Nuclear Operating Company

South Texas Project Electric Generating Station 4000 Avenue F – Suite A Bay City, Texas 77414

June 26, 2008
ABR-AE-08000046

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville MD 20852-2738

South Texas Project
Units 3 and 4
Docket Nos. 52-012 and 52-013
Response to Requests for Additional Information

Attached are responses to NRC staff questions included in Request for Additional Information (RAI) letter numbers 9, 10, 18, 34, 38, 39, 40, 41, 43, 45, 46, 47, 48, 49, 51 and 53 related to Combined License Application (COLA) Part 2, Tier 2 Sections 2.3S, 2.4S, 2.5S, 5.2, 9.1, and 11.4. This submittal includes responses to the following Question numbers:

02.03.01-8	02.04.05-1	02.05.01-5	05.02.05-1	09.01.04-1	11.04-1
02.03.01-9	02.04.11-1	02.05.03-4	05.02.05-2	09.01.04-2	11.04-2
02.03.02-4	02.04.12-19		05.02.05-3	09.01.04-3	
02.03.03-2	02.04.13-2		05.02.05-4	09.01.04-4	
	02.04.13-5			09.01.04-5	
	02.04.13-7				
	02.04.14-2				

Enclosures 1, 2 and 3 are provided as referenced in Attachments 4, 5, and 10, respectively.

When a change to the COLA is indicated by a question response, the change will be incorporated into the next routine revision of the COLA following NRC acceptance of the question response.

There are no new commitments made in this letter.

If you have any questions regarding the attached responses, please contact me at (361) 972-7206, or Greg Gibson at (361)-972-4626.

D079
NRO

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 6-26-08

Mark A. McBurnett
Vice President, Oversight and Regulatory Affairs
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fjp

Enclosures:
1. DVD- Humidity-Temp Data (Question 02.03.03-2)
2. DVD- Letter #25425-000-TCM-GEG-00010 (Question 02.04.05-1)
3. Attachment H, Kd Test Results, Consists of: SRNL Report Dated September 20, 2007 (Question 02.04.13-7)

Attachments:
1. Question 02.03.01-8
2. Question 02.03.01-9
3. Question 02.03.02-4
4. Question 02.03.03-2
5. Question 02.04.05-1
6. Question 02.04.11-1
7. Question 02.04.12-19
8. Question 02.04.13-2
9. Question 02.04.13-5
10. Question 02.04.13-7
11. Question 02.04.14-2
12. Question 02.05.01-5
13. Question 02.05.03-4
14. Question 05.02.05-1
15. Question 05.02.05-2
16. Question 05.02.05-3
17. Question 05.02.05-4
18. Question 09.01.04-1
19. Question 09.01.04-2
20. Question 09.01.04-3
21. Question 09.01.04-4
22. Question 09.01.04-5
23. Question 11.04-1
24. Question 11.04-2

cc: w/o attachment except*
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Question 02.03.01-8

QUESTION:

Both FSAR Sections 2.3S1.1 and 2.3S.2.1 state that long-term data from Victoria were used to describe the general climatic conditions at the STP site; FSAR Section 2.3S.2.1 also states that Victoria data were used to describe the site extreme climatology. FSAR Section 2.3S.2.1 further states that the monthly mean daily maximum and minimum temperatures are more extreme at Victoria compared to those measured at Palacios; therefore, Victoria data were used to describe the site extreme climatology. However, the staff notes that Victoria is located significantly further from the Gulf of Mexico as compared to either Palacios or the STP site and the climatic data tables associated with Chapter 28 of the 2005 ASHRAE Handbook – Fundamentals show that the Palacios 0.4%, 1%, and 2% exceedance wet-bulb values exceed the corresponding Victoria wetbulb values by approximately 1 °C. FSAR Section 2.3S.2.1 states that consecutive hourly data are not available at Palacios during the period of March 1959 through December 1999. However, the staff was able to download 1988–2007 Palacios hourly data from the National Climatic Data Center (NCDC) Climate Data website. FSAR Section 2.3S.3.4.1.4 further states that Palacios is considered to be representative of the STP site and data collected at Palacios from 1997 through 2001 were used to predict cooling tower plume impacts resulting from operation of the STP 3 and 4 reactor service water mechanical draft cooling towers.

(a) Justify not including meteorological data from Palacios in the selection of the minimum water cooling and maximum water usage conditions for use in evaluating the ultimate heat sink thermal performance as discussed in FSAR Section 2.3S.1.4.

(b) Justify not including meteorological data from Palacios in the selection of the 0% exceedance coincident and non-coincident wet bulb temperatures and the 100-year return period maximum wet-bulb temperature ambient design temperature site characteristics as discussed in FSAR Section 2.3S.1.5.

RESPONSE:

The UHS design described in Revision 1 of the STP 3 & 4 COLA is being modified. The following RAI response applies to the UHS design as currently described in COLA Revision 1. This response will be updated, if necessary, following completion of the UHS design modification, which will be presented in the next revision of the COLA.

The following responds to part (a):

(a) Palacios meteorological data was not used in the selection of the minimum water cooling or maximum water usage conditions in evaluating the ultimate heat sink thermal performance as discussed in FSAR Section 2.3S.1.4 because 30 years of recent representative data, as identified in Regulatory Guide 1.27, was not available. Victoria data, based on proximity to the site as discussed in FSAR Section 2.3S.2.1 and the availability of greater than 30 years of data, was therefore considered as the

representative regional climatology. An evaluation has been performed using an 18-year period of sequential data for Palacios, Texas, obtained from the National Climactic Data Center (1988 to 2005 in raw or text delimited TD-3505 or raw DS-3505 format) for comparison to the UHS performance using the Victoria data. The 18 year period chosen for this comparison represents that which would have been applicable at the time the UHS performance was evaluated. The evaluation demonstrates that water usage would be bounded by the analysis results using the Victoria data; and the UHS maximum water temperature, although slightly higher (less than 0.3 °C) than with the Victoria data, would remain below the design limit cold water temperature of 35 °C (95 °F). Thus the use of Victoria data is considered reasonable. FSAR Subsections 2.3S.1.4 and 9.2.5.5 will be revised to provide a summary of the effects of the use of the Palacios data on UHS performance.

The following responds to part (b):

(b) In order to analyze wet bulb related climatological parameters, twenty years (1988-2007) of hourly meteorological data collected at Palacios Municipal Airport were obtained from the National Climatic Data Center.

Wet bulb temperatures are not available from Palacios. However, hourly wet bulb temperatures were estimated based on hourly dry bulb, dew point temperatures, and the station atmospheric pressure (Ref. 1). According to the 20-year (1998-2007) data set (Refs 2 through 9), the maximum (0% exceedance) coincident and non-coincident wet bulb temperatures are 77.8°F and 86.1°F, respectively. The 0% exceedance coincident wet bulb temperature (77.8°F) is associated with a maximum dry bulb temperature of 106°F which occurred in Year 2000. Additionally, using a linear regression (least squares) method, the 100-year return period maximum wet bulb temperature was estimated to be 88.3°F. This value is slightly higher than the Victoria 100-year return period maximum wet bulb temperature of 86.1°F as reported in Section 2.3S.1.5 of the FSAR. This is expected as Palacios is located closer to the Gulf of Mexico than Victoria.

Because the 2.5% increase in the 100-year return maximum wet bulb temperature is a slight amount, the Palacios data were not used in the COLA. Furthermore, the maximum non-coincident wet bulb temperatures at Palacios and Victoria are 86.1°F and 84.4°F, respectively. The use of the Palacios data for this parameter will result in a slight 2% increase as well. As a result, Palacios data were not included in the COLA for these parameters.

References:

1. Reference Manual, WBAN Hourly Surface Observations 144, National Climatic Data Center, Revised, November 1970.

2. National Climatic Data Center, Integrated Surface Hourly Data, 1995-99, CD-ROM, Volume 8, Central United States of America, NCDC, NESDIS, NOAA, September 2002.

3. National Climatic Data Center, Integrated Surface Hourly Observations, 2000, CD-ROM, Volume 15, United States of America, NCDC, NESDIS, NOAA, September 2002.

4. National Climatic Data Center, Integrated Surface Hourly Observations, 2001, CD-ROM, Volume 19, United States of America, NCDC, NESDIS, NOAA, January 2003.

5. National Climatic Data Center, Integrated Surface Hourly Observations, 2002, CD-ROM, Volume 23, United States of America, NCDC, NESDIS, NOAA, August 2003.

6. National Climatic Data Center, Integrated Surface Hourly Observations, 2003, DVD-ROM, Global Data Set, United States of America, NCDC, NESDIS, NOAA, October 2004.

7. National Climatic Data Center, Integrated Surface Hourly Observations, 2004, DVD-ROM, Global Data Set, United States of America, NCDC, NESDIS, NOAA, June 2005.

8. National Climatic Data Center, Integrated Surface Hourly Observations, 2005, DVD-ROM, Global Data Set, United States of America, NCDC, NESDIS, NOAA, August 2006.

9. National Climatic Data Center, Quality Controlled Local Climatological Data, 1988-1994, 2006 and 2007, http://cdo.ncdc.noaa.gov/qclcd/QCLCD, Accessed 4/24/2008.

COLA changes for part (a):

The following will be added as the fourth paragraph of FSAR Subsection 2.3S.1.4:

> An evaluation was also performed using a recent 18-year period of sequential data for Palacios, Texas, to determine the effect on UHS performance for comparison to performance using the Victoria data. The results of the evaluation are discussed in Subsection 9.2.5.5.

The following will be added to the end of the paragraph in Subsection 9.2.5.5.1, Design Meteorology.

> For comparison to the use of the Victoria data, 18 years of recent meteorological data for (1988 to 2005) Palacios, Texas, obtained from the National Climactic Data Center was evaluated. Results using this limited number of years of Palacios data demonstrated that water usage is bounded by the analysis results using the Victoria data and the UHS maximum water temperature, although slightly higher than with the Victoria data, would remain below the design limit cold water temperature of 35 °C (95 °F).

Question 02.03.01-9

QUESTION:

Clarify the definition of the ambient design temperature site parameters discussed in FSAR Section 2.3S.1.5 and listed in ABWR DCD Tier 1 Table 5.0 and Tier 2 Table 2.0-1. For example, do the 1% exceedance values represent annual or seasonal probabilities of occurrence? Do the coincident wet-bulb values represent mean or extreme values?

RESPONSE:

The DCD listed values for Wet Bulb temperatures are defined slightly different from that intended for COLA section 02.03.01. The source of the criteria for these definitions, however, is the same (American Society of Heating, Refrigerating, and Air Conditioning Engineers [ASHRAE] Handbook of Fundamentals) which have been used for all vintages of nuclear plants.

It is important to recognize that the selection of certain parameters depends on the application. For designing devices that are more impacted by the moisture content in the air rather than the dry temperature, the maximum (non-coincident) Wet Bulb temperature values are used (Example; cooling tower and cooling reservoirs). On the other hand if the devices are impacted by both dry temperature and moisture content, then both Dry Bulb and simultaneous Wet Bulb (coincident) values are used (Example; HVAC systems cooling design).

It is also pertinent to recognize the difference/ impact of the terms Wet Bulb and Dry Bulb. The impact from Wet Bulb temperatures stems from the moisture content in the ambient which depends on the rate of water evaporation for which averaging it over time provides a more meaningful method on systems/ equipments sizing (as compared to using the highest recorded values).

Recognizing the above weather characteristic, ASHREA guidance for the Wet Bulb temperatures has evolved from the 70's to 2000's to provide more reliable data to the users.

In the 70's and 80's (the DCD era), ASHRAE listed ambient temperature values, simply, as Design Dry Bulb, Design Wet Bulb. ASHRAE emphasized that all data presented are based on the average number of hours (which varies for each % Exceedance criteria selected) at or above a given design value over a period of several seasons.

In the latest 2005 ASHRAE Handbook publication, the result of a research project initiated by ASHRAE, (project # RP-1273, ASHRAE 2004a) was used and a new definition for Wet Bulb temperature usage was devised. ASHRAE made available three Dry Bulb/ Wet Bulb/ Dew- Point combinations to choose from and allows the designer to consider various operational peak conditions; Dry Bulb with Mean Coincident Wet-Bulb (MCWB), Wet- Bulb with Mean Coincident Dry- Bulb temperature, and Dew- Point with mean coincident Dry- Bulb temperature and corresponding Humidity Ratio.

In COLA section 2.3S.1.5, the first combination (Dry- Bulb with MCWB), was used. This combination is the only data posted in ASHRAE for Palacios and Victoria, estimated from 30 years (1971 – 2000) of meteorological data.

As shown in the Table below, there is a minor difference between the old DCD values and the most recent 2005 ASHRAE values used in the COLA.

Since the 2005 ASHRAE values are based on a longer period of observation/ data collection, it is believed that these data provide more reliable basis for the design.

Summary of Maximum Temperature Listing (1% Exceedance)

DCD Tier 1, Table 5.0	Maximum Dry Bulb 37.8°C	Coincident Wet Bulb 25°C	Non-Coincident Wet Bulb 26.7°C
COLA Tier 1, Table 5.0	Maximum Dry Bulb 37.8°C	Coincident Wet Bulb 26.3°C	Non-Coincident Wet Bulb 27.3°C
DCD Tier 2, Table 2.0-1	Maximum Dry Bulb 37.8°C	Coincident Wet Bulb 25°C	Non-Coincident Wet Bulb 26.7°C
COLA Tier 1, Table 2.0-1	Maximum Dry Bulb 32.8°C	Coincident Wet Bulb 26.3°C	Non-Coincident Wet Bulb 27.3°C
COLA Tier 2, Table 2.3S.1.5**	Maximum Dry Bulb 32.8°C	Mean Coincident Wet Bulb 26.3°C	Non-Coincident Wet Bulb 27.3°C

** (There is no corresponding section in the DCD as it addresses site specific design)

No COLA revision is required as a result of this RAI response.

Question 02.03.02-4

QUESTION:

Both FSAR Sections 2.3S1.1 and 2.3S.2.1 state that long-term data from Victoria were used to describe the general climatic conditions at the STP site; FSAR Section 2.3S.2.1 also states that Victoria data were used to describe the site extreme climatology. FSAR Section 2.3S.2.1 further states that the monthly mean daily maximum and minimum temperatures are more extreme at Victoria compared to those measured at Palacios; therefore, Victoria data were used to describe the site extreme climatology. However, the staff notes that Victoria is located significantly further from the Gulf of Mexico as compared to either Palacios or the STP site and the climatic data tables associated with Chapter 28 of the 2005 ASHRAE Handbook – Fundamentals show that the Palacios 0.4%, 1%, and 2% exceedance wet-bulb values exceed the corresponding Victoria wet-bulb values by approximately 1 °C. FSAR Section 2.3S.2.1 states that consecutive hourly data are not available at Palacios during the period of March 1959 through December 1999. However, the staff was able to download 1988–2007 Palacios hourly data from the National Climatic Data Center (NCDC) Climate Data website. FSAR Section 2.3S.3.4.1.4 further states that Palacios is considered to be representative of the STP site and data collected at Palacios from 1997 through 2001 were used to predict cooling tower plume impacts resulting from operation of the STP 3 and 4 reactor service water mechanical draft cooling towers.

(a) Justify not including meteorological data from Palacios in the review of average wind direction and wind speed conditions as discussed in FSAR Section 2.3S.2.2.1.
(b) Justify not including meteorological data from Palacios in the review of atmospheric vapor as discussed in FSAR Section 2.3S.2.2.5.
(c) Justify not including meteorological data from Palacios in the review of fog in FSAR Section 2.3S.2.2.6.

RESPONSE:

(a) A 5-year period (i.e., 1995 through 1999) of wind measurements from the cooperative observing station at the Palacios Municipal Airport (Reference 1) has been evaluated. Longstanding U.S. EPA guidance has determined that for dispersion-related analyses, variations over a 5-year period of record are representative of longer duration data sets. Wind roses based on this data set for Palacios (Figures 1 through 5) show reasonably similar characteristics in predominant directions on an annual basis when compared to the onsite annual wind rose (see Figure 2.3S-2) (i.e., from the southeast through south sectors) and as indicated in the 2005 Local Climatological Data (LCD) summary for the Victoria National Weather Service (NWS) station (see Table 2.3S-2) (i.e., a prevailing direction of 160° or from the south-southeast sector).

At both locations, reasonably similar variations in the predominant wind direction sectors over the course of the year are also evident in the onsite seasonal wind roses (see Figures 2.3S-3 to 2.3S-6) and the seasonal wind roses for Palacios. Winter is characterized by a

noticeably bimodal directional distribution including a predominant northerly component along with a significant frequency of winds from the southeast quadrant. During the spring and summer, winds from the southeast quadrant dominate, shifting to a prevailing southerly component over time. The autumn transitional season shows a broad distribution of wind frequencies throughout all of the northeast and southeast quadrants, with the least-frequent winds from the westerly direction. Although not summarized in the same manner, the monthly prevailing wind directions in the Victoria LCD (see Table 2.3S-2) exhibit much the same variation during the year.

Mean wind speeds at Palacios for the 5-year period from 1995 through 1999 are similar, although somewhat higher, throughout the year compared to the lower-level, seasonal and annual wind speeds at the STP site and the Victoria NWS station as summarized in Table 2.3S-6. Mean wind speeds are higher by less than 1.0 m/sec on an annual basis, ranging from 0.4 to 1.3 m/sec higher depending on season and measurement location.

Specific differences in directional frequencies and mean wind speeds may be due to station siting and instrumentation, and to different periods of record among the three stations. Nevertheless, the wind direction and wind speed data show reasonable intermediate-field (Palacios) and far-field (Victoria) similarity to the wind conditions measured at the STP site.

(b) In order to determine the 100-year return period wet bulb temperature, a long-term meteorological data is required. As a result, 20 years (1988-2007) of continuous hourly Palacios meteorological data were obtained from National Climatic Data Center. Using a linear regression (least squares) method, the 100-year return of the Palacios maximum wet bulb temperature was estimated to be 88.3°F. Based on the same data set, the maximum (0% exceedance) coincident and non-coincident wet bulb temperatures are 83°F and 86.1°F, respectively.

The mean annual wet bulb temperature is 66.3°F at Palacios (References 1- 7 & 11). This is slightly higher than that found at Victoria (64.5°F) (Reference 12). The slight increase in wet bulb temperature is expected as Palacios is located closer to the Gulf of Mexico than Victoria. The 20-year database shows the mean annual dew point temperature is 63.2°F at Palacios (References 1-7 & 11). As expected, this value is also slightly higher than that measured at Victoria (60.9°F) (Reference 12).

The Palacios 20-year annual average relative humidity is 80% (References 1-7 & 11). Because the proximity to the Gulf of Mexico, it is higher than that found at Victoria (76%) (Reference 12).

(c) The cooperative observing station at the Palacios Municipal Airport is not a first-order NWS station. As a result, the length of a readily available, historical record for certain weather elements (in this case, heavy fog conditions) for Palacios is not as long nor as complete as that available from the Victoria, Texas NWS station.

An Automated Surface Observation System (ASOS), implemented by the NWS at Palacios through the Federal Aviation Administration, was installed in late 2000. Observations of fog conditions have been routinely archived at the Palacios Municipal Airport since that time (Reference 9). The data base available for the Victoria NWS station (see Table 2.3S-2) covers a 28-year period of record.

The average annual frequency of heavy fog conditions at Palacios is about 29 days per year based on the 7-year period of record from 2001 to 2007 (Reference 8) whereas at Victoria heavy fog occurs about 42 days per year (see Table 2.3S-2). The monthly and seasonal variation, as discussed in FSAR Subsection 2.3S.2.2.7 for the Victoria NWS station, is similar at Palacios.

The difference in frequencies of occurrence between the two locations may be due to the periods of record being quite different. While it is noted that this relative difference in annual frequencies is consistent with the Climate Atlas of the United States (Reference 10), it is also noted that the higher frequency of occurrence shown in the plot of annual frequencies that includes the STP site area probably reflects the location-specific observations at Victoria and that station coverage is not as great as the contours imply. Given the size of the Main Cooling Reservoir at the STP site and its proximity to STP Units 3 & 4, the frequency of heavy fog conditions for the Victoria NWS station is still considered to be a reasonable indicator of the conditions that may be expected to occur at the STP site.

References

1. National Climatic Data Center, Integrated Surface Hourly Data, 1995-99, CD-ROM, Volume 8, Central United States of America, NCDC, NESDIS, NOAA, September 2002.

2. National Climatic Data Center, Integrated Surface Hourly Observations, 2000, CD-ROM, Volume 15, United States of America, NCDC, NESDIS, NOAA, September 2002.

3. National Climatic Data Center, Integrated Surface Hourly Observations, 2001, CD-ROM, Volume 19, United States of America, NCDC, NESDIS, NOAA, January 2003.

4. National Climatic Data Center, Integrated Surface Hourly Observations, 2002, CD-ROM, Volume 23, United States of America, NCDC, NESDIS, NOAA, August 2003.

5. National Climatic Data Center, Integrated Surface Hourly Observations, 2003, DVD-ROM, Global Data Set, United States of America, NCDC, NESDIS, NOAA, October 2004.

6. National Climatic Data Center, Integrated Surface Hourly Observations, 2004, DVD-ROM, Global Data Set, United States of America, NCDC, NESDIS, NOAA, June 2005.

7. National Climatic Data Center, Integrated Surface Hourly Observations, 2005, DVD-ROM, Global Data Set, United States of America, NCDC, NESDIS, NOAA, August 2006.

8. Palacios Municipal Airport, Annual Climatological Summary, 2001-2007, National Climatic Data Center.

9. Palacios Municipal Airport, Local Climatological Data, 2001-2007, National Climatic Data Center.

10. "The Climatic Atlas of the United States," NCDC, Version 2.0 (CD-ROM), NCDC, Climate Services Division, NOAA, September 2002.

11. National Climatic Data Center, Quality Controlled Local Climatological Data, 1988-1994, 2006 and 2007, http://cdo.ncdc.noaa.gov/qclcd/QCLCD, Accessed 4/24/2008.

12. 2005 Local Climatological Data, Annual Summary with Comparative Data, Victoria, Texas, National Climatological Data Center, NESDIS, NOAA, 2006.

FIGURE 1 Palacios Annual Wind Rose

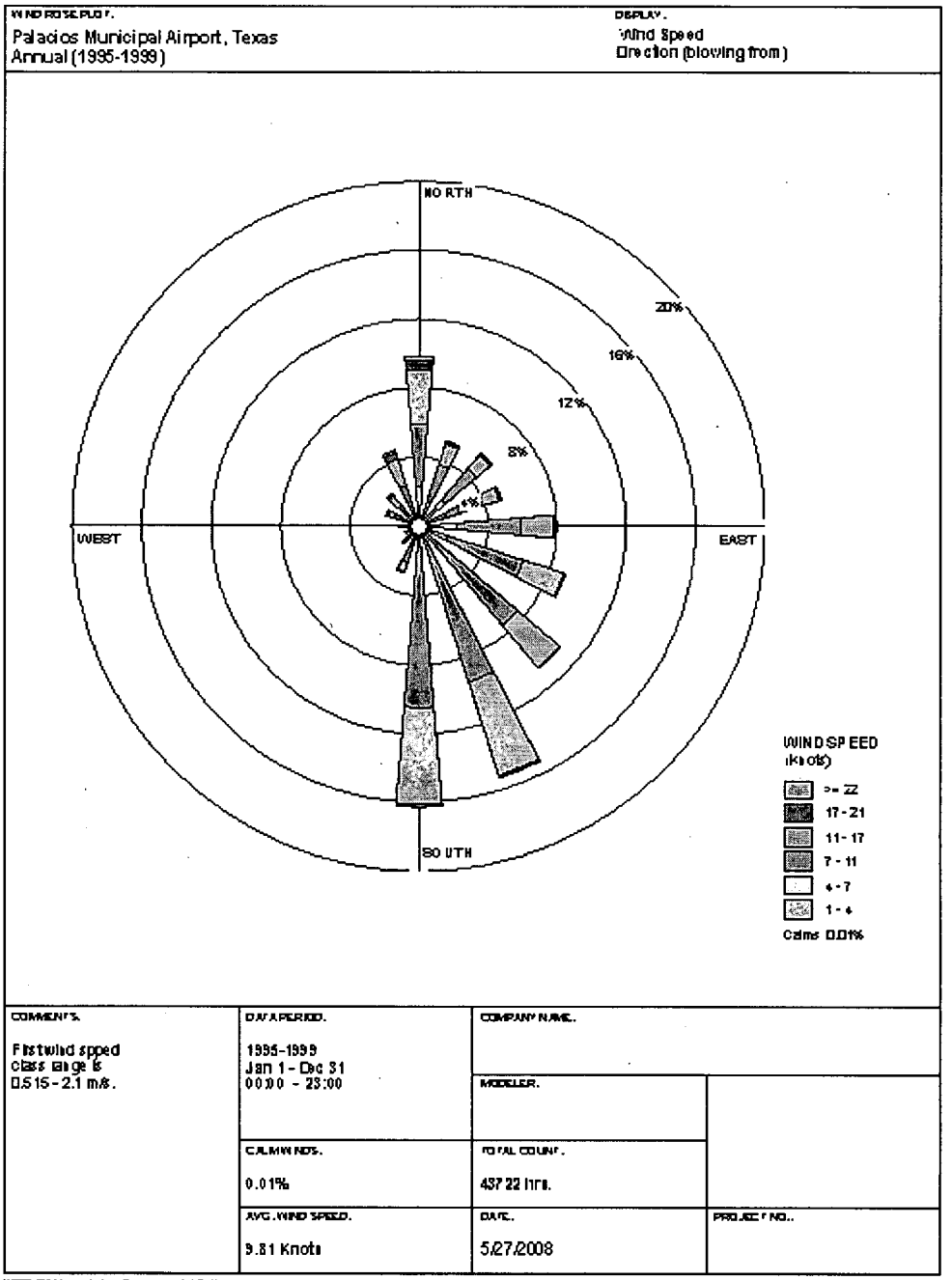
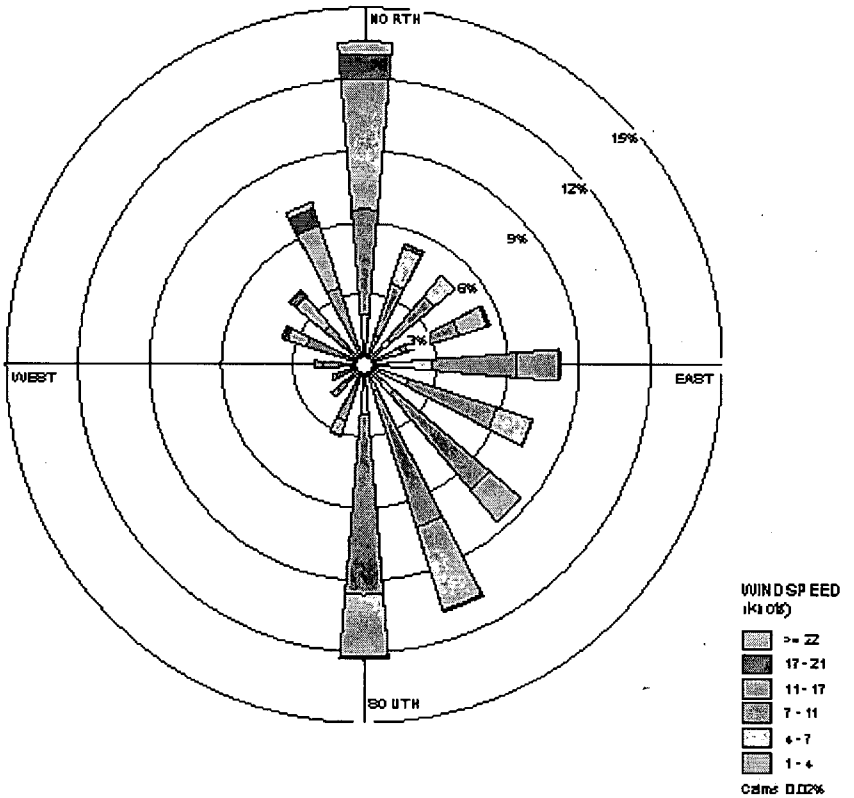


FIGURE 2 Palacios Winter Season Wind Rose

WINDROSE PLOT.
Palacios Municipal Airport, Texas
Winter (1995-1999)

DISPLAY.
Wind Speed
Direction (blowing from)



COMMENTS.	DATA PERIOD.	COMPANY NAME.	
First wind speed class range is 0.515 - 2.1 m/s.	1995-1999 Clock Date Range Report 00:00 - 23:00	MODELER.	
	CALM WINDS. 0.02%	TOTAL COUNT. 11197 hrs.	
	AVG. WIND SPEED. 9.81 Knots	DATE. 5/27/2008	PROJECT NO..

WRPLOT View - Lakes Environmental Software

FIGURE 3 Palacios Spring Season Wind Rose

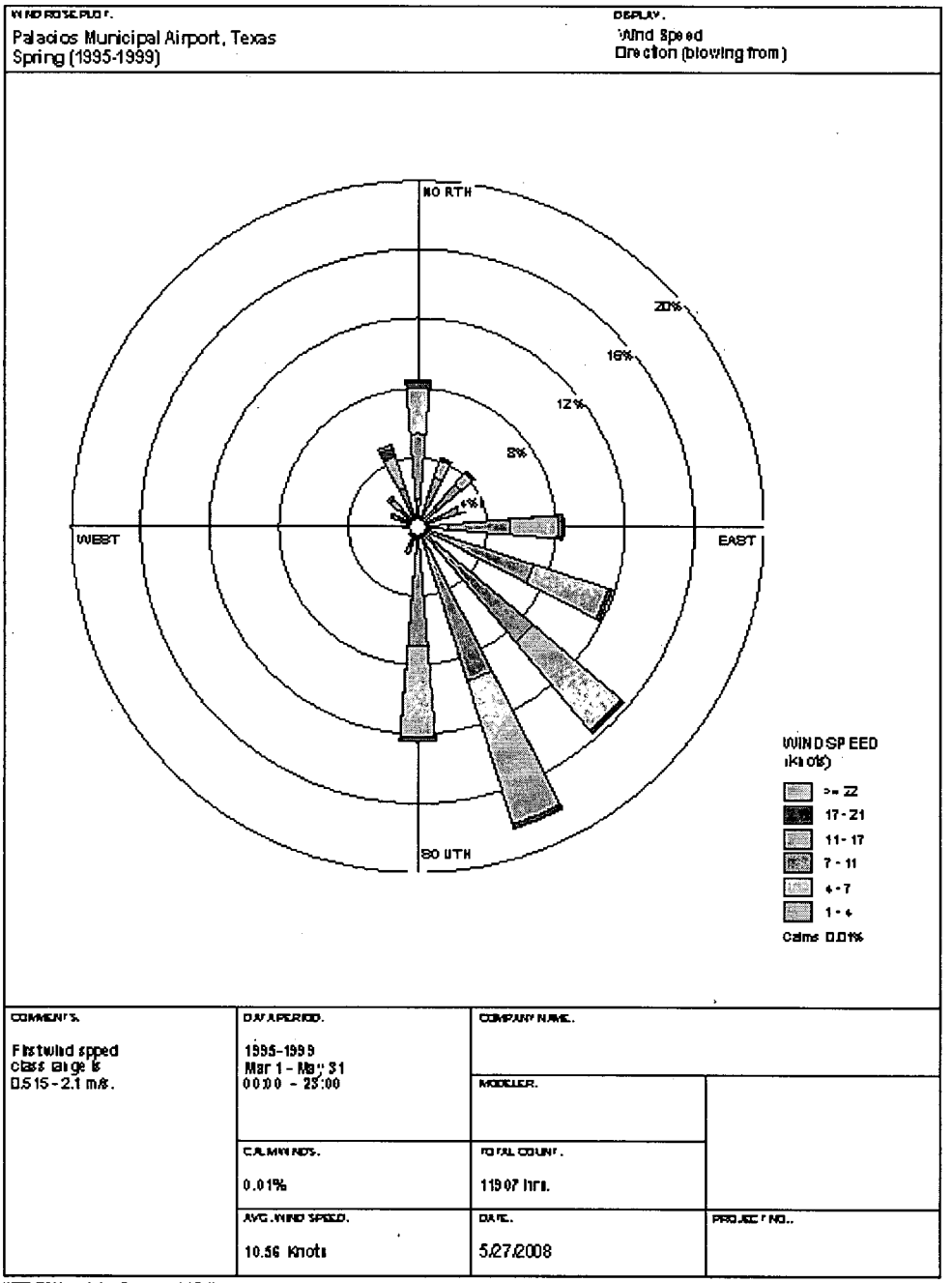


FIGURE 4 Palacios Summer Season Wind Rose

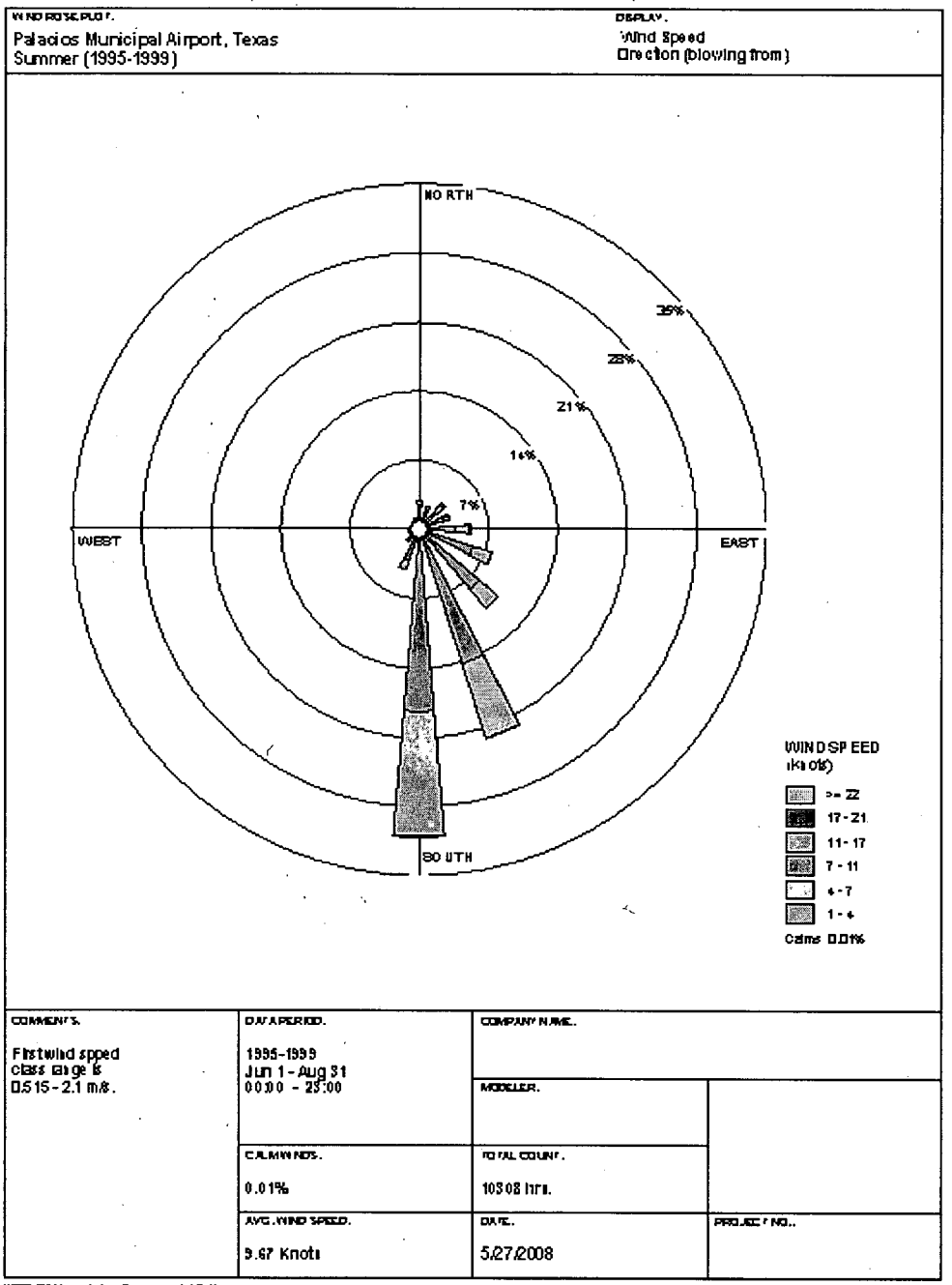
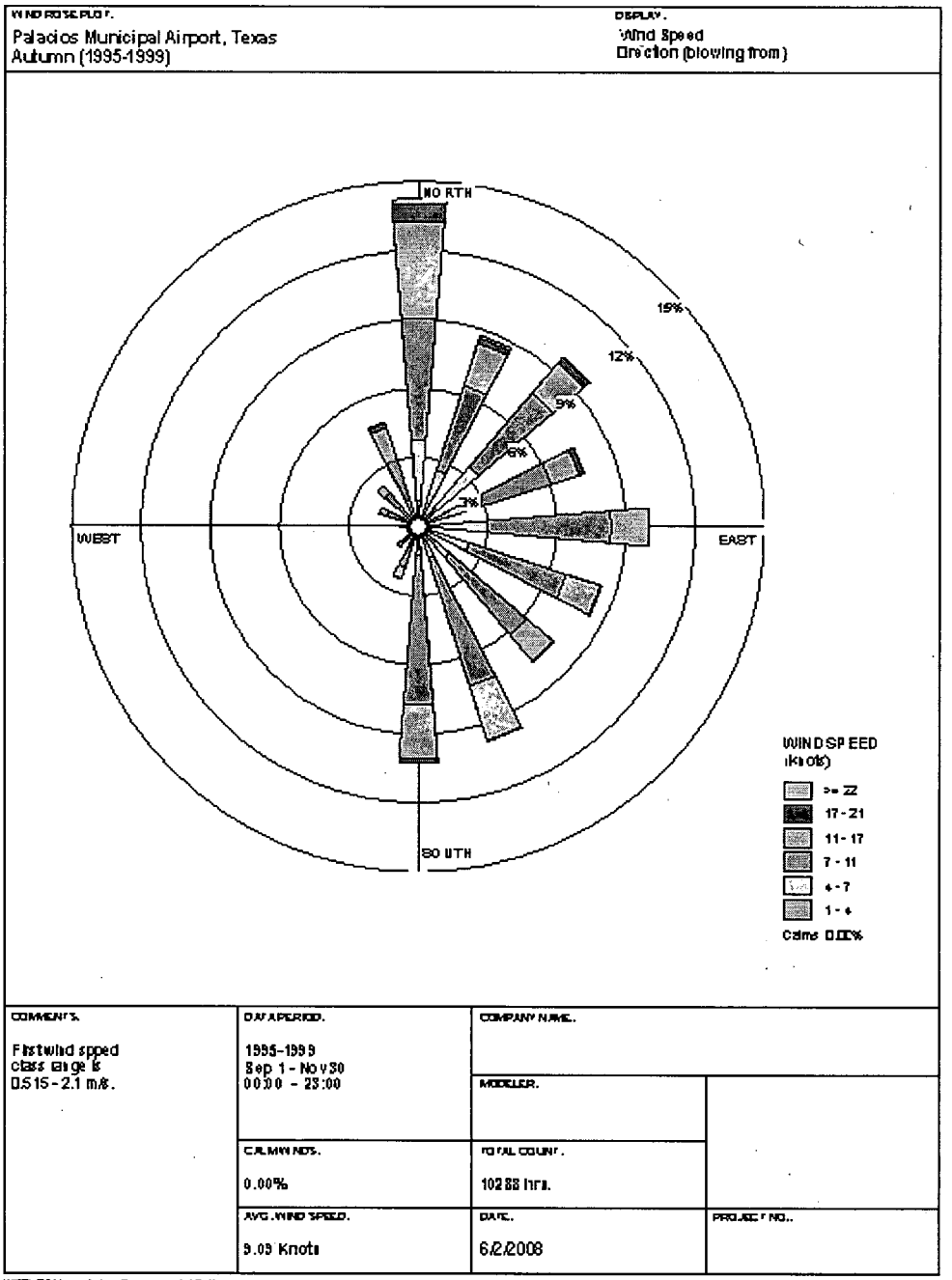


FIGURE 5 Palacios Autumn Season Wind Rose



The second paragraph of FSAR section 2.3S.2.2.1 will be revised as follows:

> Site-specific or micro-scale (i.e., 2 km or less) wind conditions, while they may reflect these larger-scale circulation effects, are ~~generally~~ influenced primarily by local and, generally, to a lesser extent, by meso- or regional-scale (i.e., up to about 200 km) topographic features. Wind measurements at these smaller scales are currently available from the meteorological monitoring program operated in support of STP 1 & 2 and from long-term data recorded at the nearby Victoria, Texas NWS station and shorter-term measurements at the cooperative observation station at Palacios Municipal Airport. Subsection 2.3S.3.3 presents a summary description of the STP onsite monitoring program. In its current configuration, wind direction and wind speed measurements are made at two levels (10-m and 60-m) on an instrumented 60-m guyed tower.

The seventh paragraph of FSAR section 2.3S.2.2.1 will be revised as follows:

> Wind information summarized in the Local Climatological Data (LCD) for the Victoria, Texas NWS station (Table 2.3S-2) over a 25-year period of record indicates a prevailing south-southeasterly wind direction (Reference 2.3S-1) that appears to be similar to the 10-m level wind flow at the STP site, at least on an annual basis (see Figure 2.3S-2). The monthly variation of prevailing wind directions for the Victoria station follows a similar pattern from March through August and November and December, but differs during September, October, January and February. However, the variations for the months of September, October, January and February are most likely due to the much shorter period of record for the STP meteorological data, as compared to Victoria station (Reference 2.3S-1).

The following paragraph will be inserted following paragraph 7:

> Based on the 5-year period of record from 1995 through 1999, wind direction measurements from the cooperative observing station at the Palacios Municipal Airport (Reference 2.3S-27) show reasonably similar characteristics in predominant directions on an annual basis. At both locations, reasonably similar variations in the predominant wind direction sectors over the course of the year are also evident.

The following paragraph will be inserted following paragraph 9 which begins:

"On an annual basis, mean wind speeds at the 10- and 60-meter levels are…

> Mean wind speeds at Palacios for the 5-year period from 1995 through 1999 are similar, although somewhat higher, throughout the year compared to the lower-

level, seasonal and annual wind speeds at the STP site and the Victoria NWS station as summarized in Table 2.3S-6. Mean wind speeds are higher by less than 1.0 m/sec on an annual basis, ranging from 0.4 to 1.3 m/sec higher depending on season and measurement location.

Specific differences in directional frequencies and mean wind speeds may be due to station siting and instrumentation, and to different periods of record among the three stations. Nevertheless, the wind direction and wind speed data show reasonable intermediate-field (Palacios) and far-field (Victoria) similarity to the wind conditions measured at the STP site.

FSAR section 2.3S.6 References will be changed as follows:

2.3S-27 ~~Climate Radar Data Inventory, 1280 Surface Airway Hourly and Airway Solar Radiation Inventory Holdings, Palacios, TX, http:// http://www4.ncdc.noaa.gov/cgi-win/wwwcgi.dll?wwDI~Dataset Search~3280~12935~20024269, accessed on June, 4 2007.~~
National Climatic Data Center, Integrated Surface Hourly Data, 1995-1999, CD-ROM, Volume 8, Central United States of America, NCDC, NESDIS, NOAA, September 2002.

Question 02.03.03-2

QUESTION:

FSAR Section 2.3S.3.2.1.2 states that additional relative humidity/temperature instrumentation were added to the primary meteorological monitoring tower in 2006 to baseline moisture content in the environment for a range of mechanical draft cooling towers to be considered for STP 3 & 4. Please provide a copy of the resulting database once a contiguous year of data has been collected and compare these data to the data used to evaluate cooling tower plume impacts as discussed in FSAR Section 2.3S3.4.1.4.

RESPONSE:

The UHS system described in Revision 1 of the STP 3 & 4 COLA is being modified. The following RAI response applies to the UHS system as currently described in COLA Revision 1. This RAI response will be updated, if necessary, following completion of the UHS system modification, which will be presented in the next revision of the COLA.

Following the addition of relative humidity/temperature instrumentation in December 2006, the STP meteorological data collected onsite was augmented with the measurement of dew point temperature during 2007. STP began collecting the site specific dew point temperature and subsequently a year of data has been collected. A copy of this data is provided in a DVD as an attachment to this letter. This data was compared to the dew point temperature data purchased from the National Climatic Data Center for the Palacios Municipal Airport National Weather Service (NWS) Station. The STP site measured dew point temperature ranged from 13°F to 80°F during 2007, while the NWS dew point temperature ranged from 19°F to 84°F during the year 1997, 9°F to 81°F during the year 1999, and 10°F to 81°F during the year 2000. An annual and monthly comparison of temperature ranges are presented in Table 1. As shown in Table 1 in the attached DVD, the NWS dew point temperature data purchased for the Palacios Municipal Airport NWS Station are generally consistent with the STP site measured dew point temperature data ranges.

No COLA revision is required as a result of this RAI response.

