

ATTACHMENT 2

**CONSUMERS ENERGY
BIG ROCKPOINT**

DOCKET NUMBERS 50-155 AND 72-043

**TRANSMITTAL OF EXCAVATED SURFACE SURVEYS, RELOCATED SOIL SURVEYS
AND FINAL STATUS SURVEY PACKAGES IN SUPPORT OF BIG ROCK POINT PHASED
LICENSE TERMINATION**

**SUPPORTING SURVEY
EXCAVATED SURFACE RELEASE RECORD TBC_{q,1}
BASE ELEVATION SURVEY OF TURBINE BUILDING EXCAVATION FOLLOWING
REMOVAL OF WEST-SIDE FOUNDATIONS AND SUBSURFACE COMPONENTS**

August 24, 2006

42 Pages

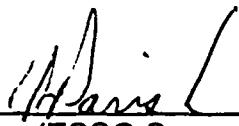
**Supporting Survey, Excavated Surface
Release Record West TBCq₁1**


**Base Elevation Survey of Turbine Building Excavation
Following Removal of West-Side Foundations and Subsurface Components**


INFORMATION COPY

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: 8/3/06
(ESSG Supervisor)

Signed:  Date: 8-8-06
(ES Superintendent)

Signed:  Date: 8-14-06
(RP & ES Manager)

Survey Area Requirements

Supporting Survey, Release Record West TBC_{q1}1 Base Elevation West Turbine Building Excavation

Survey Description

Final Status Survey West TBC_{q1}1 encompasses 1988 m² of the Turbine Building demolition area located immediately southwest of Containment. This area is an open excavation approximately seven meters below grade that results from demolition and removal of the Turbine Building and all subsurface structures and components. No materials of plant origin remain in the survey area.

History

During plant power operations the Turbine Building supported the components and interconnecting systems external to Containment that were necessary for electrical power generation. These systems included the following:

- Steam turbine and generator
- Nuclear steam supply and condensate return system piping
- Clean-up filter and demineralizer systems
- Condenser cooling water system
- Liquid waste effluent piping

A detailed review of the event history and radiological characterization for the Turbine Building area is provided in the License Termination Plan (2-13 and Appendix 2-E).

Current Radiological Status

Characterization surveys and radiological evaluations for the release of excavated soils do not indicate the presence of elevated levels of residual radioactivity in this survey area. Based on operational history and former placement of radioactive systems and material transport pathways at this location the radiological status of this survey area is Class 1. Input for this evaluation includes the following survey data:

- Characterization Surveys 8, 5(1), and 5(2) (LTP, 2E),
- Survey Package TB 041505,
- Survey Package TB 042005,
- Survey Package TB 051805,
- Survey Package TB 061005,
- Survey Package TB 061405,
- Survey Package TB 090105, and
- Survey WTB060606

Post-Construction Expectations

Survey West TBC_{q1}1 will be performed in the following activity sequence:

1. Walkdown: The ESSG (Environmental Services survey Group) will perform a walkdown assessment to ensure survey area preparations are complete and confirm that the following post-construction expectations have been satisfied:
 - 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. A licensed independent survey shall verify that the excavation area is at or below the base elevation of original construction for all structures, components and foundations formerly located in the survey unit.
 3. 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.
 4. Survey Design and Execution: Survey design and execution will follow the Data Quality Objectives for Survey WestTBC_{q1}1 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 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.
 5. 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. Once released for unrestricted use, this area will be backfilled and restored to original grade elevation.
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DATA QUALITY OBJECTIVES

Supporting survey, Release Record West TBC_{q1}1 Base Elevation West Turbine Building Excavation Area

1. STATE THE PROBLEM

The Problem:

To demonstrate that the level of residual radioactivity in the excavated area of the former Turbine Building does not exceed the release criteria of 25 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the License Termination Plan (LTP). This Class 1 survey area includes all exposed sub-surface soils in the East Turbine Building Demolition Area. It must be demonstrated that this survey area meets the criteria established for unrestricted release prior to backfill and return to original grade elevation.

