

ATTACHMENT 22

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 1 AREA – SUPPORTING SURVEY, RELOCATED SOIL RELEASE RECORD, TBC<sub>x71</sub>,  
SOIL EXCAVATED FROM TURBINE BUILDING DEMOLITION AREA

October 9, 2006

37 Pages

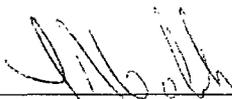
**Supporting Survey, Relocated Soil  
Release Record TBC<sub>x7</sub>1**

**Soil Excavated From Turbine Building Demolition Area**

**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:  Date: 06-05-06  
(ESSG Supervisor)

Signed:  Date: 06-13-06  
(ES Superintendent)

Signed:  Date: 7-5-06  
(RP & ES Manager)

## Survey Requirements

### Release Record TBC<sub>x7</sub>1 Relocated Soils From Turbine Building Demolition Area

#### Survey Description

Supporting survey TBC<sub>x7</sub>1 consists of excavated soils that were removed from the Turbine Building demolition area for subsurface structure and component removal. Areas of excavation included the liquid radwaste processing area and the heavy-haul roadway traversing Survey Unit 5. The excavated soil was transported to the soil verification area (SVA) and graded to maximum depth of 1.0 meter. The physical size of the survey area is 1990 square meters.

This evaluation of this excavated soil will be performed in accordance with procedure RM-76, Final Status Survey Design. Sample locations will be established by random start, systematic square grid pattern over the graded area. Each soil sample will be a full core homogenized composite that is representative of total soil thickness. Surface scanning will be conducted over 100% of the survey area.

#### History

The soil for survey evaluation originated from a Class 1 area that was excavated to remove subsurface piping components and concrete foundations beneath the western section of the Turbine Building demolition area. Soil remediation efforts were required for some areas associated with subsurface component removal.

#### Current Radiological Status

Based on post remediation analyses and supporting surveys the residual radioactivity in this excavated soil is not expected to exceed DCGL concentration values. Survey documentation is maintained in the 10 CFR 50.75(g) files. Input for this evaluation includes the following survey data:

**Turbine Building Demolition  
Supporting Surveys for Soil Transport and Evaluation**

TB051005	SB040405	SB042905	TB062805	HH060705
TB052405	SB040605	SB050205	HH050505	TB060905
TB052505	SB040705	SB051705	HH051705	TB080805
TB052605	SB041205	SB051805	HH051905	TB080905
TB060105	SB041905	HH042705	HH041905	

## Post-Construction Expectations

Survey TBC<sub>x7</sub>1 will be performed in the following activity sequence:

1. Walkdown: Site Characterization 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 survey location 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 TBC<sub>x7</sub>1 in accordance with the survey requirements established in procedures RM-76, *Final Status Survey Design* and RM-77, *Final Status Survey Implementation*, and LTP, Chapter 5. Survey size will be based on the statistical requirements of the Sign Test for Class 1 areas with soil samples collected in random start, systematic data point locations. Surface scanning will be performed with 100% 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 Quality Assessment demonstrates that the regulatory requirements for unrestricted site release have been satisfied.

## DATA QUALITY OBJECTIVES

### Survey TBC<sub>x7</sub>1 Relocated Soils from Turbine Building Demolition

#### 1. STATE THE PROBLEM

*The Problem:*

To demonstrate that the level of residual radioactivity in soil excavated from the Turbine Building demolition area does not exceed the release criteria of 25 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the License Termination Plan (LTP). This soil has been relocated to the soil verification area (SVA) and is to be prepared for survey by grading out to a depth of one (1) meter or less. The excavated soil for evaluation is to be designated as a Class 1 survey area. It must be demonstrated that soils in this survey area satisfy the criteria established for unrestricted release prior to disposition as fill material for onsite usage.

*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 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 survey and 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) survey 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 the 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 representative soil samples collected for characterization to determine suitability for transport to the SVA. The soil samples obtained are judgmentally selected as a result of multiple surveys conducted during the excavation and transport process. 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 Chapter 5, Table 5-1 and Procedure RM-76, *Final Status Survey Design*.

