi)	Inhalation Dose (mrem)	Comparison to 10 CFR 20.1402
				Assume Total Release Fraction = 1E-3			
H-3	0.2	4.44E-01	0.08	2.80E-03	3.70E+00	1.04E-03	TEDE<25 mrem
C-14	0.3	5.92E+00	1.54	2.60E-03	6.29E+01	9.62E-04	TEDE<25 mrem

*Dose conversion factors were from ICRP Publication 72, maximum values for a member of public (1 year of age or older).

ENCLOSURE 1

Facility's Response to NRC Questions/Comments in Reference 2

NRC Question/Comment 2
Fixed measurements not taken where wipes collected so could not evaluate for loose versus fixed contamination.

Facility RSO Response

Direct measurements in units of dpm/100cm^2 at identical locations of swipes were not made. However, scanning measurements of surfaces for total activity were made throughout the building and are discussed in Comment 7 below. These scanning measurements were made 1-2 inches from the surface and showed no activity significantly above background. The scanning instrument possessed an approximate 10% efficiency for C-14 activity. The fact that no response was significantly greater than background provides evidence that no significant residual contamination (fixed or removable) was present. It is noted that H-3 cannot be measured effectively by the scanning instrument, but the absence of C-14 indicates that radioactive material handling practices in the area were generally appropriate to minimize the spread of contamination. Wipe measurements were all less than 2 times background and were well below NRC Screening Levels in NUREG-1757, Vol. 1, Appendix B, Table B.1 for all potential contaminants of concern (i.e., H-3 and C-14 after considering decay). Even if removable activity is conservatively assumed to be only 10% of the total activity, then the derived total activity results (~10 times the removable levels) are still well below the NRC's Screening Levels.

NRC Question/Comment 3:
Discuss background determination, efficiency determination for detectors used, methodology for conversion to dpm/100 cm^2, and release criteria (DCGL).

Facility RSO Response:

For survey meters, we used calibrated survey meters (attached a calibration certificate [Enclosure 2]). Before surveying, the instrument was checked for background and then checked against an attached Cs-137 check source. For swipes, 100 square centimeters were swiped. The swipe was then transferred to a test tube for analysis. The background sample was an "unused" swipe, and the counting was against a standard source depending on the analysis technique (liquid scintillation counter for H-3, C-14, P-32, gross beta activity and gamma ray spectrometer coupled to a well scintillation counter for gamma spectroscopy).

NHPP Reviewer Comment:

By permit conditions, release criteria applied to closeout surveys are in NUREG-1556, Volume 9, Appendix R, Table R.3. It is noted these levels are well below the NRC's Acceptable Screening Levels for unrestricted release presented for H-3 and C-14 in NUREG-1757, Volume 1, Rev. 2, Appendix B.

NRC Question/Comment 4:
Provide calibration records for instruments used.

ENCLOSURE 1

Facility's Response to NRC Questions/Comments in Reference 2

Facility RSO Response:

Attached is the certificate of calibration of the survey equipment [Enclosure 2].

NRC Question/Comment 5:

Discuss demolition of incinerator and what surveys were conducted.

Facility RSO Response

Attached [Enclosure 3] is the survey done on ashes collected from the incinerator before demolition.

NRC Question/Comment 6:

Provide additional information on hold-up tanks, septic tanks, and sewer lines. How many were there, how big were they, how often were they used, etc.

Facility RSO Response:

As per [Facility] Engineering, there are no hold-up tanks or septic tanks. The Southern Arizona VA Health Care System sewer line is connected directly to the city of Tucson sewer system.

NRC Question/Comment 7:

Attachment A [of survey report attached to Reference 1] *mentions a "grid layout," but there is no discussion of scans being performed. Were scans performed?*

Facility RSO Response:

General area exposure rate surveys were performed at 1-meter height above the surface at fixed locations 1-1.5 feet apart using a Ludlum Model 2242-2 meter with a Model 44-98 BGO scintillation probe. The results of these measurements are provided in Attachment E. In addition to these 1-meter measurements, scanning measurements were performed at a height of about 1-2 inches from the surface using the same survey instrument. These scanning measurements involved moving the probe slowly over the surface to achieve a "continuous" survey of the area. Throughout this survey, the meter sound alarm was "ON" while visually monitoring the display meter. The alarm threshold was set at three times background and was never exceeded. Background for the instrument was determined to be 0.04 mR/hr and the instrument response (based on Cs-137) was 1.8 kcpm/(mR/hr).

NHPP Reviewer Comment:

Per manufacturer specifications, the Ludlum Model 44-98 BGO detector is a thin-window (1.2 mg/cm^2 aluminized Mylar) beta-gamma detector with a typical 4-pi efficiency of about 10% for C-14. A background level of 0.04 mR/hr corresponds to about 70 cpm (using 1.8 kcpm/(mR/hr)), or ~700 dpm after applying nominal 10% efficiency for C-14. The detector has an active window area of about 11.6 cm^2. Therefore, background would be equivalent to roughly 6000 dpm/100cm^2. Three times

background would be ~18000 dpm/100cm^2. While this technique is slightly lacking with respect the criteria in NUREG-1556, Appendix R for total average contamination (5000 dpm/100cm^2 over 1 m^2) and total maximum contamination (15,000 dpm/100cm^2), it does have the sensitivity to see well below NRC's Acceptable Screening Level for Unrestricted Release in NUREG-1757, Volume 1, Appendix B, Table B.1 for C-14 (3,700,000 dpm/100cm^2). Additionally, it is acknowledged that although low-energy betas from H-3 cannot be detected with this portable scanning instrument, the absence of C-14 contamination above the alarm threshold (three times background) provides evidence H-3 is also not present at any significant level. This finding, coupled with the fact that the NRC's Acceptable Screening Level for H-3 is 120,000,000 dpm/100cm^2, provides assurance no significant level of H-3 contamination remained in the area and it ultimately met the criteria in 10 CFR 20.1402 for unrestricted release (i.e., < 0.25 mSv/y).]

