

ATTACHMENT 7

CONSUMERS ENERGY  
BIG ROCKPOINT

DOCKET NUMBERS 50-155 AND 72-043

TRANSMITTAL OF SURVEY PACKAGES IN SUPPORT OF BIG ROCK POINT PHASED  
LICENSE TERMINATION

CLASS 2 FINAL STATUS SURVEY RELEASE RECORD, 22C<sub>1</sub>2,  
WEST POWERLINE CORRIDOR

November 8, 2006

35 Pages

**Class 2 Final Status Survey**

**Release Record West 22C,2  
West Powerline Corridor**

**SURVEY PACKAGE CLOSURE**

Final Status Survey Documentation is authorized for closure. All required reviews are complete and the evaluation of data results have satisfied the criteria established for unrestricted release.

Signed: *John L. Reed* Date: 11/02/06  
(ESSG)

Signed: *W. Davis* Date: 11/02/06  
(ES Superintendent)

Signed: *R. E. King* Date: 11-3-06  
(RP & ES Manager)

## **Survey Area Requirements**

### **Release Record West 22C<sub>1</sub>2 West Powerline Corridor**

#### **Survey Description**

Survey Unit West 22C<sub>1</sub>2 is a narrow band of property 9009 m<sup>2</sup> in area that extends along the western section of the Powerline Corridor. No materials of plant origin remain in the survey area.

#### **History**

At power operations the west section of the Powerline Corridor was used to store supplies and miscellaneous construction debris. During the decommissioning process this location was used as a lay-down area for relocated soils prior to final evaluation and onsite use as fill material. Concrete demolition debris was also staged in this area for final disposition to a local Michigan licensed landfill. A detailed review of the history and radiological characterization of this area is provided in Appendix 2B and 2E of the LTP (License Termination Plan).

#### **Current Radiological Status**

Characterization surveys have identified elevated levels of residual radioactivity in relocated soils that required remediation efforts prior to final evaluation and removal for excavation backfill. All relocated soils and materials of plant origin have been removed and pre-survey characterization measurements do not indicate the presence of residual radioactivity above the investigation level in this survey area. Based on operational history, process knowledge, and survey measurements, the radiological status of this survey unit is Class 2.

#### **Post-Construction Expectations**

Survey West 22C<sub>1</sub>2 will be performed in the following activity sequence:

1. **Walkdown:** ESSG (Environmental Services Survey Group) personnel will perform a walkdown assessment to ensure survey area preparations are complete and confirm that the following post-construction expectations have been satisfied as applicable:
  - Groundwater and Surface water control is adequate
  - All construction debris has been removed from the survey area
  - The current survey area status meets all applicable safety requirements
2. **Survey Area Isolation and Control:** Control measures will be established to ensure that any potential ongoing decommissioning activities in adjacent locations do not impact the current survey area status. Isolation and control measures include postings, barriers, access points, and the evaluation of ongoing work activities in adjacent areas.

3. **Survey Design and Execution:** Survey design and execution will follow the Data Quality Objectives for Survey West 22C<sub>1</sub>2 in accordance with the requirements established in RM-76, *Final Status Survey Design*, and RM-77, *Final Status Survey Implementation*. Survey size will be based on the statistical requirements of the Sign Test for Class 2 areas with soil samples collected in random start, systematic data point locations. Surface scanning will be performed with 10% survey area coverage. This survey will be conducted in accordance with approved BRP procedures and follow the guidance of NUREG 1575.
4. **Data Quality Assessment:** Isolation and control of the survey area will be maintained until the survey data assessment demonstrates that the regulatory requirements for unrestricted site release have been satisfied.

## DATA QUALITY OBJECTIVES

### Release Record West 22C<sub>1</sub>2 West Powerline Corridor

#### 1. STATE THE PROBLEM

*The Problem:*

To demonstrate that the level of residual radioactivity in Survey Unit West 22C<sub>1</sub>2 does not exceed the release criteria of 25 mrem/year Total Effective Dose Equivalent (TEDE) in this Class 2 survey area as specified in the License Termination Plan (LTP).

*Stakeholders:*

The primary stakeholders interested in the answer to this problem are Consumers Energy Co., and the general public as represented by the Michigan Department of Environmental Quality (MDEQ), and the US Nuclear Regulatory Commission (USNRC).

*The Planning Team:*

The planning team consists of members of the BRP Environmental Services Survey Group (ESSG). The primary decision maker will be the Final Status Survey (FSS) Supervisor. The Final Status Survey Supervisor will obtain input from the site Construction Group and Scheduling Group for issues relating to schedule and costs.

*Schedule:*

Approximately five (5) working days are projected to implement the Final Status Survey to collect and analyze field data.

*Resources:*

The primary resources needed to determine the answer to the problem are two (2) technicians to perform fieldwork, one (1) technician to prepare the samples and conduct laboratory analyses, and two (2) ESSG team members to prepare and review the design, generate maps, coordinate field activities and evaluate data.

#### 2. IDENTIFY THE DECISION

Several decisions need to be defined to address the stated problem.

*Principal Study Question (1):*

Does the mean concentration of residual radioactivity in the survey unit exceed the release criteria stated above?

*Decision (1):*

Determine whether the mean concentration of residual radioactivity in the survey exceeds the release criteria stated in the problem.

*Actions (1):*

Alternative actions include failure of the survey unit, remediation, or no action required.

*Principal Study Question (2):*

Do any areas of elevated activity in the survey unit exceed the release criteria?

*The Decision (2):*

Determine if any areas of elevated activity in the survey unit exceed the release criteria.

*Actions (2):*

Alternative actions include confirmation and investigation, performing the elevated measurement comparison (EMC), remediation, or no action required.

*Principal Study Question (3):*

Is the potential dose from residual radioactivity in the survey unit ALARA as stated?

*The Decision (3):*

Determine if the potential dose from residual radioactivity in the survey unit is ALARA. ALARA requirements for soil remediation are defined in Chapter 4 of the LTP.

*Actions (3):*

Alternative actions include remediation or no action required.

3. IDENTIFY INPUTS TO THE DECISION

*Information Needed:*

Characterization measurements are required to define the radionuclides present and determine the extent and variability of residual radioactivity in the survey area for design and implementation of this survey. Survey area classification, ALARA analysis, potential radionuclides of interest, and site-specific DCGL values are also required inputs to the decision process. The primary information required for evaluation is the analytical results of survey measurements.

*Source of the Information:*

The soil sample data to be used for survey development are the radionuclide-specific measurements of soil samples collected within the affected local coordinate grids during the characterization process. This data also includes the results of surveys performed following the removal of debris. The ALARA analysis for potential soil remediation is provided in LTP, Section 4.4. Site-specific DCGL values and BRP radionuclides of interest are defined in LTP Section 5, Table 5-1 and Procedure RM-76, *Final Status Survey Design*.

*Survey Design:*

Survey West 22C<sub>1</sub>2 will be conducted in accordance with LTP Section 5 for Class 2 areas and associated BRP survey procedures. Soil samples will be utilized for radionuclide-specific measurements in this evaluation.