The survey will be conducted in accordance with applicable regulatory guidance as established in LTP Chapter 5 for Class 1 areas. 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 total thickness of prepared soil in the survey area of 1990 m<sup>2</sup>.

*Temporal Boundaries:*

Scanning and sampling in this survey unit will only be performed during daylight hours under dry weather conditions. Surface soils must be free of significant snow cover and 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 May 11, 2006.

*Constraints:*

Cold weather or rainy 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.

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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.

*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.

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 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 one-half the DCGL<sub>w</sub> 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 survey 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 one-half the DCGL<sub>w</sub> 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 square grid spacing.

*Judgmental Sampling:*

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

*Scan Coverage:*

Scanning for this survey area will provide 100% 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:*

The area of soil excavation intersects the identified waterborne pathway for Tritium migration and shall require Tritium in soil analyses for a minimum of 10% of the sample population. Soil samples will be collected in the same random locations as those selected for QA/QC evaluation and sent to an independent laboratory for Tritium analysis. Data results will be provided in the survey package.

*Investigation Levels:*

Investigation levels defined in LTP, Chapter 5 and BRP Procedure RM-76, *Final Status Survey Design*, shall be conservatively established for this survey as shown below:

**Investigation Levels for Survey TBC<sub>x7</sub>1**

<b>Classification</b>	<b>Scan Measurement</b>	<b>Soil Sample Analysis</b>
Class 1	> 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.

## SURVEY DESIGN

Survey TBC<sub>x7</sub>1  
Survey Design  
Relocated Soils from Turbine Building Demolition Area

### Survey Unit Description

Survey TBC<sub>x7</sub>1 consists of excavated soils that have been removed from the Turbine Building demolition area for subsurface structure and component removal. Areas of excavation include the liquid radwaste processing area and the heavy-haul roadway traversing Survey Unit 5.

The soil has been graded out to a maximum thickness of one (1) meter over a total area of 1990 m<sup>2</sup>. Soil sample locations for this survey will be determined using a random start, systematic, square-grid pattern over the graded area. Each soil sample will be a homogenized composite representative of the total thickness of soil. Surface scanning will be conducted over 100% of the graded area.

### Soil Sample Design

#### Scoping Data

Sample measurements obtained to determine suitability for soil transport to the designated survey area have not identified residual radioactivity above fractional concentrations of the DCGL value. Input data for survey design were conservatively estimated based on supporting surveys for transport suitability obtained in the Turbine Building demolition area.

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

Radionuclides	Cs-137	Co-60
$\sigma^*$	0.524	0.255
DCGL	11.93	3.21

\*Survey data detailed in Attachment 1

#### 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:

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

$$\sigma = \sqrt{\left(\frac{0.524}{11.93}\right)^2 + \left(\frac{0.255}{3.21}\right)^2}$$

$$\sigma = 0.091$$

### Relative Shift

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

$$\text{Relative Shift} = \frac{1 - 0.818}{0.091}$$

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

With  $\alpha$  and  $\beta$  error levels set at 0.05 and the relative shift of 2.0, the Sign Test requires 15 sample data points (Table 5.5 NUREG 1575).

### Sample Locations

Sample locations are selected in a random start, systematic square grid 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
0.607400	0.548238

Survey Unit Dimensions: X = 199 meters  
Y = 10 meters

Random Start Location X = (0.607400)(199) = 120.9 meters  
With SW Corner Origin: Y = (0.548238)(10) = 5.5 meters

### Sample Spacing

As a conservative measure sample spacing will be calculated based on 18 samples for this survey. Samples are located in a systematic square grid pattern with sample spacing determined by the following:

$$L = \sqrt{\frac{A}{n}}$$

where A = area of survey unit, and  
n = number of samples.

$$L = \sqrt{\frac{1990}{18}} = 10.5 \text{ meters}$$

With sample spacing established at 10.5 meters, 19 data points are available for this survey. Data point locations are identified in Attachment 2.