FROM ENCLOSURE 1 - HUMIDITY - TEMP DATA
(ATTACHMENT 4 - QUESTION 02.03.03-2)

Table 1
Comparison of 2007 STP Onsite Dew Point Data with Palacios Municipal Airport NWS Station Data

Dew Point Temperature Range

	<10°F	10°F to 14°F	15°F to 19°F	20°F to 24°F	25°F to 29°F	30°F to 34°F	35°F to 39°F	40°F to 44°F	45°F to 49°F	50°F to 54°F	55°F to 59°F	60°F to 64°F	65°F to 69°F	70°F to 74°F	75°F to 79°F	≥80°F	Total Data Points
Annual																	
2007 STP Site DPT Frequency	0	9	25	95	197	214	419	504	447	422	509	956	1503	2300	1148	1	8749
1997 NWS DPT Frequency	0	0	2	39	97	247	390	344	585	635	640	1108	937	1533	2160	42	8759
1999 NWS DPT Frequency	2	4	35	28	80	216	324	273	417	568	855	1004	940	2088	1923	3	8760
2000 NWS DPT Frequency	0	3	14	34	94	188	335	334	416	432	632	992	884	2337	2050	16	8761
January																	
2007 STP Site DPT Frequency	0	0	0	7	57	60	115	162	103	93	54	38	54	0	0	0	743
1997 NWS DPT Frequency	0	0	2	39	80	120	104	36	56	31	46	132	90	8	0	0	744
1999 NWS DPT Frequency	0	0	19	13	17	63	61	62	41	75	102	164	108	20	0	0	745
2000 NWS DPT Frequency	0	3	13	11	42	85	64	27	49	50	102	193	93	13	0	0	745
February																	
2007 STP Site DPT Frequency	0	0	1	23	64	51	62	72	65	55	65	166	47	0	0	0	671
1997 NWS DPT Frequency	0	0	0	0	0	3	88	98	116	104	79	120	59	5	0	0	672
1999 NWS DPT Frequency	0	0	6	2	20	19	52	17	70	76	107	59	167	77	0	0	672
2000 NWS DPT Frequency	0	0	0	0	2	19	44	40	71	82	85	179	144	30	0	0	696
March																	
2007 STP Site DPT Frequency	0	9	12	33	17	12	22	14	34	55	73	179	282	2	0	0	744
1997 NWS DPT Frequency	0	0	0	0	0	5	15	19	51	83	72	203	220	76	0	0	744
1999 NWS DPT Frequency	0	0	0	1	9	34	18	21	52	66	135	168	181	59	0	0	744
2000 NWS DPT Frequency	0	0	0	0	0	1	39	12	46	60	83	110	181	212	0	0	744
April																	
2007 STP Site DPT Frequency	0	0	0	0	0	3	38	63	49	62	83	152	188	81	0	0	719
1997 NWS DPT Frequency	0	0	0	0	0	5	30	17	50	89	168	161	120	80	0	0	720
1999 NWS DPT Frequency	0	0	0	0	3	7	22	17	28	11	36	88	72	428	8	0	720
2000 NWS DPT Frequency	0	0	0	0	1	15	20	14	19	42	110	156	166	177	0	0	720
May																	
2007 STP Site DPT Frequency	0	0	0	0	0	0	0	0	5	34	47	74	296	287	0	0	743
1997 NWS DPT Frequency	0	0	0	0	0	0	0	0	6	20	42	101	147	335	93	0	744
1999 NWS DPT Frequency	0	0	0	0	0	0	0	0	5	24	13	101	75	381	145	0	744
2000 NWS DPT Frequency	0	0	0	0	0	0	0	0	0	0	1	56	52	388	246	1	744
June																	
2007 STP Site DPT Frequency	0	0	0	0	0	0	0	0	0	0	0	10	52	499	158	0	719
1997 NWS DPT Frequency	0	0	0	0	0	0	0	0	0	0	12	27	36	200	425	20	720
1999 NWS DPT Frequency	0	0	0	0	0	0	0	0	0	0	0	0	0	300	417	3	720
2000 NWS DPT Frequency	0	0	0	0	0	0	0	0	0	0	0	13	14	257	436	0	720

Table 1

Comparison of 2007 STP Onsite Dew Point Data with Palacios Municipal Airport NWS Station Data

	Dew Point Temperature Range																
	<10°F	10°F to 14°F	15°F to 19°F	20°F to 24°F	25°F to 29°F	30°F to 34°F	35°F to 39°F	40°F to 44°F	45°F to 49°F	50°F to 54°F	55°F to 59°F	60°F to 64°F	65°F to 69°F	70°F to 74°F	75°F to 79°F	≥80°F	Total Data Points
								July									
2007 STP Site DPT Frequency	0	0	0	0	0	0	0	0	0	0	0	0	14	377	352	0	743
1997 NWS DPT Frequency	0	0	0	0	0	0	0	0	0	0	0	0	0	80	664	0	744
1999 NWS DPT Frequency	0	0	0	0	0	0	0	0	0	0	0	0	0	218	526	0	744
2000 NWS DPT Frequency	0	0	0	0	0	0	0	0	0	0	0	0	3	252	488	0	743
								August									
2007 STP Site DPT Frequency	0	0	0	0	0	0	0	0	0	0	0	0	8	311	423	1	743
1997 NWS DPT Frequency	0	0	0	0	0	0	0	0	0	0	0	0	28	170	525	21	744
1999 NWS DPT Frequency	0	0	0	0	0	0	0	0	0	0	0	1	10	137	596	0	744
2000 NWS DPT Frequency	0	0	0	0	0	0	0	0	0	0	0	0	3	230	512	0	745
								September									
2007 STP Site DPT Frequency	0	0	0	0	0	0	0	0	0	0	0	16	128	421	154	0	719
1997 NWS DPT Frequency	0	0	0	0	0	0	0	0	0	0	0	56	63	291	309	1	720
1999 NWS DPT Frequency	0	0	0	0	0	0	0	0	9	30	71	117	71	234	188	0	720
2000 NWS DPT Frequency	0	0	0	0	0	0	1	17	45	57	65	38	23	156	305	13	720
								October									
2007 STP Site DPT Frequency	0	0	0	0	0	10	48	43	79	30	75	95	105	197	61	0	743
1997 NWS DPT Frequency	0	0	0	0	0	0	6	17	40	79	37	117	68	236	144	0	744
1999 NWS DPT Frequency	0	0	0	0	0	0	7	31	72	104	96	106	102	183	43	0	744
2000 NWS DPT Frequency	0	0	0	0	0	0	5	36	40	12	40	100	71	388	50	2	744
								November									
2007 STP Site DPT Frequency	0	0	2	9	12	13	59	73	56	31	64	163	197	40	0	0	719
1997 NWS DPT Frequency	0	0	0	0	0	10	35	35	159	139	112	118	67	45	0	0	720
1999 NWS DPT Frequency	0	0	0	0	10	20	19	35	63	112	204	146	73	38	0	0	720
2000 NWS DPT Frequency	0	0	0	0	3	7	33	54	94	62	62	73	84	234	13	0	719
								December									
2007 STP Site DPT Frequency	0	0	10	23	47	65	75	77	56	62	48	63	132	85	0	0	743
1997 NWS DPT Frequency	0	0	0	0	17	104	112	122	107	90	72	73	39	7	0	0	743
1999 NWS DPT Frequency	2	4	10	12	21	73	145	90	77	70	91	54	81	13	0	0	743
2000 NWS DPT Frequency	0	0	1	23	46	61	129	134	52	67	84	74	50	0	0	0	721

Question 02.04.05-1

QUESTION:

(a) Provide the SURGE code and supporting input and output files used to estimate the probable maximum storm surge (PMSS) at the coast near Matagorda, Texas. (b) Provide the input and output files of the HEC-RAS application used to estimate backwater effects corresponding to PMSS values obtained from the SURGE model.

RESPONSE:

For part (a), Microsoft Excel (XL) files, including Visual Basic for Applications (VBA) macros, are provided in the enclosed CD in the subdirectory named "RAI 34 - SURGE" for the four scenarios in "STP_FSAR_2.4S.5_SURGE." These files were validated using the system requirements shown in the 'Readme' worksheets of each XL file. Compatibility was not tested for another machine and the macro may not run correctly on a system with a different configuration. The macro may also not run correctly if the boundary or input conditions are changed.

For part (b), HEC-RAS project files corresponding with the probable maximum storm surge from part (a) are also provided in the enclosed CD. The project files are located in the subdirectory named "HECRAS_SURGE_Halff_Geometry." The HEC-RAS modeling was done with HEC-RAS Version 3.1.3 (Reference 1). The HEC-RAS computer code is a Bechtel standard application program, which has been independently validated by Bechtel. The cross-sectional geometry was the same as used in the Halff model (Reference 2).

References:

1. U.S. Army Corps of Engineers (USACE), 2005, "Hydrologic Engineering Center - River Analysis System, HEC-RAS Model", Version 3.1.3.

2. Halff Associates, Inc., "Flood Damage Evaluation Project", Volume I and Volume II-A through Volume II-D, prepared for the Lower Colorado River Authority and Fort Worth District Corps of Engineers, July 2002.

No COLA Revision is required as a result of this response.

Question 02.04.11-1

QUESTION:

Provide details to support the following statement in FSAR Section 2.4S.11.6, or delete it if it is not a relevant statement here: "The potential effects of all site-related proximity, seismic, and non-seismic information on the postulated worst-case low-flow scenario for the proposed plant site have been considered in establishing the design basis."

RESPONSE:

The third paragraph in FSAR Subsection 2.4S.11.6 that provides the statement "The potential effects of all site-related proximity, seismic, and non-seismic information on the postulated worst-case low-flow scenario for the proposed plant site have been considered in establishing the design basis" is not a relevant statement in this section.

Therefore, the third paragraph under FSAR Subsection 2.4S.11.6 will be removed as follows:

~~The potential effects of all site-related proximity, seismic, and non-seismic information on the postulated worst-case low-flow scenario for the proposed plant site have been considered in establishing the design basis.~~

Question 02.04.12-19

QUESTION:

In FSAR Section 2.4S.12.3.1, "Exposure Point and Pathway Evaluation", the applicant has placed an emphasis on the present day well being a "livestock" well. However, the Shallow Aquifer is an acknowledged source of "livestock and domestic" water. Provide a rationale for limiting discussion of Shallow Aquifer groundwater to "livestock" purposes.

RESPONSE:

The intent of FSAR Section 2.4S.12.3.1 is not to limit the discussion of the use of the Shallow Aquifer groundwater to "livestock" use. The well in question was cited in the discussion because it is the first well encountered in the path of the predominant groundwater flow direction in the Shallow Aquifer. Although this well was assumed to be for livestock use because most domestic wells in the area are installed in the Deep Aquifer – the pathway exposure analysis was not restricted to any particular use for the well.

The effluent concentration limits presented in FSAR Section 2.4S.13 for the well were not for indirect exposure through animals, but for the concentrations in the groundwater at this well location. As stated in FSAR Section 2.4S.13.1.4, effluent concentration limits from 10 CFR Part 20 were applied to exposure points considered in the analysis: "The analysis results indicate that an accidental liquid release of effluents in groundwater would not exceed 10 CFR 20 limits at the Lower Shallow Aquifer exposure points, which are the most likely groundwater exposure routes to be impacted by an accidental release."

It is unlikely that the Coastal Plain Groundwater Conservation District can or would require that domestic water supply wells be installed only in the Deep Aquifer. As a result, the third paragraph of Section 2.4S.12.3.1 of the FSAR will be revised to indicate that the well may be a source of either livestock or domestic water.

> The Upper Shallow Aquifer is the most likely hydrogeologic unit to be impacted by an accidental liquid effluent release onsite. Due to the shallow depth of this unit, a conservative release scenario would be a direct injection of liquid effluent into the Upper and Lower Shallow Aquifer. The Upper Shallow Aquifer has a flow direction toward the southeast, as discussed in Subsection 2.4S.12.2.2. Examination of Figure 2.4S.12-31 indicates that a potential Upper Shallow Aquifer groundwater discharge area would be the unnamed tributary, located to the east of the STP 1 & 2 Essential Cooling Pond (ECP), which flows into Kelly Lake, approximately 7300 ft from STP 3. A second possible discharge area for both the Upper and Lower Shallow Aquifer is at Well 2004120846, which is an 80 ft deep ~~livestock~~ well, located east of the site boundary approximately 9000 ft from STP 3. ~~This pathway assumes the well discharges to stock watering containers and that the groundwater is consumed by livestock, which would be an indirect human exposure pathway.~~ Although the actual use of this well is

believed to be as a livestock well; for the purpose of this exposure point and pathway analysis, it has been assumed that water from this well could also be used for human consumption. Information from Appendix 2.4S.12-A3 indicates this well is estimated to produce 200,000 gallons per year ~~or approximately 0.4 gpm~~. A third possible discharge area for both Shallow Aquifer units would be the Colorado River, approximately 17,800 ft from STP 3.

Question 02.04.13-2

QUESTION:

In FSAR Section 2.4S.13.1.2, Conceptual Model, the applicant describes the exposure as indirect and through animals (livestock). Is this germane to the analysis and results presented? In FSAR Section 2.4S.13.1.2 it is noted that the Shallow Aquifer is used for livestock watering and occasional domestic supply. During the period for which the license being sought, could the off-site well be a domestic well allowing direct exposure? Any changed or new information on the subsurface pathway in FSAR Section 2.4S.12 should be reflected in this and subsequent subsections of FSAR Section 2.4S.13.

RESPONSE:

The description of the conceptual model for exposure provided in FSAR Section 2.4S.13.1.2 had no impact on the exposure pathway analysis, but was stated to postulate the type of exposure expected from use of well 2004120846. This well, installed in the Shallow Aquifer, was assumed to be used for livestock watering in the analysis because most domestic wells in the area are installed in the Deep Aquifer. The effluent concentration limits used in the analysis discussed in FSAR Section 2.4S.13.1.3 do not pertain to indirect exposure through livestock but to direct exposure at the well.

As stated in FSAR Section 2.4S.12.3.1, well 2004120846 was used as a receptor for the Shallow Aquifer because it is the closest well in the area that lies in the prevalent direction of groundwater flow in the Shallow Aquifer – the aquifer most likely to be impacted by a release from the radwaste building. The stated expected concentrations identified in the groundwater at the location of this well, as presented in FSAR Section 2.4S.13.1.2, are independent of the use of the well. As a result, a scenario where a domestic well could be installed at this location or well 2004120846 could be converted from a livestock well to a domestic well would not affect the pathway analysis and conclusion.

No COLA revision is required as a result of this RAI response.

Question 02.04.13-5

QUESTION:

In FSAR Section 2.4S.13.1.3, Analysis of Accidental Releases to Groundwater, and FSAR Section 2.4S.13.4, Compliance with 10 CFR 20, are the effluent concentration limits identified and used in this analysis those for indirect exposure through animals (i.e., livestock) alone? Or, are the comparisons presented made to effluent concentration limits from 10 CFR Part 20, Appendix B, Table 2, Column 2? Please clarify.

RESPONSE:

The comparisons presented in FSAR Section 2.4S.13.1.3 are in reference to the effluent concentration limits from 10 CFR Part 20, Appendix B, Table 2, Column 2. The effluent concentrations limits identified are not for indirect exposure through animals only. As stated in FSAR Section 2.4S.13.1.4, effluent concentration limits from 10 CFR Part 20 were applied to exposure points considered in the analysis: "The analysis results indicate that an accidental liquid release of effluents in groundwater would not exceed 10 CFR 20 limits at the Lower Shallow Aquifer exposure points, which are the most likely groundwater exposure routes to be impacted by an accidental release." Identification of an exposure point as a livestock well did not limit the analysis to exposure to that particular use, but was merely made to identify a likely type of receptor in the area.

The following additions to FSAR Section 2.4S.13.1.2 will be made based on this response.

Seventh paragraph, first bullet:

- Pathway 1: Lower Shallow Aquifer – Flow from the STP 3 area that discharges to a Shallow aquifer livestock watering well (well number 2004120846) located offsite, to the southeast of STP 1 & 2. This pathway assumes that the well captures the effluent release and the well discharges to livestock watering troughs or the well water could be used for domestic or other human consumption.

Eight paragraph, first bullet:

- Pathway 1 terminates as discharge from a pumping well in the Shallow Aquifer. The well is reported to pump 200,000 gallons per year, or 0.4 gpm (Reference 2.4S.13-4). This well would be an indirect exposure pathway through animals (livestock) or direct exposure as a domestic well used for human consumption.

Question 02.04.13-7

QUESTION:

Provide a copy of reference 2.4S.13-7.

RESPONSE:

A copy of reference 2.4S.13-7 is attached.

Savannah River National Laboratory, STP Site Specific Kd Results Report, dated August 20, 2007, was submitted in a letter from MACTEC to Bechtel Power Corporation. Bechtel approved the Kd report and Savannah River National Laboratory (SRNL) signed and issued it final on September 20, 2007. The Kd report has been added to the STP COL Geotechnical Data Report (Revision 1), April 30, 2008, as Attachment H.

A change to the COLA will be made based upon this response. Reference 2.4S.13-7 will be revised to reflect it's inclusion as Attachment H of the STP COL Geotechnical Data Report (Revision 1).

2.4S.13 -7 ~~Savannah River National Laboratory, STP Site Specific Kd Results, Submitted by Correspondence in Letter dated August 31, 2007 from MACTEC to Bechtel Power Corporation.~~ MACTEC Engineering and Consulting, Inc., April 30, 2008 STP COL Geotechnical Data Report (Revision 1), Results of Subsurface Investigation and Laboratory Testing, South Texas Project Units 3 and 4, Matagorda, Texas, Attachment H - Kd Test Results, "Distribution Coefficients for the Combined Construction and Operation License (COL) Application at the South Texas Project Electric Generation Station", Kaplan, D. I., Savannah River National Laboratory.

Question 02.04.14-2

QUESTION:

Describe scenarios of hydrology-related events, if any, that may lead to water levels in the UHS basin dropping below 44.5 ft MSL and discuss the proposed protective measures that prevent these scenarios.

RESPONSE:

The UHS design described in Revision 1 of the STP 3 & 4 COLA is being modified. The following RAI response applies to the UHS design as currently described in COLA Revision 1. This response will be updated, if necessary, following completion of the UHS design modification, which will be presented in the next revision of the COLA.

There are no hydrology-related events that may lead directly to water levels in the UHS basin dropping below 44.5 ft mean seal level (MSL). Hydrology-related events considered for the site are described in Section 2.4S. The UHS is described in Subsection 9.2.5 as designed to withstand the most severe natural phenomena expected. Since the safety design basis of the UHS is intended to preclude its failure under natural phenomena, hydrology-related events are not directly postulated to result in the UHS dropping below 44.5 ft MSL.

An on-site well water system serves as the primary source for makeup water to the UHS. The Main Cooling Reservoir serves as a backup source. The makeup water system is classified as non safety related. Therefore, hydrology-related events such as severe storms, floods, etc., could affect the ability to provide makeup water to the UHS that may lead to water levels in the UHS reaching 44.5 ft MSL. Regardless of the scenario which may result in a loss of makeup capability, technical specifications require that a limiting condition for operation be entered when the level drops below 44.5 ft MSL. The technical specification requirements assure that 30 days minimum of inventory is available in the UHS for long-term cooling. The 30 day duration is adequate to restore the non safety-related makeup water system or to provide alternate means of makeup water to the UHS for any loss of makeup capability, including loss due to hydrology-related events such as severe storm, floods, etc, or loss of makeup capability for any other reason concurrent with the design basis accidents or design basis natural events considered in the UHS design. No further protective measures are necessary to maintain the plant in safe shutdown condition for 30 day duration.

No COLA revision is required as a result of this RAI response.

Question 02.05.01-5

QUESTION:

Section 2.5S.1.1.4.4.5.1 references Section 2.5S.1.1.4.3.3, which appears to actually reference 2.5S.1.1.4.4.3. Likewise, Section 2.5S.1.1.4.4.3 is not correct in cross-referencing Section 2.5S.1.1.4.4.5.1. In addition, Section 2.5S.1.1.4.4.5.2 directs the reader to Section 2.5S.1.1.4.3.4.3 for a review of the Balcones Fault and Luling Fault Zones. This reference is incorrect. Please review and correct the references.

RESPONSE:

A review of the document reveals that there is no Subsection 2.5S.1.1.4.3.3 and that the reference intended is Subsection 2.5S.1.1.4.4.3.

The Quaternary activity of the MEEG fault system is discussed in 2.5S.1.1.4.4.5.1, so the reference in Subsection 2.5S.1.1.4.4.3 (Page 2.5S.1-39) is correct. The sixth paragraph of Subsection 2.5S.1.1.4.4.5.1 will be changed as follows:

> As discussed in Subsection ~~2.5S.1.1.4.3.3~~2.5S.1.1.4.4.3, seismic reflection data suggest that the MEEG is rooted in the Jurassic Louann Salt at maximum depths of 3 to 4 mi (References 2.5S.1-119 and 2.5S.1-133). This suggests that observed late Quaternary displacement and contemporary creep across the MEEG may be driven by movement of salt at depth, indicating that the fault is not accommodating tectonic deformation and thus is not an independent source of moderate to large earthquakes. Presumably, this was the evaluation of the EPRI ESTs, which had access to the pre-1986 literature on the MEEG and did not specifically characterize it as a Quaternary tectonic fault and potentially capable structure. Notwithstanding, Ewing (Reference 2.5S.1-51) commented in a post-EPRI publication that "surface strata are displaced and seismicity suggests continuing deformation" on the MEEG.

The reference in Subsection 2.5S.1.1.4.4.5.2 to Section 2.5S.1.1.4.3.4.3 is incorrect and should be Subsection 2.5S.1.1.4.4.4.3 Tertiary Basement-Involved Faults. The first paragraph of Subsection 2.5S.1.1.4.4.5.2 will be changed as follows:

As discussed in Subsection ~~2.5S.1.1.4.3.4.3~~2.5S.1.1.4.4.4.3, the Balcones Fault and Luling Fault Zones comprise an approximately east-west-trending graben system located about 140 miles northwest of the site. The major displacements on the Balcones Fault are interpreted to have occurred in the late Oligocene-early Miocene (Reference 2.5S.1-129). In a post-EPRI publication, Collins et al. (Reference 2.5S.1-134) reported that downward tapering, wedge-shaped fractures filled with weathered colluvium have been observed along individual faults of the Balcones Zone. Collins et al. (Reference 2.5S.1-134) speculated that the fractures may have formed during surface-rupturing events on the associated faults and subsequently filled with colluvial material. Based on the degree of weathering and soil profile development in the colluvium, Collins et al. (Reference 2.5S.1-134) inferred that the deposits are Pleistocene in age. If the wedges of colluvium are filling fractures that formed during surface-rupturing events on

the Balcones Fault Zone, then the faults generated moderate to large earthquakes during the Quaternary. Collins et al. (Reference 2.5S.1-134) also noted, however, that strands of the Balcones Fault Zone are overlain by unfaulted Quaternary terrace deposits and that these relations suggest the fissure-fill deposits probably are not related to co-seismic faulting. Collins et al. (Reference 2.5S.1-134) concluded that detailed paleoseismic studies of the Balcones Fault Zone are needed to conclusively demonstrate activity or non-activity of the structure during the Quaternary.

Question 02.05.03-4

QUESTION:

Section 2.5S.3 contains numerous references back to Section 2.5S.1 that are incorrect. Please review and correct these references

RESPONSE:

The references in Section 2.5S.3 to subsections in Section 2.5S.1 are incorrect.

The second paragraph of Subsection 2.5S.3.1.2 will be changed as follows:

> As discussed in Subsection ~~2.5S.1.1.4.1.32.5S.1.1.4.4.5.4~~, evidence for Quaternary activity in the form of surface deformation has been documented on some growth faults in the Texas Coastal Plain. As noted by Wheeler (Reference 2.5S.3-6):

The fifth paragraph of Subsection 2.5S.3.1.2 will be changed as follows:

> The assessment of the U.S. Geological Survey (Reference 2.5S.3-6) is, consistent with the data in Subsection 2.5.1 of the STP 1 & 2 UFSAR (Reference 2.5S.3-1) and studies published since the EPRI study (Reference 2.5S.3-3) (see discussion in Subsection ~~2.5S.1.1.4.3.5.32.5S.1.1.4.4.5.4~~), that growth faults are confined to the Coastal Plain section and do not extend into the crystalline basement. The assessment of the U.S. Geological Survey (Reference 2.5S.3-6) that growth faults will not generate significant seismic ruptures also is consistent with the conclusion in Subsection 2.5.1 of the STP 1 & 2 UFSAR (Reference 2.5S.3-1) that the sediments involved in growth faulting do not have sufficient elastic strength to store strain energy that can be released in moderate to large earthquakes.

The sixth paragraph of Subsection 2.5S.3.1.2 will be changed as follows:

> Since the analyses described in the STP 1 & 2 UFSAR (Reference 2.5S.3-1), additional analysis and mapping of the subsurface geology in the site vicinity has been published to document the locations of growth faults. This mapping is tabulated and described in Subsection ~~2.5S.1.2.4.1.2.2.12.5S.1.2.4.2.2.2~~. This mapping supports the analysis and conclusions of the UFSAR regarding the locations of growth faults in the site area, and it specifically indicates that no previously unknown or undocumented growth faults have been identified in the site area.

The first paragraph of Subsection 2.5S.3.2.1 will be changed as follows:

> As shown on Figure 2.5S.1-27, no bedrock faults have been mapped within the STP 3 & 4 site area (Subsection ~~2.5S.1.2.4.1.12.5S.1.2.4.1~~).

The first paragraph of Subsection 2.5S.3.2.2.1 will be changed as follows:

> As discussed in Subsection ~~2.5S.1.2.4.1.2.1~~2.5S.1.2.4.2.1, Subsection 2.5.1.2.5.3 of the STP 1 & 2 UFSAR (Reference 2.5S.3-1) documents the presence of 10 growth faults within the site area. These faults are confined to the Mesozoic and Cenozoic Gulf Coastal Plain stratigraphic section and do not extend into the underlying crystalline basement. Subsection 2.5.1.2.5.3 of the STP 1 & 2 UFSAR presents seismic reflection and borehole data that demonstrate 8 of the 10 growth faults in the site area are buried by 5000 ft. or more of undisturbed sediments that are Miocene in age or younger, indicating that there has been no movement on these 8 faults in the past 5 million years or longer. Two of these growth faults ("A" and "I"; Figure 2.5S.1-43) exhibit evidence for deformation younger than Miocene and can be traced on seismic reflection profiles to within 800 ft. to 1000 ft. or less of the ground surface. The closest approach of growth faults "A" and "I" to the STP site area is approximately 3.0 miles and 3.8 miles, respectively. Subsection 2.5.1.2.5.3 of the STP 1 & 2 UFSAR notes that this depth range is the effective limit of resolution of the seismic reflection data, and thus the reflection data can not be used to assess whether the faults approach closer to the surface than 800 ft. to 1000 ft. Based on field reconnaissance and inspection of a shallow excavation along the western margin of the main cooling water reservoir, Subsection 2.5.1.2.5.3 of the STP 1 & 2 USFAR (Reference 2.5S.3-1) contains conclusions that there is no discrete displacement of the land surface, or of continuous stratigraphic contacts in the shallow subsurface, above the up-dip projections of growth faults "A" and "I."

The first paragraph of Subsection 2.5S.3.2.2.2 will be changed as follows:

> Subsection ~~2.5S.1.2.4.1.2.2~~2.5S.1.2.4.2.2.1 contains discussions of the compiled mapping and subsurface data that document the location and geometry of growth faults in the site area. These data support the mapping of growth faults in the site area documented in Subsection 2.5.1.2.5.3 of the STP 1 & 2 UFSAR (Reference 2.5S.3-1), and do not indicate the presence of any additional growth faults not recognized during the UFSAR investigations for STP 1 & 2. Specifically, there are no previously published data or new data that indicate the presence of growth faults whose surface projection approaches within the site.

The second paragraph of Subsection 2.5S.3.2.2.2 will be changed as follows:

> Subsection ~~2.5S.1.2.4.1.2.2~~2.5S.1.2.4.2.2.2 contains discussions of the compiled mapping and subsurface data that document the location and geometry of growth faults in the site area. These data support the mapping of growth faults in the site area documented in Subsection 2.5.1.2.5.3 of the STP 1 & 2 UFSAR (Reference 2.5S.3-1), and do not indicate the presence of any additional growth faults not recognized during the UFSAR investigations for STP 1 & 2. Specifically, there are no previously published data or new data that indicate the presence of growth faults whose surface projection approaches within the site.

The first paragraph of Subsection 2.5S.3.5 will be changed as follows:

There are no tectonic bedrock faults within the STP site area. Growth faults, which are confined to the Gulf Coastal Plain stratigraphic section and do not involve the basement, have been mapped in the site area and are associated with the Frio fault zone, which has been mapped for a minimum of 500 mi along trend in the Gulf Coastal Plain (see discussion in Subsection ~~2.5S.1.1.4.3.4.22.5S.1.1.4.4.4.2~~). Although the Frio zone of growth faults is regionally extensive, it is designated a "Class B" feature by the U.S. Geological Survey (References 2.5S.3-5 and 2.5S.3-6) because it is unclear that growth faults are capable of producing significant seismic rupture and associated strong vibratory ground motion (see discussion in Subsection ~~2.5S.3.1.1.22.5S.2.1.1.2~~). Subsection 2.5.2.4 of the STP 1 & 2 UFSAR (Reference 2.5S.3-1) concluded that growth faults are not capable of storing significant elastic strain energy to produce moderate to large earthquakes. Consequently, we conclude there is no correlation of geologic structures in the site area to regional, capable tectonic sources.

The first paragraph of Subsection 2.5S.3.8.2.1 will be changed as follows:

The potential for non-tectonic deformation at the STP site from movement on growth faults is negligible. As summarized in Subsection ~~2.5S.1.2.4.1.2.12.5S.1.2.4.2.1~~, previous detailed studies of growth faults in Subsection 2.5.1.2.5.6 of the STP 1 & 2 UFSAR (Reference 2.5S.3-1) documented the absence of growth faults that project to the surface within the STP site. The UFSAR identified only two growth faults within the site area that deform sediments younger than late Miocene. Of these two structures, only growth fault "I" exhibits *prima facie* evidence for Quaternary activity, and the closest approach of the surface projection of growth fault "I" to the STP site is about 3.8 miles. Future activity on growth fault "I," if any, will not impact the STP 3 & 4 site.

Question 05.02.05-1

QUESTION:

5.2.5-1 STD DEP 7.3-12 describes modifications to the Technical Specification limits and alarm Setpoint for Reactor Coolant Pressure Boundary Leakage. The total leakage limit, averaged over the previous 24-hour period is changed from 95 L/min (25 gpm) to 114 L/min (30 gpm); the unidentified leakage limit is changed from 3.785 L/min (1 gpm) to 19 L/min (5 gpm); and a limit of unidentified leakage increase of 8 L/min (2 gpm) within the previous four hour period while in Mode 1 is added. Section 5.2.5.9 of the Tier 2 FSAR states that the changes in total leakage limit and unidentified leakage limit satisfies Position C.9 in Regulatory Guide (RG) 1.45. Please provide information to address how Regulatory Positions C.2 and C.5 in RG 1.45 are satisfied when evaluating this departure. Include this information in the FSAR and/or the departures report (as appropriate), and provide a markup in your response.

RESPONSE:

In NUREG-1503 "Final Safety Evaluation Report Related to the Certification of the Advanced Boiling Water Reactor Design," July 1994, at page 5-11, the NRC found that "The sensitivity and response time for all these primary detection systems is 3.79 L/min (1 gpm) or its equivalent in less than 1 hour, thus satisfying Positions C.2 and C.5 of RG 1.45, Revision 0." Departure STD DEP 7.3-12 did not make any changes to the sensitivity or response time for the primary detection systems. Consequently, NRC's finding that these systems satisfy Positions C.2 and C.5 of RG 1.45, Revision 0 remains valid and effective.

There are no changes to the COLA required by this response.

Question 05.02.05-2

QUESTION:

STD DEP 7.3-12 describes modifications to the alarm setpoints to support Technical specification limits for Reactor Coolant Pressure Boundary Leakage. Regulatory Guide 1.45 (Page 1.45-2) provides guidance on the "detector sensitivity," and states that "sumps and tanks used to collect unidentified leakage and air cooler condensate should be instrumented to alarm for increases of from 0.5 to 1.0 gpm." The sensitivity of 3.785 L/min (1 gpm) claimed by STP, is not demonstrated in the alarm set point, or in the TS limit, and is not explicitly shown being used by operators under any procedures. The staff believes that the alarm limit needs to be set as low as practicable to provide an early warning signal to alert operator taking actions. The staff finds that the proposed leakage alarm setpoint of 19 L/min (5 gpm) is not acceptable because it is not consistent with RG 1.45 and does not serve the intended function of alerting the operator to take actions before the TS limit is reached. Please provide and justify a revised alarm limit for the unidentified leakage. Include this information in the FSAR and/or the departures report (as appropriate), and provide a markup in your response.

RESPONSE:

The indicated sentence in Regulatory Guide (RG) 1.45 (Page 1.45-2) discusses typical industry practices and is not part of the Regulatory Position Section of the RG. The STP 3 & 4 RCS leak monitoring for drywell and secondary containment sumps design meets the regulatory elements of the RG as stated in the COLA. The STP 3 & 4 alarm setpoints are discussed in the COLA and in the discussion below.

Subsection 7.3 of the COLA states "The drain sump instrumentation has a sensitivity of detecting a reactor coolant leakage of 3.785 L/min within a 60 minute period. Alarm setpoints (nominal values) established at 114 L/min for floor and equipment drain sumps (total leakage) to 19 L/min for floor drain sump and 8 L/min for increased floor drain sump flow within the previous four hours." STP 3 & 4 has added the 8 L/min alarm setpoint for increased floor drain sump flow to provide the operator with sufficient information and adequate early warning to ensure leakage does not violate the Technical Specification (TS) limits of 19 L/min and 114 L/min. TS 3.4.3 LCO Action B1 and B2 and Surveillance Requirement 3.4.3.1 and its associated Bases provide the supporting information for this TS limit. It should be noted that the STP 3 & 4 RCS leakage monitoring alarm setpoints are similar to the BWR-6 plants, which have been reviewed and approved by the NRC (Reference: Standard Technical Specifications General Electric Plants, BWR/6, NUREG-1434).

Alarm response procedures will be developed to specify operator actions in response to unidentified leakage rates greater than the alarm setpoint and less than the Technical Specification limit. These procedures will instruct the operators to use available monitoring of parameters such as drywell HCW sump level, drywell cooler drain flow, and airborne particulates to initiate trending while the condition is investigated. These procedures will be completed and available prior to fuel load.

The summary description of STD DEP 7.3-12 in COLA Part 7 will be revised to more clearly state the purpose for the addition of the "increase in unidentified leakage" parameter. The Departure Report of the COLA will be modified as shown below:

In lieu of providing plant-specific Leak-Before-Break analysis drywell leakage rate limits are provided as follows:

- Total leakage averaged over the previous 24-hour period is changed from 95 L/min to 114 L/min
- Unidentified leakage is changed from 3.785 L/min to 19 L/min
- Unidentified leakage increase of 8 L/min within the previous 4-hour period in Mode 1 is added

The 8 L/min increase in 4 hours is a plant computer based control room alarm that will provide an early warning to control room operators so they can take action well below the Technical Specification limit for unidentified leakage of 19 L/min. This alarm initiates on an increase in leakage above normal leakage values.

Question 05.02.05-3

QUESTION:

STD DEP 7.3-12 identifies the departure that changes the unidentified leakage limit from 3.785 L/min to 19 L/min (i.e. from 1 gpm to 5 gpm). The operating experience at Davis Besse indicated that prolonged low level unidentified leakage inside containment could cause material degradation such that it could potentially compromise the integrity of a system leading to the gross rupture of the reactor coolant pressure boundary. In order for the proposed departure to be found acceptable it would require proper compensatory measures (such as new operating procedures in response to leakage rates less than the limit set forth in the plant technical specifications). The applicant should establish a low leakage alarm setpoint that is set at 3.785 L/min (1 gpm) above normal leakage and below the TS limit of 19 L/min (5 gpm) to provide the operator sufficient time to take actions before the TS limit is reached. The applicant should also establish procedures that specify operator actions in response to leakage rates that are less than the limits set fourth in the TS. Please include this information in the FSAR and/or the departures report (as appropriate), and provide a markup in your response.

RESPONSE:

As discussed in the STPNOC response to NRC Question 05.02.05-2, STD DEP 7.3-12 adds a computer based control room alarm set at an increase in unidentified leakage of 8 L/min over the previous 4 hours. This alarm will provide adequate early warning to the operators so that they can take action well before the Technical Specification Limit of 19 L/min. It should be noted that the STP 3 & 4 RCS leakage monitoring alarm setpoints are similar to the BWR-6 operating plants, which have been reviewed and approved by the NRC.

Procedures will be established to specify operator diagnostic and corrective actions to address the alarm. These procedures will be available for NRC review prior to Fuel Load.

Subsection 5.2.5.2.1 will be revised as indicated on the following page:

STD DEP 7.3-12

(1) Drywell Floor Drain Sump Monitoring

The drywell floor drain sump collects unidentified leakage such as leakage from control rod drives, floor drains, valve flanges, closed cooling water for reactor services (e.g. , RIP motor cooling), condensate from the drywell atmospheric coolers , and any leakage not connected to the drywell equipment drain sump. The sump is equipped with two pumps and special instrumentation to measure sump fillup and pumpout times and provide continuous sump level rate of change monitoring with control room indication and alarm capabilities for excessive fill rate or pumpout frequency of the pumps. The drain sump instrumentation has a sensitivity of detecting reactor coolant leakage of 3.785 liter/ min within a 60 minute period. The alarm setpoint has an adjustable range up to 19 liters / min for the drywell floor drain sump. In order to provide early warning of RCS leakage to the operators, a computer based control room alarm is provided that requires operator action with an 8 L/min increase in unidentified leakage over four hours.

Question 05.02.05-4

QUESTION:

COL Information Item 5.1 under Section 5.2.6.1, "Conversion of Indications," in the FSAR addresses the requirement for the applicant to provide procedures and graphs to operations for converting the various indicators into a common leakage equivalent. The applicant's response to COL Information Item 5.1 indicates that surveillance procedures will direct the operator to convert the drywell leakage indications into a common leakage equivalent for unidentified and identified leakage to ensure that leakage requirements in the technical specifications (TS) are met. Furthermore, the applicant states, "The surveillance procedure measures levels in various leakage collection tanks over prescribed time frames and converts these levels into a leakage rate." The staff finds this methodology to be inadequate in the following areas:

(a) Only one of the four leakage detection instrumentation in the plant TS LCO 3.4.5 is addressed. It does not have "various indicators" specified in the COL Information Item. The applicant should specify how the rest of the various indications (i.e., drywell cooler condensate flow, airborne particulate and airborne gaseous radioactivity monitors) conversions to a leakage equivalent will be established and provided to operations as part of the important parameters to be included in the surveillance procedures for determining leakage rates.

(b) The purpose of the COL procedures is not just limited to ensuring the TS limits are met. It also provides operators leakage rates information to take actions in response to low level leakage. (c) The applicant should address when the procedures will be available. Please include this information in the FSAR and provide a markup in your response.

RESPONSE:

Surveillance procedures will be used by the operators to convert the various leakage measurements into a common leakage equivalent. These procedures will use drywell floor drain sump monitoring, airborne particulate, gaseous radioactivity, and drywell air cooler condensate to measure flow rate and will provide for operators to take actions before the Technical Specification limits are reached. The surveillance procedures will be completed and available prior to fuel load.

Section 5.2.6.1 will be revised as follows:

5.2.6.1 Conversion of Indications

The following site-specific supplement addresses COL License Information Item 5.1.

Surveillance procedures convert the drywell leakage indications into a common leakage equivalent for unidentified and identified leakage to ensure that leakage requirements in the

Technical Specifications are met. ~~The surveillance procedure measure levels in various leakage collection tanks over prescribed time frames and coverts these levels into a leakage rate.~~

There are four drywell leakage detection indications:

(1) Drywell floor drain sump monitoring system – The surveillance procedure measures the levels in various leakage collection tanks over prescribed time frames and converts these levels into a leakage rate.
(2) Airborne particulate channel of the drywell fission products monitoring system – The surveillance procedure converts the instantaneous detected radiation level into a leakage rate equivalent.
(3) Gaseous radioactivity channel of the drywell fission products monitoring system – The surveillance procedure converts the instantaneous detected radiation level into a leakage rate equivalent.
(4) Drywell air cooler condensate flow monitoring system – The surveillance procedure measures the flow rate in the drain line and converts this value to a leakage rate.

The surveillance procedures use the measured leakage rates from each of these monitors to determine a total unidentified leakage rate. The conversion of the information from the four leakage detection systems to a total leakage rate is accomplished by computerized programs. The drywell floor drain sump monitor, airborne particulates monitor, and drywell air cooler condensate flow monitor are capable of detecting leakage rates as low as 3.785 liters/min. The procedures include direction to the operators on actions to be taken before the TS limit is reached.

Question 09.01.04-1

QUESTION:

RAI-SRP 9.1.4-SBPB-02 Section 9.1.4.2.7.2, "Auxiliary Platform," of the ABWR DCD describes a maintenance platform at the reactor flange surface for in-vessel inspection and internals servicing. This section also provides details on the construction and installation of the platform. The STP Combined License Application (COLA) Section 9.1.4.2.7.2, "Auxiliary Platform," describes a work platform used to support maintenance activities during a refueling outage. The platform construction and function changed significantly from the information provided in the ABWR DCD. In accordance with SRP 9.1.4, "Light Load Handling System (Related to Refueling)," Section III.1, the reviewer verifies "The SAR information for light load handling equipment, including storage areas, is reviewed to determine whether a seismic event could cause damage to spent fuel or essential equipment. Equipment necessary to preclude inadvertent criticality should be designed consistently with Regulatory Guide (RG) 1.29 Position C.1. Equipment failure of which could damage stored fuel or other equipment essential for plant safety should be designed consistently with RG 1.29 Position C.2." Meeting this RG and applicable position supports compliance with GDC 2. The applicant should provide their evaluation of why this redesign did not require prior NRC approval by addressing the eight conditions of 10 CFR 52, Appendix A, Section VIII.B.5.

RESPONSE:

The description of Auxiliary Platform will be restored to the ABWR DCD description in the next COLA revision. FSAR Section 9.1.4.2.7.2 will be revised as follows:

9.1.4.2.7.2 Auxiliary Platform

~~*The auxiliary platform provides a reactor flange level working surface for in-vessel inspection and reactor internals servicing, and permits servicing access for the full vessel diameter. Typical operations to be performed are inservice inspections. No hoisting equipment is provided with this platform, as this function can be performed from the refueling machine. The platform operates on tracks at the reactor vessel flange level and is lowered into position by the reactor building crane using the dryer/separator strongback. The platform weighs approximately 17.79 kN and features 1.5m wide work areas and motorized travel. The platform power is supplied by a cable from the refueling floor elevation.*~~ ~~The 360 degree Auxiliary Work Platform is a temporary service platform designed to support multiple work scopes during plant refueling and maintenance outages, including in-vessel servicing, inspections, and modifications. The platform allows servicing personnel to perform parallel work scopes inside the reactor vessel.~~

~~The platform is a modular steel truss structure installed over the reactor vessel cavity and supported by structural feet sitting on the cavity ledge. The platform features a centralized access opening that provides access to the reactor vessel internal components. The auxiliary platform features a submerged personnel working area that allows workers to perform invessel activities~~

~~while the refueling machine travels overhead. The refueling mast travels through an access slot in the platform structure aligned with the fuel transfer canal.~~

The auxiliary platform provides a reactor flange level working surface for in-vessel inspection and reactor internals servicing, and permits servicing access for the full vessel diameter. Typical operations to be performed are inservice inspections. No hoisting equipment is provided with this platform, as this function can be performed from the refueling machine. The platform operates on tracks at the reactor vessel flange level and is lowered into position by the reactor building crane using the dryer/separator strongback. The platform weighs approximately 17.79 kN and features 1.5m wide work areas and motorized travel. The platform power is supplied by a cable from the refueling floor elevation.

Question 09.01.04-2

QUESTION:

RAI-SRP 9.1.4-SBPB-03: The STP COLA incorporated by reference Tier 1, Section 2.5.5, "Refueling Equipment," of the ABWR DCD, which stated that the auxiliary platform provided for servicing operations from the vessel flange level. Tier 2, Section 9.1.4.2.7.2, "Auxiliary Platform," of the STP COLA states that the auxiliary platform sits on the cavity ledge, which is inconsistent with the information provided in Section 2.5.5 of Tier 1 of the DCD. Also, Tier 1, Section 2.5.5, "Refueling Equipment," of the ABWR DCD, which is incorporated by reference in the STP COLA, describes the refueling machine as a gantry crane. Tier 2 Section 9.1.4.2.7.1, "Refueling Machine" changed the description of the refueling machine to "similar to a gantry style crane." Thus, there are conflicts between Tier 1 and Tier 2 information. 10 CFR 52, Appendix A, "Design Certification Rule for the U.S. Advanced Boiling Water Reactor" Section II. D. defines Tier 1 information, among other descriptive features, as being derived from Tier 2 information. Please provide clarifying information to reconcile the differences.

RESPONSE:

1. The description of Auxiliary Platform will be restored to the ABWR DCD description in the next COLA revision. FSAR Section 9.1.4.2.7.2 will be revised as shown in the response to RAI 09.01.04-1.
2. The refueling machine is a gantry crane.

FSAR Section 9.1.4.2.7.1 will be revised as follows:

9.1.4.2.7.1 Refueling Machine

The refueling machine~~, that~~ is ~~similar to~~ a gantry ~~style~~ crane, ~~which~~ which is used to transport fuel and reactor components to and from pool storage and the reactor vessel. The machine spans the spent fuel pool on ~~bedded~~ ~~embedded~~ bedded tracks in the refueling floor. A telescoping mast and grapple suspended from a trolley system is used to lift and orient fuel bundles for placement in the core or storage rack. Control of the machine is from an operator station on the refueling ~~floor~~ machine, or in-part from the remote operation panel in the refueling machine remote control room.

Question 09.01.04-3

QUESTION:

RAI-SRP 9.1.4-SBPB-04 Table 9.1-2, "Fuel Servicing Equipment," of the STP COLA changed the safety classification of the refueling machine from Safety Class 2 to non safety-related from the DCD. This same table invokes the quality elements of 10 CFR 50, Appendix B, commensurate with the importance of the requirement function. Section 1.4.4.1, "Inspection," states that "refueling and servicing equipment is subject to the strict controls of quality assurance, incorporating the requirements of 10 CFR 50 Appendix B" with the refueling machine having additional QA verification of compliance to drawing requirements. Table 3.2-1, "Classification Summary," of the ABWR DCD, which was incorporated by reference in the STP COLA, identifies the refueling machine as non safety-related with note (bb). Note (bb) states that "All quality assurance requirements shall be applied to ensure that the design, construction, and testing requirements are met." However, NUREG-0554, "Single Failure Proof Cranes," specifies additional quality assurance elements. Section 9.1.4.2.7.1, "Refueling Equipment," classifies the Refueling Machine as Seismic Class I and meets the requirements of NUREG-0554. NUREG-0544, Section 10, "Quality Assurance," describes the quality assurance program needed to comply with the NUREG-0554. The refueling machine is the only single proof machine listed in Table 9.1-2, "Fuel Servicing Equipment," of the STP COLA. Yet it's quality assurance requirements are not distinguished from the other components listed in the table. The applicant should clarify and identify the quality assurance requirements for the refueling machine ensuring that the interpretive requirements stated in Table 9.1-2 of the STP COLA are restated and in compliance with NUREG-0554 Section 10. Table 3.2-1 should also be in compliance with NUREG-0554.

RESPONSE:

The Quality Assurance Requirements for the Refueling Machine of "E = Elements of 10 CFR 50 Appendix B are generally applied, commensurate with the importance of the requirement function" were consistently specified in approved DCD Table 9.1-2, "Fuel Servicing Equipment," and Table 3.2-1,"Classification Summary," (Principle Component F5) and were not revised in the FSAR.

The application of quality requirements for the refueling machine is distinguished from other equipment in Table 9.1-2 by its function as a single-failure proof crane designed to meet the requirements of NUREG-0554, "Single-Failure-Proof Cranes for Nuclear Power Plants," as described in DCD (FSAR) section 9.1.4.4.1 "Inspection" and in Table 9.1-10, "Single-Failure-Proof Cranes."

STPNOC believes that the current level of detail in the FSAR is sufficient to ensure that quality requirements applied to the refueling machine are consistent with its single failure proof design features. These quality requirements would include for example: (1) design and procurement document control; (2) instructions, procedures, and drawings; (3) control of purchased material, equipment, and services; (4) inspection; (5) testing and test control; (6) non-conforming items; (7) corrective action; and (8) records.

No COLA revision is required as a result of this RAI response.

Question 09.01.04-4

QUESTION:

RAI-SRP 9.1.4-SBPB-05 10 CFR 52.47(b)(1) requires that COLAs contain the proposed inspections, tests, analyses, and acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a facility that incorporates the design certification has been constructed and will be operated in conformity with the design certification, the provisions of the Act, and the Commission's rules and regulations. COL Information Item 9.4 instructs the applicant to provide a confirmatory load drop analysis for the Spent Fuel Racks. The applicant has stated that this is dependent on vendor specific information and will be provided as an FSAR amendment and is captured in COM 9.1-2.
Please explain how capturing the COL Information Item 9.4 in COM 9.1-2 meets the requirements of 10 CFR 52.47(b) (1).

RESPONSE:

10 CFR 50.47 (b) (1) applies to a Design Certification applicant. As evidenced by Appendix A to Part 52, 10 CFR 50.47 (b) (1) has been satisfied for the ABWR.

No COLA revision is required as a result of this RAI response.

Question 09.01.04-5

QUESTION:

STD DEP 9.1-1, "Update of Fuel Storage and Handling Equipment," states that the vacuum sipper was deleted. Figure 9.1-7, "Fuel Pool Vacuum Sipper", was deleted. Yet Section 9.1.4.2.3.5, "Fuel Pool Vacuum Sipper", was modified and remains part of the application. Please explain the apparent inconsistency.

RESPONSE:

1. The Fuel Assembly Sampler will be used instead of the Fuel Pool Vacuum Sipper. Therefore, FSAR Sections 9.1.4.2.3.5, 9.1.4.2.7.3, and 9.1.4.2.10.2.3.4 will be revised and Figure 9.1-11 restored.

FSAR subsection 9.1.4.2.3.5 will no longer be used and is revised as follows:

9.1.4.2.3.5 ~~Fuel Pool Vacuum Sipper~~ Not Used
~~*The fuel pool vacuum sipper (Figure 9.1-7) provides a*~~ is one ~~*means of identifying fuel suspected of having cladding failures. The fuel pool vacuum sipper consists of a fuel isolation container, fluid console, monitoring console with program controller and beta detector and the interconnecting tubing and cables.*~~ ~~The fuel isolation containers are placed in the equipment storage racks.~~ ~~*The suspected fuel assembly is placed in the isolation container. A partial vacuum is established in the gas volume above the fuel assembly. The fission product gas leakage is sensed by the beta detector and monitoring console.*~~

FSAR subsection 9.1.4.2.7.3 will be revised to restore the approved DCD text (italics) with appropriate changes [deletions (strikethroughs) and additions (regular font, underlined text)] as follows:

9.1.4.2.7.3 *Fuel Assembly Sampler* Not Used
The fuel assembly sampler ~~*(Figure 9.1-9)*~~ *provides a means of obtaining a water sample for radiochemical analysis from fuel bundles while installed in the core. The fuel assembly sampler consists of a sampling* ~~*station*~~ head, ~~*two*~~ a *sampling chambers* ~~*and*~~ *interconnecting tubing. The sampling* head consists of two sipping tubes. ~~*chambers are lowered over four adjacent assemblies and samples are obtained of the water in the fuel channels.*~~ The refueling machine grapple with the sampling head is lowered over the fuel in the core to obtain the water samples.

