ATTACHMENT 8

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, $26C_12$,
STORM WATER DRAINAGE DITCH

November 8, 2006

38 Pages

Class 2 Final Status Survey
Release Record $26C_12$

Storm Water Drainage Ditch

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 and onsite use for excavation backfill.

Signed: Joshua L. Lead (ESSG Supervisor) Date: 11-07-06

Signed: [signature] (ES Superintendent) Date: 11-07-06

Signed: [signature] (RP & ES Manager) Date: 11-7-06

Final Status Survey Requirements

Release Record $26C_12$
Storm Water Drainage Ditch

Survey Description

The Storm Water Drainage Ditch encompasses an area of 2781.6 m^2 along the southern and western boundaries of the Protected Area. A 40 foot section of metal culvert approximately 4 feet in diameter will remain in place near the shoreline discharge to minimize environmental impact to the stream.

History

The Drainage Ditch diverts runoff from southern wetland areas around the Protected Area to Lake Michigan. During power operations the Drainage Ditch also accepted runoff from catch basins and corrugated piping connections to remove storm water away from buildings and parking lots in the Industrial Area.

Current Radiological Status

Characterization efforts conducted for evaluation of this survey area identified trace quantities of residual radioactivity at levels less that 10% of the DCGL value. Based on location, process knowledge, and characterization measurements this survey unit is designated as a Class 2 area. Input for this evaluation includes the following data:

- Characterization Survey LTP, Section 2, Appendix 2-E,
- LTP, Section 2.4.5.2(a.)

Post-Construction Expectations

Survey $26C_12$ 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 $26C_12$ in accordance with the survey 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 regulatory requirements for unrestricted site release have been satisfied.

DATA QUALITY OBJECTIVES

Release Record $26C_12$
Storm Water Drainage Ditch

1. STATE THE PROBLEM

The Problem:
To demonstrate that the level of residual radioactivity in Survey Unit $26C_12$ 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 $26C_12$ 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 2781.6 m^2

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 September 22, 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.[1] 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.

[1] 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 (α):
The α error is the maximum probability of rejecting the null hypotheses when it is true. The α 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 α error value of 0.05 will be used for survey planning and data assessment for this survey area.

Type II Error (β):
The β 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 (Δ/σ):
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. As a conservative measure, biased sampling will also be performed at the discharge points (four locations) where storm water was directed into the Drainage Ditch from the former Protected Area.

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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. As a conservative measure, biased sampling will also be performed at the former south and west Protected Area storm drain discharge basins.

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:
An additional quantity of soil shall be collected for Tritium analysis in the same locations as samples selected for QA/QC. A minimum of 10% of the sample population will be sampled. Tritium analyses will be performed by an independent laboratory. Data results will be provided in the FSS package.

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 $26C_12$

Classification	Scan Measurement	Soil Sample Analysis
Class 2	> DCGL	> $DCGL_w$

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 $_{DCGL}$ of 1818 CPM above background as detailed in the survey design.

FINAL SURVEY DESIGN

Release Record $26C_12$
Storm Water Drainage Ditch

Survey Unit Description

Survey Unit $26C_12$ encompasses an area of 2781.6 m^2 along the southern and western boundaries of the Protected Area.

Soil Sample Design

Scoping Data

Input data for development of the final status survey design was conservatively estimated based on characterization measurements performed in the Drainage Ditch (LTP, Table 2.9).

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

Radionuclides	Cs-137	Co-60
σ	0.13	0.11
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:

$$\sigma = \sqrt{\left(\frac{\sigma_{Cs137}}{DCGL_{Cs137}}\right)^2 + \left(\frac{\sigma_{Co60}}{DCGL_{Co60}}\right)^2}$$

$$\sigma = \sqrt{\left(\frac{0.13}{11.93}\right)^2 + \left(\frac{0.11}{3.21}\right)^2}$$

$$\sigma = 0.04$$

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 $DCGL_w$.

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

$$\text{Relative Shift} = \frac{1 - 0.92}{0.12}$$

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

With α and β error levels set at 0.05 and the relative shift of 2.0, the Sign Test requires 15 points (Table 5.5 NUREG 1575).