## 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 samples will be determined by random number selection.

The QA/QC scan starting point and track direction are also determined by random number selection. The first random data point selected will identify the scanning start point and the second random data point will determine the direction in which the scan will track. QA/QC location results are provided in Table 3 below:

Table 3  
Random Numbers Generated for QA/QC

QA/QC Soil Samples	Random Sample Number	Verification Scan	Random Sample Number
Split Sample:	3	Start Point:	4
Sample Recount:	4	Scan Toward:	11
Sample Recount:	6	Minimum Scan Area Requirement:	199 m <sup>2</sup>

## Surface Scanning

The coverage requirement for surface scanning in this Class 1 area is 100%. 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 3. 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:

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

$$\text{Scan}_{\text{DCGL}} \text{ for Co-60} = 1818 \text{ CPM}$$

$$\text{Scan}_{\text{DCGL}} \text{ for Cs-137} = 3518 \text{ CPM}$$

Where:<sup>1</sup>

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

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

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

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 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 TBC<sub>x7</sub>1.

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

## Attachment 1

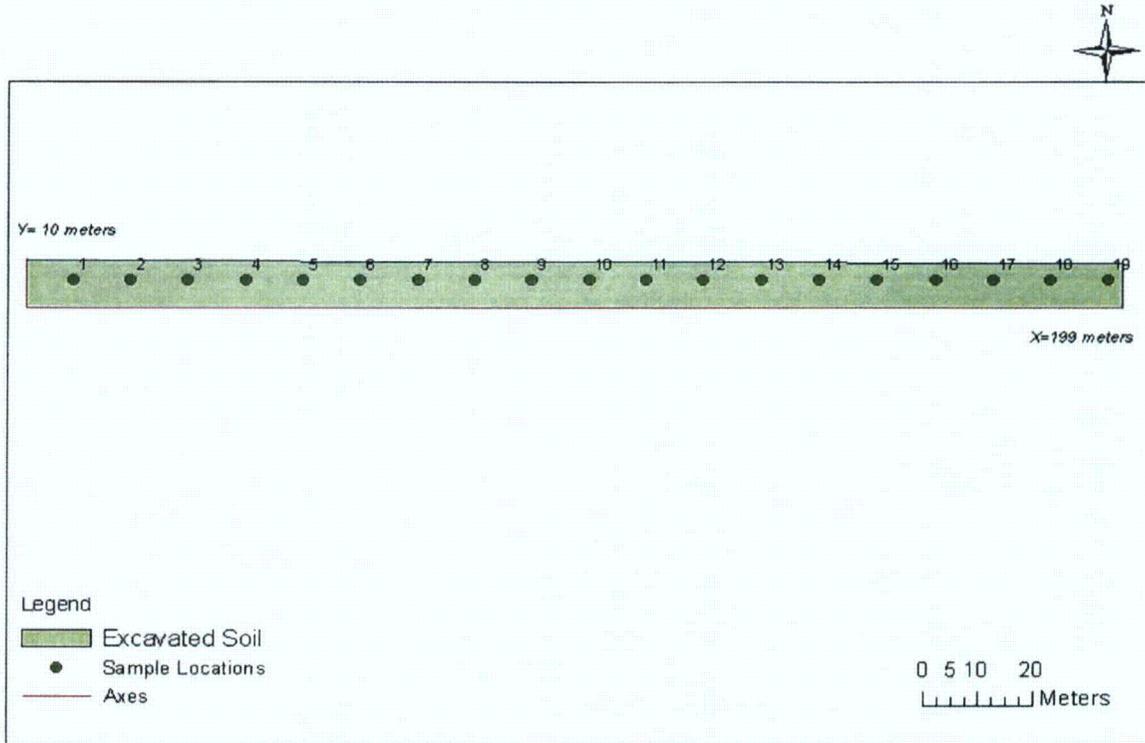
### Design Data - Survey TBC<sub>x71</sub> Relocated Soils From Turbine Building Demolition Area