FSAR subsection 9.1.4.2.10.2.3.4 will be revised to restore the approved DCD text (italics) with appropriate changes [deletions (strikethroughs) and additions (regular font, underlined text)] as follows:

9.1.4.2.10.2.3.4 *Fuel Assembly Sampling* ~~Not Used~~

During reactor operation, the core offgas radiation level is monitored. If a rise in offgas activity has been noted, the reactor core may be sampled during shutdown to locate any leaking fuel assemblies. The sipping tube is attached on the refueling machine grapple, water inside the fuel channel is sipped and the fission product gas leakage is sensed by the detector. ~~*The fuel sample isolates up to a four-bundle array in the core. This stops water circulation through the bundles and allows fission products to concentrate if a bundle is defective. After 10 minutes, a water sample is taken for fission product analysis.*~~ *If a defective bundle is found, it is transferred to the spent fuel pool and stored in a special defective fuel storage container to minimize background activity in the spent fuel pool.*

Question 11.04-1

QUESTION:

STD DEP 11.4-1, "Radioactive Solid Waste Update," completely replaces the approved solid waste management system design as approved in the ABWR DCD. The change describes including deleting equipment, adding tanks, and using modular equipment. Section 3 of the Departures Report indicates that this departure has been evaluated and determined to comply with the requirements of 10 CFR 52, Appendix A, Section VIII.B.5. However, because the DCD was completely replaced and the system redesigned, the staff has not been able to find enough information to determine the acceptability of the applicant's evaluation per the requirements in 10 CFR 52, Appendix A, Section VIII.B.5. Provide this evaluation to confirm that the requirements in 10 CFR 52, Appendix A, Section VIII.B.5 have been satisfied.

RESPONSE:

The 10 CFR 52, Appendix A, Section VIII.B.5 screening evaluations were re-created as part of the COLA Rev 2 effort since the previous documents were not available. The evaluation for DEP 11.4-1 is attached.

No COLA revision is required as a result of this response.

10 CFR 52 Review of Proposed COLA Changes (1/3)

U7-P-L02-0001/REV 0	10 CFR 52 Review of Proposed COLA Changes	Form 1		page 1 of 3	
Candidate Change Number 2007011		COLA Part 2 (FSAR) Section 11.4			
1.	Does the proposed change affect Tier 1 information, Tier 2* information, Technical Specifications, bases for the Technical Specifications, or operational requirements?	YES	☐	NO	■
If the answer is "YES", the screen is complete and the change must have prior approval by the NRC. If the answer is "NO", go to Question 2.					
2.	Does the change consist ONLY of format modifications or rewording for clarification and/or editorial correction with no change to meaning or intent?	YES	☐	NO	■
If the answer is "YES", the screen is complete and the change may proceed. If the answer is "NO", go to Question 3.					
3.	Does the proposed change affect ONLY information that is not within the scope of the ABWR DCD?	YES	☐	NO	■
If the answer is "YES", the screen is complete and the change may proceed. If the answer is "NO", continue with the rest of the screening questions below.					
4.	Could the Proposed change result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the plant-specific DCD?	YES	☐	NO	■
5.	Could the proposed change result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system, or component (SSC) important to safety previously evaluated in the plant-specific DCD?	YES	☐	NO	■
6.	Could the proposed change result in more than a minimal increase in the consequences of an accident previously evaluated in the plant-specific DCD?	YES	☐	NO	■
7.	Could the proposed change result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the plant-specific DCD?	YES	☐	NO	■
8.	Could the proposed change create a possibility for an accident of a different type than any evaluated previously in the plant-specific DCD?	YES	☐	NO	■
9.	Could the proposed change create a possibility for a malfunction of an SSC important to safety with a different result than any evaluated previously in the plant-specific DCD?	YES	☐	NO	■
10.	Could the proposed change result in a design basis limit for a fission product barrier as described in the plant-specific DCD being exceeded or altered?	YES	☐	NO	■
11.	Could the proposed change result in a departure from a method of evaluation described in the plant-specific DCD used in establishing the design bases or in the safety analyses?	YES	☐	NO	■
12.	Could there be a substantial increase in the probability of an ex-vessel severe accident such that a particular ex-vessel severe accident previously reviewed and determined to be not credible could become credible?	YES	☐	NO	■
13.	Could there be a substantial increase in the consequences to the public of particular ex-vessel severe accident previously reviewed?	YES	☐	NO	■
If the answer to any of Questions 4 through 13 is "YES," a detailed explanation must be provided on the next page.					
PREPARER (SIGN/PRINT)		DATE			
Robert A Nelson / ROBERT A. NELSON		06/25/08			
INDEPENDENT REVIEWR (SIGN/PRINT)		DATE			
William J Johnson / William J Johnson		06/25/08			

THIS FORM, WHEN COMPLETED, SHALL BE RETAINED AS PART OF THE CHANGE VALIDATION PACKAGE.

10 CFR 52 Review of Proposed COLA Changes (2/3)

U7-P-L02-0001/REV 0	10 CFR 52 Review of Proposed COLA Changes	Form 1		page 2 of 3	
Question number 4-13 for which the answer is "Yes"					
Conclusion: Is prior NRC approval required?		YES	□	NO	■

Detailed Explanation:

This departure (1) changes the Solid Waste Management System from a system using permanent volume reduction and solidification equipment to a mobile dewatering and packaging system and (2) adds additional tanks and pumps.

Evaluation Summary:

1. A standard search of the STP 3 & 4 COLA, DCD, and Technical Specifications and bases was performed for keywords "solid radwaste" and "SWMS." The Tier 1, Tier 2*, technical specifications and bases were reviewed and were found not to be impacted by this departure. Tier 2 Sections 11.4 and 12.2 were found to be impacted by this departure.

2. This departure is a Tier 2 design change and therefore is more than editorial.

3. This departure affects Tier 2 of the DCD.

4. No fundamentally new processes or equipment are introduced by the changes to the Solid Waste Management System (SWMS) and the complexity of the system is reduced (i.e., the incinerator, the dryer, the compactor, and the radwaste solidification system are removed). The limiting accident for the Radwaste Building is the failure of the Low Conductivity Waste (LCW) collector tank and the subsequent airborne release which is described in Section 15.7.3 of the DCD. The capacity of the SWMS tanks is not increased, therefore, the LWC Collector Tank failure remains the limiting accident. Therefore, the proposed change does not result in more than a minimal increase in the frequency of the limiting accident previously evaluated in the plant-specific DCD.

5. No fundamentally different processes or equipment are introduced by the changes to the SWMS. Complex components, which are more prone to malfunction than other components in the SWMS (i.e., incinerator, the dryer, the compactor, and the radwaste solidification system), are removed as part of these changes. Other changes use components that are comparable to those described in the plant-specific DCD. Therefore, the proposed change does not result in more than a minimal increase in the occurrence of a malfunction of a structure, system, or component (SSC) important to safety previously evaluated in the plant-specific DCD.

6. The description of the limiting accident associated with the Radwaste Building, which is described in DCD Section 15.7.3, states that the Radwaste Building is a Seismic Category I Structure. As part of these changes, the Radwaste Building structure will be designed in accordance with the seismic requirements of Regulatory Guide 1.143 and will not be Seismic Category I. However, the tank cubicles are lined with steel to a height capable of retaining the contents of the tank. Therefore, postulated release to the groundwater is not considered credible. Therefore, the proposed change does not result in more than a minimal increase in the consequences of the limiting accident previously evaluated in the plant-specific DCD.

10 CFR 52 Review of Proposed COLA Changes (3/3)

U7-P-L02-0001/REV 0	10 CFR 52 Review of Proposed COLA Changes	Form 1	page 3 of 3

Question number 4-13 for which the answer is "Yes"

7. No fundamentally different processes or equipment are being introduced by the changes to the SWMS. Components, which contain concentrated radionuclides at high temperatures (i.e., the incinerator, the Concentrated Waste Tank, and the dryer), are removed as part of these changes. Other changes use components that are comparable to the design described in the plant-specific DCD. Removal of these systems reduces the potential consequences of a malfunction by eliminating the potential for malfunctions. Therefore, the proposed change does not result in more than a minimal increase in the consequences of the malfunction of a SSC important to safety.

8. No fundamentally new processes or equipment are being introduced by the changes to the SWMS. Therefore, the proposed change does not create the possibility for an accident of a different type than evaluated previously in the plant-specific DCD.

9. No fundamentally new processes or equipment are being introduced by the changes to the SWMS. Therefore, the proposed changes do not create the possibility for a malfunction of an SSC important to safety with a different result than evaluated previously in the plant-specific DCD

10. The changes to the SWMS do not involve any interaction with the fuel, reactor system boundary, or the containment boundary. Therefore, the proposed change does not affect the fission product barrier as described in the plant-specific DCD.

11. The SWMS design basis waste quantities and characteristics are similar to those described in the DCD. The limiting safety analysis for the Radwaste Building is described in Section 15.7.3 of the DCD and the method of performing the analysis does not change. Therefore, the proposed change does not result in a departure from the method of evaluation described in the plant-specific DCD used in establishing the design basis or in safety analysis.

12. The changes to the SWMS do not involve any interaction with fuel, reactor system boundary, or the containment structure or interact directly with systems associated with ex-vessel severe accidents. Therefore, there is no substantial increase in the probability of an ex-vessel severe accident such that a particular ex-vessel severe service accident previously reviewed and determined to be not credible could become credible.

13. The changes to the SWMS do not involve any interaction with fuel, reactor system boundary, or the containment structure or interact directly with systems associated with ex-vessel severe accidents or severe accident mitigation. Therefore, there is no substantial increase in the consequences to the public of a particular ex-vessel severe accident that was previously reviewed.

Question 11.04-2

QUESTION:

STP Section 13.4S "Operational Program Implementation," states that "Descriptions of these operational programs, consistent with the definition of "fully described" in the Staff Requirements Memorandum for SECY-05-0197, are provided in the FSAR sections noted in Table 13.4S-1." On Table 13.4S-1, the Process Control Program (PCP) references application Section 11.4 as the section where this program is "fully described." Please justify how the description contained in Section 11.4 is consistent with the definition of "fully described" or provide additional detail regarding the PCP.

RESPONSE:

Chapter 11, Subsections 11.4.3.1(2) and 11.4.3.1(3) of the FSAR state that the PCP utilized by Units 1 & 2 is provided with the COL application. The PCP governing procedure was provided as Attachment 8 to the COL application. This document is a site procedure that will apply to all operating Units on site, fully describing the Process Control Program. Therefore it will also be utilized for Units 3 & 4. The FSAR will be revised to clarify this as shown below:

11.4.3 Plant-Specific Solid Radwaste Information

(2) The wet waste solidification process and the spent resin and sludge dewatering process will result in products that comply with 10 CFR 61.56 for STP 3 & 4 as provided in Radioactive Waste Process Control Program (PCP). The site PCP utilized by Units 1 & 2 is provided with the COL application, and will be implemented by Units 3 & 4. The latest revision will be provided as per the schedule in Table 13.4S-1.

(3) Establishment and implementation of a process control program (PCP) for the dewatering processing of the spent resins and filter sludges for STP 3 & 4 is provided in Radioactive Waste Process Control Program (PCP). The site PCP utilized by Units 1 & 2 is provided with the COL application, and will be implemented by Units 3 & 4. The latest revision will be provided as per the schedule in Table 13.4S-1.

ATTACHMENT H

Kd TEST RESULTS

CONSISTS OF:

SRNL Report Dated September 20, 2007

Volume 1 of 1

SRNL
SAVANNAH RIVER NATIONAL LABORATORY

Building 773-43A, Room 215

September 20, 2007

Mr. Michael Sufnarski
MACTEC Engineering and Consulting
2801 Yorkmont Road, Suite 100
Charlotte, NC 28208

Subject: Statement of Conformance for the South Texas Project COL Project, Work for Others Agreement WFO-06-015

Dear Mr. Sufnarski:

Attached is the Technical Letter Report summarizing the work conducted for project WFO-06-015. The contents of this document have been design verified by qualified SRNL personnel. The work described in this final Technical Letter Report conforms to the requirements in the above mentioned Work for Others Agreement.

Sincerely:

Daniel I. Kaplan, Ph.D.
Fellow Research Scientist of Environmental Molecular Sciences

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WSRC-STI-2007-00367

KEY WORDS:
Distribution coefficients, cesium, cobalt, iron, nickel, plutonium, and strontium

RETENTION:
Permanent

DISTRIBUTION COEFFICIENTS FOR THE COMBINED CONSTRUCTION AND OPERATING LICENSE (COL) APPLICATION AT THE SOUTH TEXAS PROJECT ELECTRIC GENERATING STATION

Daniel I. Kaplan

AUGUST 20, 2007

Savannah River National Laboratory
Washington Savannah River Company
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SRNL

REVIEWS AND APPROVALS

Daniel I. Kaplan, Author, Environmental & Chemical Processing Technology — Date: 9/20/2007

Kim Crapse, Peer Reviewer, Environmental & Chemical Processing Technology — Date: 9/20/2007

B. T. Butcher, Level 4 Manager, Environmental & Chemical Processing Technology — Date: 9/20/07

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LIST OF ACRONYMS AND ABREVIATIONS

avg	average
CEC	cation exchange capacity
COL	Combined License
ICP-AES	Inductively Coupled Plasma –Atomic Emission Spectroscopy
K_d	distribution coefficient
RSD	relative standard deviation
SRNL	Savannah River National Laboratory
STP	South Texas Project
stdev	standard deviation

ABSTRACT

Soil distribution coefficients, K_d values (the ratio of radionuclide concentration sorbed to the concentration in the aqueous phase), were determined in support of the Combined License application for the South Texas Project Electric Generating Station site in Matagorda County, Texas. Twenty soil samples and twenty representative groundwater samples from the South Texas Project site were provided for the Savannah River National Laboratory to conduct site-specific K_d determinations of cesium (Cs), cobalt (Co), iron (Fe), nickel (Ni), strontium (Sr), and plutonium (Pu). All measurements were conducted in duplicate with gamma emitting radioisotopes of these elements. Additionally, the pH and the cation exchange capacity of the soils were also measured. The median K_d values in units of mL/g were: Cs 227.4, Co 10.6, Fe >1232.8, Ni 37.2, Sr 1.9, and Pu 421.0. pH values of these sediments were remarkably uniform, ranging from 8.57 to 9.33, with a mean pH value of 9.08 ± 0.22. Cation exchange capacity values had a wide range from 0.28 and 12.2 milliequivalent/100 g soil (meq/100g), with a mean of 1.61 ± 2.14 meq/100g. Correlations of soil pH, cation exchange capacity, and Co- Sr-, and Cs-K_d values were calculated; similar correlations with Fe-, Ni, and Pu-K_d values were not permitted due to the presence of greater than numbers. All three K_d values were highly correlated to CEC and pH (probability $\geq$ 0.01, 19 degrees of freedom). The K_d values reported here will provide the necessary sorption data for assessing the risk associated with subsurface movement of Cs, Co, Fe, Ni, Sr, and Pu at the South Texas Project Electric Generating Station site.

1.0 INTRODUCTION

Distribution coefficients, K_d values, when used in reactive transport codes are conditional on the sediment type and groundwater (Krupka et al 1999a). For this reason it is ideal to use K_d values derived from site-specific materials when possible. The objective of this project was to provide site-specific cesium (Cs), cobalt (Co), iron (Fe), nickel (Ni), strontium (Sr), and plutonium (Pu) K_d values for the Combined License (COL) application at the South Texas Project site. Twenty soil samples and twenty groundwater samples from the site were provided for use in this study by MACTEC Engineering (Raleigh, NC). Additionally, soil pH and cation exchange capacity (CEC) were measured.

2.0 MATERIALS AND METHODS

The materials and methods for this project are described in detail in Appendix A. The K_d determinations were based on "ASTM D 4646: Standard test method for 24-hr batch-type measurement of contaminant sorption by soils and sediments" (Appendix A). CEC was measured following the standard procedure, "EPA Method 9081 for Cation-Exchange Capacity of Soils (Sodium Acetate)" (Appendix A). pH was measured by the standard method "ASTM D 4972-01 Standard Test Method for pH of Soils" (Appendix A). The following is a brief description of the materials and methods of this testing to permit understanding of the results.

2.1 MATERIALS

The soil samples and their corresponding groundwater samples from the South Texas Project Electric Generating Station site are described in Table 1. The radionuclides used in the K_d measurements were gamma emitters purchased from Eckert & Ziegler Analytics (Atlanta, Georgia, this company use to be Analytics, Inc.). The radioisotope certifications are provided in Appendix B.

The solid/groundwater suspensions used in the K_d determinations were spiked to yield the following concentrations:

- 1.8e-6 Ci/L ^{57}Co,
- 2.0e-6 Ci/L ^{137}Cs,
- 1.3e-6 Ci/L ^{85}Sr,
- 8.8e-7 Ci/L ^{55}Fe,
- 2.2e-7 Ci/L ^{59}Ni, and
- 4.0e-7 Ci/L ^{238}Pu.

The concentrations of the radionuclides used in these tests were carefully selected so that the concentrations of the spiked solutes would not exceed the linear sorption range. In the linear range, the K_d construct is appropriate to use. At higher concentrations, it is often necessary to use more complicated models, such as the Freundlich model. Another concern with using elevated radionuclide concentrations is the increased likelihood of promoting radionuclide

precipitation. If precipitation occurs, the measurement would incorrectly attribute reversible sorption to the K_d values, where in fact "less reversible" precipitation occurred. (The latter should be described with a solubility constant and not a K_d value.) The tests were conducted at several orders of magnitude lower concentrations than would be necessary for precipitation of these elements. Regarding non-linear sorption, Krupka et al. (1999b) reported that non-linear sorption of Cs occurs at concentrations greater than about 10^{-5} M (or 0.12 Ci/L ^{137}Cs) and Sr at about 10^{-7} M (or 1.2e-3 Ci/L ^{90}Sr).

The magnitude of sorption to geological materials does not vary with isotope. So even if the COL is interested in making transport calculations with different isotopes of the elements mentioned above, the K_d values will remain the same. At these very low concentrations, competition for sorption sites as a result of introducing more than one radionuclide at a time is essentially non-existent.

Table 1. Soil and groundwater pairing used in K_d measurements.

SRNL Tube #	Boring/Sample Number	Ground-water
501	B308/SS15	308-U
502	B308/SS25	308-L
503	B332/SS12	332-U
504	B332/SS23	332-La
505	B348/SS8	348-U
506	B348/SS17	348-L
507	B349/SS14	349-U
508	B349/SS23	349-L
509	B408/SS14	408-U
510	B408/SS22	408-L
511	B438/SS12	438-U
512	B438/SS24	438-L
513	B910/SS14	910-U
514	B910/SS24	910-L
515	B930/SS14	930-U
516	B930/SS27	930-L
517	B933/SS14	933-U
518	B933/SS24	933-L
519	B934/SS15	934-U
520	B934/SS26	934-L

2.2 METHODS

2.3 pH

pH was determined following ASTM D4972-01 (Appendix A). Briefly, 10 g of air-dried soil that had been sieved through a number 10 sieve (2-mm openings) was combined with either 10 mL water or 10 mL 0.01 M $CaCl_2$. These suspensions were mixed and then permitted to stand for 1 h. The pH was then measured with a pH meter. All analyses were conducted in duplicate. Calibration and standards results are discussed in Section 2.6.1.

2.4 CATION EXCHANGE CAPACITY

Cation exchange capacity (CEC) was determined following EPA Method 9081 (Appendix A). Briefly, 4 to 6 g of air dried soil that had been sieved through a number 10 sieve (2-mm openings) was put in contact with a Na^+ solution to saturate the soil exchange sites with Na^+. Then the interstial aqueous Na^+ was washed out of the sediment with isopropyl alcohol. The Na^+ saturated sediment was then put in contact with a NH_4^+ solution to desorb all the Na^+on the soil surface. This NH_4^+ wash, exchanged the adsorbed Na^+ into the aqueous phase, where it was measured by ICP-AES. Aqueous Na^+ concentrations were used to calculate the CEC in units of meq/100 g.

Two CEC QC standards were included for every 10 samples. One QC standard was a blank tube that contained only liquids, sans sediment. It provided a measure of how clean the chemicals were and whether Na may have entered the samples as an experimental artifact. The calculated CEC value was corrected for this background Na concentration. The second CEC QC standard was a SRNL sediment for which the CEC value was known (Subsurface Clayey Sediment: CEC is 5.81 ± 1.03 meq/100 g). QA for the analytical measurement of Na by ICP-AES is described below in Section 2.6.2.

2.5 K_d VALUES

Detailed descriptions of the methods used to measure radioisotope and stable isotope K_d values is presented in Appendix A. Briefly, two near identical sets of measurements were conducted, the first was spiked with ^{57}Co, ^{137}Cs, and ^{85}Sr, and the second was spiked with ^{55}Fe, ^{59}Ni, and ^{238}Pu. These radionuclides were separated in this manner to ease analytical detection of the radionuclides. For both experiments, the soil samples were air dried and then passed through a 2-mm sieve. A 0.5-g aliquot of the dried solid phase was added to a 15-mL centrifuge tube, followed by 12 mL of groundwater. The suspension was mixed overnight to pre-equilibrate the sediments with the groundwater prior to adding the radionuclides. To separate the liquid and solid phases, the tubes were centrifuged and the aqueous phase was decanted and disposed.

Following pre-equilibrating the soil samples, 10 mL of groundwater was added to the tubes followed by 170 µL of the appropriate gamma spike solution (either the $^{57}Co/^{137}Cs/^{85}Sr$ mixture or the $^{55}Fe/^{59}Ni/^{238}Pu$ mixture). Because the background solutions of the spikes were very acidic (~0.1 M HCl for the radioisotopes spike solution and 2% HNO_3 for the Fe and Ru

spike solution), it was necessary to adjust the pH by adding base to each suspensions until the pH returned to approximately that of background. It is important to maintain background pH levels in K_d measurements because pH can influence the extent that radionuclides sorb to sediments. The suspensions were periodically shaken over a two day contact period. At the end of the contact period, the samples were permitted to settle and the aqueous phase was passed through a 0.1 µm filter. The $^{57}Co/^{137}Cs/^{85}Sr$ samples were analyzed by standard high-energy liquid gamma spectroscopy. The $^{55}Fe/^{59}Ni/^{238}Pu$ samples contained low-energy gamma emitters and were first plated before counting by gamma spectroscopy.

All K_d measurements were conducted in duplicate. Three positive controls (spikes only in groundwater, no solid phase added) and two negative controls (groundwater only samples, no soil and no spike were added). Therefore a total of 94 test tubes were prepared for this study:

> For the $^{57}Co/^{137}Cs/^{85}Sr$ K_d determinations: (2 reps x 20 sediments) + 3 positive controls + 2 negative controls = 45 test tubes for the radioisotope study
>
> For the $^{55}Fe/^{59}Ni/^{238}Pu$ K_d determinations: (2 reps x 20 sediments) + 3 positive controls + 4 negative controls = 47 test tubes for the stable isotope study

The three positive controls provided estimates of radionuclide concentrations in the absence of sediment and accounted for any sorption to the labware that may have occurred as an experimental artifact. It provided a direct measure of the radionuclide concentration introduced to the sample. The negative controls provided a measure of how much of the radionuclides were in the native groundwater, either as a cross contaminations during the assay or as an existing contaminant at the study site. All negative controls had below detection limit concentrations of radionuclides. The negative controls were not used in the calculation of K_d values.

The lab notebook used to record the activity of this work was WSRC-NB-2007-00029. This unclassified notebook will be kept "permanently" by the Department of Energy.

There were no problems encountered in sample receipt, login, and analysis. Prior to shipment to SRNL, soil sample B-308 SS-15 was repackaged after the original jar cracked/broke in the field. Based on a thorough visual inspection, no glass pieces were observed in the sample. Subsequent testing of this sample produced no unusual results.

2.6 ANALYTICAL STANDARDS

2.6.1 pH Analyses

pH was measured on a Accumet, AR20 meter. The instrument was calibrated at the start and end of measurements and between every 20 samples. All calibration slopes were within specification, *i.e.*, slopes were >95% and <105% (Table 12). Furthermore, a pH 7.0 buffer was measured before and after calibration, and the difference between these values were always within specification, *i.e.*, <10% (Table 12). A SRNL standard for soil pH (Subsurface Clayey Sediment; pH 4.35 ± 0.15) was analyzed before and after measuring the

STP samples. The measured pH values of the standard were within specifications, *i.e.*, within the standard deviation of the mean (Table 2.

2.6.2 ICP-AES Analyses

ICP-AES was used to measure aqueous Na concentrations for use in the CEC determinations. The ICP-AES calibration procedure used for these measurements are presented in detail in "Perkin-Elmer Optima 3000 ICP-AES" (Manual L16.1, Procedure ADS-1510, Rev. 5, Washington Savannah River Company, Aiken, SC). This document has been submitted and accepted as part of the Document Submittal Requirements for this project. Four calibrations were conducted for the ICP-AES analyses (shown in Appendix C; Table 14). Calibration coefficients had to have a value $\geq$0.995, and they did. All standards had to have a relative standard deviation (RSD) of $\pm$10% before and after calibration, and they did.

2.6.3 Gamma Analyses

The gamma spectroscopy calibration procedure used for this test is presented in detail in "Gamma Sample Preparation and Analysis (γ-PHA)" (Manual L16.1, Procedure ADS-2420, Rev. 4, Washington Savannah River Company, Aiken, SC). This document has been submitted and accepted as part of the Document Submittal Requirements for this project.

The QA standards contained nine peak energies that spanned the gamma energy range of interest. These were measured each working day prior to analyzing any samples. The results from these QA analyses are presented in Appendix C; Table 16. A mark in the QA results in the "Deviation/Flags" column of "In" means the measured value needs to be "investigated", but the instrument is within specifications of the standard. A "Deviation/Flags" comment of "Ac" means the measured value is outside the acceptable range and "action" is required. The "action" flag indicates that the analyses results are unacceptable. During the 12 days of analysis, there were a total of 345 standard energies that were measured, of which four "investigate" flag and zero "action" flags were identified. Since the four "investigate" flags were not three back-to-back days on the same instrument, no action was required. These results indicate that all measurement QA standards were within specification.

3.0 RESULTS

3.1 pH

pH was measured in water and a 0.01 M $CaCl_2$ solution (Table 2; raw data presented in Table 13). pH($CaCl_2$) has an agricultural origin and is less important than the pH(H_2O) when discussing contaminant transport calculations and regulator requirements. As expected the pH($CaCl_2$) is lower than pH(H_2O) due to the exchange of surface protons by the solution Ca^{2+} ions of the former. The pH (H_2O) values had a very narrow range, 8.57 to 9.33, suggesting that the system was buffered by carbonate minerals (Table 3). The mean and median pH(H_2O) values were about the same, pH 9.08 and 9.13, respectively. The pH($CaCl_2$) values also had a very narrow range, but they were lower than the pH(H_2O)

values, 7.93 to 8.32. The two values were strongly correlated; the correlation coefficient (r) was 0.746, which is significant at probability ≤ 0.01 for 19 degrees of freedom (d.f.) (Table 5).

Table 2. Soil pH values.

	pH(H_2O)		pH($CaCl_2$)	
ID #	**Avg**	**Stdev**	**Avg**	**Stdev**
SRNL Std. (4.35 ± 0.15)	4.37	0.12	NA	NA
B308/SS15	8.97	0.04	8.16	0.01
B308/SS25	9.10	0.01	8.15	0.00
B332/SS12	9.27	0.01	8.31	0.02
B332/SS23	8.94	0.01	8.17	0.01
B348/SS8	9.22	0.04	8.17	0.02
B348/SS17	9.23	0.01	8.21	0.00
B349/SS14	9.33	0.00	8.25	0.01
B349/SS23	9.27	0.01	8.18	0.01
B408/SS14	9.06	0.01	8.16	0.02
B408/SS22	9.14	0.01	8.16	0.00
B438/SS12	9.12	0.01	8.15	0.00
B438/SS24	8.63	0.00	8.03	0.02
B910/SS14	8.91	0.28	8.17	0.01
B910/SS24	8.58	0.01	7.95	0.02
B930/SS14	8.91	0.01	8.05	0.00
B930/SS27	9.24	0.03	8.27	0.02
B933/SS14	9.32	0.01	8.20	0.00
B933/SS24	9.23	0.01	8.26	0.01
B934/SS15	9.24	0.04	8.21	0.02
B934/SS26	8.92	0.01	8.30	0.01
SRNL Std. (4.35 ± 0.15)	4.33	0.06	NA	NA

pH measurements conducted in duplicate.

Table 3. Soil pH and CEC descriptive statistics of the 40 measurements.

	pH (H_2O)	pH ($CaCl_2$)	CEC (meq/100g)
Mean	9.08	8.17	1.61
Median	9.13	8.17	0.90
Standard Deviation	0.217	0.0875	2.14
Range	0.76	0.39	11.9
Minimum	8.57	7.93	0.28
Maximum	9.33	8.32	12.2
Count	40	40	40

3.2 CATION EXCHANGE CAPACITY

The CEC values for these soils are presented in Table 4 (the data used to calculate CEC values are presented in Appendix D, Table 15). They tend to be low, characteristic of subsurface aquifer material. The mean CEC was 1.61 ± 2.14 meq/100 g and it had a wide range of values, 0.28 to 12.2 meq/100 g Table 3. Such a wide range is consistent with their divergent appearance, both in color and texture. It is not known why there was an inverse significant relationship between CEC and both pH measurements (Table 5). One possible explanation is that the mineralogy changed with pH, such that the low CEC minerals were more abundant at higher pH values. For example, the abundance of calcite ($CaCO_3$) is closely controlled by pH.

3.3 K_d VALUES

The Co, Cs, and Sr K_d values for the 20 samples are presented in Table 6 (the data used to calculate these K_d values is presented in Table 15 and Table 17). The Fe, Ni, and Pu K_d values are presented in Table 7. The associated descriptive statistics are presented in Table 8. With few exceptions, the standard deviation of duplicate measurements was relatively quite low for Co, Cs, and Sr (Table 6). The standard deviation of the duplicate measurements of Fe, Ni, and Pu (Table 7) were larger, in part due to the presence of greater-than values. The range of the 20 Co and Sr K_d values was relatively small, whereas that of Cs, Fe, Ni, and Pu were appreciably larger (Table 8).

A ranking of K_d values by their median values is:

Sr (1.9 mL/g) < Co (10.6 mL/g) < Cs (227.4 mL/g);

There was approximately an order of magnitude increase between these ranked median K_d value (Table 8). The value of the K_d values at the STP site are quite similar to those at the Savannah River Site and they have similar rankings (Kaplan 2006). At the Savannah River Site, the best estimates for:

- Sr K_d values are 5 mL/g for sandy sediments and 17 mL/g for clayey sediments,
- Co K_d values are 7 mL/g for sandy sediments and 30 mL/g for clayey sediments, and
- Cs K_d values are 50 mL/g for sandy sediments and 250 mL/g for clayey sediments.

Detailed data used to calculate each K_d value, including soil weight and solution volume, are presented in Appendix D (Table 11 and Table 18).

Regression analysis was conducted with the Co, Sr, and Cs K_d values, but not Fe-, Ni-, and Pu K_d values because latter data sets contained less-than values. Sr, Co, and Cs K_d values had very strong correlations to pH, and especially to CEC (Table 9). These correlations are stronger than is commonly measured (Krupka et al. 1999b). The strong correlation with CEC has important implications for the transport models. It suggests that cation exchange is the

dominant process by which these radionuclides sorb to the sediment (as oppose to surface complexation or precipitation). This gives credence for the selection of the K_d construct to describe the geochemical behavior of these radionuclides at the STP site.

Table 4. Cation exchange capacity (meq/100g).

STP Soil	Rep	[Na] (ppm)	CEC (meq/100 g)	avg CEC (meq/100g)	stdev CEC (meq/100g)
B308/SS15	1		0.82	0.749	0.095
	2		0.68		
B308/SS25	1		3.69	3.365	0.466
	2		3.04		
B332/SS12	1		0.47	0.376	0.137
	2		0.28		
B332/SS23	1		0.50	0.632	0.182
	2		0.76		
B348/SS8	1		0.97	0.841	0.177
	2		0.72		
Blank #1[b]	1	2.75			
Std #1 [a]	1		3.30		
B348/SS17	1		0.76	0.822	0.093
	2		0.89		
B349/SS14	1		0.48	0.636	0.219
	2		0.79		
B349/SS23	1		1.36	1.138	0.319
	2		0.91		
B408/SS14	1		0.70	0.726	0.032
	2		0.75		
B408/SS22	1		0.89	0.925	0.043
	2		0.96		
Blank #2[b]	1	1.693			
Std #2 [a]	1		6.65		
B438/SS12	1		2.53	2.072	0.652
	2		1.61		
B438/SS24	1		1.30	0.921	0.541
	2		0.54		
B910/SS14	1		1.19	1.295	0.150
	2		1.40		
B910/SS24	1		7.62	9.889	3.215
	2		12.16		
B930/SS14	1		2.06	2.539	0.684
	2		3.02		
Blank #3[b]	1	<0.237			
Std #3 [a]	1		5.48		
B930/SS27	1		0.49	0.509	0.021
	2		0.52		
B933/SS14	1		2.05	1.928	0.170
	2		1.81		
B933/SS24	1		0.83	0.850	0.023
	2		0.87		
B934/SS15	1		1.26	1.300	0.060
	2		1.34		
B934/SS26	1		0.99	0.750	0.339
	2		0.51		
Blank #4[b]	1	2.21			
Std #4 [a]	1		6.27		

[a] The CEC standard used in this test was created by SRNL. The CEC of this standard, "Subsurface Clayey Sediment" is 5.81 ± 1.03 meq/100 g.
[b] The Blanks were negative controls, without soil. All CEC values were corrected for the Na concentrations in the Blank controls.

Table 5. Correlation coefficients between pH and CEC.

	CEC	pH (H_2O)
pH (H_20)	-0.536[(a)]	
pH ($CaCl_2$)	-0.698[(b)]	0.754[(b)]

[(a)] All coefficients > 0.433, are significant at a probability of ≤ 0.05 (for 19 degrees of freedom).
[(b)] All coefficients > 0.549, are significant at a probability of ≤ 0.01 (for 19 degrees of freedom).

Table 6 . Summary table of Co, Sr, and Cs K_d values for soils collected at the STP site (units: mL/g).

Boring/ Sample No	Ground-water	Rep[a]	Avg. Soil pH (H_2O)[a]	Co Kd	Sr Kd	Cs Kd	Co Kd		Sr Kd		Cs Kd	
							Average	Std. Dev.[a]	Average	Std. Dev.	Average	Std. Dev.
B308/SS15	308-U	1	8.16	14.2	2.3	368.9	13.5	1.0	2.1	0.4	359.9	12.7
		2		12.8	1.8	351.0						
B308/SS25	308-L	1	8.15	13.4	1.8	328.2	17.1	5.3	2.3	0.7	531.7	287.9
		2		20.8	2.8	735.3						
B332/SS12	332-U	1	8.31	6.7	1.4	59.5	6.4	0.3	1.5	0.1	61.0	2.2
		2		6.2	1.6	62.6						
B332/SS23	332-La	1	8.17	8.2	1.6	160.2	8.3	0.1	1.6	0.1	160.1	0.1
		2		8.4	1.5	160.1						
B348/SS8	348-U	1	8.17	11.0	1.7	433.1	10.9	0.1	2.0	0.4	348.1	120.1
		2		10.9	2.4	263.2						
B348/SS17	348-L	1	8.21	9.0	1.3	288.9	9.6	0.8	2.0	1.0	242.6	65.4
		2		10.2	2.6	196.4						
B349/SS14	349-U	1	8.25	9.5	1.5	182.8	7.7	2.5	1.0	0.7	147.4	50.1
		2		6.0	0.6	112.0						
B349/SS23	349-L	1	8.18	15.0	3.1	553.5	13.1	2.7	2.9	0.3	409.5	203.5
		2		11.2	2.7	265.6						
B408/SS14	408-U	1	8.16	16.7	4.3	197.7	15.2	2.0	3.1	1.6	189.1	12.2
		2		13.8	2.0	180.5						
B408/SS22	408-L	1	8.16	13.1	2.6	607.7	11.2	2.6	2.2	0.5	520.0	124.0
		2		9.4	1.8	432.3						
B438/SS12	438-U	1	8.15	14.1	2.1	334.6	12.8	1.8	1.7	0.5	321.0	19.3
		2		11.5	1.4	307.4						
B438/SS24	438-L	1	8.03	6.3	1.6	123.3	5.5	1.2	1.0	0.9	104.0	27.3
		2		4.7	0.3	84.7						
B910/SS14	910-U	1	8.17	9.9	1.3	206.0	10.3	0.5	1.7	0.4	212.1	8.7
		2		10.6	2.0	218.3						
B910/SS24	910-L	1	7.95	24.9	7.1	3017.4	24.1	1.2	6.5	0.8	2994.3	32.6
		2		23.2	5.9	2971.3						
B930/SS14	930-U	1	8.05	12.1	3.5	561.8	11.2	1.3	3.1	0.7	554.5	10.3
		2		10.3	2.6	547.2						
B930/SS27	930-L	1	8.27	6.3	1.6	89.9	5.9	0.6	1.3	0.4	83.3	9.3
		2		5.4	1.1	76.8						
B933/SS14	933-U	1	8.20	14.3	2.9	513.3	14.9	0.8	3.0	0.2	486.2	38.4
		2		15.5	3.1	459.0						
B933/SS24	933-L	1	8.26	5.9	1.3	78.6	5.8	0.1	1.2	0.1	78.5	0.1
		2		5.8	1.1	78.5						
B934/SS15	934-U	1	8.21	6.3	1.3	119.0	6.3	0.1	1.6	0.3	113.1	8.2
		2		6.4	1.8	107.3						
B934/SS26	934-L	1	8.30	6.0	1.3	53.6	6.6	0.9	1.9	0.8	56.5	4.1
		2		7.3	2.4	59.4						

[a] Rep = replicate; Avg. Soil pH (H_2O) = the average (two replicate) pH values of 1:1 soil:water slurries; Std. Dev. = standard deviation

Table 7. Summary table of Fe, Ni, and Pu Kd values (mL/g) (average of two replicates).

Boring/ Sample #	Groundwater	Rep [a]	Avg. Soil pH(H_2O) [a]	Fe K_d	Ni K_d	Pu K_d	Fe K_d		Ni K_d		Pu K_d	
							Average	Std. Dev. [a]	Average	Std. Dev.	Average	Std. Dev.
B308/SS15	308-U	1	8.16	>3264.1	33.1	218.5	>2079.1	1675.9	29.8	4.7	242.8	34.3
		2		>894.1	26.5	267.0						
B308/SS25	308-L	1	8.15	>426.3	40.3	1398.3	>1820.0	1971.0	35.1	7.3	>1037.7	510.0
		2		>3213.7	29.9	>677.1						
B332/SS12	332-U	1	8.31	29.3	88.3	52.7	45.4	22.7	224.4	192.4	65.3	17.8
		2		61.4	360.4	77.9						
B332/SS23	332-La	1	8.17	1481.2	48.7	>1294.7	847.5	896.2	50.2	2.1	>1577.2	399.4
		2		213.8	51.7	1859.6						
B348/SS8	348-U	1	8.17	>948.5	23.4	110.8	>2021.8	1517.9	23.0	0.5	102.3	12.0
		2		>3095.1	22.7	93.8						
B348/SS17	348-L	1	8.21	302.4	44.3	>1163.4	164.0	195.7	113.3	97.6	>962.2	284.6
		2		25.6	182.3	761.0						
B349/SS14	349-U	1	8.25	65.4	264.4	118.3	99.8	48.6	233.9	43.2	109.2	12.9
		2		134.2	203.4	100.1						
B349/SS23	349-L	1	8.18	>1916.8	44.9	2437.0	>1513.5	570.3	39.2	8.2	>2434.2	3.9
		2		>1110.2	33.4	>2431.4						
B408/SS14	408-U	1	8.16	>5763.3	27.2	59.3	>3308.4	3471.7	26.8	0.6	55.4	5.6
		2		>853.6	26.4	51.4						
B408/SS22	408-L	1	8.16	>3193.0	39.1	>684.4	>1880.5	1856.2	31.6	10.7	>979.9	417.8
		2		>567.9	24.0	>1275.3						
B438/SS12	438-U	1	8.15	>906.8	18.8	177.9	>751.9	219.1	20.0	1.7	180.2	3.2
		2		>597.0	21.2	182.5						
B438/SS24	438-L	1	8.03	>3098.2	33.9	627.4	>2447.5	920.2	30.3	5.1	877.6	353.8
		2		>1796.8	26.7	1127.8						
B910/SS14	910-U	1	8.17	74.3	171.3	140.7	289.7	304.7	110.7	85.7	364.5	316.4
		2		505.2	50.1	588.2						
B910/SS24	910-L	1	7.95	>1090.2	>1094.4	>1452.4	>2032.5	1332.7	>567.9	744.6	>1063.4	550.2
		2		>2974.9	41.3	>674.4						
B930/SS14	930-U	1	8.05	>458.9	26.1	808.1	>952.0	697.4	31.0	7.1	1060.8	357.4
		2		>1445.2	36.0	1313.5						
B930/SS27	930-L	1	8.27	33.0	102.4	>1208.8	21.7	16.0	177.6	106.2	>627.3	822.4
		2		10.4	252.7	45.8						
B933/SS14	933-U	1	8.20	>885.3	24.0	61.1	>1780.5	1266.0	25.2	1.7	53.6	10.5
		2		>2675.7	26.4	46.2						
B933/SS24	933-L	1	8.26	41.3	56.3	495.7	40.9	0.7	74.3	25.4	311.7	260.3
		2		40.4	92.3	127.6						
B934/SS15	934-U	1	8.21	>5677.1	27.5	302.3	>3361.0	3275.5	27.9	0.5	477.5	247.8
		2		1044.9	28.2	652.8						
B934/SS26	934-L	1	8.30	9.8	270.2	237.2	15.5	8.1	237.5	46.3	141.8	134.9
		2		21.2	204.7	46.4						

[a] Rep = replicate; Avg. Soil pH (1:1) = the average (two replicate) pH values of 1:1 soil:water slurries; Std. Dev. = standard deviation

Table 8. Descriptive statistics of K_d average values (mL/g).

	Co K_d	Sr K_d	Cs K_d	Fe K_d	Ni K_d	Pu K_d
Mean	10.8	2.2	398.7	>1273.7	>105.5	>636.2
Median	10.6	1.9	227.4	>1232.8	37.2	421.0
Standard Deviation	4.7	1.2	634.0	>1099.1	132.9	>619.9
Range	18.6	5.5	2937.8	>3345.5	>547.8	>2380.6
Minimum	5.5	1.0	56.5	15.5	20.0	53.6
Maximum	24.1	6.5	2994.3	>3361.0	>567.9	>2434.2
Count	20	20	20	20	20	20

Table 9. Correlation coefficients (r) between Co K_d, Sr K_d, Cs K_d, pH, and CEC.

	pH(H_2O)	Co K_d	Sr K_d	Cs K_d
Co K_d	-0.614 [(a)]			
Sr K_d	-0.639 [(a)]	0.874 [(a)]		
Cs K_d	-0.694 [(a)]	0.797 [(a)]	0.911 [(a)]	
CEC	-0.536 [(a)]	0.780 [(a)]	0.867 [(a)]	0.965 [(a)]

[(a)] All coefficients > 0.549, are significant at a probability of ≤ 0.01 (for 19 degrees of freedom).

4.0 REFERENCES

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APPENDIX A. Detailed Description of the Materials and Methods for K_d, CEC, and pH Testing

R&D Directions:
K_d, pH, and CEC Measurements of South Texas Project Sediment Samples

Objective

Measure Co, Cs, Fe, Ni, Pu and Sr K_d values of 20 soils collected from the South Texas Project by MACTEC. Because these K_d values will be used in a reactive transport code as part of a Combined Construction and Operating License (COL) application of the site, all attempts will be made to make the experimental conditions of the tests representative of an accidental release. These measurements will include site-specific soil, site-specific groundwater, and radionuclides concentrations that are in the linear sorption range. The linear sorption range is the lower range in an adsorption isotherm (x-axis: aqueous solute concentration, y-axis: sorbed concentration) before non-linearity occurs (the result of limitations of sorption sites with respect to aqueous radionuclide concentrations).[1] Furthermore, the sediments will be pre-equilibrated with the groundwater prior to spiking with radionuclides, again to minimize "shocking the chemistry" and to provide a measure of steady state conditions, as implied by the K_d construct.

The following K_d method is taken from "ASTM D 4646: Standard test method for 24-hr batch-type measurement of contaminant sorption by soils and sediments."

pH and CEC also have to be analyzed in duplicate. Attached are the procedures for these tests: "EPA Method 9081 for Cation-Exchange Capacity of Soils (Sodium Acetate)" and the ASTM D 4972-01 Standard Test Method for pH of Soils." These properties will be measured following these procedures, thus no write up is necessary. pH has to be measured prior to conducting the K_d measurements because we need to know pH for the K_d test. CEC will be measured after submitting the K_d solutions for gamma analysis.

Materials

1. 20 soil samples from the STP site (Table 1A).
2. 20 STP site groundwater samples
3. radionuclide standards Co-57, Cs-137, Fe-55, Ni-59, Sr-85, and Pu-238 [2] (http://www.analyticsinc.com/prod01.htm)
4. 15-mL centrifuge tubes
5. sandwich baggies
6. large weighing boats
7. 0.1-µm syringe filters

[1] From a risk assessment point of view, it is important not to promote precipitation of the radionuclide by introducing too high a spike concentration into the sediment-groundwater system. This may be construed by regulators and reviewers of the COL application as a **non-conservative** estimate of the sorption capacity of the sediment for the radionuclide. Additionally, this may result in the precipitation of radionuclide to glassware, an experimental artifact that would be difficult (costly) to identify.

[2] The isotopes listed here differ from the isotopes of concern to facilitate measurements and save time. The degree that elements sorb to soil, i.e., their K_d value, do not differ between isotopes of the same element. Therefore the K_d value for Co-60 is the same as Co-57.

8. 0.5-M NaOH
9. pH meter
10. 0.01 M $CaCl_2$
11. Number 270 sieve (2-mm)

Methods

1. **Drying soil.** Mix field-moist sediments in jars. Transfer to a labeled aluminum weighing boats and place on counter top and permit to dry. Pass sediments through a 2-mm (No. 270) sieve.
2. Measure pH as described in procedure ASTM D 4972 01 (See attachment). Record the pH_{water} values in Table 1.
3. Record "Tube Tare (g)" weight (without cap) of labeled 15-mL centrifuge tube as identified in Table 10 and Table 11.
4. Add 0.5±0.01-g of sieved soil to each tube. Weigh and record "Soils (g)"
5. **Equilibrating soils to the groundwater.** Add 12-mL of appropriate groundwater to each tube as defined in Table 1. Put on shaker for overnight. Let sit for 1 hr. Decant liquid. If solids do not separate from the liquid, centrifuge at 15 min 6000 rpm. Then decant liquid. Throw away liquid. Error on the side of leaving liquid in tube rather than accidentally losing clays down the drain. Add 10 mL of appropriate groundwater to each tube. Also add 10-mL groundwater to the five Controls (sample # 521-A, 521-B, 521-C, 522-A, and 522-B). Record weight of each tube in "Tube + soils + Equil + GW (g)"
6. **Adding radionuclides to suspension.** Move rack of tubes to rad hood. Add 170-µL of Fe-55, Ni-59, and Pu-238 spike solution to each tube. Also add this to the No-soil Controls, (sample # 521-A, 521-B, 521-C), but **not** to Blank Controls (522-A, and 522-B). Gently shake or swirl tube sediment and solution in each tube.
7. **pH adjust suspension.** Because the spike solution is in a ~0.1 M HCl solution, you will need to add base to bring the suspensions back to their native pH. Using 0.5 M NaOH and litmus paper, add base to bring pH back to native sediment pH (1:1) noted in Table 1. Record "Final pH" you adjusted tube to.
8. **Equilibrating radionuclides with soil suspension.** Leave samples in rad hood for minimum of 2 days. During this equilibration period, shake rake of tubes twice a day for 10 seconds.
9. Collect liquids by drawing liquids into a syringe and then passing liquid through a 0.1-µm filter.
10. **Gamma Analysis.** Submit to Analytical Development Section for low energy gamma spec analysis. Note in your order, Travel Copy, that this is an expedited order, and the rads of interest are Fe-55, Ni-59, Pu-238, Co-57, Cs-137, and Sr-85.