ENCLOSURE 2

Calibration Records

Radiation Safety Engineering, Inc.

3245 North Washington Street
Chandler, Arizona 85225
(480) 897-9459

CERTIFICATE OF CALIBRATION

To: Southern Arizona VA Healthcare System
3601 S. Sixth Avenue
Tucson, AZ 85723

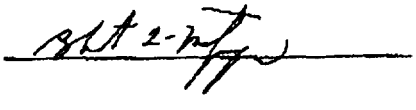
Standard: Cesium-137
Activity: 115 mCi (NIST Traceable)
Electronic Pulser: Ludlum Model 500
Range: 10 - 1,000,000 cpm

Instrument: **Ludlum Model 2241-2**
Serial No.: **150611**
Probe: **44-9**
Serial No.: **PR047435**

RANGE	CALIBRATION POINT	MEASURED
Auto	0.100 kcpm	0.10 kC/m
	0.500 kcpm	0.50 kC/m
	1.00 kcpm	0.99 kC/m
	5.00 kcpm	5.01 kC/m
	10.0 kcpm	9.9 kC/m
	50.0 kcpm	50 kC/m
	100 kcpm	100 kC/m
	500 kcpm	500 kC/m

Comments: Conversion factor for Cs-137: 3.0 kcpm/mR/hr. Check source 17.5 kC/m with door open and cap off.

Date: August 3, 2004

Signature: 

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CERTIFICATE OF CALIBRATION

To: Southern Arizona VA Healthcare System
3601 S. Sixth Avenue
Tucson, AZ 85723

Standard: Cesium-137
Activity: 115 mCi (NIST Traceable)
Electronic Pulser: Ludlum Model 500
Range: 10 - 1,000,000 cpm

Instrument: **Ludlum Model 2241-2**
Serial No.: **150611**
Probe: **44-98**
Serial No.: **PR150698**

RANGE	CALIBRATION POINT	MEASURED
× 0.1	0.100 kcpm	0.10 kC/m
× 0.1	0.500 kcpm	0.49 kC/m
× 1	1.00 kcpm	0.98 kC/m
× 1	5.00 kcpm	4.97 kC/m
× 10	10.0 kcpm	9.87 kC/m
× 10	50.0 kcpm	49.7 kC/m
× 100	100 kcpm	98.9 kC/m
× 100	500 kcpm	496 kC/M

Comments: Conversion factor for Cs-137: 1.80 kcpm/mR/hr. Check source 78 kC/m with door open and cap off.

Date: August 3, 2004

Signature: R Tyger

ENCLOSURE 3

Ash Sample Results

DEPARTMENT OF VETERANS AFFAIRS
SAVAHCS – TUCSON, ARIZONA
RADIATION SAFETY OFFICE

TESTING OF ASH SAMPLES FROM THE INCINERATOR FOR RADIOACTIVITY
May 6, 2002

10 ash samples were collected from the incinerator before demolition for analysis.

I. Test for Gamma ray activity
The test was performed on 3 gm of every ash sample in a test tube. The gross gamma activity was measured using the Canberra Multichannel Analyzer model S-35 coupled to a well counter scintillation detector. Integral counting was performed using a wide window. Samples were counted for 10 minute each, together with a background sample. The samples were counted against 0.116 uCi Cs-137 standard sources.
Counting Efficiency (%) = (Counts per minute/Decays per minute)x 100
Counting Efficiency for Cs-137 = 16.8%.
Results:
Background samples showed 430 counts per 10 minutes.
Ash samples showed count rates between 415 to 440 counts per 10 minutes.
Conclusion: The results indicate no gamma activity in the samples.

II. Test for Beta activity:
The test was performed using Beckman Liquid Scintillation Spectrometer model LS 6500. Three grams of each ash sample were soaked in 10 ml of liquid scintillation cocktail for a period of about 8 hours. The samples were filtered and the filtered liquid scintillation samples were counted for one minute each sample. Quenching effect was minimized using a computer protocol based on comparison of peak beta energy with a photoelectric peak of a standard source of Cs-137. The samples were counted, together with a background sample and standard samples. Beta activity was monitored in three channels calibrated to represent Tritium (H-3), Radiocarbon (C-14) and Radio phosphorus (P-32). The corresponding counting efficiencies are: 60% (H-3), 95% (C-14) and 99% (P-32). The standard sources activities as Decays Per Minute (dpm) are: 14620 dpm (H-3), 34577 dpm (C-14), and 95386 dpm (P-32)

Results:
Background sample counting: 30 cpm =51 dpm (H-3), 16 cpm=17 dpm (C-14), 12 cpm=13 dpm (P-32).
Standard sources counting are: 8772 cpm (H-3), 32848 cpm (C-14), and 94432 cpm (P-32)
Average net ash samples counting: 31 cpm (H-3), 16 cpm (C-14), 12 cpm (P-32)
Conclusion: The 10 ash samples indicate no beta activity