Survey No.	Sequence No.	Cs-137 Activity (pCi/g)	Co-60 Activity (pCi/g)
HH060705	16538	1.26	0.66
HH060705	16539	0.06	0.06*
HH060705	16540	1.05	0.66
TB062805	16755	1.16	0.27
TB062805	16756	0.47	0.15*
TB062805	16774	0.19	0.31
<b>Mean:</b>		0.698	0.352
<b>Std Dev:</b>		0.524	0.255

\* Measurement system MDA - Co-60 not identified in this sample

## Attachment 2

### Soil Sample Locations - Survey TBC<sub>x7</sub>1 Relocated Soils From Turbine Building Demolition Area



Sample No.	X Coord.	Y Coord.	Sample No.	X Coord.	Y Coord.
1	5.4	5.5	11	110.4	5.5
2	15.9	5.5	12	120.9	5.5
3	26.4	5.5	13	131.4	5.5
4	36.9	5.5	14	141.9	5.5
5	47.4	5.5	15	152.4	5.5
6	57.9	5.5	16	162.9	5.5
7	68.4	5.5	17	173.4	5.5
8	78.9	5.5	18	183.9	5.5
9	89.4	5.5	19	194.4	5.5
10	99.9	5.5			

\*Sample no. 12 is the random start location  
*Sample spacing is 10.5 meters*

### Attachment 3

#### Scan MDC In Varying Backgrounds

Background	d'	l	s <sub>i</sub>	CPM	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 4

### 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 TBC<sub>x7</sub>1

Survey Area Description:

Survey TBC<sub>x7</sub>1 is the final status evaluation of soil that was excavated from the Turbine Building demolition area. The soil has been relocated to the SVA and prepared for survey by grading to a maximum depth of 1 meter over an area of 1990 square meters.

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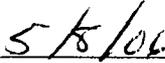
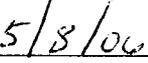
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The survey area is authorized for Final Status Survey Implementation.

 _____ Designed by	 _____ Date
 _____ Technical Review by	 _____ 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>TBCx71</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.	JAR ESSG	5-8-06
<input checked="" type="checkbox"/>	b. Survey area has been turned over to the Environmental Services Survey Group (ESSG) in acceptable condition for FSS.	JAR ESSG	5-8-06
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)	JAR ESSG	5-9-06

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).	JAR ESSG	5-9-06
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).	JAR ESSG	5-9-06
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).	JAR ESSG	5-9-06
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.	JAR ESSG	5-9-06

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

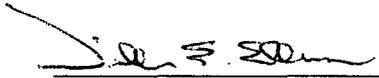
3.2 Laboratory Analysis:  
 Isotopic analyses are complete. The spectroscopy report requires a signature of completion by the laboratory analyst and a signature of evaluation documenting that a second level review has been performed (Step 6.4.2).