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
0.711950	0.109649

Survey Dimensions: X (E/W) = 159.0 meters
Y (N/S) = 228.0 meters

Random Start Location X = (0.711950)(159.0) = 113.2 meters
With SW Corner Origin: Y = (0.109649)(228.0) = 25.0 meters

The survey unit origin is located in Grid 278 of the site coordinate system at X = 3.0 meters, Y = 6.6 meters. The random start location for this survey is located in Grid 382 at X= 0.2 meters Y = 1.6 meters.

Sample Spacing

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

$$L = \sqrt{\frac{2781.6}{15}}$$ Where: A= area of survey unit and

n = number of samples.

$$L = \sqrt{\frac{2781.6}{15}} = 13.6 \text{ meters}$$

With sample spacing established at 13.6 meters, 21 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	Random Sample Number
Split Sample:	2		
Sample Recount:	14	Judgmental	280 m^2
Sample Recount:	16		

Surface Scanning

The coverage requirement for surface scanning in this Class 2 area is 10%. The Scan $_{MDC}$ has been established at fractional values of the $DCGL_W$ for typical background activity levels at Big Rock Point. Scan $_{MDC}$ 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 $_{DCGL}$ as defined by the following:

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

Scan $_{DCGL}$ for Co-60 = 1818 cpm

Scan $_{DCGL}$ for Cs-137 = 3518 cpm

Where:[1]

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

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

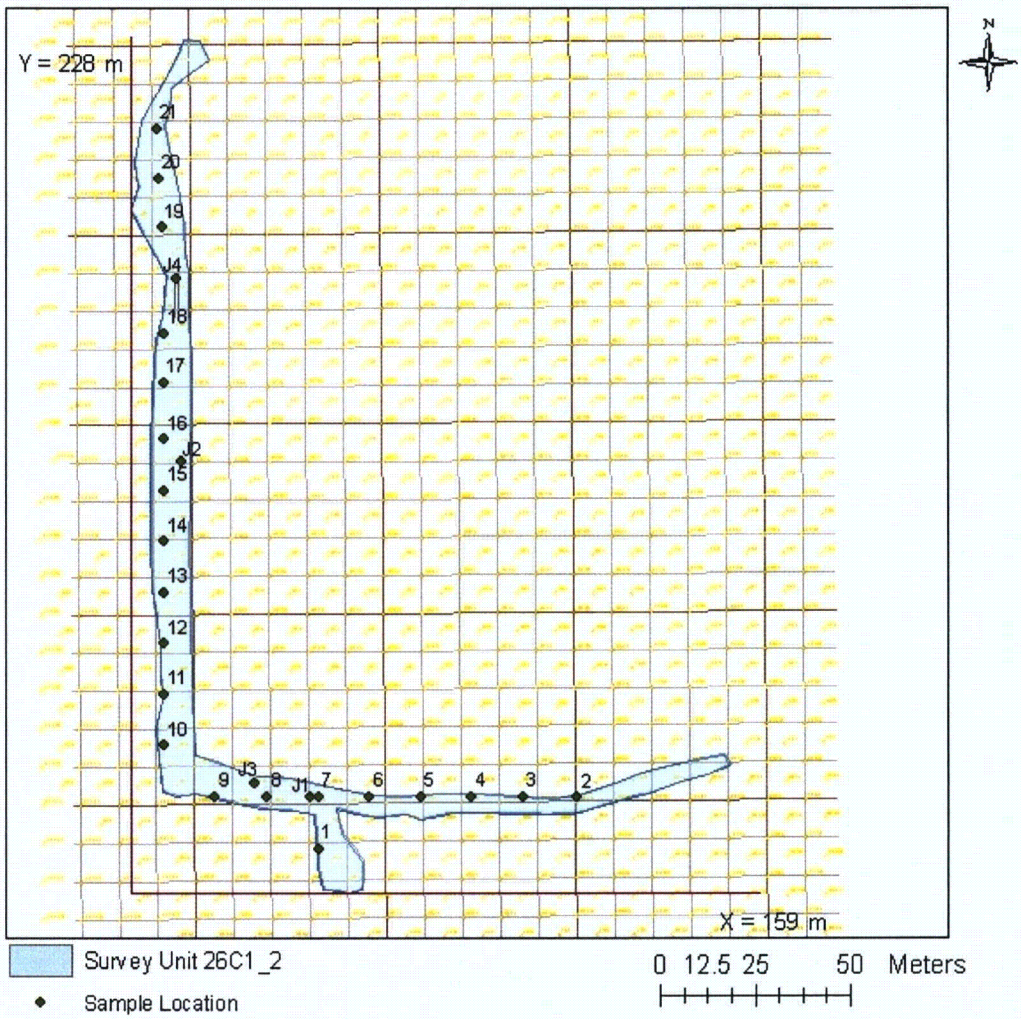
$DCGL_w$ = 11.93 pCi/g Cs-137 and 3.21 pCi/g Co-60