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 the FSS. 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 FSS measurements.

Source of the Information:

The soil sample data to be used for FSS development are the radionuclide-specific measurements of soil samples collected within the affected local coordinate grids during the characterization process. This data also include the results of multiple surveys performed during soil excavation and the removal of demolition 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*.

The FSS will be conducted in accordance with LTP Section 5 for Class 1 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 1988 m². The physical boundary includes all exposed soils in the excavated area identified by survey design within local coordinates 6S -11S by 4E -9E.

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 July 5, 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.

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.

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 (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.

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:

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; however, a more conservative approach for investigation will be established for this survey as shown below.

Investigation Levels for Survey WestTBC_{q1}1

| Classification | Scan Measurement | Soil Sample Analysis |
|-----------------------|-------------------------|-----------------------------|
| Class 1 | > 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.

SURVEY DESIGN

Survey West TBC_{q1}1
Final Status Survey Design
Turbine Building Excavation Area

Survey Unit Description

Final Status Survey West TBC_{q1}1 encompasses 1988 m² of the Turbine Building demolition area immediately south of Containment. The Turbine Building and all system components, subsurface structures, and foundations have been removed. No materials of plant origin remain at this location. The survey area is an open excavation that extends approximately seven meters below grade to the base elevation of original construction as detailed in Attachment 4.

Soil Sample Design

Scoping Data

The following input data for survey design were developed from activity measurements identified in Readiness Survey WTB060606.

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

| Radionuclides | Cs-137 | Co-60 |
|---------------|--------|-------|
| σ | 0.58 | 0.23 |
| 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:

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

$$\sigma = \sqrt{\left(\frac{0.58}{11.93}\right)^2 + \left(\frac{0.23}{3.21}\right)^2}$$

$$\sigma = 0.09$$

Relative Shift

The DCGL for the weighted sum is 1.0. The relative shift is determined using an LBGR value set at 74% of the DCGL_w.

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

$$\text{Relative Shift} = \frac{1 - 0.82}{0.09}$$

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

With α and β error levels set at 0.05 and the relative shift of 2.0, the Sign Test requires 15 sample data points (Table 5.5 NUREG 1575). As a conservative measure a minimum of 18 samples will be collected in this survey unit.

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 |
|------------------|------------------|
| 0.607670 | 0.231409 |

Survey Dimensions: X (E/W) = 53.0 meters
Y (N/S) = 49.0 meters

Random Start Location X = (0.607670)(53.0) = 32.2 meters
With SW Corner Origin: Y = (0.231409)(49.0) = 11.3 meters

The survey unit origin is located in Grid 328 of the site coordinate system at X=0.2 meters, Y= 1.0 meters. The random start location for this survey is located in Grid 319 at X = 2.5 meters Y= 2.0 meters.

Sample Spacing

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

$$L = \sqrt{\frac{A}{n}}, \quad \text{where } A = \text{area of survey unit and} \\ n = \text{number of samples.}$$

$$L = \sqrt{\frac{1988}{18}} = 10.5 \text{ meters}$$

With sample spacing established at 10.5 meters, 19 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.

The starting point and track direction for QA/QC scanning 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.

Table 3
Random Numbers Generated for QA/QC

| QA/QC Soil Samples | Random Sample Number | Verification Scan | Random Sample Number |
|--------------------|----------------------|--------------------------------|----------------------|
| Split Sample: | 5 | Start Point: | 3 |
| Sample Recount: | 9 | Scan Towards : | 14 |
| Sample Recount: | 12 | Minimum Scan Area Requirement: | 200 m ² |