4. BOUNDARIES OF THE STUDY

*Boundaries of the Survey:*

The target population for this survey is the upper 15 cm of soil in a defined survey area of 9009 m<sup>2</sup>

*Temporal Boundaries:*

Scanning and sampling in this survey unit will only be performed during daylight hours during acceptable weather conditions. Collection of data will take place when surface conditions are most favorable. Surface soils must be free of excessive snow cover and significant standing water prior to surface scanning. Soils must be in a non-frozen state or fragmented for collection to satisfy BRP procedural sampling requirements. The anticipated start date for the survey is October 06, 2006.

*Constraints:*

Cold weather or excessive rain conditions may effect the operation of electronic equipment. Adverse weather conditions that include accumulations of rain or snow may limit area access and delay survey efforts.

5. DEVELOP A DECISION RULE

The following decision rules have been developed to define a logical process for choosing among alternative actions for the principal study questions associated with this survey area.

*Decision Rule (1):*

If all reported concentrations for residual radioactivity are less than the site-specific DCGL's and the unity rule has been satisfied for each sample, then the survey unit meets release criteria. No further action is required.

*Decision Rule (2):*

If the mean value of activity in the survey unit is greater than the DCGL, then the survey unit fails to meet the release criteria.<sup>1</sup> Remediate, resurvey, and evaluate the results relative to the decision rule.

*Decision Rule (3):*

If the mean activity in the survey unit is less than the DCGL and any individual sample measurement exceeds this value conduct the Sign Test and the elevated measurement comparison (EMC) per LTP, Chapter 5 and Procedure RM-76, *Final Status Survey Design*. If the EMC and the Sign Test have been satisfied then the survey unit meets the release criteria and no further action is required. If the EMC or the Sign Test has not been satisfied then remediate the area(s) of elevated activity, resurvey as appropriate, and evaluate the results relative to the decision rule.

*Decision Rule (4):*

If the potential dose from residual radioactivity in the survey unit is ALARA, then no further action is necessary. If the potential dose from residual radioactivity in the survey unit is not ALARA, then remediate and resurvey.

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<sup>1</sup> When multiple radionuclides are present the mean activity value is determined as the average of the weighted sum. The DCGL of the weighted sum is 1.

## 6. SPECIFY TOLERABLE LIMITS ON DECISION ERRORS

### *The Null Hypothesis:*

It is assumed that residual radioactivity in the survey unit exceeds the release criterion.

### *Type I Error ( $\alpha$ ):*

The  $\alpha$  error is the maximum probability of rejecting the null hypotheses when it is true. The  $\alpha$  error is defined in the LTP at a value of at 0.05 (5%) and cannot be changed to a less restrictive value unless prior approval is granted by the USNRC. The  $\alpha$  error value of 0.05 will be used for survey planning and data assessment for this survey area.

### *Type II Error ( $\beta$ ):*

The  $\beta$  error is the probability of accepting the null hypothesis when it is false. A value of 0.05 (5%) will be used for survey planning and data assessment for this survey area.

### *The Lower Bound of the Gray Region (LBGR):*

The LBGR is initially set at 0.5 for this survey unit. The LBGR may be adjusted during survey design to achieve an optimum relative shift between 1.0 and 3.0.

### *Relative Shift ( $\Delta/\sigma$ ):*

The relative shift will be maintained within the range of 1.0 and 3.0 by adjusting the LBGR as appropriate.

## 7. OPTIMIZE DESIGN FOR OBTAINING DATA

### Statistical Test

#### *Sign Test:*

Radionuclides of potential plant origin also present in soil as background activity resulting from fallout constitute only a small fraction of the DCGL. Therefore, the Sign Test will be used where applicable in the FSS evaluation to determine if the survey area meets the requirements for unrestricted release.

#### *Number of Samples Determined:*

The number of samples required for this survey will be determined based on the relative shift as defined by the requirements of the Sign Test (LTP, Chapter 5) and Procedure RM-76, *Final Status Survey Design*. The LBGR is initially set at 0.5 and may be adjusted as necessary for optimizing the survey design to achieve a relative shift between 1.0 and 3.0. Sample point locations are to be determined using a random start, systematic grid spacing. For sample point locations where access is impractical or unsafe, alternate locations will be randomly selected to achieve the sample size requirement.

#### *Biased Sampling*

Co-60 is the most limiting radionuclide for identification by surface scanning; biased surface and subsurface core samples will be collected in any location that exceeds the scan investigation level for this radionuclide.

**Scan Coverage:**

Scanning for this survey area will provide 10% coverage.

**Number of Samples for Quality Control:**

A minimum of 5% of the sample population will be collected for quality evaluation. These samples may include sample splits, sample recounts, or third party sample analysis. Quality analyses will be conducted as defined in LTP, Chapter 5 and Procedure RM-79, *Final Status Survey Quality Control*.

**Additional Sample Analysis Requirements:**

Additional sampling for tritium in soil is not required in this survey area.

**Investigation Levels:**

Investigation levels are defined in LTP, Chapter 5 and Procedure RM-76, *Final Status Survey Design*, by individual survey area classification. A conservative approach for investigation will be established for this survey as shown below.

**Investigation Levels for Survey West 22C<sub>1</sub>2**

<b>Classification</b>	<b>Scan Measurement</b>	<b>Soil Sample Analysis</b>
Class 2	> DCGL	> DCGL <sub>w</sub>

The investigation levels for soil sample measurements are meant to include any individual radionuclide result greater than the site-specific DCGL or where the combined radionuclide values exceed the unity rule. Co-60 is the most limiting radionuclide for identification by surface scanning; further investigation will be initiated at any location that exceeds the Co-60 Scan<sub>DCGL</sub> of 1818 CPM above background as detailed in the survey design.

## FINAL STATUS SURVEY DESIGN

### Release Record West 22C<sub>1</sub>2 West Powerline Corridor

#### Survey Unit Description

Survey Unit West 22C<sub>1</sub>2 encompasses an area of 9009 m<sup>2</sup> along the western section of the Powerline Corridor. No materials of plant origin exist in this survey unit.

#### Soil Sample Design

##### Scoping Data

Input data for development of the final status survey design was conservatively estimated based on measurements performed in the former materials storage area of Survey Unit 15(2r) LTP, Appendix 2-E).