Initial      Date

JAL      5-9-06  
ESSG

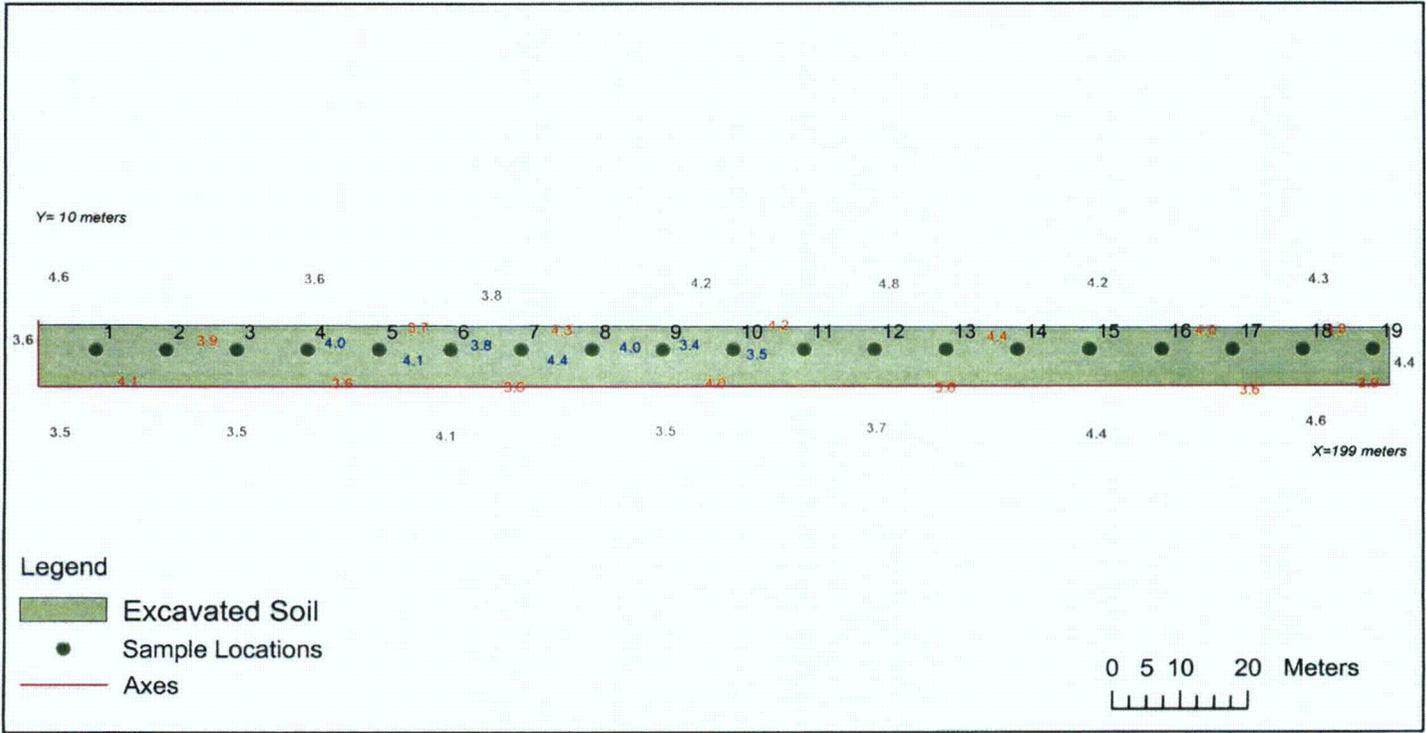
3.3 Sample Control and Documentation:  
Chain of custody documentation exhibits control of soil samples (Step 6.4.3).