Surface Scanning

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

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

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

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

Where:¹

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

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

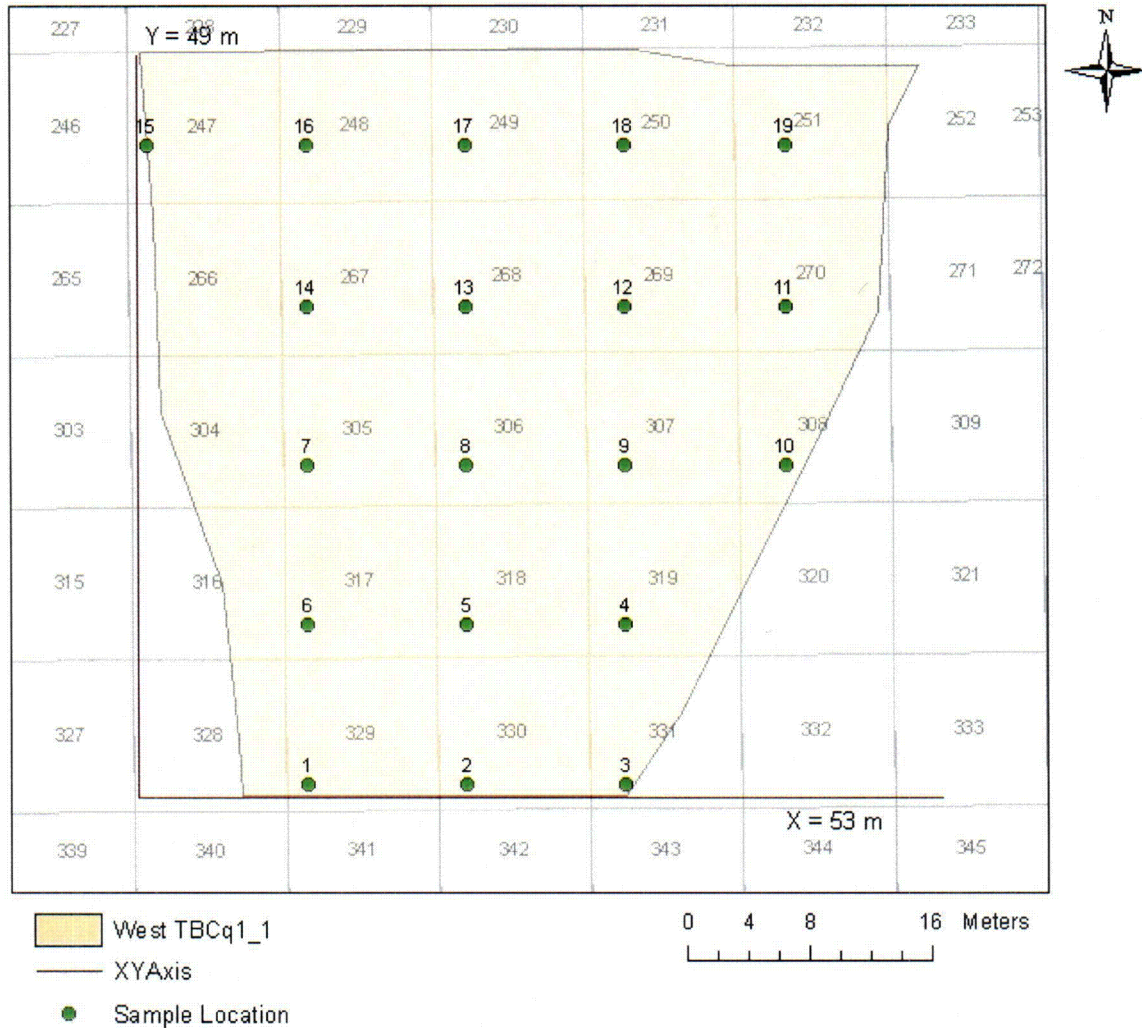
$$\text{DCGL}_w = 11.93 \text{ pCi/g Cs-137 and } 3.21 \text{ pCi/g Co-60}$$

The DCGL_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 WestTBC_{q1}1.