The $DCGL_w$ 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 $DCGL_w$ (1818 cpm) will be used as the scanning investigation level for Survey $26C_12$.

[1] These values established in EA-BRP-SC-0201, *NaI Scanning Sensitivity For Open Land Survey*

Attachment 1
Soil Sample Locations

Release Record 26C$_1$2
Storm Water Drainage Ditch



Sample No.	Grid Number	X Coord.	Y Coord.	Sample No.	Grid Number	X Coord.	Y Coord.
1	399	2.0	8.0	14	299	1.2	9.6
2	382	0.2	1.6	15	242	1.2	3.2
3	380	6.6	1.6	16	223	1.2	6.8
4	379	3.0	1.6	17	185	1.2	0.4
5	377	9.2	1.6	18	166	1.2	4.0
6	376	5.6	1.6	19	50	1.2	1.2
7	375	2.0	1.6	20	109	1.2	4.8
8	373	8.4	1.6	21	92	1.2	8.4
9	372	4.8	1.6	J1	375	0.0	1.5
10	359	1.2	5.2	J2	223	7.0	0.0
11	347	1.2	8.8	J3	373	6.2	6.0
12	323	1.2	2.4	J4	128	5.0	9.0
13	311	1.2	6.0				

Sample spacing is 13.6 meters

Attachment 2
Scan MDC In Varying Backgrounds

Release Record $26C_12$
Storm Water Drainage Ditch

				CPM	MDER uR/hr		Scan MDC pCi/g	
Background	d'	i	s_i	$MDCR_{surveyor}$	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

Release Record $26C_12$
Storm Water Drainage Ditch

Contaminated Area (m^2)	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 $26C_12$

Survey Area Description:

Survey $26C_12$ encompasses the Storm Water Drainage Ditch along the southern and western boundaries of the Protected Area controlled property. This is a Class 2 area of 2781.6 m^2.

The survey area is authorized for Final Status Survey Implementation.

Designed by	Date 9/19/06
Technical Review by	Date 9/20/06

RM-77-1
SURVEY IMPLEMENTATION CHECKLIST
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Step (+)		Initial	Date
1.0	PREPARATION FOR SURVEY 26C,2 (Survey #)		

1.1 Survey Area Status:

✓ 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.

JKR ESSG 09/20/06

✓ b. Survey area has been turned over to the Environmental Services Survey Group (ESSG) in acceptable condition for FSS.

JKR ESSG 09/20/06

1.2 Field Preparation:

✓ a. Survey unit boundaries delineated (Step 6.1.1)
✓ b. Statistical soil samples predetermined in the survey design are located and marked within the survey unit. (Step 6.1.2)
✓ c. Soil sample locations verified (Step 6.1.2.c)
✓ d. Instruments and equipment have been collected and calibrated for data measurement and collection (Step 6.1.3)
✓ e. Field documentation is prepared (Step 6.1.4)