Table 1  
Input Data for Survey Design (pCi/g)

Radionuclides	Cs-137	Co-60
$\sigma$	1.46	0.02
DCGL	11.93	3.21

#### Sample Requirements

The number of sample data points for this survey is based on the requirements of the Sign Test. The Unity Rule is used for the presence of multiple radionuclides. The Standard Deviation of the weighted sum is described by the following:

$$\sigma = \sqrt{\left(\frac{\sigma_{CS137}}{DCGL_{CS137}}\right)^2 + \left(\frac{\sigma_{CO60}}{DCGL_{CO60}}\right)^2}$$

$$\sigma = \sqrt{\left(\frac{1.46}{11.93}\right)^2 + \left(\frac{0.02}{3.21}\right)^2}$$

$$\sigma = 0.12$$

### Relative Shift

The DCGL for the weighted sum is 1.0. The relative shift is determined using an LBGR value set at 76% of the DCGL<sub>w</sub>.

$$\text{Relative Shift} = \frac{\text{DCGL} - \text{LBGR}}{\sigma}$$

$$\text{Relative Shift} = \frac{1 - 0.76}{0.12}$$

$$\text{Relative Shift} = 2.0$$

With  $\alpha$  and  $\beta$  error levels set at 0.05 and the relative shift of 2.0, the Sign Test requires 15 points (Table 5.5 NUREG 1575). As a conservative measure, 18 sample data points will be assigned for the survey design.

### Sample Locations

Sample locations are selected in a random-start systematic pattern with the southwest corner of the survey unit as origin (X=0, Y=0). Two numbers between 0 and 1 have been randomly selected and then applied to the survey unit maximum X and Y dimensions to determine the random start location as shown below.

Table 2  
Random Numbers

Random #, X Axis	Random #, Y Axis
0.883584	0.413494

Survey Dimensions: X (E/W) = 333.0 meters  
Y (N/S) = 40.0 meters

Random Start Location X = (0.883584)(333.0) = 294.2 meters  
With SW Corner Origin: Y = (0.413494)(40.0) = 16.5 meters

The survey unit origin is located in Grid 6532 of the site coordinate system at X = 6.0 meters, Y = 1.0 meter. The random start location for this survey is located in Grid 22832 at X = 1.2 meters, Y = 7.5 meters.

### Sample Spacing

Samples are located in a systematic square grid pattern with sample spacing determined by the following:

$$L = \sqrt{\frac{A}{n}} \quad \text{Where: } A = \text{area of survey unit and}$$

n = number of samples.

$$L = \sqrt{\frac{9009}{18}} = 22.3 \text{ meters}$$

With sample spacing established at 22.3 meters, 15 data point locations are available for survey as identified in Attachment 1.

### **QA/QC Sampling**

A minimum of 5% of the sample population and 5% of the scan survey area are required to be selected for QA/QC verification in accordance with BRP Procedure RM-79, *Final Status Survey Quality Control*. As a conservative measure, three (3) soil samples and 10% of the scan survey area will be selected for QA/QC evaluation. Data point locations for soil sampling will be determined by random number selection. QA/QC location results are provided in Table 3.

Table 3  
Random Numbers Generated for QA/QC

QA/QC Soil Samples	Random Sample Number	Verification Scan	Scan Coverage
Split Sample:	2	Judgmental	90 m <sup>2</sup>
Sample Recount:	9		
Sample Recount:	13		

### **Surface Scanning**

The coverage requirement for surface scanning in this Class 2 area is 10%. The Scan<sub>MDC</sub> has been established at fractional values of the DCGL<sub>w</sub> for typical background activity levels at Big Rock Point. Scan<sub>MDC</sub> values for varying backgrounds are provided in Attachment 2. The investigation level for identification of potential areas of elevated activity in this survey area will be the Scan<sub>DCGL</sub> as defined by the following:

$$\text{SCAN}_{\text{DCGL}} = \text{Detector Rating} \frac{\text{CPM}}{\text{uR/hr}} * \text{Exposure Model} \frac{\text{uRi/hr}}{\text{pCi/g}} * \text{DCGL}_w$$

Scan<sub>DCGL</sub> for Co-60 = 1818 cpm

Scan<sub>DCGL</sub> for Cs-137 = 3518 cpm

Where:<sup>1</sup>

$$\text{Detector Rating} = \frac{1200 \text{ CPM}}{\text{uR/hr}} \text{Cs-137 and } \frac{565 \text{ CPM}}{\text{uR/hr}} \text{Co-60}$$

$$\text{Exposure Model} = \frac{1.229 \text{ uRi/hr}}{5 \text{ pCi/g}} \text{Cs-137 and } \frac{5.029 \text{ uRi/hr}}{5 \text{ pCi/g}} \text{Co-60}$$

$$\text{DCGL}_w = 11.93 \text{ pCi/g Cs-137 and } 3.21 \text{ pCi/g Co-60}$$

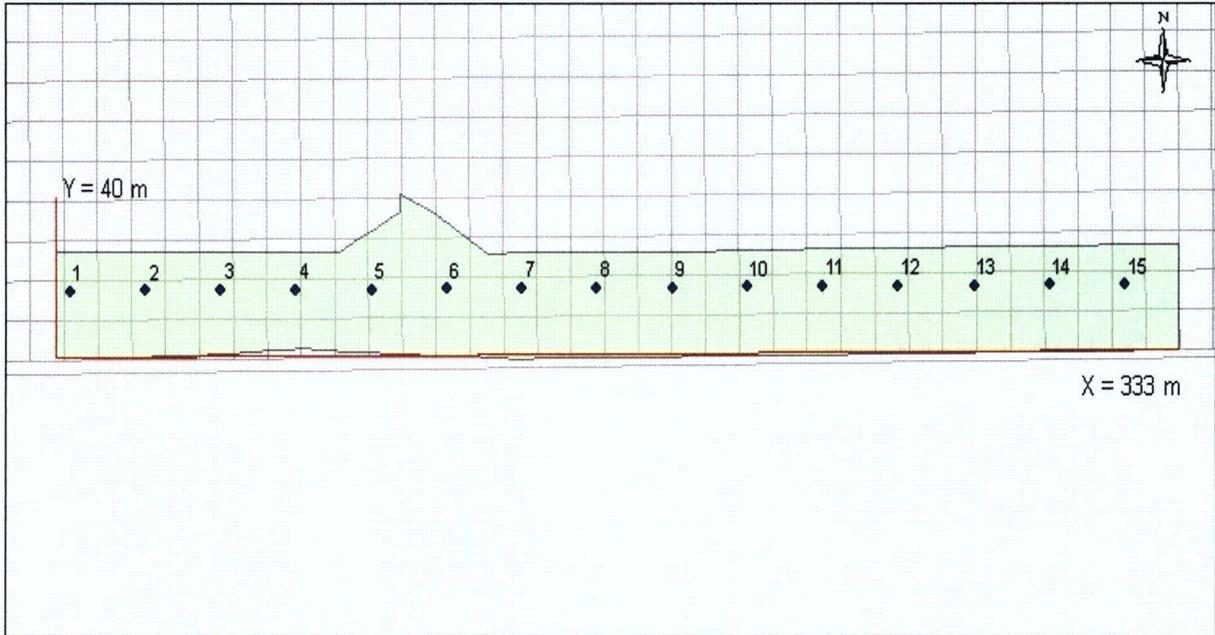
The DCGL<sub>w</sub> for Co-60 is the most limiting value for scanning measurements performed to identify areas of potentially elevated activity. Scanning conducted for this Final Status Survey will assume all residual radioactivity to originate from Co-60 and the instrument response at the Co-60 DCGL<sub>w</sub> (1818 cpm) will be used as the scanning investigation level for Survey West 22C<sub>1</sub>2.