For Co, Cs, and Sr K_d Measurements

11. Follow same procedure as Steps 1-10 above. Except
    a. Label tubes with an "a;" (e.g., 501a-A, 501a-B, 502a-A) as described in Table 2.
    b. In step 6, instead of adding Fe, Ni, and Pu, add Co-57, Cs-137, and Sr-85.

Safety, Hazards Assessment Package:

SRNL-EST-2006-00-93.

Hazards:

Radionuclides, ~3 mL of strong acids, ~3 mL of strong base

Hazards Mitigation:

Radionuclides: Follow training of Rad Worker II,
Strong Acid: wear appropriate gloves and as always, wear protective eye ware
Strong Base: wear appropriate gloves and as always, wear protective eye ware

Table 10. Sediment descriptions and weights for Fe, Ni, and Pu K_d measurements.

Tube #	Boring/Sample Number	Rep	Ground-water	Sediment pH (1:1)	Tube Tare (g)	Soil (g)	Tube + Soil + Equil + GW (g)	Final pH
Method Step			(5)	(2)	(3)	(4)	(5)	(7)
501-A	B308/SS15	1	308-U					
501-B		2						
502-A	B308/SS25	1	308-L					
502-B		2						
503-A	B332/SS12	1	332-U					
503-B		2						
504-A	B332/SS23	1	332-La					
504-B		2						
505-A	B348/SS8	1	348-U					
505-B		2						
506-A	B348/SS17	1	348-L					
506-B		2						
507-A	B349/SS14	1	349-U					
507-B		2						
508-A	B349/SS23	1	349-L					
508-B		2						
509-A	B408/SS14	1	408-U					
509-B		2						
510-A	B408/SS22	1	408-L					
510-B		2						
511-A	B438/SS12	1	438-U					
511-B		2						
512-A	B438/SS24	1	438-L					
512-B		2						
513-A	B910/SS14	1	910-U					
513-B		2						
514-A	B910/SS24	1	910-L					
514-B		2						
515-A	B930/SS14	1	930-U					
515-B		2						
516-A	B930/SS27	1	930-L					
516-B		2						
517-A	B933/SS14	1	933-U					
517-B		2						
518-A	B933/SS24	1	933-L					
518-B		2						
519-A	B934/SS15	1	934-U					
519-B		2						
520-A	B934/SS26	1	934-L					
520-B		2						
521-A	Spike control	1	308-U					
521-B		2						
521-C		3						
522-A	Blank control	2	308-U					
522-B		3						

Table 11. Sediment descriptions and weights for Co, Cs, and Sr K_d measurements.

Tube #	Boring/Sample Number	Rep	Ground-water	Sediment pH (1:1)	Tube Tare (g)	Soil (g)	Tube + Soil + Equil + GW (g)	Final pH
Method Step			**(5)**	**(2)**	**(3)**	**(4)**	**(5)**	**(7)**
501a-A	B308/SS15	1	308-U					
501a-B		2						
502a-A	B308/SS25	1	308-L					
502a-B		2						
503a-A	B332/SS12	1	332-U					
503a-B		2						
504a-A	B332/SS23	1	332-La					
504a-B		2						
505a-A	B348/SS8	1	348-U					
505a-B		2						
506a-A	B348/SS17	1	348-L					
506a-B		2						
507a-A	B349/SS14	1	349-U					
507a-B		2						
508a-A	B349/SS23	1	349-L					
508a-B		2						
509a-A	B408/SS14	1	408-U					
509a-B		2						
510a-A	B408/SS22	1	408-L					
510a-B		2						
511a-A	B438/SS12	1	438-U					
511a-B		2						
512a-A	B438/SS24	1	438-L					
512a-B		2						
513a-A	B910/SS14	1	910-U					
513a-B		2						
514a-A	B910/SS24	1	910-L					
514a-B		2						
515a-A	B930/SS14	1	930-U					
515a-B		2						
516a-A	B930/SS27	1	930-L					
516a-B		2						
517a-A	B933/SS14	1	933-U					
517a-B		2						
518a-A	B933/SS24	1	933-L					
518a-B		2						
519a-A	B934/SS15	1	934-U					
519a-B		2						
520a-A	B934/SS26	1	934-L					
520a-B		2						
521a-A	Spike control	1	308-U					
521a-B		2						
521a-C		3						
522a-A	Blank control	2	308-U					
522a-B		3						

Designation: D 4972 – 01

Standard Test Method for pH of Soils[1]

This standard is issued under the fixed designation D 4972; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope *

1.1 This test method covers the measurement of the pH of soils for uses other than for corrosion testing. Such measurements are used in the agricultural, environmental, and natural resources fields. This measurement determines the degree of acidity or alkalinity in soil materials suspended in water and a 0.01 *M* calcium chloride solution. Measurements in both liquids are necessary to fully define the soil's pH. This variable is useful in determining the solubility of soil minerals and the mobility of ions in the soil and assessing the viability of the soil-plant environment. A more detailed discussion of the usefulness of this parameter is not warranted here; however, it can be found in many discussions of the subject. A few such discussions are given as Refs (**1-6**)[2] at the end of the text.

1.2 The values given in SI units are to be regarded as the standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials[3]

D 653 Terminology Relating to Soil, Rock, and Contained Fluids[4]

D 1193 Specification for Reagent Water[5]

D 3740 Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction[6]

G 51 Test Method for pH of Soil for Use in Corrosion Testing[7]

3. Terminology

3.1 *Definitions.*

3.1.1 For common definitions of terms used in this standard, refer to Terminology D 653.

4. Summary of Test Method

4.1 Measurement of the pH of soils in both suspensions of water and a calcium chloride solution are made with either a potentiometer using a pH sensitive electrode system (Method A), or pH sensitive paper (Method B). The potentiometer is calibrated with buffer solutions of known pH. The pH sensitive paper is a less accurate measurement and should only be used for a rough estimate of the soil pH. The electrode must be used for this measurement unless the pH sensitive paper is specified.

5. Significance and Use

5.1 The pH of the soil is a useful variable in determining the solubility of soil minerals and the mobility of ions in the soil and assessing the viability of the soil-plant environment.

5.2 pH measurements are made in both water and a calcium chloride solution because the calcium displaces some of the exchangeable aluminum. The low ionic strength counters the dilution effect on the exchange equilibrium by setting the salt concentration of the solution closer to that expected in the soil solution. The pH values obtained in the solution of calcium chloride are slightly lower than those measured in water due to the release of more aluminum ions which then hydrolyses. Therefore, both measurements are required to fully define the character of the soil's pH.

5.3 For the purpose of this test method the test soil must be sieved through a No. 10 sieve (2 mm sieve mesh openings). Measurements on soils or soil fractions having particle sizes larger than 2 mm by this test method may be invalid. If soil or soil fractions with particles larger than 2 mm are used, it must be stated in the report since the results may be significantly different.

5.4 All water used for this test method must be ASTM Type III or better. Type III water is defined by Specification D 1193. It is prepared by distillation, ion exchange, reverse osmosis, or a combination thereof.

6. Interferences

6.1 This test method as measured by a pH probe has possible interferences due to a suspension effect or sedimentation potential. Users interested in a detailed discussion of the

[1] This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.22 on Soil as a Medium for Plant Growth.

Current edition approved Jan. 10, 2001. Published February 2001. Originally published as D 4972 – 89. Last previous edition D 4972 – 95a.

[2] The boldface numbers in parentheses refer to a list of references at the end of the test method.

[3] *Annual Book of ASTM Standards*, Vol 04.02.

[4] *Annual Book of ASTM Standards*, Vol 04.09.

[5] *Annual Book of ASTM Standards*, Vol 11.01.

[6] *Annual Book of ASTM Standards*, Vol 04.08.

[7] *Annual Book of ASTM Standards*, Vol 03.02.

*A Summary of Changes section appears at the end of this standard.

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mechanism of this effect can find it in Refs (5) and (6).

6.2 This effect is the main reason Test Method G 51 can not be used for general measurement of pH outside of that for corrosion analysis. Test Method G 51 measures pH (an aqueous parameter) without adding any aqueous phase to the soil. This results in excessive soil particle-pH probe contact that overestimates the activity of the hydrogen ions in solution and is therefore unacceptable for general soil analysis.

6.3 The suspension effect can be mitigated by careful attention to 10.1.

7. Apparatus

7.1 *Method A, pH Meter*—Potentiometer equipped with glass-calomel electrode system. Follow the manufacturer's instructions for the pH meter used. A silver/silver chloride electrode system or similar is also acceptable.

7.2 *Method B, pH Paper*—pH paper sensitive to a pH range from 1 to 12, with resolution to the nearest 0.2 pH unit.

8. Reagents

8.1 *Purity of Reagents*—Reagent grade chemicals should be used in all tests. Unless otherwise indicated, it is intended that all reagents should conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.[8] Other grades may be used, provided it is first ascertained that the reagent is of sufficient purity to permit its use without lessening the accuracy of the determination.

8.2 *Purity of Water*—All water used for this test method must be ASTM Type III or better. Type III water is defined by Specification D 1193. It is prepared by distillation, ion exchange, reverse osmosis, or a combination thereof.

8.3 *Acid Potassium Phthalate Buffer Solution* (0.05 *M*)—Dissolve 10.21 g (dried 1 h at 105°C) of potassium phthalate in water and dilute to 1 L. The pH of this solution should be 4.0 at 20°C. Protect the solution against evaporation and against contamination with molds. Replace the solution when mold is noticed. The effect of temperature is as follows:

°C	pH
5 to 37	4.0

This illustrates that the pH of the solution does not change over the range in temperature from 5 to 37°C.

8.4 *Calcium Chloride Stock Solution* (1.0 *M*)—Dissolve 147 g of $CaCl_2 \cdot 2H_2O$ in water in a 1-L volumetric flask, cool, dilute to volume with water, and mix.

8.5 *Calcium Chloride Solution* (0.01 *M*)—Dilute 20.0 mL of stock 1.0 *M* $CaCl_2$ solution to 2 L with water. The pH of this solution should be between 5 and 7.

8.6 *Phosphate Buffer Solution* (0.025 *M*)—Dissolve 3.40 g of KH_2PO_4 and 3.55 g of KH_2HPO_4 in water and dilute to 1 L. Dry salts 2 h at 130°C before use. The pH of this solution should be 6.9 at 20°C. The effect of temperature is as follows:

°C	pH
0	7.0
10	6.9
20	6.9
30	6.8
40	6.8

9. Calibration of pH Meter

9.1 Calibrate the pH meter using the acid potassium phthalate and phosphate buffer solutions. Adjustment of the pH meter should follow the manufacturer's direction.

10. Procedure

10.1 When making measurements with the pH electrode, place the electrode into the partially settled suspension to mitigate the suspension effect.

10.2 For both methods, begin with an air dried soil that has been sieved through a No. 10 sieve (2 mm holes) to remove the coarser soil fraction. Air drying the soil is necessary to accomplish sieving and to control the amount of water present at the time of measurement.

10.3 *pH in Distilled Water*—For both methods, weigh out approximately 10 g of air dried soil. Place the soil into a glass container and add approximately 10 mL of water. Mix thoroughly and let stand for 1 h.

10.4 *Method A*—Read pH on pH meter.

10.5 *Method B*—Read pH on pH paper.

10.6 *pH in 0.01 M Calcium Chloride Solution*—For both methods weigh out approximately 10 g of air dried soil. Place the soil into a glass container and add approximately 10 mL of the 0.01 *M* $CaCl_2$ solution. Mix thoroughly and let stand for 1 h.

10.7 *Method A*—Read pH on pH meter.

10.8 *Method B*—Read pH on pH paper.

10.9 The mixture should be at approximately room temperature (15 to 25°C) at the time of pH measurement.

11. Report

11.1 Report the pH of the soil to the first decimal place. Specify which of the pH measurements is in water and which is in the calcium chloride solution. Also specify whether the determinations were made with Method A or Method B. If size fractions other than sieved through the No. 10 sieve are used, it must be stated in the report since the results may be significantly different.

12. Precision and Bias

12.1 *Precision*:

12.1.1 *Within-Laboratory Precision*—The within laboratory standard deviations for Method A are 0.031 (pH units) for the water mixture and 0.139[9] (pH units) for the calcium chloride mixture. Therefore, results of two properly conducted tests in the same or different laboratories should not differ by more than 0.065[9] (pH units) for the water mixture and 0.389 pH units for the calcium chloride mixture. The within-laboratory standard deviations for Method B are 0.189 (pH units) for the water mixture and 0.212[9] (pH units) for the calcium chloride mixture.

[8] *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmaceutical Convention, Inc. (USPC), Rockville, MD.

[9] These data satisfy the IS and D25 requirements outlined in Practice C 670.

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Therefore, results of two properly conducted tests in the same or different laboratories should not differ by more than 0.53 (pH units) for the water mixture and 0.60 pH units for the calcium chloride mixture.

12.1.1.1 The precision of Method A presented was determined by the National Technical Center of the United States Department of Agriculture. In their evaluation they used 174 replicates for the water mixture and 32 replicates in testing the calcium chloride mixture.

12.1.1.2 The precision of Method B presented was determined by the United States Army Environmental Hygiene Agency. In their evaluation they used 25 replicates in testing each mixture.

12.1.2 *Between-Laboratory Precision*—The between-laboratory standard deviation has not been determined for either method. Subcommittee D18.22 is actively seeking data to evaluate the between laboratory precision of this test method.

12.2 *Bias*—There is no accepted reference value for this test method; therefore, bias cannot be determined.

13. Keywords

13.1 acidity; alkalinity; pH; reaction; soil

REFERENCES

(1) Garrels, R. M., and Christ, C. L., *Solutions, Minerals, and Equilibria*, Freeman Cooper, San Francisco, CA, 1965.

(2) Greenland, D. J., and Hayes, M. H. B., *The Chemistry of Soil Processes*, Wiley, New York, NY, 1981.

(3) Sposito, G., *The Thermodynamics of Soil Solutions*, Clarendon, Oxford, United Kindom, 1981.

(4) Dávica, J. T., and Rideal, E. K., *Interfacial Phenomena*, Academic, New York, NY, 1963.

(5) Hunter, R. J., *Zeta Potential in Colloid Science*, Academic, New York, NY, 1981.

(6) Perrin, D. D., and Dempsey, B., *Buffers for pH and Metal Ion Control*, Chapman and Hall, London, United Kindom, 1974.

SUMMARY OF CHANGES

This section identifies location of changes to this practice since the last edition.

(1) Added Practice D 3740 and Terminology D 653 to Referenced Documents.

(2) Added Section 3 on Terminology.

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METHOD 9081

CATION-EXCHANGE CAPACITY OF SOILS (SODIUM ACETATE)

1.0 SCOPE AND APPLICATION

1.1 Method 9081 is applicable to most soils, including calcareous and noncalcareous soils. The method of cation exchange capacity by summation (Chapman, 1965, p. 900; see Paragraph 10.1) should be employed for distinctly acid soils.

2.0 SUMMARY OF METHOD

2.1 The soil sample is mixed with an excess of sodium acetate solution, resulting in an exchange of the added sodium cations for the matrix cations. Subsequently, the sample is washed with isopropyl alcohol. An ammonium acetate solution is then added, which replaces the adsorbed sodium with ammonium. The concentration of displaced sodium is then determined by atomic absorption, emission spectroscopy, or an equivalent means.

3.0 INTERFERENCES

3.1 Interferences can occur during analysis of the extract for sodium content. Thoroughly investigate the chosen analytical method for potential interferences.

4.0 APPARATUS AND MATERIALS

4.1 Centrifuge tube and stopper: 50-mL, round-bottom, narrow neck.

4.2 Mechanical shaker.

4.3 Volumetric flask: 100-mL.

5.0 REAGENTS

5.1 Sodium acetate ($NaOAc$), 1.0 N: Dissolve 136 g of $NaC_2H_3O_2 \cdot 3H_2O$ in water and dilute it to 1,000 mL. The pH of this solution should be 8.2. If needed, add a few drops of acetic acid or NaOH solution to bring the reaction of the solution to pH 8.2.

5.2 Ammonium acetate (NH_4OAc), 1 N: Dilute 114 mL of glacial acetic acid (99.5%) with water to a volume of approximately 1 liter. Then add 138 mL of concentrated ammonium hydroxide (NH_4OH) and add water to obtain a volume of about 1,980 mL. Check the pH of the resulting solution, add more NH_4OH, as needed, to obtain a pH of 7, and dilute the solution to a volume of 2 liters with water.

5.3 Isopropyl alcohol: 99%.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 All samples must be collected using a sampling plan that addresses the considerations discussed in Chapter Nine of this manual.

7.0 PROCEDURE

7.1 Weigh 4 g of medium- or fine-textured soil or 6 g of coarse-textured soil and transfer the sample to a 50-mL, round-bottom, narrow-neck centrifuge tube. (A fine soil has >50% of the particles ≤0.074 mm, medium soil has >50% ≥0.425 mm, while a coarse soil has more than 50% of its particles ≥2 mm.

7.2 Add 33 mL of 1.0 N NaOAc solution, stopper the tube, shake it in a mechanical shaker for 5 min, and centrifuge it until the supernatant liquid is clear.

7.3 Decant the liquid, and repeat Paragraph 7.2 three more times.

7.4 Add 33 mL of 99% isopropyl alcohol, stopper the tube, shake it in a mechanical shaker for 5 min, and centrifuge it until the supernatant liquid is clear.

7.5 Repeat the procedure described in Paragraph 7.4 two more times.

7.6 Add 33 mL of NH_4OAc solution, stopper the tube, shake it in a mechanical shaker for 5 min, and centrifuge it until the supernatant liquid is clear. Decant the washing into a 100-mL volumetric flask.

7.7 Repeat the procedure described in Paragraph 7.6 two more times.

7.8 Dilute the combined washing to the 100-mL mark with ammonium acetate solution and determine the sodium concentration by atomic absorption, emission spectroscopy, or an equivalent method.

8.0 QUALITY CONTROL

8.1 All quality control data should be maintained and available for easy reference or inspection.

8.2 Employ a minimum of one blank per sample batch to determine if contamination or any memory effects are occurring.

8.3 Materials of known cation-exchange capacity must be routinely analyzed.

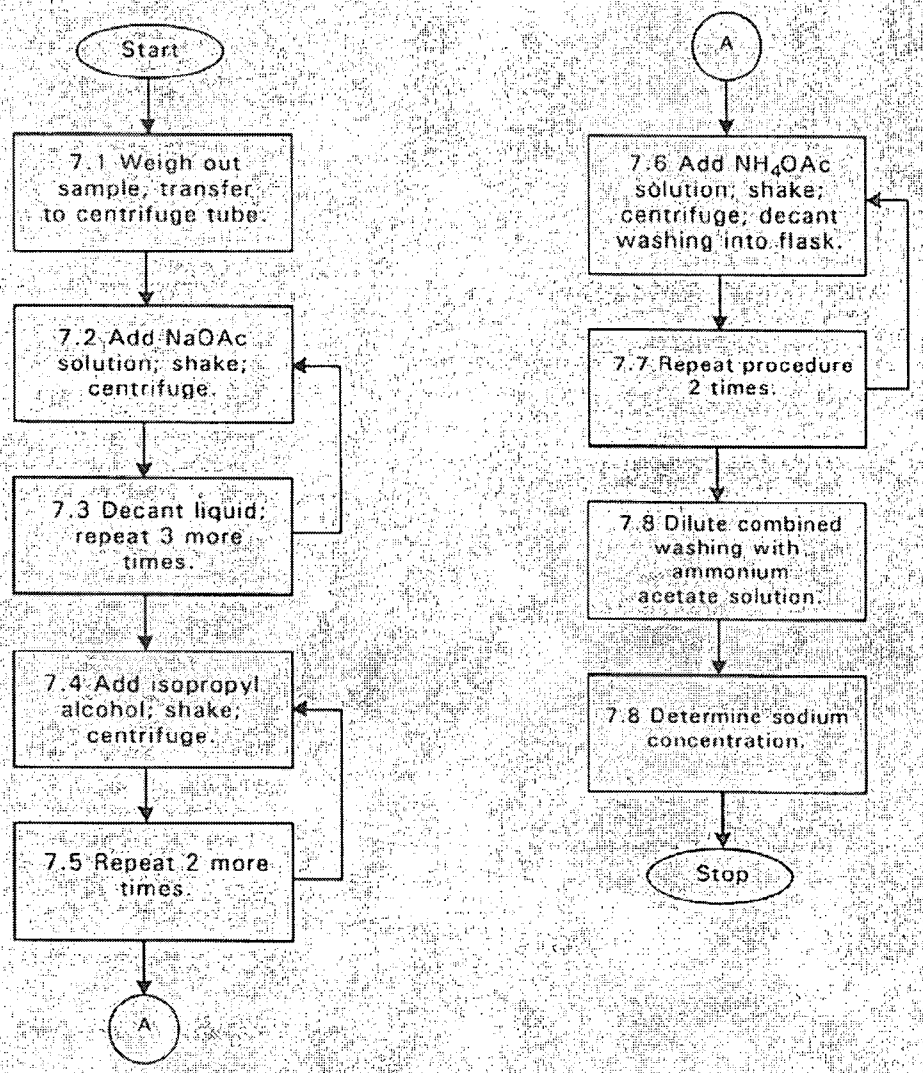
9.0 METHOD PERFORMANCE

9.1 No data provided.

10.0 REFERENCES

10.1 This method is based on Chapman, H.D., "Cation-exchange Capacity," pp. 891-900, in C.A. Black (ed.), Method of Soil Analysis, Part 2: Chemical and Microbiological Properties, Am. Soc. Agron., Madison, Wisconsin (1965).

METHOD 9081
CATION EXCHANGE CAPACITY OF SOILS (SODIUM ACETATE)



APPENDIX B. RADIOISOTOPE CERTIFICATION

Eckert & Ziegler
Analytics

[illegible]

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

75279-147

Co-57 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated with an ionization chamber that was calibrated by the National Physical Laboratory, Teddington, U.K., and is directly traceable to national standards.

Radionuclide purity and calibration were checked with a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Co-57
ACTIVITY (Bq):	1.000 Bq
HALF-LIFE:	271.79 days
CALIBRATION DATE:	June 14, 2007 12:00 EST
RELATIVE EXPANDED UNCERTAINTY (k=2):	1.7%

Impurities: Impurities <0.1%

5.0210 grams 0.1M HCl Solution with 30 µg/g Co carrier.

P O NUMBER 4500[illegible], Item 2

SOURCE PREPARED BY: [signature]
M. I. Tashaeva, Radiochemist

Q A APPROVED: [signature] 6-28-07

Corporate Office
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Laboratory
[illegible]

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CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

TS275-147

Sr-85 10 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated with an ionization chamber that was calibrated by the National Physical Laboratory, Teddington, U.K., and is directly traceable to national standards.

Radionuclide purity and calibration were checked with a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Sr-85
ACTIVITY (Bq):	1.049 MB
HALF-LIFE:	64.84 days
CALIBRATION DATE:	June 14, 2007 12:00 EST
RELATIVE EXPANDED UNCERTAINTY (k=2):	1.7%

Impurities: γ-impurities <0.1%

10.0018 grams 0.1M HCl solution with 10 µg/g Sr carrier.

P O NUMBER ACE01070, Item 1

SOURCE PREPARED BY: N. I. Tankaeva, Radiochemist

Q A APPROVED: 6/14/07

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Analytics

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[illegible]
[illegible]
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CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

[illegible]

Cs-137 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated with an ionization chamber that was calibrated by the National Physical Laboratory, Teddington, U.K., and is directly traceable to national standards.

Radionuclide purity and calibration were checked with a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Program as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Cs-137
ACTIVITY (Bq):	1.920 MB
HALF-LIFE:	3.007 E1 years
CALIBRATION DATE:	June 14, 2007 12:00 EST
RELATIVE EXPANDED UNCERTAINTY (k=2):	1.7%

Impurities: γ-impurities <0.1%

5.01021 grams 0.1M HCl solution with 10 mg/g Cs carrier.

P O NUMBER: A2501976, Item 7

SOURCE PREPARED BY: [illegible]
N. I. Teskaeva, Radiochemist

Q A APPROVED: [illegible] 6-14-07

Corporate Office
[illegible]

Laboratory
[illegible]

Eckert & Ziegler
Analytics

[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

75283-147

Pu-238 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting and alpha spectroscopy. The calibration was checked by liquid scintillation counting after source preparation.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Pu-238
ACTIVITY (Bq):	3.940 E4
HALF-LIFE:	87.7 years
CALIBRATION DATE:	June 14, 2007 13:00 EDT
RELATIVE EXPANDED UNCERTAINTY (k=2):	2.0%

Impurities: γ-impurities <0.1%; α-impurities <0.3%

5.47830 grams 3M HNO_3 solution.

P O NUMBER A260170, Item 11

SOURCE PREPARED BY: [illegible]
M. I. Tsakanova, Radiochemist

Q A APPROVED: [illegible] 6-14-07

Corporate Office
[illegible]

Laboratory
[illegible]

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
(404) 352-8673
Fax (404) 352-2837
www.analytics.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

T5801-147

Ni-59 10 mL Liquid in Flame Sealed Vial.

This standard radionuclide source was prepared gravimetrically from a calibrated master liquid radionuclide solution source. The master source was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Ni-59
ACTIVITY (Bq):	3,881 E3
HALF-LIFE:	7.600 E4 years
CALIBRATION DATE:	June 14, 2007 12:00 EST
RELATIVE EXPANDED UNCERTAINTY (k=2):	4.5%

Impurities: γ-impurities <0.1%

9.99980 grams 0.1M HCl solution with 30 mg/g DI carrier.

P.O. NUMBER: AC011070, Item 10.

SOURCE PREPARED BY: N. I. Tankaeva, Radiochemist

Q.A. APPROVED: 6-14-07

Eckert & Ziegler
Analytics

[illegible]
Atlanta, Georgia [illegible]
Tel [illegible]
Fax [illegible]
www.analytics.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

75200-107

Fe-55 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master liquid radionuclide solution source. The master source was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay data for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Fe-55
ACTIVITY (kBq):	1.207 MB
HALF-LIFE:	1001.0 days
CALIBRATION DATE:	June 14, 2007 13:00 EST
RELATIVE EXPANDED UNCERTAINTY (K=2):	1.5%

Impurities: γ-impurities <0.1%

5.12918 grams 0.1M HCl solution with 10 µg/g Fe carrier.

P.O NUMBER AC001070, Item 9

SOURCE PREPARED BY: [illegible]
H. I. Tanakawa, Radiochemist

Q.A APPROVED: [illegible] 6-19-07

Corporate Office
[illegible]
[illegible]

Laboratory
[illegible]

APPENDIX C. Gamma Spectroscopy, ICP-AES, and pH Sample and QA Results

Table 12. pH calibration results.

Calibration Trial	Pre-calibration pH	Slope (%)	Post-calibration pH
A	7.03	98.7	7.03
B	7.03	97.8	7.03
C	7.02	97.5	7.03
D	7.01	97.0	7.02

[a] Calibrations were conducted at the start and end of measurements and after every 20 sample analyses.
[b] Calibration slopes <95% and >105% are deemed unacceptable. Differences in "Pre-calibration pH" and "Post-calibration pH" greater than 10% are deemed unacceptable. All calibration slopes and differences between pre- and post-calibration pH reading were acceptable.

Table 13. pH data.

TUBE	ID NUMBER	Repli-cate	pH (H_2O)	pH ($CaCl_2$)	pH avg (H_2O)	pH stdev (H_2O)	pH avg ($CaCl_2$)	pH stdev ($CaCl_2$)
STD 1	*Subsurf. Clayey Std*	1	4.37					
501-a	B308/SS15	1	8.94	8.15	8.97	0.04	8.16	0.01
501-b	B308/SS15	2	8.99	8.17				
502-a	B308/SS25	1	9.09	8.15	9.10	0.01	8.15	0.00
502-b	B308/SS25	2	9.1	8.15				
503-a	B332/SS12	1	9.26	8.32	9.27	0.01	8.31	0.02
503-b	B332/SS12	2	9.28	8.29				
504-a	B332/SS23	1	8.93	8.16	8.94	0.01	8.17	0.01
504-b	B332/SS23	2	8.94	8.17				
505-a	B348/SS8	1	9.19	8.18	9.22	0.04	8.17	0.02
505-b	B348/SS8	2	9.24	8.15				
506-a	B348/SS17	1	9.24	8.21	9.23	0.01	8.21	0.00
506-b	B348/SS17	2	9.22	8.21				
507-a	B349/SS14	1	9.33	8.24	9.33	0.00	8.25	0.01
507-b	B349/SS14	2	9.33	8.26				
508-a	B349/SS23	1	9.27	8.17	9.27	0.01	8.18	0.01
508-b	B349/SS23	2	9.26	8.18				
509-a	B408/SS14	1	9.07	8.17	9.06	0.01	8.16	0.02
509-b	B408/SS14	2	9.05	8.14				
510-a	B408/SS22	1	9.14	8.16	9.14	0.01	8.16	0.00
510-b	B408/SS22	2	9.13	8.16				
511-a	B438/SS12	1	9.11	8.15	9.12	0.01	8.15	0.00
511-b	B438/SS12	2	9.12	8.15				
512-a	B438/SS24	1	8.63	8.01	8.63	0.00	8.03	0.02
512-b	B438/SS24	2	8.63	8.04				
513-a	B910/SS14	1	8.71	8.16	8.91	0.28	8.17	0.01
513-b	B910/SS14	2	9.1	8.18				
514-a	B910/SS24	1	8.59	7.93	8.58	0.01	7.95	0.02
514-b	B910/SS24	2	8.57	7.96				
515-a	B930/SS14	1	8.9	8.05	8.91	0.01	8.05	0.00
515-b	B930/SS14	2	8.91	8.05				
516-a	B930/SS27	1	9.22	8.25	9.24	0.03	8.27	0.02
516-b	B930/SS27	2	9.26	8.28				
517-a	B933/SS14	1	9.31	8.2	9.32	0.01	8.20	0.00
517-b	B933/SS14	2	9.33	8.2				
518-a	B933/SS24	1	9.22	8.25	9.23	0.01	8.26	0.01
518-b	B933/SS24	2	9.24	8.26				
519-a	B934/SS15	1	9.21	8.19	9.24	0.04	8.21	0.02
519-b	B934/SS15	2	9.26	8.22				
520-a	B934/SS26	1	8.91	8.29	8.92	0.01	8.30	0.01
520-b	B934/SS26	2	8.93	8.3				
STD 2	*Subsurf. Clayey Std*	1	4.28					

Table 14. Na ICP-AES standards results (used for CEC analyses).

Sample IDs	Wavelength (nm)	Calibration Coefficient	Before QC (ppm)	After QC (ppm)
300241021-032	Na 589.592	0.999988613	5.12	5.11
300241252-263	Na 589.592	0.999997831	5.03	4.69
300241264-274	Na 589.592	0.999995106	5.31	4.83
300240736-747	Na 589.592	0.999998566	5.18	5.13

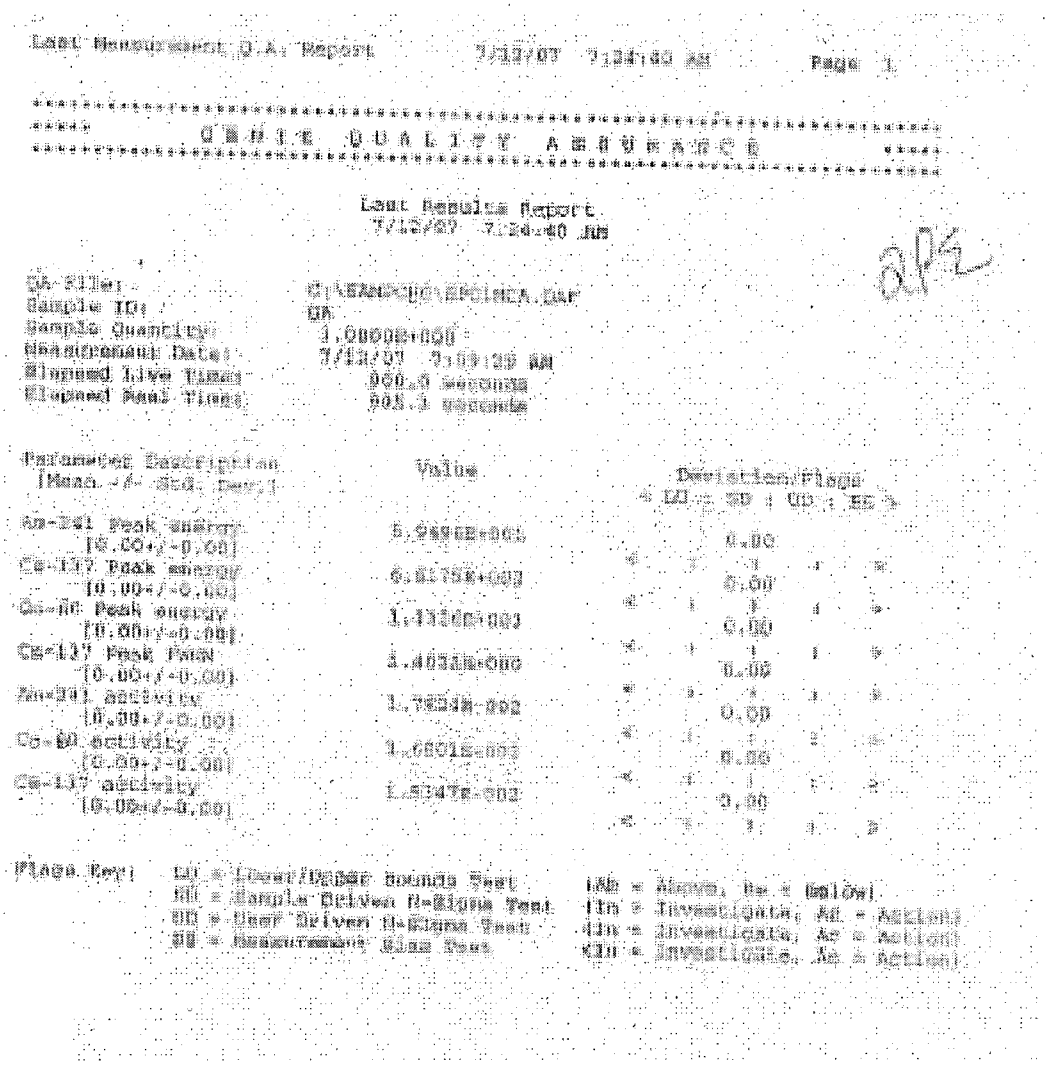
Table 15. Data used in the CEC calculations.

Expt No.	Sample ID	STP Soil	Rep	Soil Wt. (g)	[Na] (ppm)	CEC (meq/100 g)	avg CEC (meq/100g)	stdev CEC (meq/100g)
501-A	300240736	B308/SS15	1	5.355	12.8	0.82	0.75	0.095
501-B	300240737		2	5.3235	11.1	0.68		
502-A	300240738	B308/SS25	1	5.2688	47.5	3.69	3.36	0.466
502-B	300240739		2	5.2239	39.2	3.04		
503-A	300240740	B332/SS12	1	5.2672	8.48	0.47	0.38	0.137
503-B	300240741		2	5.2583	6.12	0.28		
504-A	300240742	B332/SS23	1	5.2825	8.87	0.50	0.63	0.182
504-B	300240743		2	5.2324	11.9	0.76		
505-A	300240744	B348/SS8	1	5.3345	14.6	0.97	0.84	0.177
505-B	300240745		2	5.3184	11.5	0.72		
Blank 1	300240746	No soil	1	na	2.75			
Std. 1	300240747	Subsurface Clayey	1	5.2064	42.2	3.30		
506-A	300241021	B348/SS17	1	5.0072	10.4	0.76	0.82	0.093
506-B	300241022		2	5.0022	11.9	0.89		
507-A	300241023	B349/SS14	1	5.0121	7.24	0.48	0.64	0.219
507-B	300241024		2	5.0084	10.8	0.79		
508-A	300241025	B349/SS23	1	5.0104	17.4	1.36	1.14	0.319
508-B	300241026		2	5.0124	12.2	0.91		
509-A	300241027	B408/SS14	1	5.0026	9.78	0.70	0.73	0.032
509-B	300241028		2	5.0055	10.3	0.75		
510-A	300241029	B408/SS22	1	5.0108	12	0.89	0.92	0.043
510-B	300241030		2	5.0128	12.7	0.96		
Blank 2	300241031	No soil	1	na	1.69			
Std. 2	300241032	Subsurface Clayey	1	5.0109	78.3	6.65		
511-A	300241252	B438/SS12	1	5.0103	29.3	2.53	2.07	0.652
511-B	300241253		2	5.0156	18.7	1.61		
512-A	300241254	B438/SS24	1	5.0297	15.2	1.30	0.92	0.541
512-B	300241255		2	5.0165	6.33	0.54		
513-A	300241256	B910/SS14	1	5.0047	13.8	1.19	1.29	0.150
513-B	300241257		2	5.0242	16.3	1.40		
514-A	300241258	B910/SS24	1	5.008	87.8	7.62	9.89	3.215
514-B	300241259		2	5.0027	140	12.16		
515-A	300241260	B930/SS14	1	5.0106	23.8	2.06	2.54	0.684
515-B	300241261		2	5.0044	34.9	3.02		
Blank 3	300241262	No soil	1	na	<0.119			
Std. 3	300241263	Subsurface Clayey	1	5.1006	64.4	5.48		
516-A	300241264	B930/SS27	1	5.0093	7.90	0.49	0.51	0.021
516-B	300241265		2	5.0194	8.25	0.52		
517-A	300241266	B933/SS14	1	5.008	25.8	2.05	1.93	0.170
517-B	300241267		2	5.0017	23.0	1.81		
518-A	300241268	B933/SS24	1	5.0041	11.8	0.83	0.85	0.023
518-B	300241269		2	5.0172	12.2	0.87		
519-A	300241270	B934/SS15	1	5.0117	16.7	1.26	1.30	0.060

519-B	300241271		2	5.0179	17.7	1.34		
520-A	300241272	B934/SS26	1	5.0089	13.6	0.99	0.75	0.339
520-B	300241273		2	4.9949	8.07	0.51		
Blank 4	300241274	No soil	1	na	2.21			
Std. 4	300241275	Subsurface Clayey	1	5.0054	74.4	6.27		

Table 16. Gamma analyses quality assurance results.

Explanation and overview of QA results for gamma analyses: A mark in the QA results in the "Deviation/Flags" column of "In" means the measured value needs to be "investigated", but the instrument is within specifications of the standard. A "Deviation/Flags" comment of "Ac" means the measured value is outside the acceptable range and "action" is required. The "action" flag indicates that the analyses results are unacceptable. During the 12 days of analysis, there were a total of 324 standard energies that were measured, of which three "investigate" flag and zero "action" flags were identified. Since the three "investigate" flags were not for the same instrument and for three back to back days, no action was required. These results indicate that all measurement QA standards were within specification.


Last Measurement Q.A. Report 7/13/07 7:34:40 AM Page 1

GAMMA QUALITY AWARENESS

Last Results Report
7/12/07 7:34:40 AM

QA-Filter: C:\EAMCUG\EPCIMCA.DAT
Sample ID: QA
Sample Quantity: 1.00000E+000
Measurement Date: 7/12/07 7:09:29 AM
Elapsed Live Time: 900.0 seconds
Elapsed Real Time: 905.3 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LI : SD : UD : EE >
Am-241 Peak energy [0.00+/-0.00]	5.9590E+001	0.00
Cs-137 Peak energy [0.00+/-0.00]	6.6170E+002	0.00
Co-60 Peak energy [0.00+/-0.00]	1.1330E+003	0.00
Cs-137 Peak Area [0.00+/-0.00]	3.4071E+006	0.00
Am-241 activity [0.00+/-0.00]	1.7854E-002	0.00
Co-60 activity [0.00+/-0.00]	1.6801E-002	0.00
Cs-137 activity [0.00+/-0.00]	1.5347E-002	0.00

Flags Key: LI = Lower/Upper Bounds Test; SD = Sample Driven U-Sigma Test; UD = User Driven U-Sigma Test; EE = Measurement Bias Test; (Ab = Above, Be = Below); (In = Investigate, Ac = Action); (Iln = Investigate, Ac = Action); (Ilh = Investigate, Ac = Action)

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Last Measurement Q.A. Report        7/12/07 10:53:20 AM          Page  1

*****************************************************************************
*****          G E N I E   Q U A L I T Y   A S S U R A N C E           *****
*****************************************************************************

                         Last Results Report
                         7/12/07 10:53:20 AM

QA File:                C:\GENIE\GC2MCA.QAF
Sample ID:              QA
Sample Quantity:        1.0000E+000
Measurement Date:       7/12/07 10:37:48 AM
Elapsed Live Time:          900.0 seconds
Elapsed Real Time:          900.2 seconds

Parameter Description           Value                 Deviation/Flags
 [Mean +/- Std. Dev.]                               < LU : SD : UD : MB >

Am-241 Peak energy             5.9540E+001                   0.00
        [0.00+/-0.00]                               <    :    :    :    >
Cs-137 Peak energy             6.6160E+002                   0.00
        [0.00+/-0.00]                               <    :    :    :    >
Co-60 Peak energy              1.3324E+003                   0.00
        [0.00+/-0.00]                               <    :    :    :    >
Cs-137 Peak FWHM               1.2394E+000                   0.00
        [0.00+/-0.00]                               <    :    :    :    >
Am-241 activity                1.6621E-002                   0.00
        [0.00+/-0.00]                               <    :    :    :    >
Co-60 activity                 1.6576E-003                   0.00
        [0.00+/-0.00]                               <    :    :    :    >
Cs-137 activity                1.5398E-002                   0.00
        [0.00+/-0.00]                               <    :    :    :    >