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RM-77-1
SURVEY IMPLEMENTATION CHECKLIST
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		Initial	Date
2.0	DATA COLLECTION		
2.1	Soil Survey:		
✓	All soil samples collected and controlled (Step 6.2.1).	ESSG	09/22/06
2.2	Surface Scan:		
✓	Surface Scan complete. Action response requirements have been conducted on any identified areas exceeding the investigation level (Step 6.3).	ESSG	09/22/06
2.3	Judgmental Soil Samples:		
✓	a. Judgmental soil samples have been collected and controlled (Step 6.2.3).		
N/A	b. Deep core profiles performed in areas identified to contain elevated residual activity (Step 6.2.3).	ESSG	09/22/06
3.0	SAMPLE PREPARATION AND LABORATORY ANALYSIS		
3.1	Sample Preparation (Step 6.4.1):		
✓	a. Soil samples are homogenous		
✓	b. Soil samples are visibly dry prior to packing		
✓	c. Non-soil materials have been removed from sample		
✓	d. Soil samples have been transferred to one-liter Marinelli containers and are labeled and sealed.	ESSG	09/27/06

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

		Initial	Date
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).	ESSG	09/27/06
3.3	Sample Control and Documentation:		
✓	Chain of custody documentation exhibits control of soil samples (Step 6.4.3).	ESSG	09/28/06

Robert L. Reed — Reviewed by
09/28/06 — Date

ATTACHMENT RM-59-1
SAMPLING AND ANALYSIS REPORT