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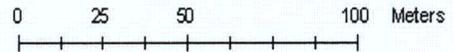
<sup>1</sup> These values established in EA-BRP-SC-0201, *Nal Scanning Sensitivity For Open Land Survey*

# Attachment 1 Soil Sample Locations

## Release Record West 22C<sub>1,2</sub> West Powerline Corridor



- Survey Unit West 22C<sub>1,2</sub>
- ◆ Sample Location



Sample No.	Grid Number	X Coord.	Y Coord.	Sample No.	Grid Number	X Coord.	Y Coord.
1	6500	1.3	7.5	9	6517	9.7	7.5
2	6502	3.6	7.5	10	22823	2.0	7.5
3	6504	5.9	7.5	11	22825	4.3	7.5
4	6506	8.2	7.5	12	22827	6.6	7.5
5	6509	0.5	7.5	13	22829	8.9	7.5
6	6511	2.8	7.5	14	22832	1.2	7.5
7	6513	5.1	7.5	15	22834	3.5	7.5
8	6515	7.4	7.5				

Sample no. 14 is the random start location

Sample spacing is 22.3 meters

## Attachment 2 Scan MDC In Varying Backgrounds

Background	d'	I	S <sub>i</sub>	GPM	MDER (uR/hr)		Scan MDC (pCi/g)	
				MDCR <sub>surveyor</sub>	Cs-137	Co-60	Cs-137	Co-60
2000	2.48	4	28.64	607.47	0.51	1.08	2.06	1.07
2500	2.48	4	32.02	679.18	0.57	1.20	2.30	1.20
3000	2.48	4	35.07	744.00	0.62	1.32	2.52	1.31
3500	2.48	4	37.88	803.61	0.67	1.42	2.72	1.41
4000	2.48	4	40.50	859.10	0.72	1.52	2.91	1.51
4500	2.48	4	42.95	911.21	0.76	1.61	3.09	1.60
5000	2.48	4	45.28	960.50	0.80	1.70	3.26	1.69
5500	2.48	4	47.49	1,007.38	0.84	1.78	3.42	1.77
6000	2.48	4	49.60	1,052.17	0.88	1.86	3.57	1.85
6500	2.48	4	51.63	1,095.14	0.91	1.94	3.71	1.93
7000	2.48	4	53.57	1,136.48	0.95	2.01	3.85	2.00
7500	2.48	4	55.45	1,176.37	0.98	2.08	3.99	2.07
8000	2.48	4	57.27	1,214.95	1.01	2.15	4.12	2.14
8500	2.48	4	59.04	1,252.34	1.04	2.22	4.25	2.20
9000	2.48	4	60.75	1,288.65	1.07	2.28	4.37	2.27
9500	2.48	4	62.41	1,323.96	1.10	2.34	4.49	2.33
10000	2.48	4	64.03	1,358.35	1.13	2.40	4.61	2.39
10500	2.48	4	65.61	1,391.90	1.16	2.46	4.72	2.45
11000	2.48	4	67.16	1,424.65	1.19	2.52	4.83	2.51
11500	2.48	4	68.67	1,456.67	1.21	2.58	4.94	2.56
12000	2.48	4	70.14	1,488.00	1.24	2.63	5.04	2.62
12500	2.48	4	71.59	1,518.68	1.27	2.69	5.15	2.67
13000	2.48	4	73.01	1,548.76	1.29	2.74	5.25	2.73
13500	2.48	4	74.40	1,578.26	1.32	2.79	5.35	2.78
14000	2.48	4	75.77	1,607.22	1.34	2.84	5.45	2.83
14500	2.48	4	77.11	1,635.67	1.36	2.89	5.55	2.88
15000	2.48	4	78.42	1,663.63	1.39	2.94	5.64	2.93
Modeled Exposure (uR/hr) @ 5 pCi/g								
	Cs-137	1.23E+00						
	Co-60	5.03E+00						

**Attachment 3**  
**Area Factors for Open Land Survey Evaluation**

Contaminated Area (m <sup>2</sup> )	Calculated Area Factors at Time of Peak Dose								
	H-3	Mn-54	Fe-55	Co-60	Sr-90	Cs-137	Eu-152	Eu-154	Eu-155
8094	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
4047	1.00	1.01	1.00	1.01	1.00	1.02	1.02	1.01	1.02
2024	1.00	1.03	1.00	1.03	1.00	1.03	1.03	1.03	1.03
1012	1.35	1.04	1.00	1.04	1.00	1.04	1.05	1.04	1.04
506	2.91	1.09	1.98	1.08	1.98	1.13	1.07	1.07	1.06
253	6.05	1.14	3.95	1.13	3.94	1.20	1.11	1.11	1.09
126	12.4	1.20	7.93	1.20	7.87	1.29	1.17	1.16	1.14
63	24.9	1.30	15.8	1.30	15.6	1.41	1.27	1.26	1.23
32	49.2	1.49	31.2	1.49	30.5	1.62	1.44	1.45	1.39
16	98.9	1.78	62.0	1.78	59.9	1.93	1.72	1.73	1.63
8	198	2.38	123	2.38	117	2.58	2.30	2.31	2.14
4	397	3.61	243	3.62	230	3.91	3.49	3.52	3.19
2	794	5.68	473	5.75	452	6.14	5.48	5.55	4.90
1	1590	9.57	905	9.73	887	10.3	9.24	9.39	7.88

RM-76-5  
FINAL STATUS SURVEY APPROVAL  
AND AUTHORIZATION FOR IMPLEMENTATION

Survey Code West 22C<sub>1</sub>2

Survey Area Description:

Final Status Survey unit 22C<sub>1</sub>2 encompasses an area of 9009m<sup>2</sup> along the western section of the Powerline Corridor. This is a Class 2 survey area.

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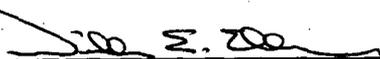
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The survey area is authorized for Final Status Survey Implementation.