Flags Key:   LU = Lower/Upper Bounds Test      (Ab = Above, Be = Below)
             SD = Sample Driven N-Sigma Test   (In = Investigate, Ac = Action)
             UD = User Driven N-Sigma Test     (In = Investigate, Ac = Action)
             MB = Measurement Bias Test        (In = Investigate, Ac = Action)
```

Last Measurement Q.A. Report 7/16/07 8:35:34 AM Page 1

GENIE QUALITY ASSURANCE

Last Results Report
7/16/07 8:35:34 AM

SFB 7/16/07

QA File: C:\GENIE2K\CAMFILES\LGAM0551.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/16/07 7:00:55 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1002.0 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9530E+001+/- 0.500]	5.9512E+001	3.4483E-002 < : : : >
Am-241 Wtd mean activity [UD: 3.6200E-003+/- 0.000]	3.4744E-003	-7.7035E-001 < : : : >
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	4.4020E-001	-7.7286E-001 < : : : >
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2210E+002	7.1625E-002 < : : : >
Co-57 Peak FWHM [UD: 4.6680E-001+/- 0.100]	6.3851E-001	1.7171E+000 < : : : >
Co-57 Wtd mean activity [UD: 8.9000E-005+/- 0.000]	9.2935E-005	1.3569E-001 < : : : >
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8020E+001	-4.0234E-003 < : : : >
Cd-109 Peak FWHM [UD: 5.3950E-001+/- 0.100]	4.7110E-001	-6.8397E-001 < : : : >
Cd-109 Wtd mean activity [UD: 5.6550E-003+/- 0.002]	5.2665E-003	-2.0999E-001 < : : : >

Flags Key: LU = Lower/Upper Bounds Test {Ab = Above, Be = Below}
SD = Sample Driven N-Sigma Test {In = Investigate, Ac = Action}
UD = User Driven N-Sigma Test {In = Investigate, Ac = Action}
BS = Measurement Bias Test {In = Investigate, Ac = Action}

Last Measurement Q.A. Report 7/17/07 7:37:19 AM Page 1

G E N I E Q U A L I T Y A S S U R A N C E

Last Results Report
7/17/07 7:37:19 AM

QA File: C:\GENIE2K\CAMFILES\LGAM05S1.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/17/07 7:06:58 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1001.9 seconds

SLB 7/17/07

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9506E+001	1.1452E-002
Am-241 Wtd mean activity [UD: 3.6200E-003+/- 0.000]	3.3678E-003	-1.3345E+000
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	4.7507E-001	-4.2419E-001
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2210E+002	8.0826E-002
Co-57 Peak FWHM [UD: 4.6680E-001+/- 0.100]	3.8754E-001	-7.9261E-001
Co-57 Wtd mean activity [UD: 8.9000E-005+/- 0.000]	8.1372E-005	-2.6302E-001
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8030E+001	3.2043E-004
Cd-109 Peak FWHM [UD: 5.3950E-001+/- 0.100]	5.1410E-001	-2.5401E-001
Cd-109 Wtd mean activity [UD: 5.6550E-003+/- 0.002]	5.2585E-003	-2.1430E-001

Flags Key: LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 7/18/07 7:41:47 AM Page 1

****
***** G E N I E Q U A L I T Y A S S U R A N C E *****
****

Last Results Report
7/18/07 7:41:47 AM

SKB 7/18/07

QA File: C:\GENIE2K\CAMFILES\LGAM0551.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/18/07 7:11:41 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1002.0 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9513E+001	2.6131E-002
Am-241 Wtd mean activity [UD: 3.6200E-003+/- 0.000]	3.4699E-003	-7.9399E-001
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	4.7318E-001	-4.4310E-001
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2210E+002	8.3817E-002
Co-57 Peak FWHM [UD: 4.6680E-001+/- 0.100]	5.6009E-001	9.3289E-001
Co-57 Wtd mean activity [UD: 8.9000E-005+/- 0.000]	8.9083E-005	2.3550E-002
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8022E+001	-1.6129E-002
Cd-109 Peak FWHM [UD: 5.3950E-001+/- 0.100]	4.3859E-001	-1.0091E+000
Cd-109 Wtd mean activity [UD: 5.6550E-003+/- 0.002]	5.1774E-003	-2.5818E-001

Flags Key: LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 7/23/07 7:41:40 AM Page 1

GENIE QUALITY ASSURANCE

Last Results Report
7/23/07 7:41:40 AM

SKB 7/23/07

QA File: C:\GENIE2K\CAMFILES\LGAH05S1.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/23/07 7:10:35 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1001.9 seconds

Parameter Description (Mean +/- Std. Dev.)	Value	Deviation/Flags LU	SD	UD	BS
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9507E+001	1.4465E-002			
Am-241 Wtd mean activity [UD: 3.6200E-003+/- 0.000]	3.2987E-003	-1.7002E+000			
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	4.7202E-001	-4.5468E-001			
Co-57 Peak energy [UD: 1.2200E+002+/- 0.500]	1.2212E+002	1.1827E-001			
Co-57 Peak FWHM [UD: 4.6680E-001+/- 0.100]	6.0082E-001	1.3402E+000			
Co-57 Wtd mean activity [UD: 8.9000E-005+/- 0.000]	8.1060E-005	-2.7309E-001			
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8024E+001	-1.2299E-002			
Cd-109 Peak FWHM [UD: 5.3950E-001+/- 0.100]	4.7869E-001	-6.0814E-001			
Cd-109 Wtd mean activity [UD: 5.6550E-003+/- 0.002]	5.0461E-003	-3.2912E-001			

Flags Key: LU = Lower/Upper Bounds Test [Ab = Above, Be = Below]
SD = Sample Driven N-Sigma Test [In = Investigate, Ac = Action]
UD = User Driven N-Sigma Test [In = Investigate, Ac = Action]
BS = Measurement Bias Test [In = Investigate, Ac = Action]

Last Measurement Q.A. Report 7/24/07 7:43:17 AM Page 1

GENIE QUALITY ASSURANCE

Last Results Report
7/24/07 7:43:17 AM

SEB 7/24/07

QA File: C:\GENIE2K\CAMFILES\LGAM05S1.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/24/07 7:12:21 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1002.0 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9511E+001	2.1996E-000 < : : : >
Am-241 Wtd mean activity [UD: 3.6200E-003+/- 0.000]	3.4878E-003	-6.9972E-001 < : : : >
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	4.5870E-001	-5.8795E-001 < : : : >
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2206E+002	-2.1973E-002 < : : : >
Co-57 Peak FWHM [UD: 4.6680E-001+/- 0.100]	5.9420E-001	1.2740E+000 < : : : >
Co-57 Wtd mean activity [UD: 8.9000E-005+/- 0.000]	9.3834E-005	1.6670E-001 < : : : >
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8033E+001	5.8357E-003 < : : : >
Cd-109 Peak FWHM [UD: 5.3950E-001+/- 0.100]	4.7556E-001	-6.3938E-001 < : : : >
Cd-109 Wtd mean activity [UD: 5.6550E-003+/- 0.002]	5.1379E-003	-2.7954E-001 < : : : >

Flags Key: LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 7/31/07 8:27:04 AM Page 1

G E N I E Q U A L I T Y A S S U R A N C E

Last Results Report
7/31/07 8:27:04 AM

QA File: C:\GENIE2K\CAMFILES\LGAM05S1.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/31/07 7:32:01 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1002.0 seconds

SB 7/31/07

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9507E+001	1.4687E-002
Am-241 Wtd mean activity [UD: 3.6200E-003+/- 0.000]	3.5188E-003	-5.3563E-001
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	4.7077E-001	-4.6720E-001
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2208E+002	4.5334E-002
Co-57 Peak FWHM [UD: 4.6690E-001+/- 0.100]	4.8963E-001	2.2928E-001
Co-57 Wtd mean activity [UD: 8.9000E-005+/- 0.000]	8.8439E-005	-1.9337E-002
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8029E+001	-2.3651E-003
Cd-109 Peak FWHM [UD: 5.3950E-001+/- 0.100]	4.8061E-001	-5.0893E-001
Cd-109 Wtd mean activity [UD: 5.6550E-003+/- 0.002]	5.2069E-003	-2.4221E-001

Flags Key:
LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 8/2/07 9:19:19 AM Page 1

GENIE QUALITY ASSURANCE

Last Results Report
8/2/07 9:19:18 AM

QA File: C:\GENIE2K\CAMFILES\LGAM05S1.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 8/2/07 7:09:35 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1002.0 seconds

SKB 8/2/07

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : RS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9505E+001	9.8640E-003 < : : : >
Am-241 Wtd mean activity [UD: 3.6200E-003+/- 0.000]	3.4065E-003	-1.1294E+000 < : : : >
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	4.6705E-001	-5.0440E-001 < : : : >
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2210E+002	8.1360E-002 < : : : >
Co-57 Peak FWHM [UD: 4.6680E-001+/- 0.100]	5.2314E-001	5.6341E-001 < : : : >
Co-57 Wtd mean activity [UD: 8.9000E-005+/- 0.000]	8.2540E-005	-2.2276E-001 < : : : >
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8030E+001	-4.1199E-004 < : : : >
Cd-109 Peak FWHM [UD: 5.3950E-001+/- 0.100]	5.1361E-001	-2.5890E-001 < : : : >
Cd-109 Wtd mean activity [UD: 5.6550E-003+/- 0.002]	4.6694E-003	-5.3328E-001 < : : : >

Flags Key: LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
RS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 8/3/07 7:34:10 AM Page 1

G E N I E Q U A L I T Y A S S U R A N C E

Last Results Report
8/3/07 7:34:10 AM

QA File: C:\GENIE2K\CAMFILES\LGAM0581.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 8/3/07 7:12:54 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1002.0 seconds

SKB 8/3/07

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9510E+001	< 2.0279E-002 : : : >
Am-241 Wtd mean activity [UD: 3.6200E-003+/- 0.000]	3.4041E-003	< -1.1421E+000 : : : >
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	4.4338E-001	< -7.4106E-001 : : : >
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2210E+002	< 7.7774E-002 : : : >
Co-57 Peak FWHM [UD: 4.6680E-001+/- 0.100]	5.7009E-001	< 1.0329E+000 : : : >
Co-57 Wtd mean activity [UD: 8.9000E-005+/- 0.000]	8.1232E-005	< -2.6788E-001 : : : >
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8033E+001	< 6.3019E-003 : : : >
Cd-109 Peak FWHM [UD: 5.3950E-001+/- 0.100]	5.6829E-001	< 2.8788E-001 : : : >
Cd-109 Wtd mean activity [UD: 5.6550E-003+/- 0.002]	5.0820E-003	< -3.0976E-001 : : : >

Flags Key: LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 8/8/07 7:56:47 AM Page 1

GENIE QUALITY ASSURANCE

Last Results Report
8/8/07 7:56:47 AM

SKB 8/8/07

QA File: C:\GENIE2K\CAMFILES\LGAM0551.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 8/8/07 7:09:19 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1001.9 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9508E+001	1.5411E-002
Am-241 Wtd mean activity [UD: 3.6200E-003+/- 0.000]	3.2781E-003	-1.8091E+000
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	4.5954E-001	-5.7950E-001
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2208E+002	4.3808E-002
Co-57 Peak FWHM [UD: 4.6660E-001+/- 0.100]	4.4752E-001	-1.9278E-001
Co-57 Wtd mean activity [UD: 8.9000E-005+/- 0.000]	7.7243E-005	-4.0540E-001
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8032E+001	3.6774E-003
Cd-109 Peak FWHM [UD: 5.3950E-001+/- 0.100]	4.9008E-001	-4.9417E-001
Cd-109 Wtd mean activity [UD: 5.6550E-003+/- 0.002]	4.5345E-003	-6.0566E-001

Flags Key:
LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 7/16/07 8:34:14 AM Page 1

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*****************************************************************
*   ***        G E N I E   Q U A L I T Y   A S S U R A N C E      ***
*   *****************************************************************
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Last Results Report
7/16/07 8:34:14 AM

SXD 7/16/07

QA File: C:\GENIE2K\CAMFILES\LXAM0532.QAF
Sample ID: SAMPLE
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/16/07 7:00:48 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1001.7 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9505E+001	9.9106E-003 < : : : >
Am-241 Wtd mean activity [UD: 3.5900E-003+/- 0.000]	3.7270E-003	7.2461E-001 < : : : >
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	5.0248E-001	-1.5014E-001 < : : : >
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2207E+002	1.0513E-002 < : : : >
Co-57 Peak FWHM [UD: 4.4800E-001+/- 0.100]	6.5295E-001	2.0495E+000 < : :In : >
Co-57 Wtd mean activity [UD: 8.8700E-005+/- 0.000]	8.8001E-005	-4.8194E-002 < : : : >
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8038E+001	1.6479E-002 < : : : >
Cd-109 Peak FWHM [UD: 5.4700E-001+/- 0.100]	4.9647E-001	-5.0529E-001 < : : : >
Cd-109 Wtd mean activity [UD: 5.6090E-003+/- 0.002]	5.1288E-003	-2.1341E-001 < : : : >

Flags Key:
LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 7/17/07 7:35:46 AM Page 1

G E N I E - Q U A L I T Y A S S U R A N C E

Last Results Report
7/17/07 7:35:46 AM

QA File: C:\GENIE2K\CAMFILES\1XAM0552.QAF
Sample ID: SAMPLE
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/17/07 7:06:51 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1091.6 seconds

SKB 7/17/07

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9505E+001	1.0895E-002
Am-241 Wtd mean activity [UD: 3.5900E-003+/- 0.000]	3.6859E-003	5.0718E-001
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	5.1602E-001	-1.4696E-002
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2208E+002	4.0024E-002
Co-57 Peak FWHM [UD: 4.4800E-001+/- 0.100]	5.9936E-001	1.5136E+000
Co-57 Wtd mean activity [UD: 8.8700E-005+/- 0.000]	9.7582E-005	6.1256E-001
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8054E+001	4.7363E-002
Cd-109 Peak FWHM [UD: 5.4700E-001+/- 0.100]	6.1655E-001	6.9551E-001
Cd-109 Wtd mean activity [UD: 5.6000E-003+/- 0.002]	5.4844E-003	-5.5398E-002

Flags Key:
LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

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Last Measurement Q.A. Report        7/18/07   7:40:31 AM        Page  1

*********************************************************************
*****        G E N I E   Q U A L I T Y   A S S U R A N C E      *****
*********************************************************************

                         Last Results Report
                         7/18/07   7:40:31 AM

QA File:                 C:\GENIE2K\CAMFILES\LXAM0532.QAF
Sample ID:               SAMPLE
Sample Quantity:          1.0000E+000
Sample Date:
Measurement Date:        7/18/07   7:11:34 AM
Elapsed Live Time:           1000.0 seconds
Elapsed Real Time:           1001.5 seconds

Parameter Description              Value             Deviation/Flags
 [Mean +/- Std. Dev.]                              < LU : SD : UD : BS >

Am-241 Peak Energy               5.9504E+001          7.8659E-003
 [UD: 5.9500E+001+/- 0.500]                        <    :    :    :    >

Am-241 Wtd mean activity         3.6957E-003          5.5922E-001
 [UD: 3.5900E-003+/- 0.000]                        <    :    :    :    >

Am-241 Peak FWHM                 4.8389E-001         -3.3605E-001
 [UD: 5.1749E-001+/- 0.100]                        <    :    :    :    >

Co-57 Peak energy                1.2210E+002          8.6166E-002
 [UD: 1.2206E+002+/- 0.500]                        <    :    :    :    >

Co-57 Peak FWHM                  4.7566E-001          2.7663E-001
 [UD: 4.4800E-001+/- 0.100]                        <    :    :    :    >

Co-57 Wtd mean activity          9.4131E-005          3.7454E-001
 [UD: 8.8700E-005+/- 0.000]                        <    :    :    :    >

Cd-109 Peak energy               8.8042E+001          2.3163E-002
 [UD: 8.8030E+001+/- 0.500]                        <    :    :    :    >

Cd-109 Peak FWHM                 5.8148E-001          3.4480E-001
 [UD: 5.4700E-001+/- 0.100]                        <    :    :    :    >

Cd-109 Wtd mean activity         5.4115E-003         -8.7787E-002
 [UD: 5.6090E-003+/- 0.002]                        <    :    :    :    >

Flags Key:   LU = Lower/Upper Bounds Test       (Ab = Above, Be = Below)
             SD = Sample Driven N-Sigma Test    (In = Investigate, Ac = Action)
             UD = User Driven N-Sigma Test      (In = Investigate, Ac = Action)
             BS = Measurement Bias Test         (In = Investigate, Ac = Action)
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SRB 7/18/07

Last Measurement Q.A. Report   7/19/07   7:50:59 AM   Page 1

*****   G E N I E   Q U A L I T Y   A S S U R A N C E   *****

Last Results Report
7/19/07   7:50:59 AM

SKB 7/19/07

QA File:	C:\GENIE2K\CAMFILES\LXAM0552.QAF
Sample ID:	SAMPLE
Sample Quantity:	1.0000E+000
Sample Date:	
Measurement Date:	7/19/07 7:21:44 AM
Elapsed Live Time:	1000.0 seconds
Elapsed Real Time:	1001.6 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9499E+001	-1.4954E-003 < : : : >
Am-241 Wtd mean activity [UD: 3.5900E-003+/- 0.000]	3.7021E-003	5.9208E-001 < : : : >
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	5.3967E-001	2.2182E-001 < : : : >
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2213E+002	1.3051E-001 < : : : >
Co-57 Peak FWHM [UD: 4.4800E-001+/- 0.100]	6.3776E-001	1.8978E+000 < : : : >
Co-57 Wtd mean activity [UD: 8.8700E-005+/- 0.000]	9.9970E-005	7.7727E-001 < : : : >
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8006E+001	-4.7470E-002 < : : : >
Cd-109 Peak FWHM [UD: 5.4700E-001+/- 0.100]	5.5306E-001	6.0645E-002 < : : : >
Cd-109 Wtd mean activity [UD: 5.6090E-003+/- 0.002]	5.2886E-003	-1.4242E-001 < : : : >

Flags Key: LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 7/20/07 7:36:13 AM Page 1

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*****          G E N I E   Q U A L I T Y   A S S U R A N C E          *****
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Last Results Report
7/20/07 7:36:13 AM

SKB
7/20/07

QA File: C:\GENIE2K\CAMFILES\LXAM0552.QAF
Sample ID: SAMPLE
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/20/07 7:15:20 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1001.5 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9500E+001	8.7738E-004 < : : : >
Am-241 Wtd mean activity [UD: 3.5900E-003+/- 0.000]	3.5846E-003	-2.8341E-002 < : : : >
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	5.3079E-001	1.3298E-001 < : : : >
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2206E+002	9.5367E-003 < : : : >
Co-57 Peak FWHM [UD: 4.4800E-001+/- 0.100]	6.5411E-003	2.0611E+000 < : :In : >
Co-57 Wtd mean activity [UD: 8.8700E-005+/- 0.000]	7.9239E-005	-6.5251E-001 < : : : >
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8024E+001	-1.2573E-002 < : : : >
Cd-109 Peak FWHM [UD: 5.4700E-001+/- 0.100]	4.8126E-001	-6.5737E-001 < : : : >
Cd-109 Wtd mean activity [UD: 5.6090E-003+/- 0.002]	5.1657E-003	-1.9704E-001 < : : : >

Flags Key:
LU = Lower/Upper Bounds Test (Ab = Above, Bo = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 7/23/07 9:17:43 AM Page 1

GENIE QUALITY ASSURANCE

Last Results Report
7/23/07 9:17:43 AM

QA File: C:\GENIE2K\CAMFILES\LXAM0552.QAF
Sample ID: SAMPLE
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/23/07 8:55:15 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1001.6 seconds

SKB 7/23/07

3rd Count

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9500E+001	5.9509E-000 < : : : >
Am-241 Wtd mean activity [UD: 3.5900E-003+/- 0.000]	3.7923E-003	1.0704E+000 < : : : >
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	5.2349E-001	6.0026E-002 < : : : >
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2206E+002	3.7857E-002 < : : : >
Co-57 Peak FWHM [UD: 4.4800E-001+/- 0.100]	5.0614E-001	1.0814E+000 < : : : >
Co-57 Wtd mean activity [UD: 8.8700E-005+/- 0.000]	9.8152E-005	6.5188E-001 < : : : >
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8010E+001	-4.0192E-002 < : : : >
Cd-109 Peak FWHM [UD: 5.4700E-001+/- 0.100]	5.9145E-001	4.4450E-001 < : : : >
Cd-109 Wtd mean activity [UD: 5.8090E-003+/- 0.002]	4.9865E-003	-2.7660E-001 < : : : >

Flags Key:
LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 7/24/07 7:42:11 AM Page 1

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*****************************************************************
*****          G E N I E   Q U A L I T Y   A S S U R A N C E          *****
*****************************************************************
```

Last Results Report
7/24/07 7:42:11 AM

SLB
7/24/07

QA File: C:\GENIE2K\CAMFILES\LXAM05S2.QAF
Sample ID: SAMPLE
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/24/07 7:12:15 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1001.7 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LD : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9498E+001	-3.3569E-003
Am-241 Wtd mean activity [UD: 3.5900E-003+/- 0.000]	3.7641E-003	9.2117E-001
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	5.3019E-001	1.2696E-001
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2208E+002	3.5294E-002
Co-57 Peak FWHM [UD: 4.4800E-001+/- 0.100]	5.6660E-001	1.1860E+000
Co-57 Wtd mean activity [UD: 8.8700E-005+/- 0.000]	1.0580E-004	1.1821E+000
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8015E+001	-3.0487E-002
Cd-109 Peak FWHM [UD: 5.4700E-001+/- 0.100]	5.9990E-001	5.2896E-001
Cd-109 Wtd mean activity [UD: 5.6090E-003+/- 0.002]	5.3768E-003	-1.0322E-001

Flags Key:
LD = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 7/31/07 8:25:52 AM Page 1

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*****************************************************************
*****        G E N I E   Q U A L I T Y   A S S U R A N C E      *****
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Last Results Report
7/31/07 8:25:52 AM

SKB 7/31/07

QA File: C:\GENIE2K\CAMFILES\LKAM0532.QAF
Sample ID: SAMPLE
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/31/07 7:31:55 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1001.6 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9504E+001	7.3090E-003 < : : : >
Am-241 Wtd mean activity [UD: 3.5900E-003+/- 0.000]	3.6832E-003	4.9300E-001 < : : : >
Am-241 Peak FWHM [UD: 5.1740E-001+/- 0.100]	4.9885E-001	-1.8639E-001 < : : : >
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2205E+002	-2.9160E-002 < : : : >
Co-57 Peak FWHM [UD: 4.4800E-001+/- 0.100]	5.2765E-001	7.9053E-001 < : : : >
Co-57 Wtd mean activity [UD: 8.8700E-005+/- 0.000]	7.5362E-005	-9.1996E-001 < : : : >
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8026E+001	-8.4534E-003 < : : : >
Cd-109 Peak FWHM [UD: 5.4700E-001+/- 0.100]	4.5800E-001	-9.6999E-001 < : : : >
Cd-109 Wtd mean activity [UD: 5.6090E-003+/- 0.002]	5.0745E-003	-2.3754E-001 < : : : >

Flags Key: LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 8/2/07 9:18:15 AM Page 1

GENIE QUALITY ASSURANCE

Last Results Report
8/2/07 9:18:15 AM

SKB 8/2/07

QA File: C:\GENIE2K\CAMFILES\LXAM0592.QAF
Sample ID: SAMPLE
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 8/2/07 7:09:28 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1001.5 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9501E+001	1.3885E-003
Am-241 Wtd mean activity [UD: 3.5900E-003+/- 0.000]	3.7659E-003	9.3059E-001
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	5.2301E-001	5.5157E-002
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2207E+002	1.6815E-002
Co-57 Peak FWHM [UD: 4.4900E-001+/- 0.100]	6.1735E-001	1.6935E+000
Co-57 Wtd mean activity [UD: 8.8700E-005+/- 0.000]	9.3429E-005	1.8819E-001
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8032E+001	4.3480E-003
Cd-109 Peak FWHM [UD: 5.4700E-001+/- 0.100]	5.4736E-001	3.5983E-003
Cd-109 Wtd mean activity [UD: 5.6090E-003+/- 0.0021]	5.6431E-003	1.5133E-002

Flags Key: LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 8/3/07 7:32:59 AM Page 1

G E N I E Q U A L I T Y A S S U R A N C E

Last Results Report
8/3/07 7:32:59 AM

QA File: C:\GENIE2K\CAMFILES\LXAM0582.QAF
Sample ID: SAMPLE
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 8/3/07 7:12:49 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1001.6 seconds

SKB 8/7/07

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9508E+001	1.6953E-002
Am-241 Wtd mean activity [UD: 3.5900E-003+/- 0.000]	3.7737E-003	9.7206E-001
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	4.9654E-001	-2.0955E-001
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2205E+002	-1.5900E-002
Co-57 Peak FWHM [UD: 4.4800E-001+/- 0.100]	4.9129E-001	4.3289E-001
Co-57 Wtd mean activity [UD: 8.8700E-005+/- 0.000]	8.4841E-005	-2.6612E-001
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8031E+001	2.2430E-003
Cd-109 Peak FWHM [UD: 5.4700E-001+/- 0.100]	5.8143E-001	3.4431E-001
Cd-109 Wtd mean activity [UD: 5.6090E-003+/- 0.002]	5.3640E-003	-1.0889E-001

Flags Key:
LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 8/7/07 7:43:37 AM Page 1

G E N I E Q U A L I T Y A S S U R A N C E

Last Results Report
8/7/07 7:43:37 AM

QA File: C:\GENIE2K\CAMFILES\LXAM0582.QAF
Sample ID: SAMPLE
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 8/7/07 7:11:29 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1001.5 seconds

SKB 8/7/07

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LV : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9501E+001	2.1439E-004 < : : : >
Am-241 Wtd mean activity [UD: 3.5900E-003+/- 0.000]	3.6672E-003	4.0822E-001 < : : : >
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	5.2795E-001	1.0464E-001 < : : : >
Co-57 Peak energy [UD: 1.2200E+002+/- 0.500]	1.2207E+002	1.0849E-002 < : : : >
Co-57 Peak FWHM [UD: 4.4800E-001+/- 0.100]	6.9881E-001	2.4881E+000 < : :Im : >
Co-57 Wtd mean activity [UD: 8.6700E-005+/- 0.000]	9.2148E-005	2.3779E-001 < : : : >
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8036E+001	1.1200E-002 < : : : >
Cd-109 Peak FWHM [UD: 5.4700E-001+/- 0.100]	5.2389E-001	-2.3169E-001 < : : : >
Cd-109 Wtd mean activity [UD: 5.6090E-003+/- 0.002]	5.2126E-003	-1.7618E-001 < : : : >

Flags Key: LV = Lower/Upper Bounds Test (Ab = Above, Bo = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 8/8/07 7:55:49 AM Page 1

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*****************************************************************
*****        G E N I E   Q U A L I T Y   A S S U R A N C E      *****
*****************************************************************
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Last Results Report
8/8/07 7:55:49 AM

SFB 8/8/07

QA File: C:\GENIE2K\CAMFILES\LXAM05S2.QAF
Sample ID: SAMPLE
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 8/8/07 7:09:15 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1001.6 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9521E+001	4.2839E-002 < : : : >
Am-241 Wtd mean activity [UD: 3.5900E-003+/- 0.000]	3.6089E-003	1.0025E-001 < : : : >
Am-241 Peak FWHM [UD: 5.1740E-001+/- 0.100]	5.1458E-001	-2.9139E-002 < : : : >
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2209E+002	6.3522E-002 < : : : >
Co-57 Peak FWHM [UD: 4.4800E-001+/- 0.100]	5.3868E-001	9.0679E-001 < : : : >
Co-57 Wtd mean activity [UD: 8.8700E-005+/- 0.000]	8.9876E-005	8.1090E-002 < : : : >
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8046E+001	3.2257E-002 < : : : >
Cd-109 Peak FWHM [UD: 5.4700E-001+/- 0.100]	5.2373E-001	-2.3265E-001 < : : : >
Cd-109 Wtd mean activity [UD: 5.6090E-003+/- 0.002]	5.0212E-003	-2.6126E-001 < : : : >

Flags Key:
LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 7/16/07 8:37:05 AM Page 1

GENIE QUALITY ASSURANCE

Last Results Report
7/16/07 8:37:05 AM

SKB
7/16/07

QA File: C:\GENIE2K\CAMFILES\LG2AM553.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/16/07 7:00:59 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1002.3 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9569E+001	1.3749E-001 < : : : >
Am-241 Wtd mean activity [UD: 3.5800E-003+/- 0.000]	3.6580E-003	3.8255E-001 < : : : >
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	4.9584E-001	-2.1647E-001 < : : : >
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2218E+002	2.4126E-001 < : : : >
Co-57 Peak FWHM [UD: 4.6680E-001+/- 0.100]	4.3842E-001	-2.9383E-002 < : : : >
Co-57 Wtd mean activity [UD: 8.8560E-005+/- 0.000]	9.6797E-005	3.1802E-001 < : : : >
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8076E+001	9.1644E-002 < : : : >
Cd-109 Peak FWHM [UD: 5.3950E-001+/- 0.100]	5.4558E-001	6.0824E-002 < : : : >
Cd-109 Wtd mean activity [UD: 5.6010E-003+/- 0.002]	5.5185E-003	-4.5847E-002 < : : : >

Flags Key: LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 7/17/07 7:38:49 AM Page 1

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*****************************************************************
*****          G E N I E   Q U A L I T Y   A S S U R A N C E    *****
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Last Results Report
7/17/07 7:38:49 AM

QA File: C:\GENIE2K\CAMFILES\1G2AM553.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/17/07 7:07:03 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1002.3 seconds

SRB 7/17/07

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9562E+001	1.2463E-001
Am-241 Wtd mean activity [UD: 3.5800E-003+/- 0.000]	3.5404E-003	-1.9424E-001
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	5.0820E-001	-9.2925E-002
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2221E+002	2.9823E-001
Co-57 Peak FWHM [UD: 4.6680E-001+/- 0.100]	4.9006E-001	2.3264E-001
Co-57 Wtd mean activity [UD: 8.8560E-005+/- 0.000]	9.8515E-005	3.8436E-001
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8080E+001	9.9792E-002
Cd-109 Peak FWHM [UD: 5.3950E-001+/- 0.100]	5.5834E-001	1.8835E-001
Cd-109 Wtd mean activity [UD: 5.6010E-003+/- 0.002]	5.3801E-003	-1.2051E-001

Flags Key: LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 7/18/07 7:43:07 AM Page 1

GENIE QUALITY ASSURANCE

Last Results Report
7/18/07 7:43:07 AM

SKB 7/18/07

QA File: C:\GENIE2K\CAMFILES\LG2AM583.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/18/07 7:11:46 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1003.3 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9566E+001	1.3216E-001 < : : : >
Am-241 Wtd mean activity [UD: 3.5800E-003+/- 0.000]	3.6770E-003	4.7526E-001 < : : : >
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	5.0610E-001	-1.1308E-001 < : : : >
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2217E+002	2.1713E-001 < : : : >
Co-57 Peak FWHM [UD: 4.6680E-001+/- 0.100]	6.3486E-001	1.6806E+000 < : : : >
Co-57 Wtd mean activity [UD: 8.8560E-005+/- 0.000]	9.9440E-005	4.2009E-001 < : : : >
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8089E+001	1.1864E-001 < : : : >
Cd-109 Peak FWHM [UD: 5.3950E-001+/- 0.100]	5.7075E-001	3.1249E-001 < : : : >
Cd-109 Wtd mean activity [UD: 5.6010E-003+/- 0.002]	5.6982E-003	5.4025E-002 < : : : >

Flags Key:
LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 7/19/07 7:53:24 AM Page 1

G E N I E Q U A L I T Y A S S U R A N C E

Last Results Report
7/19/07 7:53:24 AM

QA File: G:\GENIE2K\CAMFILES\LG2AM5S3.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/19/07 7:21:56 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1002.3 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9562E+001	1.2476E-001
Am-241 Wtd mean activity [UD: 3.5800E-003+/- 0.000]	3.7058E-003	6.1676E-001
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	5.1692E-001	-5.6559E-003
Co 57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2217E+002	2.1201E-001
Co-57 Peak FWHM [UD: 4.6680E-001+/- 0.100]	5.4330E-001	7.6496E-001
Co-57 Wtd mean activity [UD: 8.8560E-005+/- 0.000]	9.8277E-005	3.7518E-001
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8099E+001	1.3737E-001
Cd-109 Peak FWHM [UD: 5.3950E-001+/- 0.100]	5.7053E-001	3.1034E-001
Cd-109 Wtd mean activity [UD: 6.6010E-003+/- 0.002]	5.7505E-003	8.3066E-002

Flags Key: LU = Lower/Upper Bounds Test [Ab = Above, Be = Below]
SD = Sample Driven N-Sigma Test [In = Investigate, Ac = Action]
UD = User Driven N-Sigma Test [In = Investigate, Ac = Action]
BS = Measurement Bias Test [In = Investigate, Ac = Action]

Last Measurement Q.A. Report 7/20/07 7:38:46 AM Page 1

GENIE QUALITY ASSURANCE

Last Results Report
7/20/07 7:38:46 AM

SKG 7/20/07

QA File: C:\GENIE2K\CAMFILES\LG2AM583.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/20/07 7:15:31 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1002.3 seconds

Parameter Description (Mean +/- Std. Dev.)	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy (UD: 5.9500E+001+/- 0.500)	5.9520E+001	4.0314E-002 < : : : >
Am-241 Wtd mean activity (UD: 3.5800E-003+/- 0.000)	3.7580E-003	8.7643E-001 < : : : >
Am-241 Peak FWHM (D: 5.1749E-001+/- 0.100)	5.1436E-001	-3.1306E-002 < : : : >
Co-57 Peak energy (UD: 1.2206E+002+/- 0.500)	1.2210E+002	7.2617E-002 < : : : >
Co-57 Peak FWHM (UD: 4.6680E-001+/- 0.100)	5.8097E-001	1.1417E+000 < : : : >
Co-57 Wtd mean activity (UD: 8.8560E-005+/- 0.000)	1.0118E-004	4.8736E-001 < : : : >
Cd-109 Peak energy (UD: 8.8030E+001+/- 0.500)	8.8034E+001	8.9417E-003 < : : : >
Cd-109 Peak FWHM (UD: 5.3950E-001+/- 0.100)	5.3546E-001	-4.0397E-002 < : : : >
Cd-109 Wtd mean activity (UD: 5.6010E-003+/- 0.002)	5.3542E-003	-1.3711E-001 < : : : >

Flags Key:
LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 7/24/07 7:45:02 AM Page 1

G.E.N.I.E. Q.U.A.L.I.T.Y. A.S.S.U.R.A.N.C.E

Last Results Report
7/24/07 7:45:02 AM

QA File: C:\GENIE2K\CAMFILES\LG2AM503.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/24/07 7:12:26 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1002.3 seconds

SRB 7/24/07

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9542E+001	8.4351E-002
Am-241 Wtd mean activity [UD: 3.5800E-003+/- 0.000]	3.7195E-003	6.8360E-001
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	5.3410E-001	1.6610E-001
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2216E+002	1.9697E-001
Co-57 Peak FWHM [UD: 4.6680E-001+/- 0.100]	6.1935E-001	1.5255E+000
Co-57 Wtd mean activity [UD: 8.8560E-005+/- 0.000]	9.9741E-005	4.3171E-001
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8077E+001	9.3903E-002
Cd-109 Peak FWHM [UD: 5.3950E-001+/- 0.100]	5.8450E-001	4.4996E-001
Cd-109 Wtd mean activity [UD: 5.6010E-003+/- 0.002]	5.4224E-003	-9.9209E-002

Flags Key: LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 7/23/07 7:42:55 AM Page 1

GENIE QUALITY ASSURANCE

Last Results Report
7/23/07 7:42:55 AM

QA File: C:\GENIE2K\CAMFILES\LG2AM553.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/23/07 7:10:40 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1002.3 seconds

SKB 7/23/07

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags LU	SD	UD	BS
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9550E+001		9.9220E-002		
Am-241 Wtd mean activity [UD: 3.5800E+003+/- 0.000]	3.5854E-003		2.6496E-002		
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	5.3446E-001		1.6969E-001		
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2219E+002	U<	2.6822E-001		
Co-57 Peak FWHM [UD: 4.6680E-001+/- 0.100]	6.1359E-001		1.4679E+000		
Co-57 Wtd mean activity [UD: 8.8560E+005+/- 0.000]	9.9141E+005		4.0853E-001		
Cd-109 Peak energy [UD: 8.6030E+001+/- 0.500]	8.8077E+001	--	9.3201E-002		
Cd-109 Peak FWHM [UD: 5.3950E-001+/- 0.100]	5.9667E-001		5.7172E-001		
Cd-109 Wtd mean activity [UD: 5.6010E+003+/- 0.002]	5.3123E+003		-1.6038E-001		

Flags Key:
LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 7/31/07 8:28:22 AM Page 1

GENIE QUALITY ASSURANCE

Last Results Report
7/31/07 8:28:22 AM

SKB 7/31/07

QA File: C:\GENIE2K\CAMFILES\LG2AM5S3.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 7/31/07 7:32:06 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1002.3 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9515E+001	2.9160E-002 < : : : >
Am-241 Wtd mean activity [UD: 3.5800E-003+/- 0.000]	3.7084E-003	6.2935E-001 < : : : >
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	5.0880E-001	-8.6860E-002 < : : : >
Co-57 Peak energy [UD: 1.2200E+002+/- 0.500]	1.2208E+002	4.9103E-002 < : : : >
Co-57 Peak FWHM [UD: 4.6680E-001+/- 0.100]	6.3841E-001	1.7161E+000 < : : : >
Co-57 Wtd mean activity [UD: 8.8560E-005+/- 0.000]	9.3806E-005	2.0256E-001 < : : : >
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8020E+001	-1.9089E-002 < : : : >
Cd-109 Peak FWHM [UD: 5.3950E-001+/- 0.100]	5.8291E-001	4.3411E-001 < : : : >
Cd-109 Wtd mean activity [UD: 5.6010E-003+/- 0.002]	5.4131E-003	-1.0439E-001 < : : : >

Flags Key:
LU = Lower/Upper Bounds Test (Ah = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 8/2/07 9:20:43 AM Page 1

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*****************************************************************
*****        G E N I E   Q U A L I T Y   A S S U R A N C E      *****
*****************************************************************
```

Last Results Report
8/2/07 9:20:43 AM

QA File: C:\GENIE2K\CAMFILES\1G2AM583.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 8/2/07 7:09:39 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1002.3 seconds

SKB 8/3/07

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9515E+001	3.0128E-002 < : : : >
Am-241 Wtd mean activity [UD: 3.5800E-003+/- 0.000]	3.6725E-003	4.5343E-001 < : : : >
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	5.3484E-001	1.7352E+001 < : : : >
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2210E+002	8.9500E-002 < : : : >
Co-57 Peak FWHM [UD: 4.6680E-001+/- 0.100]	5.1179E-001	4.4994E-001 < : : : >
Co-57 Wtd mean activity [UD: 8.8560E-005+/- 0.000]	8.8875E-005	1.2161E-002 < : : : >
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8026E+001	-7.1669E-003 < : : : >
Cd-109 Peak FWHM [UD: 5.3950E-001+/- 0.100]	5.6932E-001	2.9822E+001 < : : : >
Cd-109 Wtd mean activity [UD: 5.6010E-003+/- 0.002]	5.4013E-003	-1.1092E-001 < : : : >

Flags Key:
LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 8/3/07 7:33:22 AM Page 1

GENIE QUALITY ASSURANCE

Last Results Report
8/3/07 7:35:22 AM

QA File: C:\GENIE2K\CAMFILES\LG2AM551.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 8/3/07 7:13:02 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1002.3 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9560E+001	1.2073E-001 < : : : >
Am-241 Wtd mean activity [UD: 3.5800E-003+/- 0.000]	3.6112E-003	1.5280E-001 < : : : >
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	4.9858E-001	-1.8909E-001 < : : : >
Co-57 Peak energy [UD: 1.2206E+002+/- 0.500]	1.2219E+002	2.3848E-001 < : : : >
Co-57 Peak FWHM [UD: 4.6880E-001+/- 0.100]	6.0266E-001	1.3586E+000 < : : : >
Co-57 Wtd mean activity [UD: 3.6560E-005+/- 0.000]	8.8826E-005	1.0281E-002 < : : : >
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8087E+001	1.3310E-001 < : : : >
Cd-109 Peak FWHM [UD: 5.3950E-001+/- 0.100]	5.3552E-001	-2.9763E-002 < : : : >
Cd-109 Wtd mean activity [UD: 5.6010E-003+/- 0.002]	5.0940E-003	-3.8104E-001 < : : : >

Flags Key:
LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Last Measurement Q.A. Report 8/7/07 7:46:23 AM Page 1

GENIE QUALITY ASSURANCE

Last Results Report
8/7/07 7:46:23 AM

QA File: C:\GENIE2K\CAMFILES\LG2AM583.QAF
Sample ID:
Sample Quantity: 1.0000E+000
Sample Date:
Measurement Date: 8/7/07 7:11:43 AM
Elapsed Live Time: 1000.0 seconds
Elapsed Real Time: 1092.3 seconds

SKB 8/7/07

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Am-241 Peak Energy [UD: 5.9500E+001+/- 0.500]	5.9563E+001	1.2556E-001
Am-241 Wtd mean activity [UD: 3.5000E-003+/- 0.000]	3.5761E-003	-1.9231E-002
Am-241 Peak FWHM [UD: 5.1749E-001+/- 0.100]	4.9896E-001	-1.8530E-001
Co-57 Peak energy [UD: 1.2200E+002+/- 0.500]	1.2217E+002	2.1556E-001
Co-57 Peak FWHM [UD: 4.6680E-001+/- 0.100]	5.6669E-001	9.9893E-001
Co-57 Wtd mean activity [UD: 8.8560E-005+/- 0.000]	8.7896E-005	-2.5642E-002
Cd-109 Peak energy [UD: 8.8030E+001+/- 0.500]	8.8104E+001	1.4893E-001
Cd-109 Peak FWHM [UD: 5.3950E-001+/- 0.100]	5.4532E-001	5.8237E-002
Cd-109 Wtd mean activity [UD: 5.6010E-003+/- 0.002]	5.7169E-003	6.4405E-002

Flags Key: LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

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Last Measurement Q.A. Report        8/8/07     7:58:00 AM        Page  1

*****************************************************************************
*****        G E N I E   Q U A L I T Y   A S S U R A N C E              *****
*****************************************************************************

                          Last Results Report
                          8/8/07     7:58:00 AM

QA File:                  C:\GENIE2K\CAMFILES\LG2AM533.QAF
Sample ID:
Sample Quantity:            1.0000E+000
Sample Date:
Measurement Date:         8/8/07     7:09:25 AM
Elapsed Live Time:           1000.0 seconds
Elapsed Real Time:           1002.3 seconds

Parameter Description            Value                  Deviation/Flags
 [Mean +/- Std. Dev.]                               < LU : SD : UD : BS >

Am-241 Peak Energy               5.9565E+001               1.2940E-001
 [UD: 5.9500E+001+/- 0.500]                         <    :    :    :    >

Am-241 Wtd mean activity         3.6879E-003               5.2887E-001
 [UD: 3.5800E-003+/- 0.000]                         <    :    :    :    >

Am-241 Peak FWHM                 5.0741E-001              -1.0080E-001
 [UD: 5.1749E-001+/- 0.100]                         <    :    :    :    >

Co-57 Peak energy                1.2217E+002               2.1643E-001
 [UD: 1.2206E+002+/- 0.500]                         <    :    :    :    >

Co-57 Peak FWHM                  6.6269E-001               1.9589E+000
 [UD: 4.6680E-001+/- 0.100]                         <    :    :    :    >

Co-57 Wtd mean activity          9.0437E-005               7.2485E-002
 [UD: 8.8560E-005+/- 0.000]                         <    :    :    :    >

Cd-109 Peak energy               8.8104E+001               1.4825E-001
 [UD: 8.8030E+001+/- 0.500]                         <    :    :    :    >

Cd-109 Peak FWHM                 5.1910E-001              -2.0398E-001
 [UD: 5.3950E-001+/- 0.100]                         <    :    :    :    >

Cd-109 Wtd mean activity         5.1001E-003              -2.3830E-001
 [UD: 5.6010E-003+/- 0.002]                         <    :    :    :    >

Flags Key:   LU = Lower/Upper Bounds Test       (Ab = Above, Be = Below)
             SD = Sample Driven N-Sigma Test    (In = Investigate, Ac = Action)
             UD = User Driven N-Sigma Test      (In = Investigate, Ac = Action)
             BS = Measurement Bias Test         (In = Investigate, Ac = Action)
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SKB 8/8/07

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Last Measurement Q.A. Report          7/17/07  8:15:40 AM          Page  1

*****************************************************************************
*  *          G E R M   Q U A L I T Y   A S S U R A N C E              *****
*****************************************************************************

                          Last Results Report
                          7/17/07  8:10:40 AM

QA File:                  C:\SPC2\SPC2MCA.QAF
Sample ID:                QA
Sample Quantity:           1.0000E+000
Measurement Date:          7/17/07  7:55:28 AM
Elapsed Live Time:              900.0 seconds
Elapsed Real Time:              903.2 seconds

Parameter Description              Value                 Deviation/Flags
 [Mean +/- Std. Dev.]                                  < LU | SD | UD | MB >

Am-241 Peak energy               5.9598E+001                   0.00
       [0.00+/-0.00]                                   <    |    |    |    >
Cs-137 Peak energy               6.6160E+002                   0.00
       [0.00+/-0.00]                                   <    |    |    |    >
Co-60 Peak energy                1.3325E+003                   0.00
       [0.00+/-0.00]                                   <    |    |    |    >
Cs-137 Peak FWHM                 1.2044E+000                   0.00
       [0.00+/-0.00]                                   <    |    |    |    >
Am-241 activity                  1.7329E-002                   0.00
       [0.00+/-0.00]                                   <    |    |    |    >
Co-60 activity                   1.6464E-002                   0.00
       [0.00+/-0.00]                                   <    |    |    |    >
Cs-137 activity                  1.5033E-002                   0.00
       [0.00+/-0.00]                                   <    |    |    |    >

Flags Key:  LU = Lower/Upper Bounds Test      (Ab = Above, Be = Below)
            SD = Sample Driven N-Sigma Test   (In = Investigate, Ac = Action)
            UD = User Driven N-Sigma Test     (In = Investigate, Ac = Action)
            MB = Measurement Bias Test        (In = Investigate, Ac = Action)
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Lab Measurement Q.A. Report 7/17/07 8:10:50 AM Page 1

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*****************************************************************
**  *        D E N I E   Q U A L I T Y   A S S U R A N C E      ****
*****************************************************************
```

Lab Results Report
7/17/07 8:10:50 AM

QA File: C:\GAMPCNT\GPCLMCA.QAF
Sample ID: QA
Sample Quantity: 1.00000E+00
Measurement Date: 7/17/07 7:55:39 AM
Elapsed Live Time: 950.0 seconds
Elapsed Real Time: 995.3 seconds

Parameter Description (Mean +/- Std. Dev.)	Value	Deviation/Flags < LO : SO : QD : BO >
Am-241 Peak energy [0.00+/-0.00]	5.5507E+001	0.00
Cs-137 Peak energy [0.00+/-0.00]	6.6173E+002	0.00
Co-60 Peak energy [0.00+/-0.00]	3.3320E+003	0.00
Cs-137 Peak FWHM [0.00+/-0.00]	1.0370E+000	0.00
Am-241 activity [0.00+/-0.00]	1.7030E-002	0.00
Co-60 activity [0.00+/-0.00]	1.6223E-003	0.00
Cs-137 activity [0.00+/-0.00]	1.5304E-002	0.00

OK DAE

Flags Key: LO = Lower/Upper Bounds Test (Ab = Above, Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, AC = Action)
QD = User Driven N-Sigma Test (In = Investigate, AC = Action)
BO = Measurement Bias Test (In = Investigate, AC = Action)

Table 17. Gamma analyses results for Co-57, Sr-85 and Cs-137.

ADP FILE/NOTEBOOK REF	WSRC-NB-2003-00207 PAGE 93	
Sample ID	300241078	
	Date Counted	
Comment	7/12/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	2.53E+03	1.29%
Sr-85	2.65E+03	1.60%
Cs-137	2.69E+02	1.84%
Sample ID	300241079	
	Date Counted	
Comment	7/12/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	2.62E+03	1.30%
Sr-85	2.70E+03	1.60%
Cs-137	2.82E+02	1.82%
Sample ID	300241080	
	Date Counted	
Comment	7/13/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	2.58E+03	1.30%
Sr-85	2.70E+03	1.60%
Cs-137	3.01E+02	1.77%
Sample ID	300241081	
	Date Counted	
Comment	7/13/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	2.15E+03	1.37%
Sr-85	2.60E+03	1.61%
Cs-137	1.39E+02	2.42%
Sample ID	300241082	
	Date Counted	
Comment	7/13/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	3.14E+03	1.28%
Sr-85	2.74E+03	1.60%
Cs-137	1.26E+03	1.27%

Sample ID	300241083	
	Date Counted	
Comment	7/13/07	
		1 Sigma
Nuclide	dpm/mL	Uncertainty
Co-57	3.19E+03	1.29%
Sr-85	2.72E+03	1.60%
Cs-137	1.22E+03	1.27%

Sample ID	300241084	
	Date Counted	
Comment	7/13/07	
		1 Sigma
Nuclide	dpm/mL	Uncertainty
Co-57	2.99E+03	1.30%
Sr-85	2.72E+03	1.60%
Cs-137	5.71E+02	1.48%

Sample ID	300241085	
	Date Counted	
Comment	7/14/07	
		1 Sigma
Nuclide	dpm/mL	Uncertainty
Co-57	2.97E+03	1.31%
Sr-85	2.73E+03	1.60%
Cs-137	5.75E+02	1.46%

Sample ID	300241086	
	Date Counted	
Comment	7/14/07	
		1 Sigma
Nuclide	dpm/mL	Uncertainty
Co-57	2.75E+03	1.30%
Sr-85	2.71E+03	1.60%
Cs-137	2.31E+02	1.95%

Sample ID	300241087	
	Date Counted	
Comment	7/14/07	
		1 Sigma
Nuclide	dpm/mL	Uncertainty
Co-57	2.76E+03	1.29%
Sr-85	2.64E+03	1.60%
Cs-137	3.67E+02	1.68%

Sample ID	300241088	
	Date Counted	
Comment	7/14/07	
		1 Sigma
Nuclide	dpm/mL	Uncertainty
Co-57	2.92E+03	1.29%
Sr-85	2.76E+03	1.60%
Cs-137	3.38E+02	1.72%

Sample ID	300241089	
	Date Counted	
Comment	7/14/07	
		1 Sigma
Nuclide	dpm/mL	Uncertainty
Co-57	2.82E+03	1.30%
Sr-85	2.62E+03	1.60%
Cs-137	4.82E+02	1.54%

Sample ID	300241090	
	Date Counted	
Comment	7/15/07	
		1 Sigma
Nuclide	dpm/mL	Uncertainty
Co-57	2.87E+03	1.29%
Sr-85	2.73E+03	1.60%
Cs-137	5.09E+02	1.53%

Sample ID	300241091	
	Date Counted	
Comment	7/15/07	
		1 Sigma
Nuclide	dpm/mL	Uncertainty
Co-57	3.21E+03	1.29%
Sr-85	2.84E+03	1.60%
Cs-137	7.74E+02	1.38%

Sample ID	300241092	
	Date Counted	
Comment	7/15/07	
		1 Sigma
Nuclide	dpm/mL	Uncertainty
Co-57	2.48E+03	1.32%
Sr-85	2.58E+03	1.61%
Cs-137	1.85E+02	2.15%

ADP FILE/NOTEBOOK REF	WSRC-NB-2003-00207 PAGE 093	
Sample ID	300241093	
Comment	Date Counted 7/15/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	2.73E+03	1.31%
Sr-85	2.61E+03	1.60%
Cs-137	3.63E+02	1.67%

Sample ID	300241094	
Comment	Date Counted 7/15/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	2.36E+03	1.35%
Sr-85	2.47E+03	1.61%
Cs-137	4.75E+02	1.54%

Sample ID	300241095	
Comment	Date Counted 7/16/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	2.54E+03	1.29%
Sr-85	2.68E+03	1.60%
Cs-137	5.14E+02	1.51%

Sample ID	300241096	
Comment	Date Counted 7/16/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	2.60E+03	1.29%
Sr-85	2.62E+03	1.60%
Cs-137	1.68E+02	2.29%

Sample ID	300241097	
Comment	Date Counted 7/16/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	2.88E+03	1.28%
Sr-85	2.70E+03	1.60%
Cs-137	2.30E+02	1.95%

Sample ID	300241098	
Comment	Date Counted 7/12/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	2.53E+03	1.34%
Sr-85	2.67E+03	1.61%
Cs-137	2.93E+02	1.89%

Sample ID	300241099	
Comment	Date Counted 7/12/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	2.71E+03	1.32%
Sr-85	2.74E+03	1.61%
Cs-137	3.18E+02	1.85%

Sample ID	300241100	
Comment	Date Counted 7/13/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	3.17E+03	1.29%
Sr-85	2.72E+03	1.61%
Cs-137	7.12E+02	1.45%

Sample ID	300241101	
Comment	Date Counted 7/13/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	3.36E+03	1.27%
Sr-85	2.86E+03	1.61%
Cs-137	9.70E+02	1.36%

Sample ID	300241102	
Comment	Date Counted 7/13/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	2.84E+03	1.30%
Sr-85	2.75E+03	1.61%
Cs-137	4.60E+02	1.63%

Sample ID	300241103	
Comment	Date Counted 7/13/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	2.78E+03	1.32%
Sr-85	2.68E+03	1.61%
Cs-137	4.35E+02	1.66%

Sample ID	300241104	
Comment	Date Counted 7/13/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	1.97E+03	1.39%
Sr-85	2.25E+03	1.62%
Cs-137	3.48E+01	5.56%

Sample ID	300241105
Comment	Date Counted 7/14/07

Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	2.04E+03	1.35%
Sr-85	2.33E+03	1.62%
Cs-137	3.52E+01	5.32%

Sample ID	300241106	
Comment	Date Counted 7/14/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	2.67E+03	1.31%
Sr-85	2.53E+03	1.62%
Cs-137	1.80E+02	2.35%

Sample ID	300241107	
Comment	Date Counted 7/14/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	2.80E+03	1.31%
Sr-85	2.62E+03	1.61%
Cs-137	1.84E+02	2.27%

ADP FILE/NOTEBOOK REF	WSRC-NB-2003-00207 PAGE 94	
Sample ID	300241108	
Comment	Date Counted 7/14/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	3.18E+03	1.30%
Sr-85	2.72E+03	1.61%
Cs-137	9.27E+02	1.37%

Sample ID	300241109	
Comment	Date Counted 7/14/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	3.27E+03	1.29%
Sr-85	2.78E+03	1.61%
Cs-137	1.05E+03	1.34%

Sample ID	300241110	
Comment	Date Counted 7/15/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	2.51E+03	1.33%
Sr-85	2.59E+03	1.62%
Cs-137	1.96E+02	2.20%

Sample ID	300241111
Comment	Date Counted 7/15/07

Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	2.44E+03	1.33%
Sr-85	2.57E+03	1.62%
Cs-137	2.19E+02	2.08%

Sample ID	300241112	
Comment	Date Counted 7/15/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	3.22E+03	1.28%
Sr-85	2.76E+03	1.61%
Cs-137	1.03E+03	1.34%

Sample ID	300241113	
Comment	Date Counted 7/15/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	3.23E+03	1.00%
Sr-85	2.78E+03	1.61%
Cs-137	1.03E+03	1.35%

Sample ID	300241114	
Comment	Date Counted 7/15/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	3.18E+03	1.29%
Sr-85	2.75E+03	1.61%
Cs-137	7.38E+02	1.44%

Sample ID	300241115	
Comment	Date Counted 7/16/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	3.16E+03	1.30%
Sr-85	2.70E+03	1.61%
Cs-137	7.99E+02	1.42%

Sample ID	300241116	
Comment	Date Counted 7/16/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	3.21E+03	1.39%
Sr-85	2.75E+03	1.61%
Cs-137	1.36E+03	1.28%

Sample ID	300241117	
Comment	Date Counted 7/16/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	3.08E+03	1.34%

Sr-85	2.64E+03	1.61%
Cs-137	1.27E+03	1.30%

Sample ID	300241118	
Comment	Date Counted 7/16/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	4.07E+03	1.28%
Sr-85	2.99E+03	1.61%
Cs-137	4.49E+03	1.14%

Sample ID	300241119	
Comment	Date Counted 7/17/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	3.86E+03	1.27%
Sr-85	2.77E+03	1.61%
Cs-137	4.21E+03	1.14%

Sample ID	300241120	
Comment	Date Counted 7/17/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	4.09E+03	1.30%
Sr-85	2.95E+03	1.62%
Cs-137	4.45E+03	1.15%

Sample ID	300241121	
Comment	Date Counted 7/17/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	<2.66E+00	MDA
Sr-85	<4.72E+00	MDA
Cs-137	<4.06E+00	MDA

Sample ID	300241122	
Comment	Date Counted 7/17/07	
Nuclide	dpm/mL	1 Sigma Uncertainty
Co-57	<2.63E+00	MDA
Sr-85	<4.63E+00	MDA
Cs-137	<4.07E+00	MDA

Table 18 . Gamma data for Pu, Fe, and Ni.