Date: 09-22-2006	Time: 1100	Location: $26C_12$	Tech: LED/SSO/JHW/JNS

SURVEY IDENTIFICATION / DESCRIPTION

Survey Unit $26C_12$, Storm Water Drainage Ditch, encompasses 2781.6 m^2 along the southern and western boundaries of the Protected Area. No materials of plant origin remain in this area.

SURVEY TYPE

Survey Type:
- ____ Characterization
- ____ Remediation
- __X__ Final
- __X__ Scan (Motive)
- ____ Scan (Static)
- ____ Trenching and Digging (use RM-59-4)

SURVEY DESIGN

Sample Collection: ____ Judgmental ____ Random __X__ Systematic ____ Large Container Assay
Scan Coverage: 10%

ANALYSIS

Inst.SN/Cal Due 186192/03-14-2007	DAILY CHECK:	X	SAT	UNSAT	INIT: JNS
Inst.SN/Cal Due 201195/02-10-2007	DAILY CHECK:	X	SAT	UNSAT	INIT: SSO
Inst.SN/Cal Due Det. # 6	DAILY CHECK:	X	SAT	UNSAT	INIT: JCP
Inst.SN/Cal Due	DAILY CHECK:		SAT	UNSAT	INIT:
Inst.SN/Cal Due	DAILY CHECK:		SAT	UNSAT	INIT:
Investigation of Unidentified Peaks:		X	SAT	UNSAT	INIT: JLR
Minimum Detectable Activity (Section 5.3.2)		X	SAT	UNSAT	INIT: JLR

COMMENTS

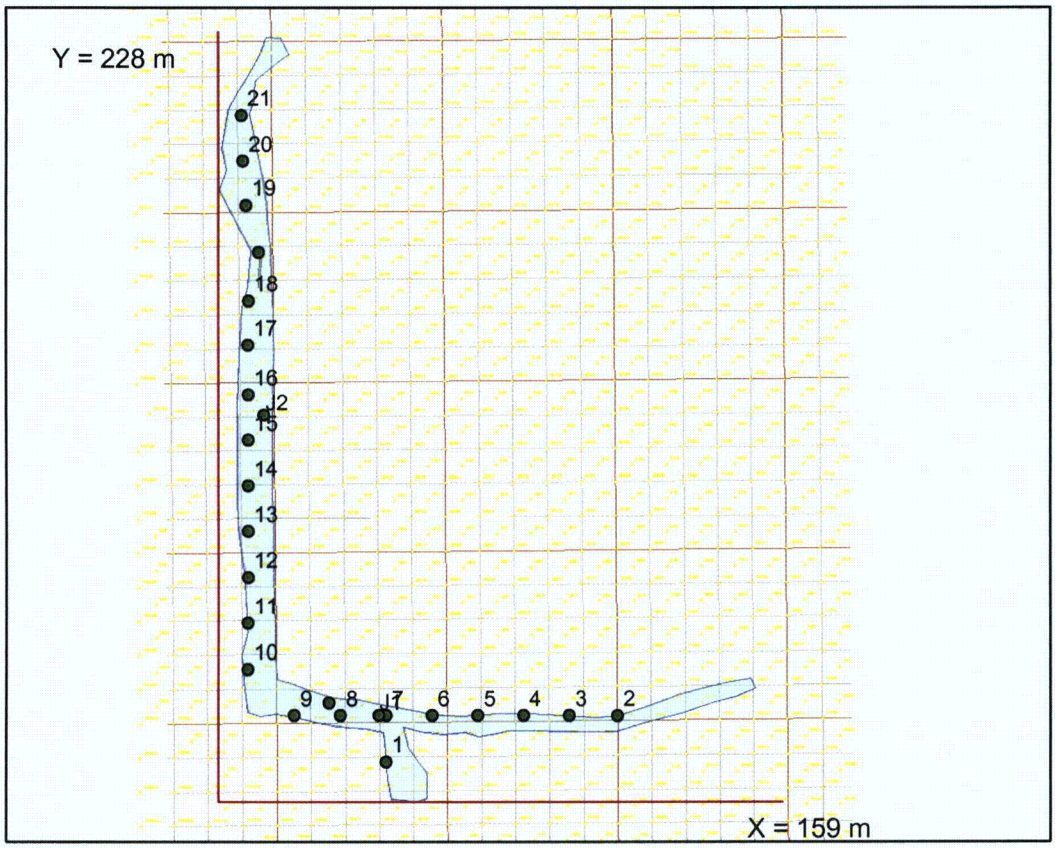
Survey $26C_12$ was performed in a random start, square grid, systematic sampling pattern with samples collected at 21 data point locations. Four judgmental samples were collected at the location of previous drainage points. Laboratory analyses did not identify residual radioactivity above trace levels 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: _____ JNS Date: 9/26/06