JAL      5-9-06  
ESSG

      06-08-06  
Reviewed by      Date

# Surface Scan Summary

## Release Record TBC<sub>x7</sub>1 Excavated Soil from Turbine Building Excavation Area



**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)

Primary Scan : 100 %

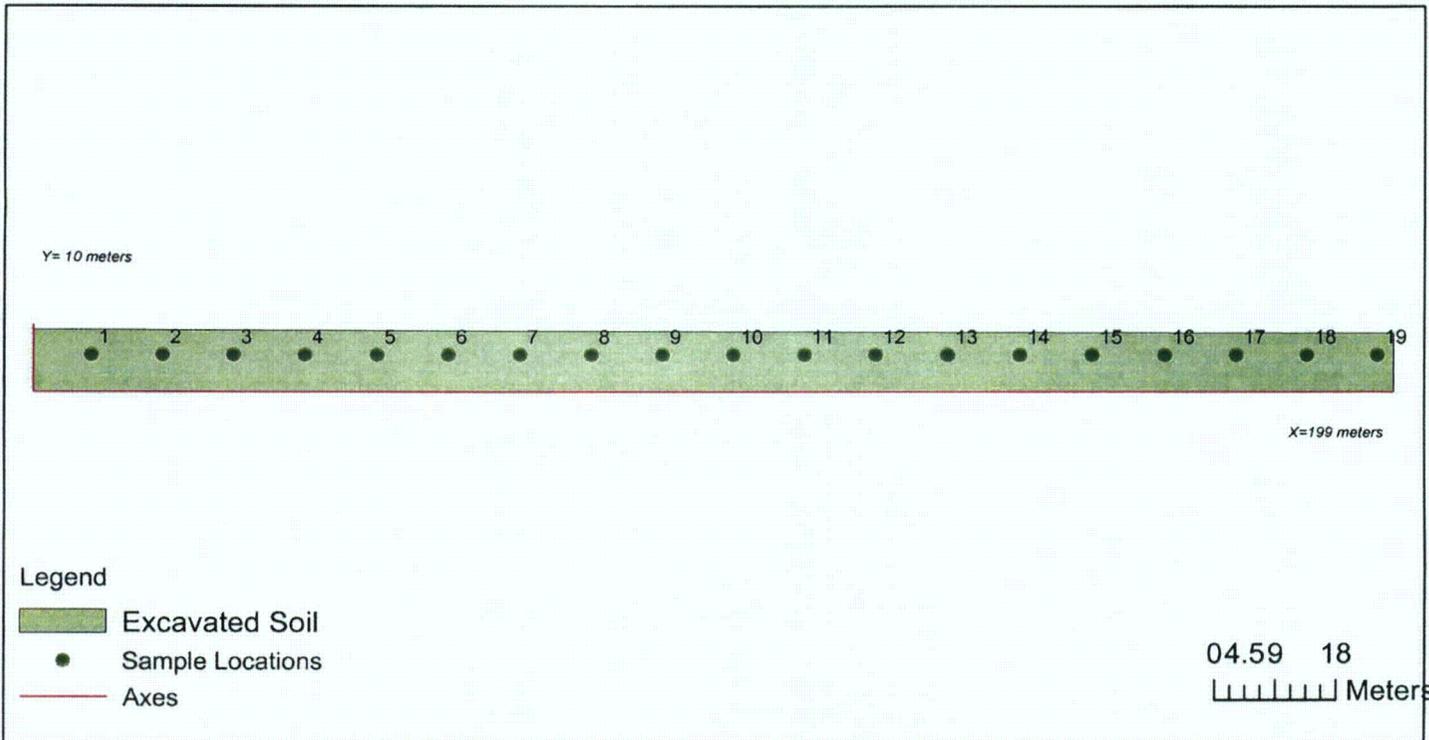
Technician Signature: [Signature] Date: 5-9-06  
 Time: 1500

QC Verification Scan: 10 %

Technician Signature: [Signature] Date: 5-9-06  
 Time: 1600

# ActivitySummary

## Release Record TBC<sub>x7</sub> Excavated Soil from Turbine Building Excavation Area



Sample No.	X Coord.	Y Coord.	Cs-137 (pCi/g)		Co-60 (pCi/g)	
			Activity	MDA	Activity	MDA
1	5.4	5.5	*0.0425	0.0597	*0.0041	0.0565
2	15.9	5.5	*-0.0095	0.0416	*0.0167	0.0631
3	26.4	5.5	*0.0142	0.0482	*0.0016	0.0533
4	36.9	5.5	*0.0100	0.0478	*0.0244	0.0633
5	47.4	5.5	0.0253		*0.0174	0.0589
6	57.9	5.5	*0.0098	0.0545	*0.0321	0.0693
7	68.4	5.5	*0.0170	0.0563	*0.0130	0.0569
8	78.9	5.5	0.0517		*0.0246	0.0651
9	89.4	5.5	0.0686		*0.0091	0.0668
10	99.9	5.5	0.0587		*0.0139	0.0666
11	110.4	5.5	0.0520		*-0.0067	0.0589
12	120.9	5.5	*0.0334	0.0629	*0.0117	0.0632
13	131.4	5.5	*0.0115	0.0561	*-0.0076	0.0485
14	141.9	5.5	0.0814		*0.0350	0.0809
15	152.4	5.5	*0.0382	0.0656	*0.0233	0.0741
16	162.9	5.5	*0.0346	0.0570	*0.0181	0.0716
17	173.4	5.5	*0.0400	0.0615	*0.0081	0.0652
18	183.9	5.5	0.0410		*0.0026	0.0498
19	194.4	5.5	0.0198		*0.0224	0.0698

\*Forced-count values

\*\*Coordinate location relative to SW corner of survey unit where X=0 m. and Y=0 m.