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

Attachment 1 **Soil Sample Locations**

Release Record WestTBC_{q1}1 **Base Elevation of Turbine Building Excavation**



| Sample No. | Grid # | X Coord. | Y Coord. | Sample No. | Grid # | X Coord. | Y Coord. |
|------------|--------|----------|----------|------------|--------|----------|----------|
| 1 | 329 | 1.5 | 1.5 | 11 | 270 | 3.0 | 3.0 |
| 2 | 330 | 2.0 | 1.5 | 12 | 269 | 2.5 | 3.0 |
| 3 | 331 | 2.5 | 1.5 | 13 | 268 | 2.0 | 3.0 |
| 4 | 319 | 2.5 | 2.0 | 14 | 267 | 1.5 | 3.0 |
| 5 | 318 | 2.0 | 2.0 | 15 | 247 | 1.0 | 3.5 |
| 6 | 317 | 1.5 | 2.0 | 16 | 248 | 1.5 | 3.5 |
| 7 | 305 | 1.5 | 2.5 | 17 | 249 | 2.0 | 3.5 |
| 8 | 306 | 2.0 | 2.5 | 18 | 250 | 2.5 | 3.5 |
| 9 | 307 | 2.5 | 2.5 | 19 | 251 | 3.0 | 3.5 |
| 10 | 308 | 3.0 | 2.5 | | | | |

*Sample no. 4 is the random start location

*Sample spacing is 10.5 meters

Attachment 2

Scan MDC In Varying Backgrounds

| | | | | 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 | | | | | | |
| | | | | | | | | |