Second Level Review Signature: _____ Date: 9/28/06

Soil Sample Activity Summary

Release Record 26C12
Storm Water Drainage Ditch

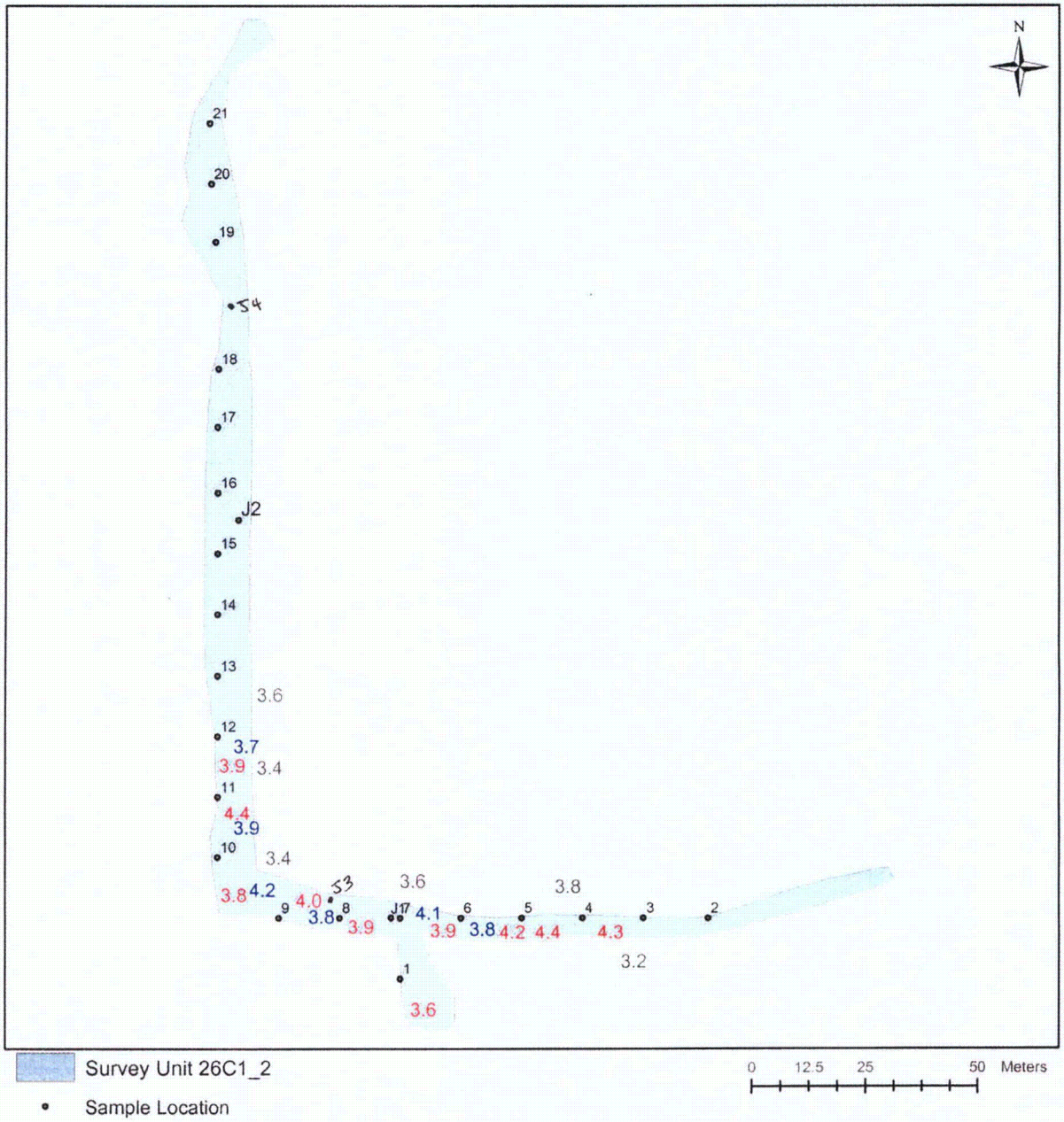


Sample No.	Grid #	X Coord.	Y Coord.	Cs-137 (pCi/g)		Co-60 (pCi/g)	
				Activity	MDA	Activity	MDA
1	399	2.0	8.0	0.6637		*0.0166	0.0603
2	382	0.2	1.6	0.2767		*0.0441	0.0797
3	380	6.6	1.6	0.0524		*-0.0077	0.0449
4	379	3.0	1.6	0.1002		*0.0244	0.0631
5	377	9.2	1.6	0.0591		*0.0011	0.0559
6	376	5.6	1.6	0.0121		*0.0217	0.0584
7	375	2.0	1.6	0.0580		*0.0078	0.0503
8	373	8.4	1.6	0.2743		*-0.0032	0.0561
9	372	4.8	1.6	0.2772		*0.0050	0.0788
10	359	1.2	5.2	0.1913		*0.0222	0.0694
11	347	1.2	8.8	0.2254		*0.0021	0.0661
12	323	1.2	2.4	0.1047		*0.0120	0.0863
13	311	1.2	6.0	0.1444		*0.0277	0.0610
14	299	1.2	9.6	0.1963		*0.0114	0.0610
15	242	1.2	3.2	0.2092		*0.0167	0.0591
16	223	1.2	6.8	0.1509		*0.0289	0.0614
17	185	1.2	0.4	0.1262		*0.0122	0.0586
18	166	1.2	4.0	0.3466		*-0.0108	0.0331
19	50	1.2	1.2	0.3041		*0.0367	0.0803
20	109	1.2	4.8	0.1686		*-0.0282	0.0303
21	92	1.2	8.4	0.1671		*-0.0027	0.0378
J1	375	0.0	1.5	0.3395		0.1493	
J2	223	7.0	0.0	0.0994		*0.0210	0.0564
J3	373	6.2	6.0	0.1517		*0.0182	0.0627
J4	128	5.0	9.0	0.2194		*0.0151	0.0546

*Forced-count values

Surface Scan Summary

Release Record 26C12
Storm Water Drainage Ditch



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 level exceeded.