ADS LIMS#	Pu-238 (DPM/ml)	1 Sigma %Unc	Fe-55 (DPM/ml)	1 Sigma %Unc	Ni-59 (DPM/ml)	1 Sigma %Unc
241033	8.74E+01	15.10%	< 1.44E+01	mda	2.10E+02	10.00%
241034	7.21E+01	13.84%	< 5.10E+01	mda	2.36E+02	10.00%
241035	1.46E+01	32.86%	< 1.03E+02	mda	1.84E+02	9.61%
241036	< 3.02E+01	MDA	< 1.46E+01	mda	2.22E+02	7.26%
241037	2.74E+02	8.63%	8.80E+02	15.00%	1.06E+02	14.04%
241038	2.07E+02	7.20%	5.51E+02	15.00%	3.11E+01	24.16%
241039	< 1.58E+01	MDA	3.09E+01	21.83%	1.63E+02	6.75%
241040	1.12E+01	24.70%	1.98E+02	16.07%	1.58E+02	7.39%
241041	1.55E+02	10.33%	< 4.79E+01	mda	2.51E+02	7.77%
241042	1.79E+02	10.90%	< 1.51E+01	mda	2.56E+02	7.09%
241043	< 1.76E+01	MDA	1.43E+02	29.10%	1.74E+02	10.50%
241044	2.69E+01	21.65%	9.50E+02	13.74%	5.80E+01	20.21%
241045	1.49E+02	10.25%	5.29E+02	17.74%	4.17E+01	30.44%
241046	1.68E+02	10.88%	2.94E+02	13.10%	5.19E+01	15.85%
241047	8.62E+00	27.65%	< 2.44E+01	mda	1.74E+02	6.83%
241048	< 8.65E+00	MDA	< 4.18E+01	mda	2.09E+02	7.26%
241049	2.54E+02	7.47%	< 8.18E+00	mda	2.34E+02	6.20%
241050	2.75E+02	8.63%	< 5.24E+01	mda	2.34E+02	7.96%
241051	< 2.97E+01	MDA	< 1.46E+01	mda	1.89E+02	7.47%
241052	< 1.61E+01	MDA	< 7.89E+01	mda	2.48E+02	8.78%
241053	1.03E+02	11.70%	< 4.98E+01	mda	2.77E+02	7.59%
241054	1.02E+02	11.43%	< 7.57E+01	mda	2.64E+02	8.60%
241055	3.20E+01	29.74%	< 1.49E+01	mda	2.05E+02	7.40%
241056	1.82E+01	17.75%	< 2.57E+01	mda	2.35E+02	6.54%
241057	1.28E+02	8.99%	4.79E+02	11.25%	6.12E+01	10.84%
241058	3.47E+01	12.82%	8.96E+01	26.26%	1.62E+02	8.08%
241059	< 1.43E+01	MDA	< 4.23E+01	mda	< 1.07E+01	mda
241060	< 3.02E+01	MDA	< 1.57E+01	mda	1.83E+02	7.60%
241061	2.54E+01	23.05%	< 9.77E+01	mda	2.39E+02	9.07%
241062	1.55E+01	19.74%	< 3.15E+01	mda	1.97E+02	6.79%
241063	< 1.71E+01	MDA	8.25E+02	10.88%	9.45E+01	8.85%
241064	2.99E+02	6.81%	1.36E+03	12.41%	4.26E+01	22.32%
241065	2.48E+02	9.04%	< 5.18E+01	mda	2.49E+02	7.94%
241066	3.00E+02	9.48%	< 1.74E+01	mda	2.37E+02	7.27%
241067	4.03E+01	17.91%	7.17E+02	16.19%	1.48E+02	11.71%
241068	1.38E+02	7.96%	7.27E+02	12.58%	1.02E+02	9.65%
241069	6.42E+01	12.07%	< 8.20E+00	mda	2.31E+02	6.20%
241070	3.12E+01	13.48%	4.41E+01	40.60%	2.29E+02	7.24%
241071	8.03E+01	12.59%	1.39E+03	13.17%	4.04E+01	29.75%
241072	2.99E+02	7.21%	1.04E+03	10.76%	5.21E+01	12.25%
241073	5.84E+02	7.31%	1.70E+03	13.86%	< 5.44E+02	upper limit
241074	1.04E+03	6.80%	2.10E+03	12.67%	< 1.58E+02	upper limit
241075	1.01E+03	6.74%	2.08E+03	13.60%	< 7.91E+02	upper limit
241076	< 7.83E+00	MDA	< 3.72E+01	mda	< 7.84E+00	mda
247077	< 7.17E+00	MDA	< 2.18E+01	mda	< 4.97E+00	mda

APPENDIX D. Data Used in K_d and CEC Calculations

Table 19. Raw data for Co, Sr, and Cs K_d calculations.

Boring/ Sample No	ADS LIMS #	Rep	Soil (g)	Final aqueous vol (mL)	Co-57 (dpm/mL)	Sr-85 (dpm/mL)	Cs-137 (dpm/mL)	Co Kd (mL/g)	Sr Kd (mL/g)	Cs Kd (mL/g)
B308/SS15	300241078	1	0.5068	12.236	2525.0	2646.0	269.3	14.2	2.3	368.9
	300241079	2	0.5042	12.155	2617.1	2704.3	281.7	12.8	1.8	351.0
B308/SS25	300241080	1	0.5041	12.183	2580.3	2701.6	300.7	13.4	1.8	328.2
	300241081	2	0.4981	11.973	2146.0	2600.0	138.8	20.8	2.8	735.3
B332/SS12	300241082	1	0.4976	11.947	3136.8	2744.7	1260.1	6.7	1.4	59.5
	300241083	2	0.4998	12.025	3188.5	2724.3	1217.2	6.2	1.6	62.6
B332/SS23	300241084	1	0.4969	11.911	2985.5	2716.7	570.6	8.2	1.6	160.2
	300241085	2	0.5057	12.231	2973.0	2733.7	575.3	8.4	1.5	160.1
B348/SS8	300241086	1	0.5017	12.096	2753.5	2710.3	231.2	11.0	1.7	433.1
	300241087	2	0.4981	11.961	2757.7	2644.2	366.5	10.9	2.4	263.2
B348/SS17	300241088	1	0.5035	12.162	2918.6	2758.8	338.2	9.0	1.3	288.9
	300241089	2	0.5081	12.327	2821.8	2618.5	482.0	10.2	2.6	196.4
B349/SS14	300241090	1	0.5019	12.064	2869.7	2732.0	509.3	9.5	1.5	182.8
	300241091	2	0.4958	11.908	3210.6	2837.9	774.2	6.0	0.6	112.0
B349/SS23	300241092	1	0.5048	12.282	2480.9	2578.4	184.6	15.0	3.1	553.5
	300241093	2	0.4972	11.932	2731.2	2613.2	363.2	11.2	2.7	265.6
B408/SS14	300241094	1	0.4978	11.958	2364.9	2466.8	474.8	16.7	4.3	197.7
	300241095	2	0.4974	11.926	2544.1	2676.7	514.0	13.8	2.0	180.5
B408/SS22	300241096	1	0.5073	12.280	2601.9	2622.4	167.9	13.1	2.6	607.7
	300241097	2	0.4992	11.965	2882.2	2695.4	230.2	9.4	1.8	432.3
B438/SS12	300241098	1	0.498	11.942	2525.8	2673.1	293.1	14.1	2.1	334.6
	300241099	2	0.4997	12.014	2709.2	2744.6	318.0	11.5	1.4	307.4
B438/SS24	300241100	1	0.4953	11.841	3171.4	2718.6	712.0	6.3	1.6	123.3
	300241101	2	0.4997	12.024	3357.6	2862.9	969.7	4.7	0.3	84.7
B910/SS14	300241102	1	0.5059	12.217	2840.9	2750.2	460.0	9.9	1.3	206.0
	300241103	2	0.5011	12.048	2777.3	2684.8	434.9	10.6	2.0	218.3
B910/SS24	300241104	1	0.5088	12.301	1974.0	2246.9	34.8	24.9	7.1	3017.4
	300241105	2	0.5006	12.058	2038.9	2334.0	35.2	23.2	5.9	2971.3
B930/SS14	300241106	1	0.5044	12.163	2670.0	2533.9	180.4	12.1	3.5	561.8
	300241107	2	0.4995	11.986	2804.7	2619.9	184.2	10.3	2.6	547.2
B930/SS27	300241108	1	0.5053	12.178	3180.0	2720.0	927.0	6.3	1.6	89.9
	300241109	2	0.5087	12.300	3270.0	2780.0	1050.0	5.4	1.1	76.8

B933/SS14	300241110	1	0.4988	11.986	2510.0	2590.0	196.0	14.3	2.9	513.3
	300241111	2	0.506	12.214	2440.0	2570.0	219.0	15.5	3.1	459.0
Boring/ Sample No	**ADS LIMS #**	**Rep**	**Soil (g)**	**Final aqueous vol (mL)**	**Co-57 (dpm/mL)**	**Sr-85 (dpm/mL)**	**Cs-137 (dpm/mL)**	**Co Kd (mL/g)**	**Sr Kd (mL/g)**	**Cs Kd (mL/g)**
B933/SS24	300241112	1	0.5063	12.218	3220.0	2760.0	1030.0	5.9	1.3	78.6
	300241113	2	0.5047	12.164	3230.0	2780.0	1030.0	5.8	1.1	78.5
B934/SS15	300241114	1	0.505	12.161	3180.0	2750.0	738.0	6.3	1.3	119.0
	300241115	2	0.4975	11.902	3160.0	2700.0	799.0	6.4	1.8	107.3
B934/SS26	300241116	1	0.5066	12.220	3210.0	2750.0	1360.0	6.0	1.3	53.6
	300241117	2	0.5021	12.173	3080.0	2640.0	1270.0	7.3	2.4	59.4
Spike no soil control	300241118	1		10.201	4070	2990	4490			
	300241119	2		10.198	3860	2770	4210			
	300241120	3		10.195	4090	2950	4450			
Blank no soil control	300241121	2		10.203	<2.66E+00	<4.72E+00	<4.06E+00			
	300241122	3		10.198	<2.63E+00	<4.63E+00	<4.07E+00			
				10.198	**4006.7**	**2903.3**	**4383.3**			

Table 20. Fe, Ni, and Pu gamma analyses used in the K_d determinations.

Tube #	Boring/ Sample #	ADS LIMS #	Rep	Fe (dpm/mL)	Ni(dpm/mL)	Pu (dpm/mL)
501-A	B308/SS15	300241033	1	1.44E+01	2.10E+02	8.74E+01
501-B		300241034	2	5.10E+01	2.36E+02	7.21E+01
502-A	B308/SS25	300241035	1	1.03E+02	1.84E+02	1.46E+01
502-B		300241036	2	1.46E+01	2.22E+02	< 3.02E+01
503-A	B332/SS12	300241037	1	8.80E+02	1.06E+02	2.74E+02
503-B		300241038	2	5.51E+02	3.11E+01	2.07E+02
504-A	B332/SS23	300241039	1	3.09E+01	1.63E+02	< 1.58E+01
504-B		300241040	2	1.98E+02	1.58E+02	1.12E+01
505-A	B348/SS8	300241041	1	4.79E+01	2.51E+02	1.55E+02
505-B		300241042	2	1.51E+01	2.56E+02	1.79E+02
506-A	B348/SS17	300241043	1	1.43E+02	1.74E+02	< 1.76E+01
506-B		300241044	2	9.50E+02	5.80E+01	2.69E+01
507-A	B349/SS14	300241045	1	5.29E+02	4.17E+01	1.49E+02
507-B		300241046	2	2.94E+02	5.19E+01	1.68E+02
508-A	B349/SS23	300241047	1	2.44E+01	1.74E+02	8.62E+00
508-B		300241048	2	4.18E+01	2.09E+02	< 8.65E+00
509-A	B408/SS14	300241049	1	8.18E+00	2.34E+02	2.54E+02
509-B		300241050	2	5.24E+01	2.34E+02	2.75E+02
510-A	B408/SS22	300241051	1	1.46E+01	1.89E+02	< 2.97E+01
510-B		300241052	2	7.89E+01	2.48E+02	< 1.61E+01
511-A	B438/SS12	300241053	1	4.98E+01	2.77E+02	1.03E+02
511-B		300241054	2	7.57E+01	2.64E+02	1.02E+02
512-A	B438/SS24	300241055	1	1.49E+01	2.05E+02	3.20E+01
512-B		300241056	2	2.57E+01	2.35E+02	1.82E+01
513-A	B910/SS14	300241057	1	4.79E+02	6.12E+01	1.28E+02
513-B		300241058	2	8.96E+01	1.62E+02	3.47E+01
514-A	B910/SS24	300241059	1	4.23E+01	< 1.07E+01	< 1.43E+01
514-B		300241060	2	1.57E+01	1.83E+02	< 3.02E+01
515-A	B930/SS14	300241061	1	9.77E+01	2.39E+02	2.54E+01
515-B		300241062	2	3.15E+01	1.97E+02	1.55E+01
516-A	B930/SS27	300241063	1	8.25E+02	9.45E+01	< 1.71E+01
516-B		300241064	2	1.36E+03	4.26E+01	2.99E+02
517-A	B933/SS14	300241065	1	5.18E+01	2.49E+02	2.48E+02
517-B		300241066	2	1.74E+01	2.37E+02	3.00E+02
518-A	B933/SS24	300241067	1	7.17E+02	1.48E+02	4.03E+01
518-B		300241068	2	7.27E+02	1.02E+02	1.38E+02
519-A	B934/SS15	300241069	1	8.20E+00	2.31E+02	6.42E+01
519-B		300241070	2	4.41E+01	2.29E+02	3.12E+01
520-A	B934/SS26	300241071	1	1.39E+03	4.04E+01	8.03E+01
520-B		300241072	2	1.04E+03	5.21E+01	2.99E+02
521-A	Spike control	300241073	1	1.70E+03	5.44E+02	5.84E+02
521-B		300241074	2	2.10E+03	1.58E+02	1.04E+03
521-C		300241075	3	2.08E+03	7.91E+02	1.01E+03
522-A	Blank control	300241076	1	3.72E+01	< 7.84E+00	< 7.83E+00
522-B		300241077	2	2.18E+01	< 4.97E+00	< 7.17E+00

Table 21. Data used in CEC calculations.

ID		STP Soil	Rep	Soil Wt. (g)		[Na] (ppm)	CEC (meq/100g)	avg CEC (meq/100g)	stdev CEC (meq/100g)
501-A	300240736	B308/SS15	1	5.355		12.8	0.82	0.749	0.095
501-B	300240737		2	5.3235		11.1	0.68		
502-A	300240738	B308/SS25	1	5.2688		47.5	3.69	3.365	0.466
502-B	300240739		2	5.2239		39.2	3.04		
503-A	300240740	B332/SS12	1	5.2672		8.48	0.47	0.376	0.137
503-B	300240741		2	5.2583		6.12	0.28		
504-A	300240742	B332/SS23	1	5.2825		8.87	0.50	0.632	0.182
504-B	300240743		2	5.2324		11.9	0.76		
505-A	300240744	B348/SS8	1	5.3345		14.6	0.97	0.841	0.177
505-B	300240745		2	5.3184		11.5	0.72		
Blank 1	300240746	No soil	1	na		2.75			
Std. 1	300240747	Subsurface Clayey	1	5.2064		42.2	3.30		
506-A	300241021	B348/SS17	1	5.0072		10.4	0.76	0.822	0.093
506-B	300241022		2	5.0022		11.9	0.89		
507-A	300241023	B349/SS14	1	5.0121		7.24	0.48	0.636	0.219
507-B	300241024		2	5.0084		10.8	0.79		
508-A	300241025	B349/SS23	1	5.0104		17.4	1.36	1.138	0.319
508-B	300241026		2	5.0124		12.2	0.91		
509-A	300241027	B408/SS14	1	5.0026		9.78	0.70	0.726	0.032
509-B	300241028		2	5.0055		10.3	0.75		
510-A	300241029	B408/SS22	1	5.0108		12	0.89	0.925	0.043
510-B	300241030		2	5.0128		12.7	0.96		
Blank 2	300241031	No soil	1	na		1.693			
Std. 2	300241032	Subsurface Clayey	1	5.0109		78.3	6.65		
511-A	300241252	B438/SS12	1	5.0103		29.3	2.53	2.072	0.652
511-B	300241253		2	5.0156		18.7	1.61		
512-A	300241254	B438/SS24	1	5.0297		15.2	1.30	0.921	0.541
512-B	300241255		2	5.0165		6.33	0.54		
513-A	300241256	B910/SS14	1	5.0047		13.8	1.19	1.295	0.150
513-B	300241257		2	5.0242		16.3	1.40		
514-A	300241258	B910/SS24	1	5.008		87.8	7.62	9.889	3.215
514-B	300241259		2	5.0027		140	12.16		
515-A	300241260	B930/SS14	1	5.0106		23.8	2.06	2.539	0.684
515-B	300241261		2	5.0044		34.9	3.02		
Blank 3	300241262	No soil	1	na	<	0.237			
Std. 3	300241263	Subsurface Clayey	1	5.1006		64.4	5.48		
516-A	300241264	B930/SS27	1	5.0093		7.9	0.49	0.509	0.021
516-B	300241265		2	5.0194		8.25	0.52		
517-A	300241266	B933/SS14	1	5.008		25.8	2.05	1.928	0.170
517-B	300241267		2	5.0017		23	1.81		
518-A	300241268	B933/SS24	1	5.0041		11.8	0.83	0.850	0.023
518-B	300241269		2	5.0172		12.2	0.87		
519-A	300241270	B934/SS15	1	5.0117		16.7	1.26	1.300	0.060
519-B	300241271		2	5.0179		17.7	1.34		

ID		STP Soil	Rep	Soil Wt. (g)	[Na] (ppm)	CEC (meq/100g)	avg CEC (meq/100g)	stdev CEC (meq/100g)
520-A	300241272	B934/SS26	1	5.0089	13.6	0.99	0.750	0.339
520-B	300241273		2	4.9949	8.07	0.51		
Blank 4	300241274	No soil	1	na	2.21			
Std. 4	300241275	Subsurface Clayey	1	5.0054	74.4	6.27		

APPENDIX E. Traceability Records of Soil and Groundwater Samples

MACTEC

LABORATORY ASSIGNMENT SHEET / CHAIN OF CUSTODY RECORD

MACTEC PROJECT NUMBER: 6050-06-0406

Page 1 of 4

LABORATORY RECIEVING ID: Savannah River

DATE: January 11, 2007

PREPARED BY (NAME / COMPANY): Lani Johnson/MACTEC

LAB MANAGER: Don Hopkins

MACTEC PROJECT MANAGER: Michael D. Sufnarski

JOB NAME: South Texas COL Project

CLIENT CONTACT: Michael D. Sufnarski

CLIENT PHONE: Office: 704-357-5833 Mobile: 704-309-0624

CLIENT FAX: 704-357-6633

RETAIN SAMPLES UNTIL: Contact M. Sufnarski before disposal

DATE REPORT REQUIRED: (Lab Mgr initials required)

ACTUAL DATE OF REPORT: (Lab Mgr initials required)

NOTE: LIST QUANTITY OF EACH TEST FOR EACH SAMPLE BELOW

SAMPLE NUMBER	Boring No.	Sample Number	Sample Depth Top (ft)	Sample Depth Bottom (ft)	Sample Type	Field Classification (USCS)	ADSORPTION DESTRUCTION COEFFICIENT (Kd)								EFFECTIVE OVERBURDEN STRESS (psf)	ESTIMATED K	REMARKS
1	B-308	SS-18	38.5	40	soil	SP	X										
2	B-309 DH	SS-26	63.5	90	soil	SP	X										
3	B-332	SS-12	28.5	40	soil	SM	X										
4	B-332	SS-23	93.5	95	soil	SP	X										
5	B-348	SS-8	28.5	30	soil	SP	X										
6	B-348	SS-17	73.5	75	soil	SP	X										
7	B-349	SS-14	33.5	35	soil	SP	X										
8	B-349	SS-23	78.5	80	soil	SP	X										
9	B-400	SS-14	33.5	35	soil	SP	X										
10	B-400 DH	SS-22	73.5	75	soil	SP	X										
11	B-433	SS-12	28.5	30	soil	SM	X										
12	B-433	SS-24	98.5	100	soil	SM	X										
TOTAL NUMBER OF TESTS							12										

Special Instructions:

DATE / TIME RELINQUISHED FROM SITE	1/11/07 10:30	RELINQUISHED BY (SIGNATURE OF SITE PERSONNEL) / RELINQUISHED TO (SIGNATURE OF CARRIER)	
DATE / TIME RELINQUISHED TO	1/12/07 6:10 PM	RELINQUISHED BY (SIGNATURE OF CARRIER) / RECEIVED BY (LABORATORY)	
DATE / TIME RELINQUISHED TO	2/14/07 1600	RELINQUISHED BY / RECEIVED BY	
DATE / TIME RELINQUISHED TO	2/20/07 0800	RELINQUISHED BY / RECEIVED BY	Carol Black

MACTEC

LABORATORY ASSIGNMENT SHEET / CHAIN OF CUSTODY RECORD

MACTEC PROJECT NUMBER: 5053-05-0490

Page 2 of 4

LABORATORY RECIEVING ID: Savannah River

DATE: January 11, 2007
PREPARED BY (NAME / COMPANY): Lem Johnson/MACTEC
LAB MANAGER: Don Kaplan
MACTEC PROJECT MANAGER: Michael D. Buhwinski

JOB NAME: South Texas COL Project

CLIENT CONTACT: Michael D. Buhwinski
CLIENT PHONE: Office: 704-357-5833 Mobile: 704 309 0024
CLIENT FAX: 704-357-8858
RETAIN SAMPLES UNTIL: Contact M. Buhwinski before disposal

DATE REPORT REQUIRED (Lab Mgr initials required)
ACTUAL DATE OF REPORT (Lab Mgr initials required)

NOTE: LIST QUANTITY OF EACH TEST FOR EACH SAMPLE BELOW

SAMPLE NUMBER	Boring No.	Sample Number	Sample Depth Top (ft)	Sample Depth Bottom (ft)	Sample Type	Field Classification (USCS)	ADSORPTION DISTRIBUTION COEFFICIENT (Kd)									EFFECTIVE DIFFUSION COEFFICIENT (De)	ESTIMATED Kd	REMARKS
13	B-910	SS-14	33.5	35	soil	SP	X											
14	B-910	SS-24	83.5	85	soil	SM	X											
15	B-930	SS-14	33.5	35	soil	SM	X											
16	B-930	SS-27	98.5	100	soil	SP	X											
17	B-933	SS-14	33.5	35	soil	SP	X											
18	B-933	SS-24	83.5	85	soil	SP	X											
19	B-934	SS-15	38.5	40	soil	SP	X											
20	B-934	SS-28	93.5	95	soil	SP	X											
21																		
22																		
23																		
TOTAL NUMBER OF TESTS							20											

Special Instructions:

DATE / TIME RELINQUISHED FROM SITE	1-11-07 10:30	RELINQUISHED BY (SIGNATURE OF SITE PERSONNEL) / RELINQUISHED TO (SIGNATURE OF CARRIER)	
DATE / TIME RELINQUISHED TO	1/12/07 6:10 PM	RELINQUISHED BY (SIGNATURE OF CARRIER) / RECEIVED BY (LABORATORY)	
DATE / TIME RELINQUISHED TO	2/14/07 14:00	RELINQUISHED BY / RECEIVED BY	
DATE / TIME RELINQUISHED TO	2/20/07 08:00	RELINQUISHED BY / RECEIVED BY	Carol Black

MACTEC

LABORATORY ASSIGNMENT SHEET / CHAIN OF CUSTODY RECORD

MACTEC PROJECT NUMBER 6010-06-0406

Page 3 of 4

LABORATORY RECIEVING ID Savannah River

DATE: January, 112007
PREPARED BY (NAME / COMPANY) Lent Johnson/MACTEC
LAB MANAGER Don Kaplan
MACTEC PROJECT MANAGER Michael D. Suhanski

JOB NAME South Texas COL Project

CLIENT CONTACT Michael D. Suhanski
CLIENT PHONE Office: 704-357-5633 Mobile: 704-339-0624
CLIENT FAX 704-357-5638
RETAIN SAMPLES UNTIL Contact M. Suhanski before disposal

DATE REPORT REQUIRED (Lab Mgr initials required)
ACTUAL DATE OF REPORT (Lab Mgr initials required)

NOTE: LIST QUANTITY OF EACH TEST FOR EACH SAMPLE BELOW

SAMPLE NUMBER	Observation Well No.	Associated Soil Sample Number	Screen Interval - Top	Screen Interval - Bottom	Sample Type	Field Classification (USCS)	ADSORPTION DISTRIBUTION COEFFICIENT (Kd) SPIKE								EFFECTIVE OVERBURDEN STRESS (psi)	ESTIMATED K	REMARKS
1	OW-368-U	SS-15	35	45	water	NA	X										
2	OW-338-L	SS-25	85	95	water	NA	X										
3	OW-337-U	SS-17	35	45	water	NA	X										
~~4~~	~~OW-337-L~~	~~SS-25~~	~~85~~	~~95~~	~~water~~	~~NA~~	~~X~~										
4	OW-348-U	SS-6	20	30	water	NA	X										
5	OW-348-L	SS-17	68	78	water	NA	X										
6	OW-349-U	SS-14	35	45	water	NA	X										
7	OW-349-L	SS-23	70	80	water	NA	X										
8	OW-408-U	SS-14	32	42	water	NA	X										
9	OW-408-L	SS-22	70	80	water	NA	X										
10	OW-439-U	SS-12	30	40	water	NA	X										
11	OW-439-L	SS-24	93	103	water	NA	X										
TOTAL NUMBER OF TESTS							11										

Special Instructions:

DATE / TIME RELINQUISHED FROM SITE	1.11.07 10:30	RELINQUISHED BY (SIGNATURE OF SITE PERSONNEL) / RELINQUISHED TO (SIGNATURE OF CARRIER)	
DATE / TIME RELINQUISHED TO	1/12/07 6:00PM	RELINQUISHED BY (SIGNATURE OF CARRIER) / RECEIVED BY (LABORATORY)	
DATE / TIME RELINQUISHED TO	2/19/07 16:00	RELINQUISHED BY / RECEIVED BY	
DATE / TIME RELINQUISHED TO	2/20/07 08:00	RELINQUISHED BY / RECEIVED BY	Carol Black

4-3

MACTEC

LABORATORY ASSIGNMENT SHEET / CHAIN OF CUSTODY RECORD

MACTEC PROJECT NUMBER: 3053-06-0456

Page 4 of 4

LABORATORY RECIEVING ID: Savannah River

DATE: January 11, 2007

PREPARED BY (NAME / COMPANY): Lani Johnson/MACTEC

LAB MANAGER: Dan [illegible]

MACTEC PROJECT MANAGER: Michael D. Sufranski

JOB NAME: South Texas COL Project

CLIENT CONTACT: Michael D. Sufranski

CLIENT PHONE: Office 704-357-8835 Mobile 704 309 0674

CLIENT FAX: 704-357-8836

RETAIN SAMPLES UNTIL: Contact M. Sufranski before disposal

DATE REPORT REQUIRED: (Lab Mgr initials required)

ACTUAL DATE OF REPORT: (Lab Mgr initials required)

NOTE: LIST QUANTITY OF EACH TEST FOR EACH SAMPLE BELOW

	SAMPLE NUMBER	Boring No.	Associated Soil Sample Number	Screen Interval Top	Screen Interval Bottom	Sample Type	Field Classification (USCS)	ADSORPTION DISTRIBUTION COEFFICIENT (Kd) SPIKE								EFFECTIVE OVERBURDEN STRESS (psf)	ESTIMATED K	REMARKS
12	15	OW-919-U	SS-14	25	35	water	NA	X										
13	16	OW-919-L	SS-24	82	92	water	NA	X										
14	15	OW-933-U	SS-14	25	35	water	NA	X										
15	16	OW-933-L	SS-27	85	105	water	NA	X										
16	17	OW-923-U	SS-14	20	30	water	NA	X										
		~~OW-923-L~~	~~SS-24~~	~~75~~	~~85~~	~~water~~	~~NA~~	~~X~~										
17	18	OW-934-U	SS-15	30	40	water	NA	X										
18	16	OW-934-L	SS-26	85	95	water	NA	X										
19	15	OW-552Lo (2/9/07)				water	NA	X										
20	16	OW-933L (1/11/07)				water	NA	X										
	23																	

MDS 1/12/07

1/11/07

2/14/07

2/14/07

TOTAL NUMBER OF TESTS: 20

2/14/07

Special Instructions:

DATE / TIME RELINQUISHED FROM SITE:	1/11/07 10:30	RELINQUISHED BY (SIGNATURE OF SITE PERSONNEL) / RELINQUISHED TO (SIGNATURE OF CARRIER)	
DATE / TIME RELINQUISHED TO:	1/12/07 6:00PM	RELINQUISHED BY (SIGNATURE OF CARRIER) / RECEIVED BY (LABORATORY)	
DATE / TIME RELINQUISHED TO:	2/14/07 16:00	RELINQUISHED BY / RECEIVED BY	
DATE / TIME RELINQUISHED TO:	2/20/07 08:00	RELINQUISHED BY / RECEIVED BY	Carl Black

MACTEC

LABORATORY ASSIGNMENT SHEET / CHAIN OF CUSTODY RECORD

MACTEC PROJECT NUMBER: 5050-06-0409

Page 1 of 2

LABORATORY RECIEVING ID: Savannah River ~~Savannah River St. Louis~~

DATE: January 11, 2007

PREPARED BY (NAME / COMPANY): ~~Lori Lowenstein/MACTEC~~

LAB MANAGER: ~~Lisa Powell-Smith~~ Dan Vaughn

MACTEC PROJECT MANAGER: Michael D. Sufrinski

JOB NAME: South Texas COL Project

CLIENT CONTACT: Michael D. Sufrinski

CLIENT PHONE: Office: 704-357-8833 Mobile: 704 909 0624

CLIENT FAX: 704-357-8836

RETAIN SAMPLES UNTIL: Contact M. Sufrinski before disposal

DATE REPORT REQUIRED: (Lab Mgr initials required)

ACTUAL DATE OF REPORT: (Lab Mgr initials required)

NOTE: LIST QUANTITY OF EACH TEST FOR EACH SAMPLE BELOW

SAMPLE NUMBER	Boring No.	Sample Number	Sample Depth Top (ft)	Sample Depth Bottom (ft)	Sample Type	Field Classification (USCS)	CATION EXCHANGE CAPACITY EPA METHOD 9080	Pb ASTM D4972								EFFECTIVE OVERBURDEN STRESS (psf)	ESTIMATED K	REMARKS
1	B-306	SS-15	38.5	40	soil	SP	X	X										
2	B-309	SS-25	88.5	90	soil	SP	X	X										
3	B-322	SS-12	38.5	40	soil	SM	X	X										
4	B-332	SS-23	93.5	95	soil	SP	X	X										
5	B-345	SS-6	28.5	30	soil	SP	X	X										
6	B-345	SS-17	73.5	75	soil	SP	X	X										
7	B-349	SS-14	33.5	35	soil	SP	X	X										
8	B-349	SS-23	78.5	80	soil	SC	X	X										
9	B-408	SS-14	33.5	35	soil	SP	X	X										
10	B-408	SS-22	73.5	75	soil	SP	X	X										
11	B-436	SS-12	28.5	30	soil	SM	X	X										
12	B-459	SS-24	98.5	100	soil	SM	X	X										
TOTAL NUMBER OF TESTS							12	12										

Special Instructions:

DATE / TIME RELINQUISHED FROM SITE: 1.11.07 10:30

RELINQUISHED BY (SIGNATURE OF SITE PERSONNEL)

RELINQUISHED TO (SIGNATURE OF CARRIER)

DATE / TIME RELINQUISHED TO

RELINQUISHED BY (SIGNATURE OF CARRIER)

RECEIVED BY (LABORATORY)

DATE / TIME RELINQUISHED TO: 2/14/07 16:00

RELINQUISHED BY

RECEIVED BY

DATE / TIME RELINQUISHED TO: 2/20/07 08:00

RELINQUISHED BY

RECEIVED BY: Carl Black

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MACTEC

LABORATORY ASSIGNMENT SHEET / CHAIN OF CUSTODY RECORD

MACTEC PROJECT NUMBER: 5159-06-5490

Page 2 of 2

LABORATORY RECIEVING ID: Savannah River Seven Trees Stanford

DATE: January 11, 2007

PREPARED BY (NAME / COMPANY): Lori Jansen/MACTEC

LAB MANAGER: John Powell - Contact

MACTEC PROJECT MANAGER: Michael D. Sultanski

JOB NAME: Sixth Texas DGL Period

CLIENT CONTACT: Michael D. Sultanski

CLIENT PHONE: Office 704-357-5631 Mobile 704-300-0524

CLIENT FAX: 704-357-8638

RETAIN SAMPLES UNTIL: Contact M. Sultanski before disposal

DATE REPORT REQUIRED: (Lab Mgr initials required)

ACTUAL DATE OF REPORT: (Lab Mgr initials required)

NOTE: LIST QUANTITY OF EACH TEST FOR EACH SAMPLE BELOW

SAMPLE NUMBER	Boring No.	Sample Number	Sample Depth Top (ft)	Sample Depth Bottom (ft)	Sample Type	Field Classification (USCS)	CATION EXCHANGE CAPACITY EPA METHOD 9080	pH ASTM D 4972							EFFECTIVE OVERBURDEN STRESS (psf)	ESTIMATED K	REMARKS
13	B-910	SS-14	93.5	35	soil	SM	X	X									
14	B-910	SS-24	93.5	65	soil	SM	X	X									
15	B-930	SS-14	93.5	35	soil	SM	X	X									
16	B-930	SS-27	96.5	100	soil	SM	X	X									
17	B-933	SS-14	93.5	35	soil	SP	X	X									
18	B-933	SS-24	93.5	65	soil	SP	X	X									
19	B-934	SS-15	93.5	40	soil	SM	X	X									
20	B-934	SS-28	93.5	95	soil	SP	X	X									
21																	
22																	
23																	
TOTAL NUMBER OF TESTS							20	20									

Special Instructions:

DATE / TIME RELINQUISHED FROM SITE: 1-11-07 10:30 — RELINQUISHED BY (SIGNATURE OF SITE PERSONNEL) / RELINQUISHED TO (SIGNATURE OF CARRIER)

DATE / TIME RELINQUISHED TO: — RELINQUISHED BY (SIGNATURE OF CARRIER) / RECEIVED BY (LABORATORY)

DATE / TIME RELINQUISHED TO: 2/14/07 16:00 — RELINQUISHED BY / RECEIVED BY

DATE / TIME RELINQUISHED TO: 2/20/07 08:00 — RELINQUISHED BY / RECEIVED BY: Carol Black

APPENDIX F. Radiological Standard Certificate of Calibration

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

75273-147

Co-57 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated with an ionization chamber that was calibrated by the National Physical Laboratory, Teddington, U.K., and is directly traceable to national standards.

Radionuclide purity and calibration were checked with a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Co-57
ACTIVITY (Bq):	1.886 E6
HALF-LIFE:	271.79 days
CALIBRATION DATE:	June 14, 2007 12:00 EST
RELATIVE EXPANDED UNCERTAINTY (k=2):	1.7%

Impurities: γ-impurities <0.1%

5.02210 grams 0.1M HCl solution with 30 µg/g Co carrier.

P O NUMBER AC60107G, Item 2

SOURCE PREPARED BY: MTaskaeva
M. I. Taskaeva, Radiochemist

Q A APPROVED: WM Mg 6-14-07

Corporate Office Laboratory

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

75278-147

Cs-137 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated with an ionization chamber that was calibrated by the National Physical Laboratory, Teddington, U.K., and is directly traceable to national standards.

Radionuclide purity and calibration were checked with a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Cs-137
ACTIVITY (Bq):	1.922 E6
HALF-LIFE:	3.007 E1 years
CALIBRATION DATE:	June 14, 2007 12:00 EST
RELATIVE EXPANDED UNCERTAINTY (k=2):	1.7%

Impurities: γ-impurities <0.1%

5.01021 grams 0.1M HCl solution with 30 µg/g Cs carrier.

P O NUMBER: AC60107G, Item 7

SOURCE PREPARED BY: MITaskaeva
M. I. Taskaeva, Radiochemist

Q A APPROVED: M. Mitz 6-14-07

Corporate Office
24937 Avenue Tibbitts Valencia, California 91355

Laboratory
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

75280-147

Fe-55 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master liquid radionuclide solution source. The master source was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Fe-55
ACTIVITY (Bq):	1.987 E5
HALF-LIFE:	1001.0 days
CALIBRATION DATE:	June 14, 2007 12:00 EST
RELATIVE EXPANDED UNCERTAINTY (k=2):	4.5%

Impurities: γ-impurities <0.1%

5.12918 grams 0.1M HCl solution with 30 µg/g Fe carrier.

P O NUMBER AC60107G, Item 9

SOURCE PREPARED BY: MTaskaeva
M. I. Taskaeva, Radiochemist

Q A APPROVED: VM Mof 6-14-07

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

75281-147

Ni-59 10 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master liquid radionuclide solution source. The master source was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Ni-59
ACTIVITY (Bq):	3.841 E3
HALF-LIFE:	7.600 E4 years
CALIBRATION DATE:	June 14, 2007 12:00 EST
RELATIVE EXPANDED UNCERTAINTY (k=2):	4.5%

Impurities: γ-impurities <0.1%

9.99750 grams 0.1M HCl solution with 30 μg/g Ni carrier.

P O NUMBER AC60107G, Item 10

SOURCE PREPARED BY: MITaskaeva
M. I. Taskaeva, Radiochemist

Q. A APPROVED: MM Mof 6-14-07

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

75282-147

Pu-238 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting and alpha spectroscopy. The calibration was checked by liquid scintillation counting after source preparation.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Pu-238
ACTIVITY (Bq):	3.940 E4
HALF-LIFE:	87.7 years
CALIBRATION DATE:	June 14, 2007 12:00 EST
RELATIVE EXPANDED UNCERTAINTY (k=2):	2.0%

Impurities: γ-impurities <0.1%, α-impurities <0.2%

5.47038 grams 3M HNO_3 solution.

P O NUMBER AC60107G, Item 11

SOURCE PREPARED BY: M Taskaeva
M. I. Taskaeva, Radiochemist

Q A APPROVED: 6-14-07

Corporate Office
24937 Avenue Tibbitts Valencia, California 91355

Laboratory
1380 Seaboard Industrial Blvd. Atlanta, Georgia 30318

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

75276-147

Sr-85 10 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated with an ionization chamber that was calibrated by the National Physical Laboratory, Teddington, U.K., and is directly traceable to national standards.

Radionuclide purity and calibration were checked with a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Sr-85
ACTIVITY (Bq):	1.842 E6
HALF-LIFE:	64.84 days
CALIBRATION DATE:	June 14, 2007 12:00 EST
RELATIVE EXPANDED UNCERTAINTY (k=2):	1.7%

Impurities: γ-impurities <0.1%

10.04818 grams 0.1M HCl solution with 30 µg/g Sr carrier.

P O NUMBER AC60107G, Item 1

SOURCE PREPARED BY: MTaskaeva
M. I. Taskaeva, Radiochemist

Q A APPROVED: M. M. [illegible] 6-14-07

Corporate Office
24937 Avenue Tibbitts Valencia, California 91355

Laboratory
1380 Seaboard Industrial Blvd. Atlanta, Georgia 30318

APPENDIX G. M&TE Approval of Balance

Certificate of Calibration

Issued by
Savannah River Standards Laboratory
Westinghouse SRC, Building 736-A
Aiken, SC 29801

M & TE #: IW-0105
Description: BALANCE
Manufacturer: SARTORIUS
Model#: R-200D
Serial#: 30200365
Calibrated: 03/07/2007
Frequency: 12 Months
Expires: 03/07/2008

Cal Procedure: BAL-CAL/11.4 (08/16/05)

Cal Calculation: N/A

NIST Traceable Standard(s) used, (Expiration Date):
SL-407 (2/27/2011)

Print Specification: N/A
The estimated uncertainty (k=2) of the standard(s) and measurement process at SRSL is:
SEE ATTACHED

The measurements made on **IW-0105** were obtained at **23 +/- 2.0** °c and **24%** RH

CALIBRATION DATA FOR IW-0105

RUSH
Calibrate balance to ISO 17025 (NVLAP, A2LA, OR NIST).
SEE ATTACHED FOR BALANCE CALIBRATION
ONSITE CALIBRATION

THIS INSTRUMENT PASSED CALIBRATION. AS FOUND = AS LEFT.

The assigned uncertainty of the UUT as determined by tolerance test is:
SEE ATTACHED

Metrologist: D. R. SMITH D R Smith — Signature; PR Init.; Engr. Init. 3/12/07

Note 1: This certificate shall not be reproduced except in full without the advanced written approval of the SRSL.
Note 2: The 'as received' condition of the standard, set of standards, or measurement equipment described herein was as expected, unless otherwise noted in the body of the certificate.

IW-0105

Page 1 of 3

SRS Method

Analyst Information	
Calibrator Initials:	DRS
Calibrator ID #	w0894
Date:	3/7/2007
Balance Information	
Location	773A/B122 -
Unique ID Number	IW-0105
Manufacturer	Sartorius
MODEL#	R200D
Confidence Level	3-Stdev
QA Limit (%)	0.0100
Sen. Limit (g)	0.00060
1 Bal. Maint. SD	0.00020
Wt. Set Selection	SL-407

Function Tests	
Power	Pass
Load	Pass
Taring	Pass
P/NDisplay	Pass

Visual Inspection Parameters	
Damaged	Pass
Level	Pass
Clean	Pass
Complete	Pass

Cornerloading(g)	100
Position	Reading
Top	99.9996
Right	99.9996
Bottom	99.9997
Left	99.9996

Environmental Conditions			
	Before	After	Average
Temp (C)	24	24	24
Humidity (%)	24	24	24

	MEASUREMENTS (in grams)			
Stacking Information	High Wt(s).	Mid Wt(s).	Low Wt.	Sensitivity Wt.
High Weights(g)	200	100	50	1
200	199.9996	99.9997	50.0000	1.0000
No stacking	199.9996	99.9998	50.0000	1.0010
Mid-Weights(g)	199.9996	99.9997	50.0000	0.9999
100	199.9996	99.9997	50.0000	1.0000
No stacking	199.9996	99.9997	50.0000	1.0000

Pg 2 of 3

QA BALANCE CERTIFICATION

Next Certification due date: 6-Mar-08

BalCal11v3 7/15/04

Minimum Quantities Calculations updated to match industry standards

Analyst Information	
Initials:	DRS
Calibrator ID #	w0894
Date:	3/7/2007

Balance Information	
Manufacturer	Sartorius
MODEL#	R200D
ID Number	IW-0105
Lab/Rooms	773A/B122

Weight Set Information	
Expiration	02/20/11
Manufacturer	Troemner
Wt. Set ID	SL-407

Functionality	
Power	Pass
Load	Pass
Taring	Pass
P/NDisplay	Pass

Visual Inspection	
Damaged	Pass
Level	Pass
Clean	Pass
Complete	Pass

Statistics	High Wt(s).	Mid Wt(s).	Low Wt.	Minimal Wt.
AVERAGE	199.999600	99.999720	50.000000	1.000160
Bias (abs)	0.000183	0.000097	0.000059	0.000215
% Bias	0.000091	0.000097	0.000118	0.021538
% RSD	0.000000	0.000045	0.000000	0.040025
SD(abs)	0.000000	0.000045	0.000000	0.000400
Max SD	0.000238	0.000232	0.000231	0.000231
Calculated t	Not Significant	Not Significant	Not Significant	Not Significant

Pooled Abs. Std. Dev., 16 df =	0.000231	Tab. Chi Sq =	32.0
Tabled t, 16 df (99% Conf.) =	2.921	Cal. Chi Sq =	21.4
Tabled F, 2, 16 df (99% Conf.)=	6.23	F Statistic =	Not Significant

Bal./Wt.Uncertainty Ratio	
HighWt(s).	7.27273
MidWt(s).	34.78261
LowWt.	50.00000
Minimal Wt.	907.69231

Cornerloading	
Position	t-Statistic
Top	0.52
Right	0.52
Bottom	0.09
Left	0.52

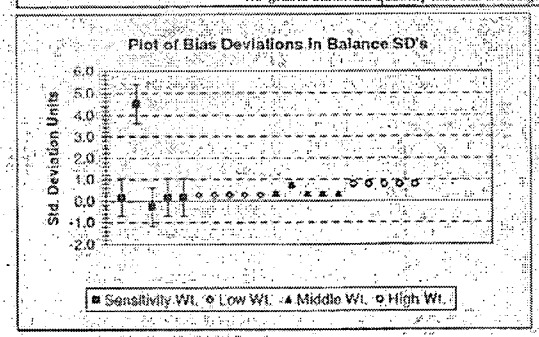
Total Uncertainty 95% CL (K=2)	Grams	Percent
High Wt.	0.00051	0.00025%
Middle Wt.	0.00047	0.00047%
Low Wt.	0.00047	0.00093%
Minimal Wt.	0.00051	0.05103%

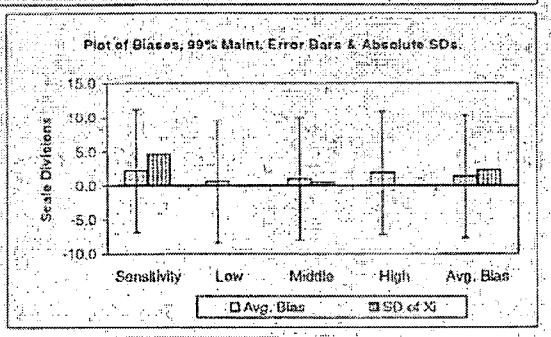
Control Limits	Mean Wt.	3 DEV'S	Low Limit	High Limit
High Wt.	199.9996	0.000713242	199.9988868	200.0003122
Middle Wt.	99.99972	0.000694752	99.98902525	100.0004146
Low Wt.	50	0.00069431	49.99930569	50.00069431
Minimal Wt.	1.00016	0.000503906	0.999496094	1.000673906

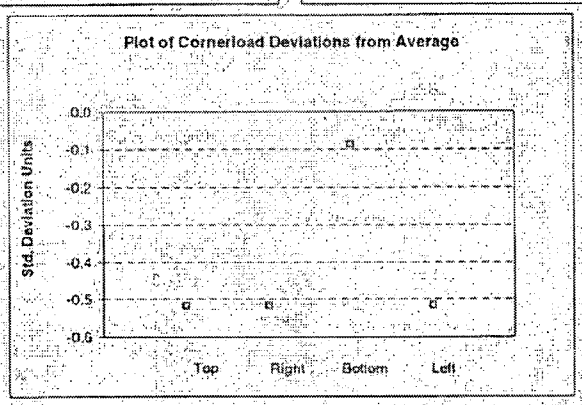
ACCEPTANCE CRITERIA	
Summary:	Balance passes QA Limits
Linearity(Bias)	Balance passes
Precision (SD)	Balance passes
Corner Loading	Balance passes
Disposition	AS LEFT = AS FOUND

9.8 grams minimum quantity that can be weighed to maintain QA Test Limits with 99.7% confidence

1.0 grams minimum quantity that can be weighed to maintain 5 Standard Deviation Limits @ 0.1% Tolerance per USP







Pg 3of3

Certificate of Calibration

Issued by

Savannah River Standards Laboratory

Westinghouse SRC, Building 736-A
Aiken, SC 29801

M & TE #: WP-550 **Cal. Procedure:** L10.1-301, REV.2
Description: WEIGHT SET,1MG-100G
Manufacturer: TROEMNER
Model#: N/A
Serial#: 53514
Calibrated: 08/08/2005
Frequency: 24 Months
Expires: 08/08/2007

NIST Traceable Standard(s) used, (Expiration Date):
SL-1005 (CBU), SL-749A (CBU), SL-20KGWTSET (04/21/08)

Print Specification: n/a
The estimated uncertainty (k=2) of the standard(s) and measurement process at SRSL is:
SEE ATTACHED DATA SHEET

The measurements made on **WP-550** were obtained at **23 +/- 2.0** c and **33%** RH

CALIBRATION DATA FOR WP-550

SEE ATTACHED INSTRUMENT TEST REPORT FOR MEASUREMENT DATA

NOTE: CUSTODIAN REQUESTED TOLERANCE: NONE
NOTE: THE WEIGHT SET HAS MET CLASS 2 TOLERANCES PREVIOUSLY. THE WEIGHT SET MEETS CLASS 2 EXCEPT THE 20MG WEIGHT. IT MEETS CLASS 3.