  
\_\_\_\_\_  
Designed by

10-05-06  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Technical Review by

10-05-06  
\_\_\_\_\_  
Date

RM-77-1  
SURVEY IMPLEMENTATION CHECKLIST  
Page 1 of 3

<u>Step</u>		<u>Initial</u>	<u>Date</u>
(+) 1.0	PREPARATION FOR SURVEY <u>West 22C, 2</u> Survey #		
1.1	Survey Area Status:		
<input checked="" type="checkbox"/>	a. Final Status Survey Design has been approved for implementation (see RM-76-5, Final Status Survey Approval and Authorization for Supplementation).		
	1. Survey area walkdown complete		
	2. Survey area determined ready for FSS		
	3. Decommissioning activities that may impact the environmental status of the survey area have been completed.		
	4. Survey area environment is controlled by barriers and postings or other approved method to restrict access.	<u>JAL</u> ESSG	<u>10/25/06</u>
<input checked="" type="checkbox"/>	b. Survey area has been turned over to the Environmental Services Survey Group (ESSG) in acceptable condition for FSS.	<u>JAL</u> ESSG	<u>10/25/06</u>
1.2	Field Preparation:		
<input checked="" type="checkbox"/>	a. Survey unit boundaries delineated (Step 6.1.1)		
<input checked="" type="checkbox"/>	b. Statistical soil samples predetermined in the survey design are located and marked within the survey unit. (Step 6.1.2)		
<input checked="" type="checkbox"/>	c. Soil sample locations verified (Step 6.1.2.c)		
<input checked="" type="checkbox"/>	d. Instruments and equipment have been collected and calibrated for data measurement and collection (Step 6.1.3)		
<input checked="" type="checkbox"/>	e. Field documentation is prepared (Step 6.1.4)	<u>JAL</u> ESSG	<u>10/26/06</u>

RM-77-1  
SURVEY IMPLEMENTATION CHECKLIST  
Page 2 of 3

		<u>Initial</u>	<u>Date</u>
2.0	DATA COLLECTION		
2.1	Soil Survey:		
<input checked="" type="checkbox"/>	All soil samples collected and controlled (Step 6.2.1).	JAL ESSG	10/06/06
2.2	Surface Scan:		
<input checked="" type="checkbox"/>	Surface Scan complete. Action response requirements have been conducted on any identified areas exceeding the investigation level (Step 6.3).	JAL ESSG	10/06/06
2.3	Judgmental Soil Samples:		
<u>N/A</u>	a. Judgmental soil samples have been collected and controlled (Step 6.2.3).		
<u>N/A</u>	b. Deep core profiles performed in areas identified to contain elevated residual activity (Step 6.2.3).	JAL ESSG	10/06/06
3.0	SAMPLE PREPARATION AND LABORATORY ANALYSIS		
3.1	Sample Preparation (Step 6.4.1):		
<input checked="" type="checkbox"/>	a. Soil samples are homogenous		
<input checked="" type="checkbox"/>	b. Soil samples are visibly dry prior to packing		
<input checked="" type="checkbox"/>	c. Non-soil materials have been removed from sample		
<input checked="" type="checkbox"/>	d. Soil samples have been transferred to one-liter Marinelli containers and are labeled and sealed.	JAL ESSG	10/07/06

RM-77-1  
SURVEY IMPLEMENTATION CHECKLIST  
Page 3 of 3

3.2 Laboratory Analysis:

Isotopic analyses are complete. The spectroscopy report requires a signature of completion by the laboratory analyst and a signature of evaluation documenting that a second level review has been performed (Step 6.4.2).

Initial      Date

JAL      10/09/06  
ESSG

3.3 Sample Control and Documentation:

Chain of custody documentation exhibits control of soil samples (Step 6.4.3).

JAL      10/09/06  
ESSG

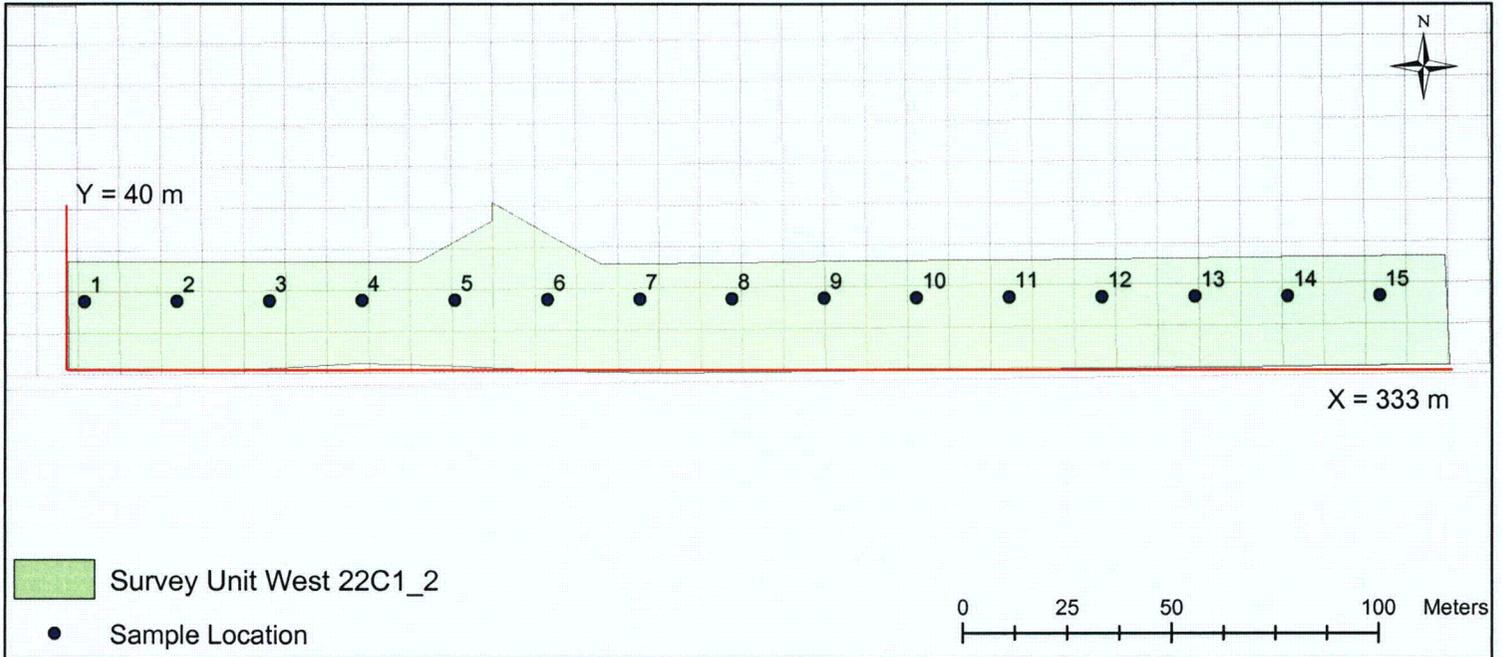
Judith L Reed      11-02-06  
Reviewed by      Date