9/22/06

Primary Scan : 10 % ~~50~~ (as-left)

Technician Signature: _____ **Date:** 9.22.06

Time: 1100

QC Verification Scan: 10 % of Survey Area

Technician Signature: for JWS **Date:** 9-22-06

Time: 1300

$26C_12$
RM-72-1
CHAIN-OF-CUSTODY RECORD

Sample Number	Sampling Location	Date	Time	Final Disposition of Sample
1	S/U 26C1-2	9.22.06	~~0923~~ 0916 ~~1020~~	S1 1020
2		9.22.06	0855	
2 QA Split		9.22.06	0855	J2 0953
3		9.22.06	859	J3 1048
4		9.22.06	0901	J4 1042
5		9.22.06	0903	
6		9.22.06	0904	
7		9.22.06	0905	
8		9.22.06	0914	
9		9.22.06	0918	
10		9.22.06	0927	
11		9.22.06	0933	
12		9.22.06	0937	
13		9.22.06	0940	
14 (R)			0945	
15			0950	
16 (R)			0956	
17			1003	
18			1007	
19			1011	
20			1015	

Judgmental

21

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

1020

1. Relinquished by: in locked Safe LAND	Date 9-22-06	Time 1100	Received in good condition by: for GCP
2. Relinquished by: for GCP	Date 9-23-06	Time 0700	Received in good condition by: Locked in permanent Storage
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: 26C, 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
Assessor

11-06-06
Date

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

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.

RM-78-3
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: 21

c. Calculate % Completeness: $\frac{b \times 120}{a}$ = 168%

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

Data Validation Completed: (Yes) No

Comments: _____

Joshua L. Reed
Assessor

11-06-06
Date

RM-78-3
DATA ASSESSMENT REPORT
Page 5 of 8

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: _____

_____

_____

RM-78-3
DATA ASSESSMENT REPORT
Page 6 of 8

3.2.2 Calculate Basic Statistical Quantities:

a. Number of qualified data points 21

b. Calculation of the Mean 0.0199 (SOR)

c. Calculation of the Median 0.0200 (SOR)

d. Calculation Standard Deviation 0.0133 (SOR)

N/A 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 $DCGL_w$, statistical testing in not required and the survey unit meets the regulatory requirement for unrestricted release.

✓ All survey measurements are below the $DCGL_w$.

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 level 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
Page 8 of 8

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 $DCGL_w$. and the null hypothesis is confirmed.

N/A The mean concentration of the survey area is below the $DCGL_w$ but individual measurements in the Unit exceed the $DCGL_w$.. 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.

Jodie L. Read — Assessor — 11/06/06 — Date

Reviews:

[signature] — Technical Review — 11/06/06 — Date

[signature] — ES Superintendent — 11/07/06 — Date

[signature] — RP&ES Manager — 11-7-06 — Date

RM-78-3, Attachment 1
Statistical Quantities

Release Record $26C_12$
Storm Water Drainage Ditch

Sample Number	Cs-137 (pCi/gm)	Co-60 (pCi/gm)	Weighted Sum (SOR)	**Weighted Sum <DCGLw?	DCGL-W. Sum	Sign
1	0.6637	0.0166	0.0608	yes	0.9392	+1
2	0.2767	0.0441	0.0369	yes	0.9631	+1
3	0.0524	-0.0077	0.0020	yes	0.9980	+1
4	0.1002	0.0244	0.0160	yes	0.9840	+1
5	0.0591	0.0011	0.0053	yes	0.9947	+1
6	0.0121	0.0217	0.0078	yes	0.9922	+1
7	0.0580	0.0078	0.0073	yes	0.9927	+1
8	0.2743	-0.0032	0.0220	yes	0.9780	+1
9	0.2772	0.0050	0.0248	yes	0.9752	+1
10	0.1913	0.0222	0.0230	yes	0.9770	+1
11	0.2254	0.0021	0.0195	yes	0.9805	+1
12	0.1047	0.0120	0.0125	yes	0.9875	+1
13	0.1444	0.0277	0.0207	yes	0.9793	+1
14	0.1963	0.0114	0.0200	yes	0.9800	+1
15	0.2092	0.0167	0.0227	yes	0.9773	+1
16	0.1509	0.0289	0.0217	yes	0.9783	+1
17	0.1262	0.0122	0.0144	yes	0.9856	+1
18	0.3466	-0.0108	0.0257	yes	0.9743	+1
19	0.3041	0.0367	0.0369	yes	0.9631	+1
20	0.1686	-0.0282	0.0053	yes	0.9947	+1
21	0.1671	-0.0027	0.0132	yes	0.9868	+1

Std. Dev	0.1404	0.0170	0.0133
Mean	0.1956	0.0113	0.0199
Median	0.1686	0.0120	0.0200