THIS INSTRUMENT PASSED CALIBRATION. AS FOUND = AS LEFT

The assigned uncertainty of the UUT as determined by tolerance test is:
SEE ATTACHED SHEET

Metrologist: D. R. SMITH D R Smith — Signature — PR Init. — Engr. Init. 8/10/05

Note 1: This certificate shall not be reproduced except in full without the advanced written approval of the SRSL.
Note 2: The 'as received' condition of the standard, set of standards, or measurement equipment described herein was as expected, unless otherwise noted in the body of the certificate.

WP-559

Page 1 of 2

Mass Calibration Data Summary

Issued By
Savannah River Standards Laboratory
Westinghouse SRC, Building 736-A
Aiken, SC 29801

Calibration Serial No.	M&TE No.	Metrologist	Date
WP-550-2005001	WP-550	D Smith	08/08/2005
Tolerance Class			
ASTM 3			

Comments:

CUSTODIAN TOLERANCE REQUEST: NONE. THE WEIGHT SET HAS MET CLASS 2 TOLERANCES PREVIOUSLY. THE WEIGHT SET MEETS CLASS 2 "EXCEPT" THE 20MG WEIGHT. IT MEETS CLASS 3.

Uncertainties are calculated using the GUM method of RSS. They are reported at K=2, 95% Confidence. Standards used are 1 piece ASTM Class 0 Weights Calibrated at NIST 5/15/01.

Nom Wt		Wt # or Marking	True Mass		App. Mass at 8g/cc		Uncertainty (mg)	Density (g/cc)	Method
1	mg		1.011583330	mg	1.011285430	mg	0.0020	2.70	Comparison
2	mg		2.008920000	mg	2.008328400	mg	0.0020	2.70	Comparison
2	mg	*	2.010420000	mg	2.009827950	mg	0.0020	2.70	Comparison
5	mg		4.990903330	mg	4.989433570	mg	0.0021	2.70	Comparison
10	mg		9.990190000	mg	9.987248000	mg	0.0020	2.70	Comparison
20	mg		19.99070667	mg	19.98481963	mg	0.0020	2.70	Comparison
20	mg	*	19.99627333	mg	19.99038466	mg	0.0020	2.70	Comparison
50	mg		50.00707667	mg	50.01096334	mg	0.0020	16.60	Comparison
100	mg		100.0143592	mg	100.0221325	mg	0.0020	16.60	Double Substitution
200	mg		200.0054846	mg	200.0210295	mg	0.0020	16.60	Double Substitution
200	mg	*	200.0037489	mg	200.0192937	mg	0.0020	16.60	Double Substitution
500	mg		499.9703844	mg	500.0092433	mg	0.0020	16.60	Double Substitution
1	g		1.000033040	g	1.000033040	g	0.0026	8.00	Double Substitution
2	g		2.000031400	g	2.000031400	g	0.0026	8.00	Double Substitution
2	g	*	2.000019300	g	2.000019300	g	0.0026	8.00	Double Substitution
5	g		5.000008760	g	5.000008760	g	0.0031	8.00	Double Substitution
10	g		9.9999887	g	9.9999887	g	0.012	8.00	Double Substitution
20	g		19.999987	g	19.999987	g	0.013	8.00	Double Substitution
20	g	*	19.999987	g	19.999987	g	0.013	8.00	Double Substitution
50	g		49.999907	g	49.999907	g	0.016	8.00	Double Substitution
100	g		100.00002	g	100.00002	g	0.023	8.00	Double Substitution

APPENDIX H. List of Equipment Used in Study

List of Equipment Used for South Texas Project

Instrument	Room	Building
Balance	B122	773A
Gamma Analyzer	B022	773A
ICP-AES	B054	773A

6/8/2007

APPENDIX I. Personnel Qualification

Approval of Personnel Qualification Working on South Texas Project are Qualified for their Tasks.

Individuals	Task
Daniel Kaplan	Project Leader, Scientist
Carl Black	Kd Measurement, geochemistry measurements
Dave Diprete	gamma radiation measurements
John Connelly	QA
Mark Jones	ICP

I approve that the above personnel are qualified to complete their respective tasks

Daniel I. Kaplan 6/8/2007

DANIEL I. KAPLAN

Savannah River National Laboratory, Aiken, SC 29808
Phone: 803/725-2363; Fax: 803/725-4707; daniel.kaplan@srnl.doe.gov

EDUCATION

Ph.D. Environmental Chemistry, University of Georgia 1993
M.S. Soil and Plant Science, University of New Hampshire 1983
B.S. Soil and Plant Science, University of New Hampshire 1977

EMPLOYMENT

1998 to Present. Research Fellow, Savannah River National Laboratory, Aiken, SC.
1993 to 1998. Senior Research Scientist, Transport Geochemistry. Pacific Northwest National Laboratory, Richland, WA.
1985 to 1993. Laboratory Technician, Biogeochemistry, University of Georgia, Savannah River Ecology Laboratory, Aiken, SC.
1983 to 1985 Laboratory Researcher. Molecular Biology/Genetic Engineering. Agracetus,Corporation, Middleton, WI

RESEARCH FOCUS

- Developing geochemical models for reactive transport codes
- Geochemical processes at the water/mineral interface
- Speciation and transport of radionuclide, especially as they related to the vadose zone
- Remediation: In-situ groundwater and soil remediation and monitored natural attenuation
- Nanoparticle and colloid chemistry

SELECTED PROFESSIONAL APPOINTMENTS and AWARDS

- 8 Patents or Pending Patents related to environmental remediation, analytical chemistry, & molecular biology
- Adjunct Professor: Washington State University and Clemson University

SELECTED PUBLICATIONS (10 of >80)

Kaplan, D. I., B. A. Powell, L. Gumapas, J. T. Coates, and R. A. Fjeld.. 2006. Influence of pH on Plutonium Deosportion /Solubilization from Sediment. **Environ. Sci. Technol.** (In press).

Kaplan, D. I., D. I. Demirkanli, L. Gumapas, B. A. Powell, R. A. Fjeld, F. J. Molz, and S. M. Serkiz. 2006. 11-Year Field Study of Pu Migration from Pu III, IV, and VI Sources. **Environ. Sci. Technol.** 40(2): 443-448.

Powell, B. A., Duff, M. C., Kaplan, D. I., Fjeld, R. A., Hunter, D. B., Bertsch, P. M., Eng, P., Newville, M., Rivers, M. L., Sutton, S. R., Triay, I. R., and Vaniman, D. T. 2006. Plutonium Oxidation and Subsequent Reduction by Mn(IV) Minerals in Yucca Mountain Tuff. **Environ Sci. Technol.** 40(11):3508-3514.

Kaplan, D. I., B. A. Powell, D. I. Demirkanli, R. A. Fjeld, F. J. Molz, S. M. Serkiz. 2004. Plutonium Mobility During Long-Term Transport Through an Unsaturated Subsurface Environment. **Environ. Sci. Technol**. 38:6016–6024.

Gamerdinger, A. P., and D. I. Kaplan. 2001. Physical and Chemical Determinants of Colloid Transport and Deposition in Water-Unsaturated Sand and Yucca Mountain Tuff. **Environ. Sci. Technol.** 35:2497-2504.

Powell, B. A., R. A. Fjeld, D. I. Kaplan, J. T. Coates, and S. M. Serkiz. 2005. $Pu(V)O_2^+$ Adsorption and Reduction by Synthetic Hematite (α-Fe_2O_3) and Goethite (α-FeOOH). **Environ. Sci. Technol.** 39:2107–2114.

Gamerdinger, A. P., D. I. Kaplan, and R. J. Serne. 2001. Two-region Flow Contributes to Rate-Limited Sorption of Uranium(VI) During Transport in an Unsaturated Silt Loam. **Water Resources Research** 37(12), 3147-3153.

Kaplan, D. I., P. M. Bertsch, and D. C. Adriano. 1995. Facilitated Transport of Metals Through an Acidified Coastal Plain Aquifer. **Ground Water** 33:708-717.

Kaplan, D. I., P. M. Bertsch, and K. A. Orlandini. 1994. Actinide Association with Groundwater Colloids as a Function of Distance from a Point Source. **Radiochimica Acta** 66/67:181-187.

Kaplan, D. I., D. B. Hunter, P. M. Bertsch, and D. C. Adriano. 1994. Application of Synchrotron X-Ray Fluorescence Spectroscopy and Energy Dispersive X-Ray to Identify Contaminant Metals on Groundwater Colloids. **Environ. Sci. Technol**. 28:1186-1189.

John J. Connelly, PE, CM
Resume
Experience and Qualifications

Work Experience

1988 to Present: DuPont and Westinghouse/Washington Savannah River Company
Principal Quality Engineer in the Savannah River National Laboratory on the Department of Energy's Savannah River Site. Responsible for providing quality engineering services to assigned Savannah River National Laboratory (SRNL) organizations. Additional duties include the performance of audits, surveillances, and assessments on SNNL organizations. Provided QE services including: reviewing and approving task QA plans, task technical plans, procurement documents, nonconformance reports (NCRs), and corrective actions. Review and comment on site-level QA Manual and SRNL LI Manual revisions. Interfacing with quality engineers, researchers and managers, as required, on QA matters. Assist in the training and qualification of auditors and lead auditors.

1974 to 1988: Gilbert Associates, Inc./Gilbert Commonwealth, Inc.
Lead Civil Quality Engineer and Lead Auditor on nuclear power plants during the construction phase. Performed oversight for owner utility of contractor's civil construction activities.

1972-1974: Stone & Webster Engineering Corporation.
Materials Testing Laboratory Supervisor over testing of civil construction materials on nuclear power plant under construction.

1970-1972: General Public Utilities.
Quality Assurance Engineer and Auditor. Provided owner's oversight of contractor's and designer's on-site civil activities.

1966-1970: United States Air Force

1966: NYC Board of Water Supply.
Civil Engineer. Provide surveying for water tunnel 900 feet under New York harbor.

Military

United States Air Force, Civil Engineering Officer, 4 years active duty (including Vietnam service) + 16 years Air National Guard in combat engineering squadron. Retired LTC.

Education:

- Bachelor of Civil Engineering, Manhattan College, 1966
- Graduate program for Master of Science in Engineering Management, University of Alabama Huntsville, not completed.

ASME Codes & Standards

Participant in ASME/ASTM Nuclear QA Standards development since 1971.

- Member & secretary of working groups of "daughter standards."
- Member of NQA subcommittees
- Vice Chair of SC on Applications,
- Member, ASME NQA Main Committee

Training History

Last Name	DIPRETE	First Name	DAVID	User ID	L5694	Org Code	LA200

Course Code	Course Title	Setting	Revision	Class Status	Completion Date
V1000000	10TH ANNUAL CONF ON MODERN TRENDS IN ACTIVATION	Offsite		COMPLETED	null
V1000000	37TH ORNL-DOE CONF. ANAL. CHEM	Offsite		COMPLETED	null
V1000000	43RD BIOASSAY,ANALYTICAL. & RADIOCHEMISTRY	Offsite		COMPLETED	null
V1000000	46TH ANNUAL CONF BIOASSAY,ENVIRON,& ANALYTICAL RAD	Offsite		COMPLETED	null
V1000000	ACS 220TH NATIONAL MEETING	Offsite		COMPLETED	null
V1000000	49TH ANNUAL RADIOBIOASSAY & RADIOCHEMICAL MEASUREM	Offsite		COMPLETED	null
V1000000	47TH ANNUAL CONF BIOASSAY,ANALYTICAL,&ENVIROMENTAL	Offsite		COMPLETED	null
V1000000	44TH ANNUAL BIOASSAY, ANALYTICAL & ENV. CHEM CONF.	Offsite		COMPLETED	null
V1000000	AMERICAN CHEMICAL SOCIETY NATIONAL MEETING	Offsite		COMPLETED	null
V1000000	TWELFTH SYMP ON SEPARATION SCIENCE & TECH ENERGY	Offsite		COMPLETED	null
V1000000	TSA CLASS FOR SLD PROGRAM	Offsite		COMPLETED	null
V1000000	NUCLEAR CHEMISTRY AND THE SAVANNAH RIVER SITE	Offsite		COMPLETED	null
V1000000	METHODS AND APPLICATIONS OF RADIOANALYTICAL CHEM	Offsite		COMPLETED	null
V1000000	METHODS & APPLCIATIONS OF RADIOANALYTICAL CHEMISTR	Offsite		COMPLETED	null
TMME1305	ELECTRICAL HAZARDS AWARENESS BRIEFING	SP	00	COMPLETED	02-Jul-2007
LSGEN058	L7.7, 1.06 & 1.07 PROCEDURE CHANGES	BR	00	COMPLETED	07-Jun-2007
XTMGTTAV	TRITIATED WATER ANALYSIS AND SOLIDIFICATION	BR	00	COMPLETED	16-May-2007
TMEE3050	SAFE PRACTICE ON OR NEAR ELECTRICAL CONDUCTORS	SP	04	COMPLETED	30-Apr-2007
HPSSRC11	HEALTH PHYSICS ASPECTS OF HOMELAND SECUITY	BS	00	COMPLETED	20-Apr-2007
SLBE3013	SRNL 3013 PROJECT BERYLLIUM & MEDICAL SURVEILLANCE	BR	00	COMPLETED	08-Mar-2007
TRWG5203	RADIATION INSTRUMENTATION AND MONITORING	PA	02	COMPLETED	07-Mar-2007
TRWG5204	BETA-GAMMA INSTRUMENTATION AND MONITORING	PA	02	COMPLETED	07-Mar-2007
TRWG5205	ALPHA CONTAMINATION INSTRUMENTATION AND MONITOR	PA	02	COMPLETED	07-Mar-2007
LSGEN048	NUCLEAR MATERIAL CUSTODIAN DELTA TRAINING	RS	00	COMPLETED	04-Mar-2007
LSGEN049	ACCOUNTABLE MATERIAL HANDLER DELTA TRAINING	RS	00	COMPLETED	04-Mar-2007
LSGEN050	NUCLEAR CRITICALITY SAFETY DELTA TRAINING	RS	00	COMPLETED	04-Mar-2007
TREG0014	BLOODBORNE PATHOGEN ALTERNATE YEAR BRIEFING	SP	02	COMPLETED	28-Feb-2007
LSLST003	LAB STANDARD TRAINING REFRESHER FOR 2007	SP	04	COMPLETED	20-Feb-2007
LSCT0046	RESPONSE TO ABNORMAL EVENTS	BR	00	COMPLETED	14-Feb-2007
SG152951	SRNL ACCOUNTABLE MATERIAL HANDLER	SP	05	COMPLETED	13-Feb-2007

LSADS054	OPERATE B003 WATER FILTRATION SYSTEM	PF	00	GRANTED EXCEPTION	23-Jan-2007
TRGCAT07	CONSOLIDATED ANNUAL TRAINING 2007 (CAT)	SP	00	COMPLETED	23-Jan-2007
LSGEN034	SRNL R&D BRIEF ON WORK PLANNING & CONTROL FOR EMPL	BR	00	COMPLETED	18-Jan-2007
LSGEN037	CONTROLLING FLAM. GASES & LIQ. IN RAD. GLOVEBOXES	BR	00	COMPLETED	17-Jan-2007
HRDOD285	WSRC LEADERS FORUM	CR	00	COMPLETED	15-Nov-2006
LSGEN031	VESSEL PROCUREMENT	RS	00	COMPLETED	06-Oct-2006
LSADS052	HANDLE TREATABILITY SAMPLES	PF	01	COMPLETED	19-Sep-2006
TMEE6400	MINOR/EDITORIAL CHANGES TO 18Q-2	BR	00	COMPLETED	13-Sep-2006
LSGEN029	R&D RQMTS FOR WORKING W/CLASS 1 FLAMMABLE LIQUID	RS	00	COMPLETED	27-Jul-2006
QHRG0400	RADIOLOGICAL WORKER 2 SELF-STUDY	SP	17	COMPLETED	30-Jun-2006
TMME1300	ELECTRICAL HAZARD AWARENESS - ADMINISTRATIVE	BR	01	COMPLETED	30-Jun-2006
TMME1302	ELECTRICAL HAZARD AWARENESS-ELECTRICAL WORKERS	BR	01	COMPLETED	30-Jun-2006
TMME1301	ELECTRICAL HAZARD AWARENESS-NON-ELECTRICAL WORKERS	BR	01	COMPLETED	28-Jun-2006
LSGEN025	TREATABILITY STUDY AWARENESS TRAINING	BR	00	COMPLETED	08-Jun-2006
TMEE3050	SAFE PRACTICE ON OR NEAR ELECTRICAL CONDUCTORS	SP	04	COMPLETED	28-Apr-2006
LSADS052	HANDLE TREATABILITY SAMPLES	PF	00	COMPLETED	15-Mar-2006
TMEE6200	GENERAL REVISION BRIEFING PACKAGE	BR	00	COMPLETED	14-Mar-2006
TREG0013	BLOODBORNE PATHOGENS/FIRST AID/CPR	CR	05	COMPLETED	01-Mar-2006
TREG0013	BLOODBORNE PATHOGENS/FIRST AIT/CPR	JP	01	COMPLETED	01-Mar-2006
LSLST003	LABORATORY STANDARD REFRESHER TRNG. (2006)	SP	03	COMPLETED	24-Feb-2006
TRGCAT06	CONSOLIDATED ANNUAL TRAINING 2006 (CAT)	SP	00	COMPLETED	20-Jan-2006
LSGEN024	R&D ARW RADCON PRACTICES REFRESHER (2005)	CR	00	COMPLETED	14-Nov-2005
LSGEN016	PRESSURE PROTECTION PRACTICES	SP	00	COMPLETED	27-Sep-2005
QCSC0001	SOURCE CONTROL CUSTODIAN PROCEDURE UPDATE TRAINING	SP	00	COMPLETED	21-Sep-2005
LSGEN020	R&D PROCEDURE COMPLIANCE	BR	00	COMPLETED	01-Sep-2005
SSPOE002	ASSIGN COMPETENT PERSON (ACP) BRIEFING	SP	00	COMPLETED	01-Aug-2005
TRWG5203	RADIATION INSTRUMENTATION & MONITORING	PA	01	COMPLETED	26-May-2005
TRWG5204	BETA-GAMMA CONTAMINATION INSTRUMENTATION & MONITOI	PA	01	COMPLETED	26-May-2005
TRWG5205	ALPHA CONTAMINATION INSTRUMENTATION & MONITORING	PA	01	COMPLETED	26-May-2005
TMEE0300	SAFE PRACTICE ON OR NEAR ELECTRICA L CONDUCTORS	CR	05	COMPLETED	20-Apr-2005
TMEE2800	ELECTRICAL SYSTEMS SAFETY	CL	01	COMPLETED	12-Apr-2005
LSLST003	LAB STANDARD REFRESHER FOR 2005	SP	02	COMPLETED	24-Mar-2005
STGN0016	HANFORD TREATABILITY STUDY - MATERIAL HANDLING, MO	RS	03	COMPLETED	18-Mar-2005
LSWEM002	L1, 6.24 CHANGES: TRU RADIOACTIVE WASTE PROCEDURE	BR	00	COMPLETED	01-Mar-2005
SG152950	SRNL NUCLEAR MATERIAL CUSTODIAN	SP	05	COMPLETED	22-Feb-2005
SG152951	SRNL ACCOUNTABLE MATERIAL HANDLER	SP	05	COMPLETED	22-Feb-2005
SG152952	SRNL NUCLEAR CRITICALITY SAFETY TRAINING	SP	05	COMPLETED	22-Feb-2005
LSWPT001	RPP TREATABILITY STUDY AND RESIDUE MANAGEMENT OVER	CR	02	COMPLETED	03-Feb-2005

TRGCAT05	CONSOLIDATED ANNUAL TRAINING	SP	00	COMPLETED	26-Jan-2005
QRIS5008	BEHAVIOR BASED SAFETY BBS OBSERVER WORKSHOP(MOD 4)	CL	00	COMPLETED	19-Jan-2005
TRGCAT04	CONSOLIDATED ANNUAL TRAINING	SP	02	COMPLETED	09-Nov-2004
QRIH3030	LASER SAFETY FOR CLASS III & IV	CR	00	COMPLETED	27-Oct-2004
LSADS037	ANALYZE SAMPLE (ALPHA SPECTROSCOPY)	OJ	00	GRANTED EXCEPTION	16-Sep-2004
LSADS038	ANALYZE SAMPLE (GAS FLOW PROPORTIONAL COUNTER)	OJ	00	GRANTED EXCEPTION	16-Sep-2004
ST020045	PREPARE SAMPLE FOR LIQUID SCINTILLATION	OM	00	GRANTED EXCEPTION	16-Sep-2004
ST020051	PREPARE SAMPLE FOR TRITIUM ANALYSIS	OM	00	GRANTED EXCEPTION	16-Sep-2004
ST020053	ANALYZE SAMPLE (GAMMA SPECTROSCOPY)	OM	00	GRANTED EXCEPTION	16-Sep-2004
ST020065	PREPARE ALPHA PLANCHET	OM	00	GRANTED EXCEPTION	16-Sep-2004
ST020066	ANALYZE SAMPLE (LIQUID SCINTILLATION)	OM	00	GRANTED EXCEPTION	16-Sep-2004
ST020067	ANALYZE SAMPLE NEUTRON ACTIVATION ANALYSIS METHOD	OM	00	GRANTED EXCEPTION	16-Sep-2004
ST020068	PERFORM SOLVENT/SOLVENT EXTRACTION	OM	01	GRANTED EXCEPTION	16-Sep-2004
LSGEN007	SRTC JHA TRAINING	SP	00	COMPLETED	04-Aug-2004
QHRG0400	RADIOLOGICAL WORKER II SELF-STUDY	SP	16	COMPLETED	14-Jun-2004
TRWG5203	RADIATION INSTRUMENTATION & MONITORING	PA	01	COMPLETED	01-Apr-2004
TRWG5204	BETA-GAMMA CONTAMINATION INSTRUMENTATION & MONITOI	PA	01	COMPLETED	01-Apr-2004
TRWG5205	ALPHA CONTAMINATION INSTRUMENTATION & MONITORING	PA	01	COMPLETED	01-Apr-2004
LSGEN006	SRTC ARW PRACTICE REFRESHER AND PROFICIENCY	CR	00	COMPLETED	31-Mar-2004
LSLST003	LAB STANDARD REFRESHER TRAINING	SP	01	COMPLETED	24-Mar-2004
QRRP1001	NEGATIVE PRESSURE RESPIRATOR RETRAINING CHALLENGE	SP	01	COMPLETED	27-Feb-2004
TRPG4001	GENERAL RESPIRATORY RETRAINING	SP	01	COMPLETED	27-Feb-2004
LSMTD002	SUMMARY OF CHANGES TO SRTC DRAIN SYSTEM TRAINING	SP	00	COMPLETED	27-Jan-2004
STGN0022	DOE/RW-0333P QUALITY ASSURANCE REQUIREMENTS DOCUME	SP	02	COMPLETED	13-Jan-2004
TRGCAT03	CONSOLIDATED ANNUAL TRAINING	SP	00	COMPLETED	25-Nov-2003
LSGEN005	L1, 2.32 RADIOLOGICAL WORK PRACTICES OVERVIEW	CR	00	COMPLETED	28-Oct-2003
LSBMDV02	SRTC HUMAN PERFORMANCE - UNDERSTANDING RISK	CR	00	COMPLETED	10-Sep-2003
LSLST003	LAB STANDARD REFRESHER FOR 2003 (TOXICS)	SP	00	COMPLETED	26-Jun-2003
STGN0024	ENGINEERING CALCULATIONS	RS	00	COMPLETED	12-Jun-2003
TRWG5203	RADIATION INSTRUMENTATION & MONITORING	PA	00	COMPLETED	31-Mar-2003
TRWG5204	BETA-GAMMA CONTAMINATION INSTRUMENTATION & MONITOI	PA	00	COMPLETED	31-Mar-2003
TRWG5205	ALPHA CONTAMINATION INSTRUMENTATION & MONITORING	PA	00	COMPLETED	31-Mar-2003
LSGEN004	FIRE SUPRESSION TRAINING FOR GLOVE BOX USERS	RS	00	COMPLETED	03-Mar-2003
SG152950	SRTC NUCLEAR MATERIAL CUSTODIAN	SP	04	COMPLETED	28-Feb-2003
SG152951	SRTC ACCOUNTABLE MATERIAL HANDLER	SP	04	COMPLETED	27-Feb-2003

SG152952	SRTC NUCLEAR CRITICALITY SAFETY TRAINING	SP	04	COMPLETED	27-Feb-2003
STGN0022	DOE/RW-0333P QUALITY ASSURANCE REQUIREMENTS DOCUME	SP	01	COMPLETED	18-Feb-2003
QRRP1000	INITIAL NEGATIVE PRESSURE RESPIRATOR TRAINING	CR	05	COMPLETED	13-Feb-2003
QRRP1000	INITIAL NEGATIVE PRESSURE RESPIRATOR TRAINING	JP	01	COMPLETED	13-Feb-2003
TRPG4000	GENERAL RESPIRATORY PROTECTION	CR	02	COMPLETED	13-Feb-2003
SE010402	SRTC WASTE GENERATOR - CBT	SP	01	COMPLETED	21-Nov-2002
TRGCAT02	CONSOLIDATED ANNUAL TRAINING (CAT)	SP	00	COMPLETED	01-Nov-2002
LSLST002	LAB STANDARD REFRESHER 2002-HIGHLY TOXIC MATERIALS	SP	00	COMPLETED	28-Jun-2002
QHRG0400	RADIOLOGICAL WORKER II SELF STUDY TRAINING	JP	09	COMPLETED	28-Jun-2002
QHRG0400	RADIOLOGICAL WORKER II SELF-STUDY	SE	14	COMPLETED	28-Jun-2002
LSMTD001	SRTC DRAINS TRAINING	SP	00	COMPLETED	23-Apr-2002
TRWG5203	RADIATION INSTRUMENTATION & MONITORING	PA	00	COMPLETED	01-Apr-2002
TRWG5204	BETA-GAMMA CONTAMINATION INSTRUMENTATION & MONITOI	PA	00	COMPLETED	01-Apr-2002
TRWG5205	ALPHA CONTAMINATION INSTRUMENTATION & MONITORING	PA	00	COMPLETED	01-Apr-2002
STGN0003	SRTC LAB STANDARD ANNUAL REFRESHER TRAINING (U)	SP	02	COMPLETED	28-Mar-2002
QRIS5007	BEHAVIOR BASED SAFETY TEAM SAFETY WORKSHOP (MOD 3)	CR	00	COMPLETED	14-Mar-2002
TICTS003	OJT TRAINER EVALUATOR	CR	03	GRANTED EXCEPTION	06-Mar-2002
SE010401	SRTC TECHNICAL AREA TRU WASTE HANDLER	SP	01	COMPLETED	15-Feb-2002
TRGCAT01	CONSOLIDATED ANNUAL TRAINING	SP	00	COMPLETED	12-Oct-2001
TRWG2001	RWT REFRESHER TRAINING	RS	00	COMPLETED	13-Sep-2001
SL090606	SRTC/TNX/AL RCRA SATELLITE AREAS	RS	06	COMPLETED	18-Jul-2001
STGN0022	RW-0333P QUALITY ASSURANCE REQUIRED READING	RS	00	COMPLETED	15-May-2001
TRWG5203	RADIATION INSTRUMENTATION & MONITORING	PA	00	COMPLETED	28-Mar-2001
TRWG5204	BETA-GAMMA CONTAMINATION INSTRUMENTATION & MONITOI	PA	00	COMPLETED	28-Mar-2001
TRWG5205	ALPHA CONTAMINATION INSTRUMENTATION & MONITORING	PA	00	COMPLETED	28-Mar-2001
STGN0003	SRTC LAB STANDARD ANNUAL REFRESHER TRAINING (U)	SC	00	COMPLETED	21-Mar-2001
SG152950	SRTC NUCLEAR MATERIAL CUSTODIAN INITIAL BRIEFING	BR	03	COMPLETED	06-Feb-2001
SG152951	SRTC ACCOUNTABLE MATERIAL HANDLER INITIAL BRIEFING	BR	03	COMPLETED	06-Feb-2001
SG152952	SRTC NUCLEAR CRITICALITY SAFETY TRNG INITIAL BRIEF	BR	03	COMPLETED	06-Feb-2001
STGN0028	CRC/ARC REQUIRED READING	RS	00	COMPLETED	11-Jan-2001
STGN0037	SRTC CONSTANT AIR MONITORING (CAM) SYSTEM	WE	00	COMPLETED	19-Dec-2000
SE010402	SRTC WASTE GENERATOR	WE	00	COMPLETED	06-Nov-2000
SE010417	L1 MANUAL 2.17/6.03 OVERVIEW	BR	00	COMPLETED	19-Oct-2000
TRGCAT00	CONSOLIDATED ANNUAL TRAINING	WE	00	COMPLETED	18-Oct-2000
QHRG0400	RADIOLOGICAL WORKER II SELF-STUDY TRAINING	JP	07	COMPLETED	31-Jul-2000
QHRG0400	RADIOLOGICAL WORKER II SELF-STUDY	SE	11	COMPLETED	31-Jul-2000
HRDGV001	APRIL 2000 DIVERSITY STAND-DOWN	BS	00	COMPLETED	19-Apr-2000
STGN0031	L7.7, PROCEDURE 1.07, INTERIM REV. 5 (U)	RS	00	COMPLETED	21-Oct-1999

TREGCAT9	CONSOLIDATED ANNUAL TRAINING (CAT)	SP	00	COMPLETED	14-Oct-1999
STGN0007	SRTC NUCLEAR CRITICALITY SAFETY ANNUAL REFRESHER	BS	00	COMPLETED	28-Sep-1999
STGN0008	SRTC ACCOUNTABLE MATERIAL HANDLER ANNUAL REFRESHE	BS	00	COMPLETED	28-Sep-1999
STGN0009	SRTC NUCLEAR MATERIAL CUSTODIAN ANNUAL REFRESHER	BS	00	COMPLETED	28-Sep-1999
STGN0003	SRTC LAB STANDARD ANNUAL REFRESHER TRAINING (U)	SC	00	COMPLETED	01-Sep-1999
QSCL1600	SITEWIDE SECURITY STANDDOWN	VC	00	COMPLETED	03-Aug-1999
QSCL1601	SITEWIDE SECURITY STANDDOWN	RS	01	COMPLETED	03-Aug-1999
QRCID208	SOURCE CONTROL CUSTODIAN TRAINING	CR	02	COMPLETED	12-Jul-1999
STGN0016	BNFL - I-WPT-003	RS	01	COMPLETED	28-Jun-1999
TRWG8000	F-CANYON OPERATOR INTAKE	VC	00	COMPLETED	24-Jun-1999
TICTS023	OJT CONTINUING TRAINING	CR	01	COMPLETED	03-Jun-1999
TMEE0300	SAFE PRACTCES ON OR NEAR ELECTRICAL CONDUCTORS	CR	01	COMPLETED	15-Apr-1999
TICTS023	OJT CONTINUING TRAINING	CR	01	EXEMPTION B	14-Apr-1999
TRWG5220	ARWT CORE SELF STUDY	JP	01	COMPLETED	10-Mar-1999
TRWG5220	ARWT CORE SELF STUDY	SE	01	COMPLETED	10-Mar-1999
STGN0015	RECEIPT OF SPECIAL NUCLEAR MATERIAL, MISSED SIGNA	RS	00	COMPLETED	16-Feb-1999
STGN0005	JOB HAZARDS ANALYSIS: HANDLING LEAD BRICKS AND OTH	RS	00	COMPLETED	28-Jan-1999
STVE0002	SYSTEMATIC INDUSTRIAL OPERATIONS SEMINAR (U)	CR	00	COMPLETED	15-Dec-1998
TRWG5200	ADVANCED RADIOLOGICAL WORKER TRAINING CORE	CR	01	GRANTED EXCEPTION	07-Dec-1998
TREGCATB	CONSOLIDATED ANNUAL TRAINING (CAT)	WE	00	COMPLETED	01-Dec-1998
STGN0010	SRTC NUCLEAR MATERIAL CUSTODIAN REQUIRED READING	RS	00	COMPLETED	24-Nov-1998
STGN0016	BNFL - I-WPT-003	RS	00	COMPLETED	26-Oct-1998
SG152901	LOW LEVEL WASTE HANDLING & MINIMIZATION FOR WASTE	CR	01	TESTOUT	29-Sep-1998
STGN0007	SRTC NUCLEAR CRITICALITY SAFETY ANNUAL REFRESHER	SE	00	COMPLETED	23-Sep-1998
STGN0008	SRTC ACCOUNTABLE MATERIAL HANDLER ANNUAL REFRESHE	SE	00	COMPLETED	23-Sep-1998
STGN0009	SRTC NUCLEAR MATERIAL CUSTODIAN ANNUAL REFRESHER	SE	00	COMPLETED	23-Sep-1998
LSADS011	ADS JOB SPECIFIC TRAINING FOR HANDLING SAMPLES CON	BS	00	COMPLETED	01-Sep-1998
TMEE2800	ELECTRICAL SYSTEMS SAFETY	CL	00	COMPLETED	07-Aug-1998
STGN0003	SRTC LAB STANDARD ANNUAL REFRESHER TRAINING (U)	SC	00	COMPLETED	31-Jul-1998
QHRG0400	RADIOLOGICAL WORKER II SELF-STUDY	JP	06	COMPLETED	14-Jul-1998
QHRG0400	RADIOLOGICAL WORKER II SELF-STUDY	SE	08	COMPLETED	14-Jul-1998
TRWG5200	ADVANCED RADIOLOGICAL WORKER TRAINING CORE	PA	00	COMPLETED	08-Jul-1998
HRD10923	TEAMWORK, THE KEY TO VALUING DIVERSITY	CR	00	COMPLETED	27-May-1998
STGN0002	SRTC ADVANCED RAD WORKER HANDOUT	BS	00	COMPLETED	27-May-1998
TICTS023	OJT TRAINER/EVALUATOR CONTINUING TRAINING	CR	00	COMPLETED	15-Apr-1998
SE010401	SRTC TECHNICAL AREA TRU WASTE HANDLER	CL	00	COMPLETED	24-Feb-1998
SG152980	SRTC TECHNICAL AREA FACILITY ACCESS TRAINING	SC	00	COMPLETED	04-Nov-1997

TRWG9700	RWT REFRESHER 1997, VOL. 2	RS	01	COMPLETED	04-Nov-1997
TREGCAT7	CONSOLIDATED ANNUAL TRAINING	SC	00	COMPLETED	14-Oct-1997
SG152950	SRTC NUCLEAR MATERIAL CUSTODIAN INITIAL BRIEFING	CR	00	COMPLETED	11-Sep-1997
SG152952	SRTC NUCLEAR CRITICALITY SAFETY TRAINING	CR	00	COMPLETED	11-Sep-1997
SG152954	WSRC GENERAL CRITICALITY	CR	00	COMPLETED	11-Sep-1997
SG152951	SRTC NUCLEAR MATERIAL HANDLER	CR	00	COMPLETED	04-Sep-1997
QRCTS014	GLOVE CHANGEOUT	CR	00	COMPLETED	23-Apr-1997
TRWG5200	ADVANCED RADIOLOGICAL WORKER TRAINING CORE	JP	01	COMPLETED	19-Mar-1997
TRWG5200	ADVANCED RADIOLOGICAL WORKER TRAINING CORE	CR	01	COMPLETED	12-Dec-1996
TRWG5210	ADVANCED RAD WORKER TRAINING CORE PRE-TEST	CE	00	COMPLETED	07-Nov-1996
TREGCAT6	CONSOLIDATED ANNUAL TRAINING	SC	00	COMPLETED	30-Oct-1996
V1000000	QUALITY ASSURANCE IN RADIOCHEMISTRY	Offsite		COMPLETED	23-Oct-1996
QRCID208	SOURCE CONTROL	CR	01	COMPLETED	29-Aug-1996
V1000000	GAMMA-RAY SPECTROSCOPY FOR NUCLEAR MATR'LS ACCTNG	Offsite		COMPLETED	08-Aug-1996
QHRG0400	RADIOLOGICAL WORKER II SELF STUDY	JP	02	COMPLETED	22-Jul-1996
QHRG0400	RWT SELF STUDY - LEVEL II	SE	04	COMPLETED	22-Jul-1996
SG152901	LOW LEVEL WASTE HANDLING & MINIMIZATION FOR WASTE	CR	01	TESTOUT	09-Jul-1996
V1000000	41ST CONFERENCE ON BIOASSAY, ANALYTICAL & ENVIR	Offsite		COMPLETED	16-Nov-1995
TICATB00	CONSOLIDATED ANNUAL TRAINING	SC	00	COMPLETED	04-Oct-1995
QHRG2501	RWT REFRESHER 95 VOLUME I	SP	00	COMPLETED	27-Mar-1995
LEPBRF94	1994 SRTC EP BRIEFING	RS	00	COMPLETED	23-Nov-1994
SS152900	LOW LEVEL WASTE HANDLING & MINIMIZATION	CR	00	COMPLETED	18-Nov-1994
V1000000	US DOE SAFEGUARDS TECH TRNG PROGRAM	Offsite		COMPLETED	30-Sep-1994
QRIH1200	OSHA'S LAB STANDARD TRAINING	CR	00	COMPLETED	14-Sep-1994
QHRG0300	RWT LEVEL II FULL PRESENTATION	CL	04	COMPLETED	04-Aug-1994
TRSGETC2	INITIAL GENERAL EMPLOYEE TRAINING	CR	00	COMPLETED	27-Jul-1994

Training History

Last Name	JONES	First Name	MARK	User ID	A430(	Org Code	LA100

Course Code	Course Title	Setting	Revision	Class Status	Completion Date
TSUBMP02	SUBCONTRACT TECHNICAL REPRESENTATIVE TRAINING II	SP	00	COMPLETED	15-Jul-2007
TSUBMP01	SUBCONTRACT MANAGEMENT PROGRAM TRAINING	SP	02	COMPLETED	09-Jul-2007
TMME1305	ELECTRICAL HAZARDS AWARENESS BRIEFING	SP	00	COMPLETED	27-Jun-2007
QHRG0400	RADIOLOGICAL WORKER TRAINING 2 RETRAINING	SP	18	COMPLETED	12-Jun-2007
ZSAF0705	2007 SAFETY CONFERENCE - TAKE IT PERSONALLY	BR	00	COMPLETED	12-Jun-2007
LSADS060	ANALYZE SAMPLE USING LEEMAN ICP-ES	PF	00	GRANTED EXCEPTION	11-Jun-2007
LSGEN058	L7.7, 1.06 & 1.07 PROCEDURE CHANGES	BR	00	COMPLETED	06-Jun-2007
LSMTD003	USE OF DRAIN SYSTEMS DELTA TRAINING	RS	00	COMPLETED	09-Mar-2007
SLBE3013	SRNL 3013 PROJECT BERYLLIUM & MEDICAL SURVEILLANCE	BR	00	COMPLETED	08-Mar-2007
LSGEN048	NUCLEAR MATERIAL CUSTODIAN DELTA TRAINING	RS	00	COMPLETED	04-Mar-2007
LSGEN049	ACCOUNTABLE MATERIAL HANDLER DELTA TRAINING	RS	00	COMPLETED	04-Mar-2007
LSGEN050	NUCLEAR CRITICALITY SAFETY DELTA TRAINING	RS	00	COMPLETED	04-Mar-2007
LSLST003	LAB STANDARD TRAINING REFRESHER FOR 2007	SP	04	COMPLETED	02-Mar-2007
LSCT0046	RESPONSE TO ABNORMAL EVENTS	BR	00	COMPLETED	14-Feb-2007
LSADS017	CONTAINED INDUCTIVELY COUPLED PLASMA EMISSION SPEC	JP	00	GRANTED EXCEPTION	13-Feb-2007
TMEE3050	SAFE PRACTICE ON OR NEAR ELECTRICAL CONDUCTORS	SP	04	COMPLETED	10-Feb-2007
LSGEN034	SRNL R&D BRIEF ON WORK PLANNING & CONTROL FOR EMPL	BR	00	COMPLETED	16-Jan-2007
TRGCAT07	CONSOLIDATED ANNUAL TRAINING 2007 (CAT)	SP	00	COMPLETED	02-Jan-2007
LSMTD001	SRTC DRAINS TRAINING	SP	01	COMPLETED	01-Dec-2006
TRPG5600	INITIAL BULLARD PA30 PAPR	CR	01	COMPLETED	17-Nov-2006
TRPG5600	INITIAL BULLARD PA 30 PAPR	JP	00	COMPLETED	17-Nov-2006
HRDOD285	WSRC LEADERS FORUM	CR	00	COMPLETED	15-Nov-2006
STGN0022	DOE/RW-0333P QUALITY ASSURANCE REQUIREMENTS DOCUME	SP	02	COMPLETED	07-Nov-2006
QRRP1000	INITIAL NEGATIVE PRESSURE RESPIRATOR TRAINING	CR	05	COMPLETED	02-Nov-2006
QRRP1000	INITIAL NEGATIVE PRESSURE RESPIRATOR TRAINING	JP	01	COMPLETED	02-Nov-2006
TRPG4000	GENERAL SUPERVISOR RESPIRATORY PROTECTION	CR	03	COMPLETED	02-Nov-2006
SA230111	QUALITY ASSURANCE PLAN FOR INDUSTRIAL HYGIENE LAB	BR	00	COMPLETED	16-Oct-2006
CLGENSAR	SAFETY ANALYSIS REPORT & TECH SAFETY REQUIREMENTS	BR	00	COMPLETED	05-Oct-2006
SE010402	SRTC WASTE GENERATOR - CBT	SP	01	COMPLETED	05-Oct-2006
CLGEN118	HUMAN PERFORMANCE FUNDAMENTALS	BR	01	COMPLETED	04-Oct-2006

SG152904	SRNL R&D COMPRESSED GAS CYLINDER TRAINING	SP	01	COMPLETED	04-Oct-2006
LSLST003	LABORATORY STANDARD REFRESHER TRNG. (2006)	SP	03	COMPLETED	03-Oct-2006
TMEE6400	MINOR/EDITORIAL CHANGES TO 18Q-2	BR	00	COMPLETED	27-Sep-2006
SA220972	N500 AV ALPHA SPECTROSCOPY TRAINING	SM	00	COMPLETED	21-Jul-2006
TMME1302	ELECTRICAL HAZARD AWARENESS-ELECTRICAL WORKERS	BR	01	COMPLETED	29-Jun-2006
TMEE2900	ELECTRICAL HAZARD AWARENESS	CR	00	COMPLETED	12-Jun-2006
TRWG5203	RADIATION INSTRUMENTATION & MONITORING	PA	01	COMPLETED	12-Apr-2006
TRWG5204	BETA-GAMMA CONTAMINATION INSTRUMENTATION & MONITOI	PA	01	COMPLETED	12-Apr-2006
TRWG5205	ALPHA CONTAMINATION INSTRUMENTATION & MONITORING	PA	01	COMPLETED	12-Apr-2006
SA200260	SAFE CHEMICAL HANDLING	SP	00	COMPLETED	21-Mar-2006
SE010502	F/H AREA LABORATORY WASTE GENERATOR (CBT)	SP	03	COMPLETED	11-Mar-2006
TMEE3050	SAFE PRACTICE ON OR NEAR ELECTRICAL CONDUCTORS	SP	04	COMPLETED	10-Feb-2006
TRGCAT06	CONSOLIDATED ANNUAL TRAINING 2006 (CAT)	SP	00	COMPLETED	06-Jan-2006
CLGEN117	USE OF CALCIUM GLUCONATE FOR HF SKIN CONTACT	BR	00	COMPLETED	10-Nov-2005
TRWGHA03	HAZARD ANALYSIS FOR WORKERS	CR	03	COMPLETED	15-Sep-2005
TMEE2850	ELECTRICAL SYSTEMS SAFETY WEB BASED	SP	01	COMPLETED	09-Aug-2005
TMME1302	ELECTRICAL HAZARD AWARENESS - E	BR	00	COMPLETED	30-Jun-2005
QHRG0400	RADIOLOGICAL WORKER 2 SELF-STUDY	SP	17	COMPLETED	17-Jun-2005
SA102701	SAMPLE ANALYSIS BY LEEMAN LAB ICP - PROCESS SAMPLE	JP	02	COMPLETED	12-May-2005
TMEE3050	SAFE PRACTICVE ON OR NEAR ELECTRICAL CONDUCTORS	SP	01	COMPLETED	09-Feb-2005
TRGCAT05	CONSOLIDATED ANNUAL TRAINING	SP	00	COMPLETED	01-Jan-2005
SA220300	NUCLEAR CRITICALITY SAFETY	SP	01	COMPLETED	15-Nov-2004
SA260700	INDEPENDENT ANALYYSIS PROTOCOL BRIEFING	BR	00	COMPLETED	15-Oct-2004
LSLST003	LAB STANDARD REFRESHER TRAINING	SP	01	COMPLETED	25-Aug-2004
SE010304	OSHA LAB STANDARD INITIAL (WEB BASED)	SP	00	COMPLETED	25-Aug-2004
SA220105	SOURCE CONTROL AND ACCOUNTABILITY, CLAB	BS	00	COMPLETED	21-Aug-2004
SA113100	ORGANIC EXTRACTANTS IN AQUEOUS SOLUTION BY INFRACA	JP	00	COMPLETED	30-Jul-2004
CLGEN116	LAB BACK TO BASICS/CONDUCT OF OPERATIONS	BR	00	COMPLETED	23-Jul-2004
V1000000	ICP EMISSION SPECTROMETERS TRAINING	Offsite		COMPLETED	18-Jun-2004
TRWG5203	RADIATION INSTRUMENTATION & MONITORING	PA	01	COMPLETED	26-Apr-2004
TRWG5204	BETA-GAMMA CONTAMINATION INSTRUMENTATION & MONITOI	PA	01	COMPLETED	26-Apr-2004
TRWG5205	ALPHA CONTAMINATION INSTRUMENTATION & MONITORING	PA	01	COMPLETED	26-Apr-2004
SE010502	F/H AREA LABORATORY WASTE GENERATOR (CBT)	SP	02	COMPLETED	13-Apr-2004
TRGCAT04	CONSOLIDATED ANNUAL TRAINING	SP	02	COMPLETED	07-Apr-2004
TMEE0300	SAFE PRACTCES ON OR NEAR ELECTRICAL CONDUCTORS	CR	04	COMPLETED	29-Mar-2004
CLCT4005	FB-LINE CASE STUDY (ACTION #2)	BR	00	COMPLETED	06-Feb-2004
SA103100	URANIUM ISOTOPICS BY MASS SPECTROMETRY: IAP BRIEF.	BR	00	COMPLETED	16-Dec-2003
SA103200	URANIUM BY DAVIES-GRAY: IAP BRIEFING	BR	00	COMPLETED	16-Dec-2003