ATTACHMENT RM-59-1  
SAMPLING AND ANALYSIS REPORT

Date: 10-06-2006	Time: 1430	Location: West 22C <sub>1</sub> 2	Tech: SSO/TRS/JNS
<b>SURVEY IDENTIFICATION / DESCRIPTION</b>			
Survey Unit West 22C <sub>1</sub> 2 encompasses 9009 m <sup>2</sup> of a narrow band of property in the area that extends along the western section of the Powerline Corridor . No materials of plant origin remain in this area.			
<b>SURVEY TYPE</b>			
Survey Type:	Characterization	<input checked="" type="checkbox"/>	Scan (Motive)
	Remediation	<input type="checkbox"/>	
	Final	<input checked="" type="checkbox"/>	Scan (Static)
			Trenching and Digging (use RM-59-4)
<b>SURVEY DESIGN</b>			
Sample Collection:	Judgmental	<input type="checkbox"/>	Random <input checked="" type="checkbox"/> Systematic <input type="checkbox"/> Large Container Assay <input type="checkbox"/>
Scan Coverage:	10%		
<b>ANALYSIS</b>			
Inst.SN/Cal Due	201195/02-10-2007	DAILY CHECK:	<input checked="" type="checkbox"/> SAT <input type="checkbox"/> UNSAT INIT: TRS
Inst.SN/Cal Due	186201/04-02-2007	DAILY CHECK:	<input checked="" type="checkbox"/> SAT <input type="checkbox"/> UNSAT INIT: TRS
Inst.SN/Cal Due	186194/02-08-2007	DAILY CHECK:	<input checked="" type="checkbox"/> SAT <input type="checkbox"/> UNSAT INIT: TRS
Inst.SN/Cal Due	Det. # 6	DAILY CHECK:	<input checked="" type="checkbox"/> SAT <input type="checkbox"/> UNSAT INIT: JCP
Inst.SN/Cal Due		DAILY CHECK:	<input type="checkbox"/> SAT <input type="checkbox"/> UNSAT INIT: _____
Investigation of Unidentified Peaks:		<input checked="" type="checkbox"/>	SAT <input type="checkbox"/> UNSAT INIT: JLR
Minimum Detectable Activity (Section 5.3.2)		<input checked="" type="checkbox"/>	SAT <input type="checkbox"/> UNSAT INIT: JLR
<b>COMMENTS</b>			
Survey West 22C <sub>1</sub> 2 was performed in a random start, square grid, systematic sampling pattern with samples collected at 15 data point locations. Laboratory analyses did not identify residual radioactivity above trace levels of the DCGL value. Surface scanning identified no areas of elevated residual radioactivity. The results of the QA/QC verification scan (10%) were consistent with the scan values identified in the survey.			
Technician Signature: <i>[Signature]</i>		Date: 10/09/06	
Second Level Review Signature: <i>[Signature]</i>		Date: 11/02/06	

# Soil Sample Activity Summary

## Release Record West 22C<sub>1,2</sub> West Powerline Corridor

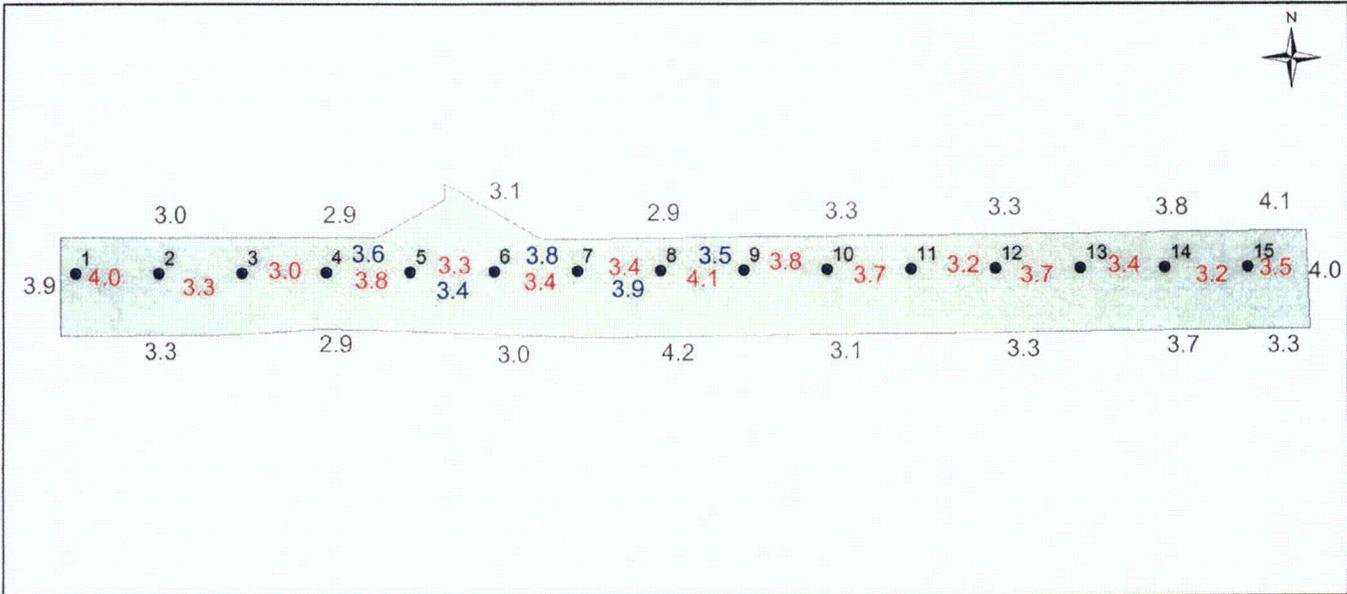


Sample No.	Grid #	X Coord.	Y Coord.	Cs-137 (pCi/g)		Co-60 (pCi/g)	
				Activity	MDA	Activity	MDA
1	6500	1.3	7.5	0.7400		*-0.0090	0.0639
2	6502	3.6	7.5	0.4615		*0.0054	0.0569
3	6504	5.9	7.5	0.0978		*-0.0017	0.0556
4	6506	8.2	7.5	0.0682		*0.0096	0.0556
5	6509	0.5	7.5	0.0394		*-0.0080	0.0414
6	6511	2.8	7.5	0.0544		*0.0284	0.0548
7	6513	5.1	7.5	0.0106		*0.0413	0.0744
8	6515	7.4	7.5	0.1064		*-0.0033	0.0525
9	6517	9.7	7.5	0.1608		*-0.0110	0.0516
10	22823	2.0	7.5	0.4676		*0.0421	0.0835
11	22825	4.3	7.5	0.1077		*0.0042	0.0619
12	22827	6.6	7.5	0.0686		*0.0146	0.0576
13	22829	8.9	7.5	0.0465		*-0.0053	0.0459
14	22832	1.2	7.5	0.1025		*-0.0006	0.0494
15	22834	3.5	7.5	0.0373		*0.0015	0.0475

\*Forced-count values

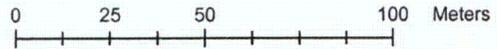
# Surface Scan Summary

## Release Record West 22C<sub>1</sub>2 West Powerline Corridor



Survey Unit West 22C<sub>1</sub>\_2

• Sample Location



**RED** Values are Average Mobile Scan General Area Activity (kcpm)  
**BLUE** Values are Average Verification Scan General Area Activity (kcpm)  
**GREY** Values are Average General Background Area Activity (kcpm)

\* No investigation levels exceeded.  
*JDR 10/16/06*

Primary Scan :

10 %  
*S. Schuster*

Technician Signature:

*J. Schuster*

Date: 10-6-06

Time: 1430

QC Verification Scan:

10 % of primary scan

Technician Signature:

*Schuster JWS*

Date: 10-6-06

Time: 1500

West 22C<sub>12</sub>  
RM-72-1  
CHAIN-OF-CUSTODY RECORD

Sample Number	Sampling Location	Date	Time	Final Disposition of Sample
1	Grid # 6500 (2.8) (7.2)	10.6.06	1401	<i>Permanent Storage</i>
2	Grid # 6502 (3.1) (7.2)	10.6.06	1359	
2	QA Split Grid # 6502 (3.1) (7.6)	10.6.06	1359	
3	Grid # 6504 (3.1) (7.6)	10.6.06	1356	
4	Grid # 6506 (2.8) (7.6)	10.6.06	1354	
5	Grid # 6509 (2.5) (8.0)	10.6.06	1350	
6	Grid # 6511 (2.8) (8.0)	10.6.06	1347	
7	Grid # 6513 (3.1) (8.0)	10.6.06	1342	
8	Grid # 6515 (3.1) (8.4)	10.6.06	1340	
9	(R) Grid # 6517 (2.8) (8.4)	10.6.06	1336	
10	Grid # 22823 (2.5) (8.4)	10.6.06	1334	
11	Grid # 22825 (2.5) (8.8)	10.6.06	1333	
12	Grid # 22827 (2.8) (8.8)	10.6.06	1331	
13	(R) Grid # 22829 (3.1) (8.8)	10.6.06	1330	
14	Grid # 22832 (3.1) (9.2)	10.6.06	1325	
15	Grid # 22834 (2.8) (9.2)	10.6.06	1327	

(Samples may be analyzed and stored, shipped for offsite evaluation or analyzed and disposed of.)

1. Relinquished by: <i>[Signature]</i>	Date 10.6.06	Time 1427	Received in good condition by: lab. locked stor. closet
2. Relinquished by: <i>[Signature]</i>	Date 10/9/06	Time 1030	Received in good condition by: <i>Permanent Storage - S&amp;H&amp;S</i>
3. Relinquished by:	Date	Time	Received in good condition by:
4. Relinquished by:	Date	Time	Received in good condition by:

RM-78-3  
DATA ASSESSMENT REPORT  
Page 1 of 8

FINAL STATUS SURVEY: West 22C, 2

1.0 DATA VERIFICATION

1.1 Data Acceptance

Review the Implementation Checklist (RM-77-1) to verify that survey isolation and control measures were executed prior to FSS and are being maintained.

Review RM-77, Final Status Survey Implementation, to verify that methods, techniques, and survey activities required for FSS have been applied in accordance with the appropriate procedures.

1.2 Field QC Records:

Review all assessments, Condition Reports and audits to ensure that identified issues have been resolved.

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Verify scan instrumentation was in calibration and the QC source checks were performed prior to and after surveys.

Verify daily QC source checks for Canberra gamma spectroscopy detector properly logged prior to soil sample analysis.

1.3 Review Verification:

Verify that the Data Quality Objectives are complete.

Verify that the survey design has been technically reviewed.

RM-78-3  
DATA ASSESSMENT REPORT  
Page 2 of 8

- Verify that gamma spectroscopy results have received a technical review.
- Verify the Sample and Analysis Report (RM-59-1) is completed and reviewed.

Data Verification Completed:  Yes  No

Comments \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Joshua L. Reed      11-02-06  
Assessor                      Date

RM-78-3  
DATA ASSESSMENT REPORT  
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2.0 DATA VALIDATION

2.1 Documentation Review:

Perform documentation review for quality control purposes and validate the data collected is complete and appropriate for use as defined by the survey design. Documentation includes:

- Field measurement records
- Chain-of-custody
- Quality Control (QC) measurement records
- Current qualification of survey personnel
- Corrective Action Reports
- Data inputs (laboratory spectroscopy)
- Sample preparation techniques

2.2 Detection Limit Review:

- Scan MDCs are below established site DCGLs.
- Forced-count values are assigned as necessary when activity is not detected in a sample.
- Minimum Detectable Concentration (MDC) values of gamma spectroscopy are below established DCGLs.

2.3 Quality Control (QC) Data Review:

- Quality Control (QC) data results have received required reviews and are complete and consistent.
- Results of judgmental samples have been reviewed and evaluated.
- Review to ensure that the analytical results of judgmental samples do not impact the evaluation for unrestricted release of the survey area.

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DATA ASSESSMENT REPORT  
Page 4 of 8

2.4 Qualification of Data:

Statistical radionuclide-specific measurements for completeness. Evaluate the survey for determination of data usability and confirm that sufficient qualified data are present for the decision process.

- a. Total number of statistical samples planned for the survey: 15
- b. Total number of statistical samples determined as valid: 15
- c. Calculate % Completeness:  $\frac{b \times 120}{a} = \underline{120\%}$

Qualified data are  $\geq 100\%$  completeness and are sufficient to support the Sign Test requirement for determination of unrestricted release.

Data Validation Completed:  Yes  No

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Joseph L. Reed  
Assessor

11-02-06  
Date

RM-78-3  
DATA ASSESSMENT REPORT  
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3.0 DATA QUALITY ASSESSMENT

3.1 Review the DQOs and Survey Design:

- Confirm that all inputs to the decision have been reviewed and are complete.
- Verify that boundaries or constraints identified in the survey area have not affected the quality of the data.
- Review the Statement of Hypothesis and confirm that it remains relevant.
- Confirm that Type I and Type II error limits are consistent with DQOs.
- Confirm that the survey design is consistent with DQOs and that the appropriate number of data points were obtained.

3.2 Preliminary Review:

3.2.1 Preliminary Evaluation:

- N/A Quality Assessment (QA) reports consistent with procedure RM-79, Final Status Survey Quality Control.
- Survey is of sufficient intensity to satisfy classification requirement.
- Potential trends of radioactivity levels in the survey area do not impact a decision for unrestricted release.

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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DATA ASSESSMENT REPORT  
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3.2.2 Calculate Basic Statistical Quantities:

- a. Number of qualified data points 15
- b. Calculation of the Mean 0.0166 (SOR)
- c. Calculation of the Median 0.0101 (SOR)
- d. Calculation Standard Deviation 0.0183 (SOR)

Attach graphic representation of the data if any radionuclide-specific measurements exceed 50% of the DCGL.

Sample QA/QC measurements consistent with FSS data

3.3 Statistical Evaluation:

NOTE: If all measurement data are less than the DCGL<sub>w</sub>, statistical testing is not required and the survey unit meets the regulatory requirement for unrestricted release.

All survey measurements are below the DCGL<sub>w</sub>.

3.3.1 Verify Assumptions of the Survey Design

Review the posting plot to verify that the data exhibits spatial independence. Spatial trends must be investigated and resolved prior to further assessment.

Review to verify dispersion symmetry. The appearance of skewed data must be investigated for cause and documented prior to further assessment.

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DATA ASSESSMENT REPORT  
Page 7 of 8

Review the dataset standard deviation and range for data variance. Questionable data must be investigated for cause and documented prior to further assessment.

Verify that the data exhibits adequate power and confirm that the sample size is sufficient to satisfy the DQOs.