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 $DCGL_w$, then the Sign Test is not required.*

RM-78-3, Attachment 1
Statistical Quantities
Judgmental Samples

Release Record $26C_12$
Storm Water Drainage Ditch

Sample Number	Cs-137 (pCi/gm)	Co-60 (pCi/gm)	Weighted Sum (SOR)	**Weighted Sum <DCGLw?	DCGL-W. Sum	Sign
J1	0.3395	0.1493	0.0750	yes	0.9250	+1
J2	0.0994	0.0210	0.0149	yes	0.9851	+1
J3	0.1517	0.0182	0.0184	yes	0.9816	+1
J4	0.2194	0.0151	0.0231	yes	0.9769	+1

Std. Dev	0.1037	0.0656	0.0283
Mean	0.2025	0.0509	0.0328
Median	0.1856	0.0196	0.0207

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 $DCGL_w$, then the Sign Test is not required.*

RM-79-1
FSS QUALITY CONTROL EVALUATION RESULTS

FSS Package # 26C,2 QC Package # 26C,2

QC Measurement Type	Acceptance Criteria Met*?	Reference
✓ 1. Replicate Scan	(Yes) / No	Step 5.1.3
2. Sample Recounts		Step 5.1.4.1
✓ a. In-house	(Yes) / No	
N/A b. Third party	Yes / No	
3. Split Samples		Step 5.1.4.2
✓ c. In-house	(Yes) / No	
N/A 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 #14 & #16 = recounts.

Reviews:

Joshua T. Reed — Evaluator — 11-06-06 — Date

[signature] — Technical Review — 11/06/06 — Date

QA Verification
Split Sample Analysis

Date: 9/22/2006

QA: 26C,2 Storm Water Drainage Ditch

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	<	0.0797	n/a	n/a	n/a	<	0.0604	0.76	YES
2	Cs-137		0.2767	10.28	9.73	0.6-1.66		0.3264	1.18	YES

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

< Indicates results less than the MDA.

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

QA Verification
Sample Recount Analysis

Date: 9/22/2006

QA: 26C,2 Storm Water Drainage Ditch

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)**
14	Co-60	<	0.0610	n/a	n/a	n/a	<	0.0247	0.40	YES
14	Cs-137		0.1963	11.97	8.35	0.6-1.66		0.1739	0.89	YES
16	Co-60	<	0.0614	n/a	n/a	n/a	<	0.0665	1.08	YES
16	Cs-137		0.1509	14.24	7.02	0.5-2.0		0.1588	1.05	YES

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

< Indicates results less than the MDA.

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

Tritium in Soil
Data Results
Final Status Survey $26C_12$

Sample Number	Tritium in Soil pCi/g
2	0.038
14	0.019
16	0.015

Mean:	0.0240
Median:	0.0190
St. Dev:	0.0123

Note: The DCGL for Tritium is 327 pCi/g.
Sample results are less than 0.02% of the DCGL

Environmental, Inc.
Midwest Laboratory
an Allegheny Technologies Co.

700 Landwehr Road • Northbrook, IL 60062-2310
ph. (847) 564-0700 • fax (847) 564-4517

Mr. David W. Parish
Big Rock Point
10269 US-31 North
Charlevoix, MI 49720

LABORATORY REPORT NO. 8022-100-242
DATE: 10-03-2006
SAMPLES RECEIVED: 09-27-2006
PURCHASE ORDER NO:

Below are the results of the analyses for tritium on three soil samples.

Excavated Soil Survey 26C$_1$-J

Sample Description	Collection Date	Lab Code	Concentration (pCi/g of soil) H-3	MDA (pCi/g of soil)
2	09-22-06	BRSO-6594	0.038 ± 0.008	< 0.011
14	09-22-06	BRSO-6595	0.019 ± 0.010	< 0.015
16	09-22-06	BRSO-6596	0.015 ± 0.005	< 0.007

The error given is the probable counting error at 95 % confidence level. The less than, (<), value is based on 4.66 sigma counting error for background sample.

Sincerely,

Bronia Grob /RA

Bronia Grob,
Laboratory Manager

APPROVED BY

Tony Coorlim,
Quality Assurance