SA260600	HEU SAMPLING & ANALYTICAL QUALITY ASSURANCE PLAN	BR	00	COMPLETED	11-Nov-2003
FESHAHAO	AUTOMATED HAZARD ANALYSIS ORIENTATION	SP	00	COMPLETED	08-Nov-2003
WETISI01	ETF PROCESS SYSTEMS OVERVIEW	CR	02	COMPLETED	28-Aug-2003
QHRG0400	RADIOLOGICAL WORKER II SELF-STUDY	SP	16	COMPLETED	31-Jul-2003
SA220500	PROCEDURE PROCESS IN AL	BR	00	COMPLETED	22-Jul-2003
WAAIGO01	LIQUID WASTE PROCESSING OVERVIEW	CR	02	COMPLETED	10-Jun-2003
TRGCAT03	CONSOLIDATED ANNUAL TRAINING	SP	00	COMPLETED	11-Apr-2003
QRIS5008	BEHAVIOR BASED SAFETY BBS OBSERVER WORKSHOP(MOD 4)	CL	00	COMPLETED	19-Mar-2003
SA220300	NUCLEAR CRITICALITY SAFETY	SP	01	COMPLETED	14-Jan-2003
SA220700	THE IMPORTANCE OF ACCOUNTABILITY MEASUREMENTS	BR	00	COMPLETED	06-Jan-2003
TFSHC00F	F - AREA HAZCOM WITH FACILITY SPECIFIC	SP	00	COMPLETED	03-Jan-2003
EE000103	SYSTEMS APPROACH TO ENGINEERING	CR	00	COMPLETED	10-Dec-2002
V1000000	ION CHROMATOGRAPHY TRAINING COURSE - DIONEX	Offsite		COMPLETED	15-Oct-2002
CLGENFET	CLAB FACILITY ENTRANCE TRAINING	SP	03	COMPLETED	17-Sep-2002
QRRP1001	NEGATIVE PRESSURE RESPIRATOR RETRAINING CHALLENGE	SP	01	COMPLETED	30-Aug-2002
TRPG4001	GENERAL RESPIRATORY RETRAINING	RS	01	COMPLETED	15-Aug-2002
TRPG4001	GENERAL RESPIRATORY RETRAINING	SP	01	COMPLETED	15-Aug-2002
SA172000	HOW TO ISSUE, USE & CONTROL OPERATOR AIDS-BRIEFING	BR	00	COMPLETED	08-Aug-2002
TMEE2850	ELECTRICAL SYSTEMS SAFETY WEB BASE	SP	00	COMPLETED	02-Aug-2002
QTIHAT05	ANNUAL HEAT STRESS BRIEFING FOR AT RISK WORKERS	BS	05	COMPLETED	23-Jul-2002
TSUBMP01	SUBCONTRACT MANAGEMENT PROGRAM TRAINING	CR	00	COMPLETED	21-May-2002
SE010502	CLAB WASTE GENERATOR	SP	01	COMPLETED	20-May-2002
TRGCAT02	CONSOLIDATED ANNUAL TRAINING (CAT)	SP	00	COMPLETED	09-May-2002
EE000219	MEASUREMENT UNCERTAINTY	CR	00	COMPLETED	02-May-2002
EELT0092	DENSITY MEASUREMENT WORKSHOP	BR	00	COMPLETED	30-Apr-2002
EELT0093	TITRATION AND ELECTRODE WORKSHOP	BR	00	COMPLETED	30-Apr-2002
TRWG5203	RADIATION INSTRUMENTATION & MONITORING	PA	00	COMPLETED	29-Apr-2002
TRWG5204	BETA-GAMMA CONTAMINATION INSTRUMENTATION & MONITOI	PA	00	COMPLETED	29-Apr-2002
TRWG5205	ALPHA CONTAMINATION INSTRUMENTATION & MONITORING	PA	00	COMPLETED	29-Apr-2002
SA171002	CLAS CHEMICAL CONTROL BRIEFING	BR	00	COMPLETED	12-Feb-2002
SE010529	TRU WASTE BRIEFING	BR	00	COMPLETED	09-Jan-2002
QQMA1010	WSRC QUALITY ASSURANCE ORIENTATION	CR	11	COMPLETED	08-Jan-2002
SA220401	LABORATORY REFRESHER TRAINING (CLAS 2002)	SP	00	COMPLETED	05-Dec-2001
SA220600	WORKING IN CLAS RAD. CONTAINMENT UNITS IN A CA	JP	01	COMPLETED	05-Dec-2001
QRIS5007	BEHAVIOR BASED SAFETY TEAM SAFETY WORKSHOP (MOD 3)	CR	00	COMPLETED	31-Oct-2001
SC220001	L2.1-00118: ACCOUNTABILITY METHOD QC CHART REVIEW	BR	00	COMPLETED	31-Oct-2001
QHRG0400	RADIOLIGICAL WORKER II SELF STUDY TRAINING	JP	08	COMPLETED	20-Aug-2001
QHRG0400	RADIOLOGICAL WORKER II SELF-STUDY	SE	12	COMPLETED	20-Aug-2001
QRRP1001	NEGATIVE PRESSURE RETRAINING (U)	JP	01	COMPLETED	20-Aug-2001
TRPG4001	GENERAL RESPIRATORY RETRAINING	RS	01	COMPLETED	20-Aug-2001

SA120100	INITIAL TECHNICAL SUPPORT READING--CLAB	SP	01	COMPLETED	08-Aug-2001
TRGCAT01	CONSOLIDATED ANNUAL TRAINING	SP	00	COMPLETED	10-Jun-2001
ZTAIXB00	ETF FACILITY ENTRY BRIEFING	RS	01	COMPLETED	09-Mar-2001
NSMTCH02	H AREA PROCESSING & CHEMICAL COMPATABILITY O'VIEW	BS	00	COMPLETED	05-Mar-2001
CLGENTSR	CLAB AUTHORIZATION BASIS BRIEFING (U)	BR	00	COMPLETED	20-Feb-2001
SA220400	CLAS PROFICIENCY TOPIC " LABORATORY SAFETY (U)	WE	00	COMPLETED	20-Feb-2001
SA120300	USING STATISTICS IN THE LABORATORY	SM	00	COMPLETED	06-Feb-2001
SA220300	NUCLEAR CRITICALITY SAFETY	CR	00	TESTOUT	23-Jan-2001
TFSHC033	SFSD K-REACTOR, FS HAZCOM	SP	00	COMPLETED	18-Dec-2000
TFSHC040	TSD CENTRAL LAB, OPS & MAINT, FS HAZCOM	SP	00	COMPLETED	18-Dec-2000
EE000199	BASIC RADIOCHEMISTRY	CR	00	COMPLETED	12-Dec-2000
SA220200	2SMANUAL TRAINING FOR AL SUPPORT PERSONNEL	CR	00	COMPLETED	09-Nov-2000
TRPG2000	INITIAL PLASTIC SUIT AND HOOD AIRLINE RESPIRATOR	CR	01	COMPLETED	09-Nov-2000
TRPG2000	INITIAL PLASTIC SUIT AND HOOD AIRLINE RESPIRATORY	JP	01	COMPLETED	09-Nov-2000
SA220103	ACCESS CONTROL BRIEFING, L2-100035 (U)	BS	00	COMPLETED	18-Oct-2000
CLGENFET	CLAB FACILITY ENTRANCE TRAINING	WE	02	COMPLETED	16-Oct-2000
SA102701	SAMPLE ANALYSIS BY THE LEEMAN LABS ICP (U)	OM	00	COMPLETED	09-Oct-2000
QRRP1001	NEGATIVE PRESSURE RETRAINING (U)	JP	01	COMPLETED	14-Aug-2000
TRPG4001	GENERAL RESPIRATORY RETRAINING	RS	01	COMPLETED	14-Aug-2000
TRGCAT00	CONSOLIDATED ANNUAL TRAINING	WE	00	COMPLETED	21-Jul-2000
SE010502	CLAB WASTE GENERATOR	WE	00	COMPLETED	18-Jul-2000
SA140101	AL FACILITY SPECIFIC HAZARD COMMUNICATION	SE	03	COMPLETED	16-Jul-2000
SA171001	CHEMICAL CONTROL	CL	02	COMPLETED	20-Jun-2000
SA220106	RADIOLOGICAL CONTROL PRACTICES	BS	00	COMPLETED	09-Jun-2000
SA052009	QUALS&TNG REQ FOR WQL CURIE MAT.CTF 772-F	BS	00	COMPLETED	20-May-2000
SA052010	QUALS/TRNG REQ FOR WQL NUC MAT CUSTODIAN	BS	00	COMPLETED	20-May-2000
SA171801	NUCLEAR SAFETY SAMPLES: PROGRAM CONTROLS (U)	CR	01	COMPLETED	15-May-2000
HRDGV001	APRIL 2000 DIVERSITY STAND-DOWN	BS	00	COMPLETED	26-Apr-2000
TRWG5203	RADIATION INSTRUMENTATION & MONITORING	PA	00	COMPLETED	13-Apr-2000
TRWG5204	BETA-GAMMA CONTAMINATION INSTRUMENTATION & MONITOI	PA	00	COMPLETED	13-Apr-2000
TRWG5205	ALPHA CONTAMINATION INSTRUMENTATION & MONITORING	PA	00	COMPLETED	13-Apr-2000
SA220105	SOURCE CONTROL AND ACCOUNTABILITY, CLAB	BS	00	COMPLETED	03-Apr-2000
V1000000	ICP TRAINING SEMINAR	Offsite		COMPLETED	28-Jan-2000
SA050701	PH AND ION SELECTIVE ELECTRODE (ISE)	OM	00	COMPLETED	24-Jan-2000
SA050901	WQL CONDUCTIVITY (U)	OM	01	COMPLETED	24-Jan-2000
SA051001	LIQUID SCINTILLATION COUNTING ANALYSIS/OPERATION	OJ	00	COMPLETED	24-Jan-2000
SA051401	RADIOMETRIC COUNTING-CALIBRATION/OPERATION/MAINT.	OJ	00	COMPLETED	24-Jan-2000
SA051501	MERCURY ANALYSIS BY COLD VAPOR	OJ	00	COMPLETED	24-Jan-2000
SS061201	ICP ANALYSIS/OPERATION/MAINTENANCE (U)	CJ	01	COMPLETED	24-Jan-2000
SA050501	WQL ION CHROMATOGRAPH (U)	OM	01	COMPLETED	21-Jan-2000
SA220104	OVERVIEW OF ALARMS & INDICATORS IN THE LABS	SC	00	COMPLETED	21-Jan-2000

V1000000	SU-800-3 TENNELEC ECLIPSE/SERIES 5 LB TRNG	Offsite		COMPLETED	12-Jan-2000
QSOG0002	SAFETY OBSERVER MOCKUP TRAINING	CL	00	COMPLETED	16-Dec-1999
QSOG0001	SAFETY OBSERVER TRAINING	CR	02	COMPLETED	15-Dec-1999
QSOG0001	SAFETY OBSERVER TRAINING WORKBOOK W/ PRETEST	SP	01	COMPLETED	13-Dec-1999
THRV0033	TWELVE ANGRY MEN: TEAMS DON'T QUIT	VC	00	COMPLETED	07-Dec-1999
SA050901	WQL CONDUCTIVITY (U)	OM	01	COMPLETED	01-Dec-1999
SA051601	SOLVENT EXTRACTION ANALYZER-OPERATION/MAINTENANCE	OM	00	COMPLETED	01-Dec-1999
SA051801	WQ REAGENT AND STANDARD PREPARATION	OM	00	COMPLETED	01-Dec-1999
SA220300	NUCLEAR CRITICALITY SAFETY	CR	00	COMPLETED	30-Nov-1999
SA220104	OVERVIEW OF ALARMS & INDICATORS IN THE LABS	SC	00	COMPLETED	23-Nov-1999
SA041101	PROPER HANDLING OF SPILLS	CL	02	COMPLETED	27-Oct-1999
HRD11000	JOB HAZARD ANALYSIS (COMPUTER BASED)	SC	00	COMPLETED	13-Oct-1999
TRWG5200	ADVANCED RADIOLOGICAL WORKER TRAINING CORE	JP	01	COMPLETED	23-Sep-1999
TICTS003	OJT TRAINER EVALUATOR	CR	02	COMPLETED	16-Sep-1999
TMEE0300	SAFE PRACTCES ON OR NEAR ELECTRICAL CONDUCTORS	CR	01	COMPLETED	14-Sep-1999
TRWG5200	ADVANCED RADIOLOGICAL WORKER TRAINING CORE	CR	01	COMPLETED	02-Sep-1999
TRWG5210	ADVANCED RADIOLOGICAL WORKER TRNG CORE PRE-TEST	CE	03	COMPLETED	30-Aug-1999
TTSWCP01	WORK CLEARANCE & AUTHORIZATION	CR	01	COMPLETED	30-Aug-1999
QRRP1000	INITIAL NEGATIVE PRESSURE RESPIRATOR TRAINING	CR	04	COMPLETED	26-Aug-1999
QRRP1000	INITIAL NEGATIVE PRESSURE RESPIRATOR TRAINING	JP	00	COMPLETED	26-Aug-1999
TRPG4000	GENERAL RESPIRATORY PROTECTION	CR	01	COMPLETED	26-Aug-1999
QHRG0300	RADIOLOGICAL WORKER II INITIAL TRAINING	CR	11	COMPLETED	25-Aug-1999
QHRG0300	RADIOLOGICAL WORKER II INITIAL TRAINING	JP	07	COMPLETED	23-Aug-1999
TMEE2800	ELECTRICAL SYSTEMS SAFETY	CL	00	COMPLETED	18-Aug-1999
SS060807	OVERVIEW OF ANALYTICAL LABORATORIES REQUIREMENTS	CR	01	COMPLETED	17-Aug-1999
TREGGETA	GENERAL EMPLOYEE TRAINING (GET)	CR	01	COMPLETED	12-Aug-1999
NSRGFET4	CLAB FACILITY ENTRANCE TRAINING	SC	00	COMPLETED	11-Aug-1999
QSCL1600	SITEWIDE SECURITY STANDDOWN	VC	00	COMPLETED	03-Aug-1999
QSCL1601	SITEWIDE SECURITY STANDDOWN	RS	01	COMPLETED	03-Aug-1999

Training History

Last Name	BLACK	First Name	JOHN	User ID	W620	Org Code	L3435

Course Code	Course Title	Setting	Revision	Class Status	Completion Date
TMME1305	ELECTRICAL HAZARDS AWARENESS BRIEFING	SP	00	COMPLETED	27-Jun-2007
LSGEN058	L7.7, 1.06 & 1.07 PROCEDURE CHANGES	BR	00	COMPLETED	13-Jun-2007
QHRG0400	RADIOLOGICAL WORKER TRAINING 2 RETRAINING	SP	18	COMPLETED	18-May-2007
LSGEN049	ACCOUNTABLE MATERIAL HANDLER DELTA TRAINING	RS	00	COMPLETED	20-Mar-2007
LSGEN050	NUCLEAR CRITICALITY SAFETY DELTA TRAINING	RS	00	COMPLETED	20-Mar-2007
TRWG5203	RADIATION INSTRUMENTATION AND MONITORING	PA	02	COMPLETED	07-Mar-2007
TRWG5204	BETA-GAMMA INSTRUMENTATION AND MONITORING	PA	02	COMPLETED	07-Mar-2007
TRWG5205	ALPHA CONTAMINATION INSTRUMENTATION AND MONITOR	PA	02	COMPLETED	07-Mar-2007
LSMTD003	USE OF DRAIN SYSTEMS DELTA TRAINING	RS	00	COMPLETED	05-Mar-2007
LSCT0046	RESPONSE TO ABNORMAL EVENTS	BR	00	COMPLETED	15-Feb-2007
LSLST003	LAB STANDARD TRAINING REFRESHER FOR 2007	SP	04	COMPLETED	30-Jan-2007
TRGCAT07	CONSOLIDATED ANNUAL TRAINING 2007 (CAT)	SP	00	COMPLETED	11-Jan-2007
QRRP1001	NEGATIVE PRESSURE RETRAINING (U)	JP	01	COMPLETED	19-Dec-2006
TRPG4001	GENERAL/SUPERVISOR RESPIRATOR RETRAINING	SP	03	COMPLETED	19-Dec-2006
TMAD0022	MATERIALS OF TRADE TRAINING	CR	00	COMPLETED	05-Dec-2006
LSTRCT29	TRU WASTE TOOL HANDLING AND SAFE PRACTICES	BR	00	COMPLETED	16-Aug-2006
QRRP7000	RESPIRATORY PROTECTION ISSUANCE TRAINING (U)	SP	00	COMPLETED	14-Aug-2006
LSGEN029	R&D RQMTS FOR WORKING W/CLASS 1 FLAMMABLE LIQUID	RS	00	COMPLETED	02-Aug-2006
TREG0013	BLOODBORNE PATHOGENS/FIRST AID/CPR	CR	05	COMPLETED	28-Jun-2006
TREG0013	BLOODBORNE PATHOGENS/FIRST AIT/CPR	JP	01	COMPLETED	28-Jun-2006
TMME1301	ELECTRICAL HAZARD AWARENESS-NON-ELECTRICAL WORKERS	BR	01	COMPLETED	26-Jun-2006
LSTRCT20	MANAGEMENT REVIEW BRIEFING FROM 6/15/06 EVENT	BR	00	COMPLETED	15-Jun-2006
LSDR0031	SRNL TRU REPACKAGING CAM ALARM DRILL	DR	02	COMPLETED	22-May-2006
LSDRTQOE	DRT OPERATIONAL EVALUATION	OE	00	GRANTED EXCEPTION	22-May-2006
LSTRCT16	MONITORING WHEN EXITING GLOVEBOX GLOVES EXPECTATIO	BR	00	COMPLETED	09-May-2006
LSTRCT17	RESPONSE TO ABNORMAL CONDITIONS FOR RADCON	BR	00	COMPLETED	09-May-2006
LSTRCT21	EMERGENCY EXIT F-091	BR	00	COMPLETED	08-May-2006
LSTRCT22	REPORTING UNSAFE CONDITIONS	BR	00	COMPLETED	08-May-2006
LSTRCT23	REVIEW OF HEAT STRESS PROCEDURES IN 4Q MANUAL	BR	00	COMPLETED	08-May-2006

LSTRCT24	HAND AND FINGER PROTECTION	BR	00	COMPLETED	08-May-2006
LSTRCT26	WORK UNDERNEATH SUSPENDED LOAD	BR	00	COMPLETED	08-May-2006
LSTRCT27	GENERAL SITE SAFETY REQUIREMENTS	BR	00	COMPLETED	08-May-2006
LSTRCT28	BARRICADES	BR	00	COMPLETED	08-May-2006
LSTRU800	TRU WASTE DRUM REMEDIATION PROCESS LESSONS LEARNED	BR	00	COMPLETED	05-May-2006
LSTRCT15	TRU INSPECTION FORM CHANGES	BR	00	COMPLETED	04-May-2006
LSTRCT19	DRT DOSIMETRY AND PPE ADHERENCE	BR	00	COMPLETED	04-May-2006
LSDR0030	TRU PROCESS PHEX PRESSURE GAUGE READ DRUM LID REM	DR	00	COMPLETED	26-Apr-2006
LSTRCT14	SP-18-002 REVIEW OF REV. 1 CHANGES	BR	00	COMPLETED	21-Apr-2006
LSTRCT11	OPS S.O.: F091 TRU PROG. PROC. IMPLEMENTATION	BR	00	COMPLETED	12-Apr-2006
LSTRCT12	SRNL TRU GLOVEBOX REM. PROCESS LESSONS LEARNED	BR	00	COMPLETED	12-Apr-2006
LSDR0025	TRU WASTE GLOVE CONTAMINATION	DR	00	COMPLETED	11-Apr-2006
LSTRCT13	RCRA REVIEW/CONTINGENCY PLAN	BR	00	COMPLETED	11-Apr-2006
LSTRCT05	CHEMICAL HAZARD AWARENESS BRIEFING	BR	00	COMPLETED	10-Apr-2006
LSEP0005	TRU WASTE DRUMS DRILL (U)	DR	01	COMPLETED	07-Apr-2006
ZEAIXD01	SWMF E-AREA FACILITY ENETRY BRIEFING	BR	01	COMPLETED	07-Apr-2006
LSTRD300	DELTA TRU WASTE DRUM REMEDIATION PROCESS	BR	00	COMPLETED	03-Apr-2006
LSTRD301	DELTA TRU WASTE DRUM REMEDIATION PROCESS PRACFAC	PF	00	COMPLETED	03-Apr-2006
LSTRCT05	CHEMICAL HAZARD AWARENESS BRIEFING	BR	00	COMPLETED	30-Mar-2006
LSTRCT07	RADCON PRACTICES BRIEF	BR	00	COMPLETED	30-Mar-2006
LSTRCT09	INCOMPATIBLE MATERIALS IN GLOVEBOX	BR	00	COMPLETED	30-Mar-2006
LSTRCT10	LCOS 3.2.6/3.2.7 REVIEW WITH TRU TEAM	BR	00	COMPLETED	28-Mar-2006
LSCT0D20	TRU DRUM ALARM RESPONSE AND AOPS	BR	00	COMPLETED	23-Mar-2006
LSDR0031	SIMULATED TRU PROCESS CAM ALARM	DR	00	COMPLETED	23-Mar-2006
LSEP0005	TRU WASTE DRUMS DRILL (U)	DR	01	COMPLETED	23-Mar-2006
LSOPS0D4	DELTA JCO BRIEFING FOR DRTS & RCO	BR	00	COMPLETED	23-Mar-2006
LSDR0028	SIMULATED TRU PROCESS GLOVEBOX DROP IN FLOW	DR	00	COMPLETED	20-Mar-2006
LSTRCT04	DOFFING AND POTENTIAL CONTAMINATION ACTIONS	BR	00	COMPLETED	15-Mar-2006
LSTRCT08	POSTED SIGNAGE	BR	00	COMPLETED	15-Mar-2006
LSDR0030	TRU PROCESS PHEX PRESSURE GAUGE READ DRUM LID REM	DR	00	COMPLETED	14-Mar-2006
LSTRCT02	USE OF SAFETY GLASSES DURING TRU WASTE OPERATIONS	BR	00	COMPLETED	14-Mar-2006
LSTRCT03	DRUM HANDLING SAFETY	BR	00	COMPLETED	14-Mar-2006
LSWEM004	TRU REMEDIATION AREA INSPECTION BRIEFING	BR	00	COMPLETED	13-Mar-2006
LSDR0023	TRU REPACKAGING WASTE LIQUID SPILL	DR	00	COMPLETED	08-Mar-2006
LSTRCT01	RESPONSE TO ABNORMAL EVENTS	BR	00	COMPLETED	01-Mar-2006
LSTRU700	CONDUCT OF OPERATIONS TRAINING FOR TRU WASTE WORK	BR	00	COMPLETED	28-Feb-2006
LSTRU600	FIRE PROTECTION TRAINING FOR TRU WASTE WORKERS	BR	00	COMPLETED	27-Feb-2006
LSCT0011	PROCEDURE COMPLIANCE	BR	00	COMPLETED	23-Feb-2006
LSDR0030	TRU PROCESS PHEX PRESSURE GAUGE READ DRUM LID REM	CR	00	COMPLETED	15-Feb-2006

LSDR0028	SIMULATED TRU PROCESS GLOVEBOX DROP IN FLOW	DR	00	COMPLETED	13-Feb-2006
LSTRU301	TRU WASTE DRUM REMEDIATION PROCESS PRACFAC	PF	00	COMPLETED	06-Feb-2006
LSDR0025	TRU WASTE GLOVE CONTAMINATION	DR	00	COMPLETED	02-Feb-2006
LSTRU101	PREPARE/REPLACE GLOVES AND BAGS ON GLOVEBOXES	PF	00	COMPLETED	23-Jan-2006
LSTRU401	OPERATING THE RAMAN SPECTROMETER PRACFAC	PF	00	COMPLETED	19-Jan-2006
LSDR0027	TRU WASTE SUSPECT DRUM F-091	DR	00	COMPLETED	17-Jan-2006
LSLST003	LABORATORY STANDARD REFRESHER TRNG. (2006)	SP	03	COMPLETED	17-Jan-2006
LSTRU300	TRU WASTE DRUM REMEDIATION PROCESS	BR	00	COMPLETED	09-Jan-2006
TRGCAT06	CONSOLIDATED ANNUAL TRAINING 2006 (CAT)	SP	00	COMPLETED	03-Jan-2006
LSDR0023	TRU REPACKAGING WASTE LIQUID SPILL	DR	00	COMPLETED	28-Dec-2005
LSDR0025	TRU WASTE GLOVE CONTAMINATION	DR	00	COMPLETED	28-Dec-2005
LSDR0024	TRU WASTE SUSPECT DRUM	DR	00	COMPLETED	27-Dec-2005
SL090012	MONITOR THE BREATHING AIR MANIFOLD (U)	PF	02	COMPLETED	21-Dec-2005
TRPG2000	INITIAL PLASTIC SUIT AND HOOD AIRLINE RESPIRATOR	CR	03	COMPLETED	20-Dec-2005
TRPG2000	INITIAL PLASTIC SUIT AND HOOD AIRLINE RESPIRATOR	JP	02	COMPLETED	20-Dec-2005
LSCT0020	TRU DRUM ALARM RESPONSE & ABNORMAL OPERATING PROC.	BR	00	COMPLETED	16-Dec-2005
LSOPS004	SRNL JUSTIFICATION FOR CONTINUED OPERATION (JCO)	BR	00	COMPLETED	16-Dec-2005
LSTRU201	TRU WASTE DRUM INSPECTION AND HANDLING PRACFAC	PF	00	COMPLETED	15-Dec-2005
LSTRU100	TRU WASTE DRUM REMEDIATION OPERATION IN SRNL	CR	00	COMPLETED	14-Dec-2005
SE010425	PREPARE TRU WASTE CONTAINERS FOR SHIPMENT	PF	00	COMPLETED	14-Dec-2005
LSTRU200	TRU WASTE DRUM INSPECTION AND HANDLING TECHNIQUES	BR	00	COMPLETED	13-Dec-2005
LSTRU400	RAMAN SPECTROMETER BRIEFING	BR	00	COMPLETED	07-Dec-2005
QRRP1001	NEGATIVE PRESSURE RETRAINING (U)	JP	01	COMPLETED	06-Dec-2005
LSGEN004	FIRE SUPPRESSION SYS TRNG FOR GLOVEBOX AND ILC USE	RS	01	COMPLETED	05-Dec-2005
SE010425	PREPARE TRU WASTE CONTAINERS FOR SHIPMENT	OJ	01	COMPLETED	05-Dec-2005
LSTRU302	OPERATE TORQUE WRENCH PRACFAC	PF	00	COMPLETED	30-Nov-2005
TRPG4001	GENERAL RESPIRATORY RETRAINING	SP	02	COMPLETED	18-Nov-2005
QREP2000	24 HR. HAZARDOUS WASTE SAFETY & HEALTH TRAINING	CR	02	COMPLETED	17-Nov-2005
QREP2000	24 HR. HAZARDOUS WASTE SAFETY & HEALTH TRAINING	JP	03	COMPLETED	17-Nov-2005
TMAR3700	LIFT TRUCK SAFETY BRIEFING	BR	00	COMPLETED	10-Nov-2005
QSMC1201	TID TRAINING FOR APPLICATORS (U)	CR	03	COMPLETED	08-Nov-2005
LSWEM003	SRNL TRU REMEDIATION RCRA TRAINING	SP	00	COMPLETED	07-Nov-2005
BMPSPCC0	BMP/SPCC/STORM WATER BRIEFING	SP	00	COMPLETED	27-Oct-2005
TMAM0601	FORKLIFT OPERATIONS	JP	01	COMPLETED	16-Sep-2005
LSGEN020	R&D PROCEDURE COMPLIANCE	BR	00	COMPLETED	14-Sep-2005
TMAR0600	INCIDENTAL RIGGER/OPERATOR	CR	03	COMPLETED	14-Sep-2005
TMAR0601	INCIDENTAL RIGGER/OPERATOR	JP	03	COMPLETED	14-Sep-2005
LSMTD001	SRTC DRAINS TRAINING	SP	01	COMPLETED	06-Sep-2005

SE010419	RCRA TRAINING FOR SRTC TECHNICAL AREA	SP	02	COMPLETED	06-Sep-2005
THMWCBT1	HAZMAT (INITIAL AND RECURRENT) TRAINING	SP	01	COMPLETED	06-Sep-2005
TMAM0600	FORKLIFT OPERATIONS, STANDARD	SP	00	COMPLETED	06-Sep-2005
QHRG0400	RADIOLOGICAL WORKER 2 SELF-STUDY	SP	17	COMPLETED	06-Jun-2005
TRWG5203	RADIATION INSTRUMENTATION & MONITORING	PA	01	COMPLETED	31-Mar-2005
TRWG5204	BETA-GAMMA CONTAMINATION INSTRUMENTATION & MONITOI	PA	01	COMPLETED	31-Mar-2005
TRWG5205	ALPHA CONTAMINATION INSTRUMENTATION & MONITORING	PA	01	COMPLETED	31-Mar-2005
STGN0016	HANFORD TREATABILITY STUDY - MATERIAL HANDLING, MO	RS	03	COMPLETED	21-Mar-2005
SG152951	SRNL ACCOUNTABLE MATERIAL HANDLER	SP	05	COMPLETED	23-Feb-2005
SG152952	SRNL NUCLEAR CRITICALITY SAFETY TRAINING	SP	05	COMPLETED	23-Feb-2005
LSWPT001	RPP TREATABILITY STUDY AND RESIDUE MANAGEMENT OVER	CR	02	COMPLETED	26-Jan-2005
QRRP1001	NEGATIVE PRESSURE RETRAINING (U)	JP	01	COMPLETED	18-Jan-2005
TRPG4001	GENERAL RESPIRATORY RETRAINING	SP	02	COMPLETED	18-Jan-2005
TMAD0022	MATERIALS OF TRADE TRAINING	CR	00	COMPLETED	13-Jan-2005
LSLST003	LAB STANDARD REFRESHER FOR 2005	SP	02	COMPLETED	10-Jan-2005
TRGCAT05	CONSOLIDATED ANNUAL TRAINING	SP	00	COMPLETED	05-Jan-2005
SG152904	SRNL R&D COMPRESSED GAS CYLINDER TRAINING	SP	01	COMPLETED	20-Sep-2004
TREG0013	BLOODBORNE PATHOGENS/FIRST AID/CPR	CR	03	COMPLETED	15-Jun-2004
TREG0013	BLOODBORNE PATHOGENS/FIRST AIT/CPR	JP	00	COMPLETED	15-Jun-2004
QRIS5008	BEHAVIOR BASED SAFETY BBS OBSERVER WORKSHOP(MOD 4)	CL	00	COMPLETED	14-Jun-2004
LSGEN010	SRNL TRAINING FOR RADIOACTIVE MATERIAL PACKAGER,PA	SP	00	COMPLETED	19-May-2004
LSGEN006	SRTC ARW PRACTICE REFRESHER AND PROFICIENCY	CR	00	COMPLETED	01-Mar-2004
TRWG5203	RADIATION INSTRUMENTATION & MONITORING	PA	01	COMPLETED	01-Mar-2004
TRWG5204	BETA-GAMMA CONTAMINATION INSTRUMENTATION & MONITOI	PA	01	COMPLETED	01-Mar-2004
TRWG5205	ALPHA CONTAMINATION INSTRUMENTATION & MONITORING	PA	01	COMPLETED	01-Mar-2004
QRRP1001	NEGATIVE PRESSURE RETRAINING (U)	JP	01	COMPLETED	28-Jan-2004
THMWCBT1	HAZMAT COMPUTER BASED TRAINING (CBT)	SP	00	COMPLETED	28-Jan-2004
TRPG4001	GENERAL RESPIRATORY RETRAINING	RS	01	COMPLETED	27-Jan-2004
LSLST003	LAB STANDARD REFRESHER FOR 2003 (TOXICS)	SP	00	COMPLETED	15-Jan-2004
LSLST003	LAB STANDARD REFRESHER TRAINING	SP	01	COMPLETED	15-Jan-2004
LSMTD002	SUMMARY OF CHANGES TO SRTC DRAIN SYSTEM TRAINING	SP	00	COMPLETED	15-Jan-2004
TRGCAT04	CONSOLIDATED ANNUAL TRAINING (CAT)	SP	00	COMPLETED	15-Jan-2004
LSGEN005	L1, 2.32 RADIOLOGICAL WORK PRACTICES OVERVIEW	CR	00	COMPLETED	10-Nov-2003
LSBMDV02	SRTC HUMAN PERFORMANCE - UNDERSTANDING RISK	CR	00	COMPLETED	11-Sep-2003
TFSHC00A	A - AREA HAZCOM WITH FACILITY SPECIFIC	SP	00	COMPLETED	19-Aug-2003
QHRG0400	RADIOLOGICAL WORKER II SELF-STUDY	SP	16	COMPLETED	03-Jul-2003
TRWG5203	RADIATION INSTRUMENTATION & MONITORING	PA	00	COMPLETED	26-Jun-2003
TRWG5204	BETA-GAMMA CONTAMINATION INSTRUMENTATION & MONITOI	PA	00	COMPLETED	26-Jun-2003

TRWG5205	ALPHA CONTAMINATION INSTRUMENTATION & MONITORING	PA	00	COMPLETED	26-Jun-2003
LSWPT003	PERFORM TOXICITY CHARACTERISTIC LEACHING TEST	JP	00	GRANTED EXCEPTION	12-May-2003
LSWPT013	PERFORM CUTTING OF SHELBY TUBES	JP	00	GRANTED EXCEPTION	12-May-2003
LSLST003	LAB STANDARD REFRESHER FOR 2003 (TOXICS)	SP	00	COMPLETED	17-Apr-2003
SE010401	SRTC TECHNICAL AREA TRU WASTE HANDLER	SP	02	COMPLETED	18-Mar-2003
STGN0022	DOE/RW-0333P QUALITY ASSURANCE REQUIREMENTS DOCUME	SP	01	COMPLETED	24-Feb-2003
SG152951	SRTC ACCOUNTABLE MATERIAL HANDLER	SP	04	COMPLETED	05-Feb-2003
SG152952	SRTC NUCLEAR CRITICALITY SAFETY TRAINING	SP	04	COMPLETED	05-Feb-2003
QRRP1001	NEGATIVE PRESSURE RETRAINING (U)	JP	01	COMPLETED	29-Jan-2003
TRPG4001	GENERAL RESPIRATORY RETRAINING	RS	01	COMPLETED	29-Jan-2003
TRGCAT03	CONSOLIDATED ANNUAL TRAINING	SP	00	COMPLETED	13-Jan-2003
STGN0016	BNFL - I-WPT-003	RS	02	COMPLETED	06-Sep-2002
TRWG5203	RADIATION INSTRUMENTATION & MONITORING	PA	00	COMPLETED	28-Jun-2002
TRWG5204	BETA-GAMMA CONTAMINATION INSTRUMENTATION & MONITOI	PA	00	COMPLETED	28-Jun-2002
TRWG5205	ALPHA CONTAMINATION INSTRUMENTATION & MONITORING	PA	00	COMPLETED	28-Jun-2002
LSLST002	LAB STANDARD REFRESHER 2002-HIGHLY TOXIC MATERIALS	SP	00	COMPLETED	07-Jun-2002
SE010402	SRTC WASTE GENERATOR - CBT	SP	01	COMPLETED	07-Jun-2002
QRIS5007	BEHAVIOR BASED SAFETY TEAM SAFETY WORKSHOP (MOD 3)	CR	00	COMPLETED	14-May-2002
EELT0091	GETTING THE MOST FROM YOUR ELECTRONIC BALANCES	BR	00	COMPLETED	30-Apr-2002
LSGEN001	SRTC SAR/TSR R&D OVERVIEW BRIEFING	BS	00	COMPLETED	25-Apr-2002
LSWPT001	RPP TREATABILITY STUDY EXTENSION	RS	00	COMPLETED	23-Apr-2002
STGN0016	BNFL - I-WPT-003	RS	01	COMPLETED	23-Apr-2002
STGN0022	RW-0333P QUALITY ASSURANCE REQUIRED READING	RS	00	COMPLETED	23-Apr-2002
HRD11000	JOB HAZARD ANALYSIS (COMPUTER BASED)	SC	00	COMPLETED	13-Mar-2002
TRWG2002	RWT REFRESHER TRAINING	RS	00	COMPLETED	13-Mar-2002
LSMTD001	SRTC DRAINS TRAINING	SP	00	COMPLETED	20-Feb-2002
TRGCAT02	CONSOLIDATED ANNUAL TRAINING (CAT)	SP	00	COMPLETED	15-Jan-2002
QRRP1000	INITIAL NEGATIVE PRESSURE RESPIRATOR TRAINING	CR	05	COMPLETED	10-Jan-2002
QRRP1000	INITIAL NEGATIVE PRESSURE RESPIRATOR TRAINING	JP	01	COMPLETED	10-Jan-2002
TRPG4000	GENERAL RESPIRATORY PROTECTION	CR	02	COMPLETED	10-Jan-2002
SL980015	DRAIN SYSTEMS GUIDELINES	BS	00	COMPLETED	18-Dec-2001
SE010304	OSHA LAB STANDARD INITIAL (WEB BASED)	SC	00	COMPLETED	05-Dec-2001
SF300000	LAB SKILLS (WRITTEN) FOR LABORATORY TECHNICIANS CH	CH	00	COMPLETED	24-Oct-2001
QHRG0400	RADIOLIGICAL WORKER II SELF STUDY TRAINING	JP	08	COMPLETED	31-Jul-2001
QHRG0400	RADIOLOGICAL WORKER II SELF-STUDY	SE	12	COMPLETED	31-Jul-2001
TRWG5203	RADIATION INSTRUMENTATION & MONITORING	PA	00	COMPLETED	12-Jun-2001
TRWG5204	BETA-GAMMA CONTAMINATION INSTRUMENTATION & MONITOI	PA	00	COMPLETED	12-Jun-2001
TRWG5205	ALPHA CONTAMINATION INSTRUMENTATION & MONITORING	PA	00	COMPLETED	12-Jun-2001

SG152951	SRTC ACCOUNTABLE MATERIAL HANDLER INITIAL BRIEFING	BR	03	COMPLETED	06-Feb-2001
SG152952	SRTC NUCLEAR CRITICALITY SAFETY TRNG INITIAL BRIEF	BR	03	COMPLETED	06-Feb-2001
SG152904	COMPRESSED GAS CYLINDERS (U)	CR	00	COMPLETED	30-Jan-2001
TMAMHAZ1	HAZMAT (INITIAL & RECURRENT)	CR	01	COMPLETED	24-Jan-2001
TRGCAT01	CONSOLIDATED ANNUAL TRAINING	SP	00	COMPLETED	24-Jan-2001
TRWG1401	RADIATION GENERATING DEVICE OPERATOR	CR	01	COMPLETED	09-Nov-2000
STGN0013	BNFL PART B1 TRAINING	BS	00	COMPLETED	03-Nov-2000
STGN0014	L1,2.21 RAD SAMPLE REC'G,LABELING & TRACKING	BS	00	COMPLETED	03-Nov-2000
STGN0016	BNFL - I-WPT-003	RS	01	COMPLETED	03-Nov-2000
STGN0037	SRTC CONSTANT AIR MONITORING (CAM) SYSTEM	WE	00	COMPLETED	03-Nov-2000
STGN0039	SRTC BNFL OR LISTED SAMPLE PROCESSING AUTHORIZA.	BS	00	COMPLETED	03-Nov-2000
STGN0040	LESSONS LEARNED B154/158 DISCHARGE TO HAD 5-20-99	BS	00	COMPLETED	03-Nov-2000
SE010417	L1 MANUAL 2.17/6.03 OVERVIEW	BR	00	COMPLETED	25-Oct-2000
SL090606	SRTC/TNX/AL RCRA SATELLITE AREAS	RS	05	COMPLETED	06-Sep-2000
SE010304	OSHA LAB STANDARD INITIAL (WEB BASED)	SC	00	COMPLETED	30-Aug-2000
SE010402	SRTC WASTE GENERATOR	WE	00	COMPLETED	30-Aug-2000
SG152980	SRTC TECHNICAL AREA FACILITY ACCESS TRAINING	SC	01	COMPLETED	29-Aug-2000
SF200000	GENERAL CHEMISTRY FOR LAB TECHS (CHALLENGE EXAM)	CE	00	COMPLETED	26-Jul-2000
SL980015	DRAIN SYSTEMS GUIDELINES	BS	00	COMPLETED	19-Apr-2000
HRDGV001	APRIL 2000 DIVERSITY STAND-DOWN	BS	00	COMPLETED	12-Apr-2000
TRGCAT00	CONSOLIDATED ANNUAL TRAINING	WE	00	COMPLETED	21-Jan-2000
TRWG5200	ADVANCED RADIOLOGICAL WORKER TRAINING CORE	JP	01	COMPLETED	27-Oct-1999
TRWG5200	ADVANCED RADIOLOGICAL WORKER TRAINING CORE	CR	01	COMPLETED	23-Sep-1999
TRWG5210	ADVANCED RADIOLOGICAL WORKER TRNG CORE PRE-TEST	CE	03	COMPLETED	30-Aug-1999
SE010300	GREEN IS CLEAN/ASSOCIATED WASTE	WE	00	COMPLETED	06-Aug-1999
QSCL1600	SITEWIDE SECURITY STANDDOWN	VC	00	COMPLETED	03-Aug-1999
QSCL1601	SITEWIDE SECURITY STANDDOWN	RS	01	COMPLETED	03-Aug-1999
QHRG0300	RADIOLOGICAL WORKER II INITIAL TRAINING	CR	11	COMPLETED	14-Jul-1999
QHRG0300	RADIOLOGICAL WORKER II INITIAL TRAINING	JP	07	COMPLETED	14-Jul-1999
SF100000	MATHEMATICS FOR LABORATORY TECHNICIANS	CE	00	COMPLETED	17-Mar-1999
SF100000	MATHEMATICS FOR LABORATORY TECHNICIANS	SE	00	COMPLETED	17-Mar-1999
TREGCAT9	CONSOLIDATED ANNUAL TRAINING (CAT)	SP	00	COMPLETED	03-Feb-1999
TREGO13Q	HAZCOM: FACILITY-SPECIFIC TRNG-ESH&QA	RS	00	COMPLETED	04-Sep-1998
SE010904	SRTC TA/CALB BRIEFING FOR POLLUTION PREVENTION & .	BS	00	COMPLETED	27-Aug-1998
HRD10923	TEAMWORK, THE KEY TO VALUING DIVERSITY	CR	00	COMPLETED	02-Jun-1998
QHRG1300	RADIOLOGICAL WORKER I SELF STUDY	JP	07	COMPLETED	17-Mar-1998
QHRG1300	RADIOLOGICAL WORKER I SELF-STUDY	SE	08	COMPLETED	17-Mar-1998
TREGCATB	CONSOLIDATED ANNUAL TRAINING (CAT)	SC	00	COMPLETED	27-Jan-1998
SG152980	SRTC TECHNICAL AREA FACILITY ACCESS TRAINING	SC	00	COMPLETED	03-Dec-1997

QSHP9701	EMERGENCY PREPAREDNESS DRILL FOR CRITICALITY	BS	00	COMPLETED	05-Aug-1997
BMMG0001	TIME & ATTENDANCE COLLECTION SYSTEMS (TACS)	CR	01	COMPLETED	13-Mar-1997
TREGCAT7	CONSOLIDATED ANNUAL TRAINING	SC	00	COMPLETED	23-Jan-1997
TREGCAT6	CONSOLIDATED ANNUAL TRAINING	SC	00	COMPLETED	24-Jan-1996
TREGGERT	GENERAL EMPLOYEE RADIOLOGICAL TRAINING (GERT)	SC	00	COMPLETED	24-Jan-1996
TICATB00	CONSOLIDATED ANNUAL TRAINING	SC	00	COMPLETED	12-Jan-1995
QRIH1100	BASIC HAZARD COMM TRNG FOR OFFICE/ADMIN PERSONNEL	CR	00	COMPLETED	23-Jun-1994
TICATA00	CONSOLIDATED ANNUAL TRAINING	CR	00	COMPLETED	18-Jan-1994
QRIH1000	BASIC HAZARD COMMUNICATION TRAINING	CR	00	COMPLETED	06-Dec-1993
TICTS003	OJT TRAINER/EVALUATOR	CR	00	COMPLETED	18-Nov-1993
QRIS110C	EMERGENCY PREPAREDNESS TRAINING	CR	00	COMPLETED	12-Nov-1993
SS140300	OCCUPANT FIRE SAFETY	CR	00	COMPLETED	22-Oct-1993
QSED1293	1993 ANNUAL SECURITY REFRESHER BRIEFING	CR	00	COMPLETED	23-Sep-1993
QRISINFO	HAZARDOUS ENERGY CONTROL TRAINING	RS	00	COMPLETED	23-Aug-1993
QRIS120B	SEVEN BASIC SAFETY PROCEDURES	RS	00	COMPLETED	21-Jun-1993
QTIHAT05	HEAT STRESS	CR	00	COMPLETED	19-May-1993
QSCP3000	COMPUTER SECURITY AWARENESS TRAINING	CR	00	COMPLETED	26-Mar-1993
TRSGETCN	CONTINUING GENERAL EMPLOYEE TRAINING	SC	00	COMPLETED	26-Feb-1993
NMMG9360	RESP NIM ALARM	CR	00	COMPLETED	21-Nov-1991
BIF91001	FIELD PROPERTY ADMINISTRATOR (FPA)	CR	00	COMPLETED	23-Jul-1991
QHRC0000	RADIATION WORKER TRAINING - NMP/SRTC/RM PRACTICAL	CL	02	COMPLETED	24-May-1991
TRSGETC1	GENERAL EMPLOYEE TRAINING COMMON	CR	00	COMPLETED	01-Feb-1991
BIE92102	INTRO TO THE IBM PC/IBM	CL	00	COMPLETED	19-Nov-1990
QHRA0000	RADIATION WORKER TRAINING – CORE	CR	03	COMPLETED	23-Aug-1990

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