3.4 Draw Conclusions from the Data:

3.4.1 Investigation Levels and Response Actions

Determine if data results have exceeded any investigation level. Document findings. *No investigation levels exceeded.*

3.4.2 Evaluation for Unrestricted Release

Select applicable conclusion:

Survey area acceptance criteria met and survey area satisfies the requirements for unrestricted release:

All concentrations are less than the  $DCGL_w$ . The Null Hypothesis is rejected.

*N/A* The mean concentration of the survey area is below the  $DCGL_w$  but individual measurements in the survey unit exceed the  $DCGL_w$ . The Sign Test and EMC evaluation are successful and the Null Hypothesis is rejected.

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DATA ASSESSMENT REPORT

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N/A Survey area acceptance criteria not met and survey area fails to satisfy the requirements for unrestricted release:

N/A The mean concentration in the survey area exceeds the DCGL<sub>w</sub> and the null hypothesis is confirmed.

N/A The mean concentration of the survey area is below the DCGL<sub>w</sub> but individual measurements in the Unit exceed the DCGL<sub>w</sub>. The Sign Test and EMC evaluation are unsuccessful and the null hypothesis is confirmed.

Data Quality Assessment Completed:  Yes  No

Comments

Statistical quantities are provided in Attachment 1.

Joshua Reed  
Assessor

11-02-06  
Date

Reviews:

[Signature]  
Technical Review

11/02/06  
Date

[Signature]  
ES Superintendent

11/02/06  
Date

[Signature]  
RP&ES Manager

11-3-06  
Date

**RM-78-3, Attachment 1  
Statistical Quantities**

**Release Record West 22C<sub>1</sub>2  
West Powerline Corridor**

Sample Number	Cs-137 (pCi/gm)	Co-60 (pCi/gm)	Weighted Sum (SOR)	**Weighted Sum <DCGLw?	DCGL-W. Sum	Sign
1	0.7400	-0.0090	0.0592	yes	0.9408	+1
2	0.4615	0.0054	0.0404	yes	0.9596	+1
3	0.0978	-0.0017	0.0077	yes	0.9923	+1
4	0.0682	0.0096	0.0087	yes	0.9913	+1
5	0.0394	-0.0080	0.0008	yes	0.9992	+1
6	0.0544	0.0284	0.0134	yes	0.9866	+1
7	0.0106	0.0413	0.0138	yes	0.9862	+1
8	0.1064	-0.0033	0.0079	yes	0.9921	+1
9	0.1608	-0.0110	0.0101	yes	0.9899	+1
10	0.4676	0.0421	0.0523	yes	0.9477	+1
11	0.1077	0.0042	0.0103	yes	0.9897	+1
12	0.0686	0.0146	0.0103	yes	0.9897	+1
13	0.0465	-0.0053	0.0022	yes	0.9978	+1
14	0.1025	-0.0006	0.0084	yes	0.9916	+1
15	0.0373	0.0015	0.0036	yes	0.9964	+1

Std. Dev	0.2114	0.0173	0.0183
Mean	0.1713	0.0072	0.0166
Median	0.0978	0.0015	0.0101

Number of Positive Differences (S+): n/a

Critical Value, k, Table I.3 of Marssim: n/a

S+ > than k?: n/a

Survey Unit Pass or Fail: **\*\*Pass**

*\*Note: Forced-Count values are used for samples with activity levels below the MDA.*

*\*\*Note: If all measurement data are less than the DCGL<sub>w</sub>, then the Sign Test is not required.*

RM-79-1  
FSS QUALITY CONTROL EVALUATION RESULTS

FSS Package # West 22C, 2

QC Package # West 22C, 2

QC Measurement Type	Acceptance Criteria Met*?	Reference
<input checked="" type="checkbox"/> 1. Replicate Scan	<input checked="" type="radio"/> Yes / No	Step 5.1.3
2. Sample Recounts		Step 5.1.4.1
<input checked="" type="checkbox"/> a. In-house	<input checked="" type="radio"/> Yes / No	
<u>N/A</u> b. Third party	Yes / No	
3. Split Samples		Step 5.1.4.2
<input checked="" type="checkbox"/> c. In-house	<input checked="" type="radio"/> Yes / No	
<u>N/A</u> d. Third party	Yes / No	

\*NOTE: If Acceptance Criteria is not met, completion of Attachment RM-79-2, FSS Quality Control Investigation Results, is required.

Comments: Sample #2 = QA/QC split; Sample #9 & #13 = recounts.

Reviews:

Joshua L. Reed  
Evaluator

11-02-06  
Date

[Signature]  
Technical Review

11-02-06  
Date

## QA Verification Split Sample Analysis

Date: 10/6/2006

QA: West 21C,2 West Powerline Corridor

Type: Split Sample

Lab: In-House

Table 1

Acceptance Criteria	
Resolution	Ratio
<4	N/A
4-7	0.5-2.0
8-15	0.6-1.66
16-50	0.75-1.33
51-200	0.8-1.25
>200	0.85-1.18

		A	B	C	D	E	F	G		
Sample	Radionuclide	BRP Result Below MDA	BRP Results (pCi/g)	BRP % Error (Sigma)	BRP Resolution	Acceptance Ratio ( Table 1)	Split Results Below MDA	Split Results (pCi/g)	Comparison Ratio F/A	Results in Agreement Compare G with D)
2	Co-60	<	0.0569	n/a	n/a	n/a	<	0.0537	0.94	YES
2	Cs-137		0.4615	9.84	10.16	0.6-1.66		0.5042	1.09	YES

$$\text{Resolution C} = \frac{A}{(A \times B / 100)}$$

< Indicates results less than the MDA.

\*Note Results are considered in agreement for MDA and near-MDA measurement comparisons  
Results that fail agreement must be investigated per RM-79.

**QA Verification  
Sample Recount Analysis**

**Date:** 10/6/2006  
**QA:** West 22C,2 West Powerline Corridor  
**Type:** Sample Recounts  
**Lab:** In- House

Table 1

Acceptance Criteria	
Resolution	Ratio
<4	N/A
4-7	0.5-2.0
8-15	0.6-1.66
16-50	0.75-1.33
51-200	0.8-1.25
>200	0.85-1.18

		A	B	C	D	E	F	G		
Sample	Radionuclide	BRP Result Below MDA	BRP Results (pCi/g)	BRP % Error (Sigma)	BRP Resolution	Acceptance Ratio ( Table 1)	Recount Result Below MDA	Recount Results (pCi/g)	Comparison Ratio F/A	Results in Agreement Compare G with D)
9	Co-60	<	0.0516	n/a	n/a	n/a	<	0.0487	0.94	YES
9	Cs-137		0.1608	16.58	6.03	0.5-2.0		0.1701	1.06	YES
13	Co-60	<	0.0459	n/a	n/a	n/a	<	0.0621	1.35	YES
13	Cs-137		0.0465	25.89	3.86	n/a		0.0310	0.67	YES

$$\text{Resolution C} = \frac{A}{(A \times B / 100)}$$

< Indicates results less than the MDA.

\*Note Results are considered in agreement for MDA and near-MDA measurement comparisons  
 Results that fail agreement must be investigated per RM-79.