TBC<sub>x7</sub>1  
 RM-72-1  
 CHAIN-OF-CUSTODY RECORD

Sample Number	Sampling Location	Date	Time	Final Disposition of Sample
#1	X= 5.4 Y= 5.5	5-9-06	1300	Permanent Storage
#2	X= 15.9 Y= 5.5	5-9-06	1305	
#3	X= 26.4 Y= 5.5	5-9-06	1310	
#4	X= 36.9 Y= 5.5	5-9-06	1314	
#5	X= 47.4 Y= 5.5	5-9-06	1316	
#6	X= 57.9 Y= 5.5	5-9-06	1318	
#7	X= 68.4 Y= 5.5	5-9-06	1325	
#8	X= 78.9 Y= 5.5	5-9-06	1329	
#9	X= 89.4 Y= 5.5	5-9-06	1322	
#10	X= 99.9 Y= 5.5	5-9-06	1335	
#11	X= 110.4 Y= 5.5	5-9-06	1340	
#12	X= 120.9 Y= 5.5	5-9-06	1355	
#13	X= 131.4 Y= 5.5	5-9-06	1358	
#14	X= 141.9 Y= 5.5	5-9-06	1401	
#15	X= 152.4 Y= 5.5	5-9-06	1425	
#16	X= 162.9 Y= 5.5	5-9-06	1428	
#17	X= 173.4 Y= 5.5	5-9-06	1431	
#18	X= 183.9 Y= 5.5	5-9-06	1435	
#19	X= 194.4 Y= 5.5	5-9-06	1441	
#3(QC)	X= 26.4 Y= 5.5	5-9-06	1310	

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

1. Relinquished by: <i>To locked storage</i> <i>J. Schlueter Chem Lab</i>	Date 5-9-06	Time 1530	Received in good condition by: <i>J. Schlueter</i>
2. Relinquished by: <i>J. Schlueter</i>	Date 5-16-06	Time 0815	Received in good condition by: <i>J. Schlueter</i>
3. Relinquished by: <i>To Soil Storage</i> <i>J. Schlueter Sealand</i>	Date 5-16-06	Time 0815	Received in good condition by: <i>Permanent Storage</i>
4. Relinquished by:	Date	Time	Received in good condition by:

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

FINAL STATUS SURVEY: TBC #71

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.

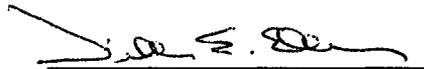
Verify that the survey design has been technically reviewed.

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 \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

  
\_\_\_\_\_  
Assessor

6-03-06  
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.
- N/A Results of judgmental samples have been reviewed and evaluated.
- N/A 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: 18
- b. Total number of statistical samples determined as valid: 19
- c. Calculate % Completeness:  $\frac{b \times 120}{a} = \underline{126.7\%}$

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: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Jodie L. Reed  
Assessor

5-15-06  
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 19
- b. Calculation of the Mean 0.0071
- c. Calculation of the Median 0.0075
- d. Calculation Standard Deviation 0.0043

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<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.

RM-78-3  
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.

RM-78-3  
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<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 provided in Attachment 1.

Jodie Reed  
Assessor

5-15-06  
Date

Reviews:

J. S. E. E.  
Technical Review

06-08-06  
Date

[Signature]  
ES Superintendent

01-12-06  
Date

[Signature]  
RP&ES Manager

7-3-06  
Date

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

**Release Record TBC<sub>x7</sub>1  
Excavated Soil from Turbine Building Demolition Area**

Sample Number	Cs-137 (pCi/gm)	Co-60 (pCi/gm)	Weighted Sum (SOR)	**Weighted Sum <DCGLw?	DCGL-W. Sum	Sign
1	0.0425	0.0041	0.0048	yes	0.9952	+1
2	-0.0095	0.0167	0.0044	yes	0.9956	+1
3	0.0142	0.0016	0.0017	yes	0.9983	+1
4	0.0100	0.0244	0.0084	yes	0.9916	+1
5	0.0253	0.0174	0.0075	yes	0.9925	+1
6	0.0098	0.0321	0.0108	yes	0.9892	+1
7	0.0170	0.0130	0.0055	yes	0.9945	+1
8	0.0517	0.0246	0.0120	yes	0.9880	+1
9	0.0686	0.0091	0.0086	yes	0.9914	+1
10	0.0587	0.0139	0.0093	yes	0.9907	+1
11	0.0520	-0.0067	0.0023	yes	0.9977	+1
12	0.0334	0.0117	0.0064	yes	0.9936	+1
13	0.0115	-0.0076	-0.0014	yes	0.9986	+1
14	0.0814	0.0350	0.0177	yes	0.9823	+1
15	0.0382	0.0233	0.0105	yes	0.9895	+1
16	0.0346	0.0181	0.0085	yes	0.9915	+1
17	0.0400	0.0081	0.0059	yes	0.9941	+1
18	0.0410	0.0026	0.0042	yes	0.9958	+1
19	0.0198	0.0224	0.0086	yes	0.9914	+1

Std. Dev      0.0228      0.0118      0.0043  
Mean            0.0337      0.0139      0.0071  
Median          0.0346      0.0139      0.0075

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 # TBCx71

QC Package # TBCx71

QC Measurement Type	Acceptance Criteria Met*?	Reference
<input checked="" type="checkbox"/> 1. Replicate Scan	<input checked="" type="radio"/> Yes / No	Step 5.1.3
<input checked="" type="checkbox"/> 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	
<input checked="" type="checkbox"/> 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 # 3 = split; Samples # 4 + 6 = Recounts

Reviews:

Joshua L. Reed  
Evaluator

5-15-06  
Date

S. S. S. S.  
Technical Review

06-07-06  
Date



**QA Verification  
Sample Recount Analysis**

Date: 5/9/2006

QA: TBC<sub>7</sub>1 Exc avated Soil from Turbine Bldg. Area

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)
4	Co-60	<	0.0633	n/a	n/a	n/a	<	0.0563	0.89	YES
4	Cs-137	<	0.0478	n/a	n/a	n/a	<	0.0444	0.93	YES
6	Co-60	<	0.0693	n/a	n/a	n/a	<	0.0677	0.98	YES
6	Cs-137	<	0.0545	n/a	n/a	n/a		0.0289	0.53	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 that fail agreement must be investigated per RM-79.

**Tritium in Soil  
Data Results  
Final Status SurveyTBC<sub>x7</sub>1**

<b>Sample Number</b>	<b>Tritium in Soil pCi/g</b>
<b>3</b>	<b>0.031</b>
<b>4</b>	<b>0.042</b>
<b>6</b>	<b>0.032</b>

Mean: 0.035  
Median: 0.032  
St. Dev: 0.006

Note: The DCGL for Tritium is 327 pCi/g.  
Sample results are less than 0.2% of the DCGL



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

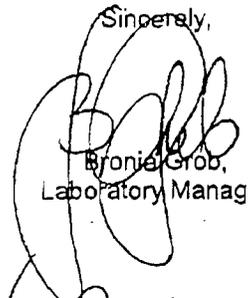
LABORATORY REPORT NO. 8022-100-218-1  
 DATE: 06-06-2006  
 SAMPLES RECEIVED: 06-01-2006  
 PURCHASE ORDER NO: \_\_\_\_\_

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

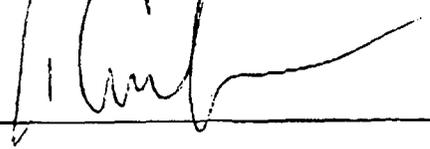
Sample Description	Collection Date	Lab Code	Concentration (pCi/g of soil) H-3	MDA (pCi/g of soil)
#3T	05-09-06	BRSO-3555	0.031 ± 0.006	< 0.009
#4T	05-09-06	BRSO-3556	0.042 ± 0.005	< 0.007
#6T	05-09-06	BRSO-3557	0.032 ± 0.005	< 0.009

The error given is the probable counting error at 95 % confidence level.

Sincerely,

  
 Bronie Grob,  
 Laboratory Manager

APPROVED BY \_\_\_\_\_

  
 Tony Coorlim,  
 Quality Assurance