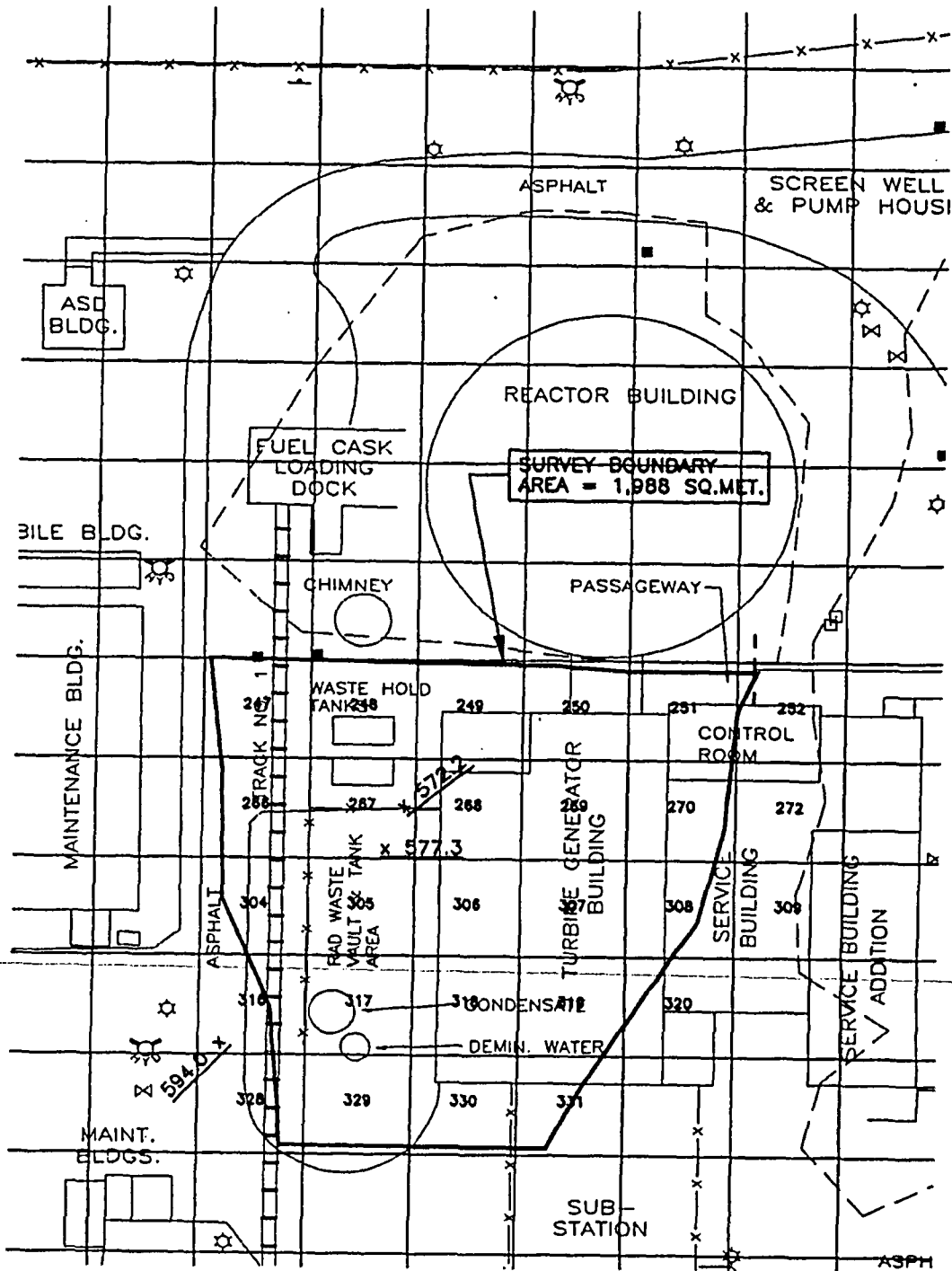
Attachment 3

Area Factors for Open Land Survey Evaluation

| 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 |

Attachment 4

Survey Grade Elevations



FERGUSON & CHAMBERLAIN ASSOCIATES, INC.
 PROFESSIONAL SURVEYORS
 103 W. UPRIGHT STREET, CHARLEVOIX, MICHIGAN 49720
 (231) 547-6882 - FAX (231) 547-0021
 EMAIL: survey@freeway.net

FIELD: RR, SP DRAWN: DDH SCALE: 1"=30'
 JOB: BIG ROCK POINT DATE: 6-22-06

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

Survey Code West TBC_{q1}1

Survey Area Description:

Supporting Survey West TBC_{q1}1 encompasses 1988 m² of the Turbine Building demolition area located immediately southwest of Containment. This area is an open excavation approximately seven meters below grade that results from demolition and removal of the Turbine Building and all subsurface structures and components. All demolition debris and materials of plant origin have been removed from the survey area. The radiological status of this survey unit is Class 1.

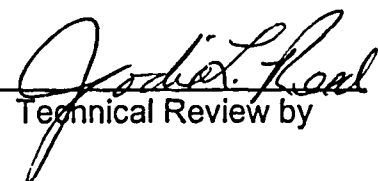
The survey area is authorized for Final Status Survey Implementation.



Designed by

06-28-06

Date



Technical Review by

07-03-06

Date

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

Step
(+)
1.0

Initial

Date

PREPARATION FOR SURVEY

West TBC g. 1
Survey #

1.1 Survey Area Status:

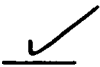


- a. Final Status Survey Design has been approved for implementation (see RM-76-5, Final Status Survey Approval and Authorization for Supplementation).

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.

JHL
ESSG

07-03-06



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

JHL
ESSG

07-03-06

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)

JHL
ESSG

07-03-06

RM-77-1
SURVEY IMPLEMENTATION CHECKLIST
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| | | <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 | 07-05-06 |
| 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 | 07-05-06 |
| 2.3 | Judgmental Soil Samples: | | |
| <input checked="" type="checkbox"/> | a. Judgmental soil samples have been collected and controlled (Step 6.2.3). | | |
| <input checked="" type="checkbox"/> | b. Deep core profiles performed in areas identified to contain elevated residual activity (Step 6.2.3). | JAR ESSG | 07-05-06 |
| 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 | 07-06-06 |

RM-77-1
SURVEY IMPLEMENTATION CHECKLIST
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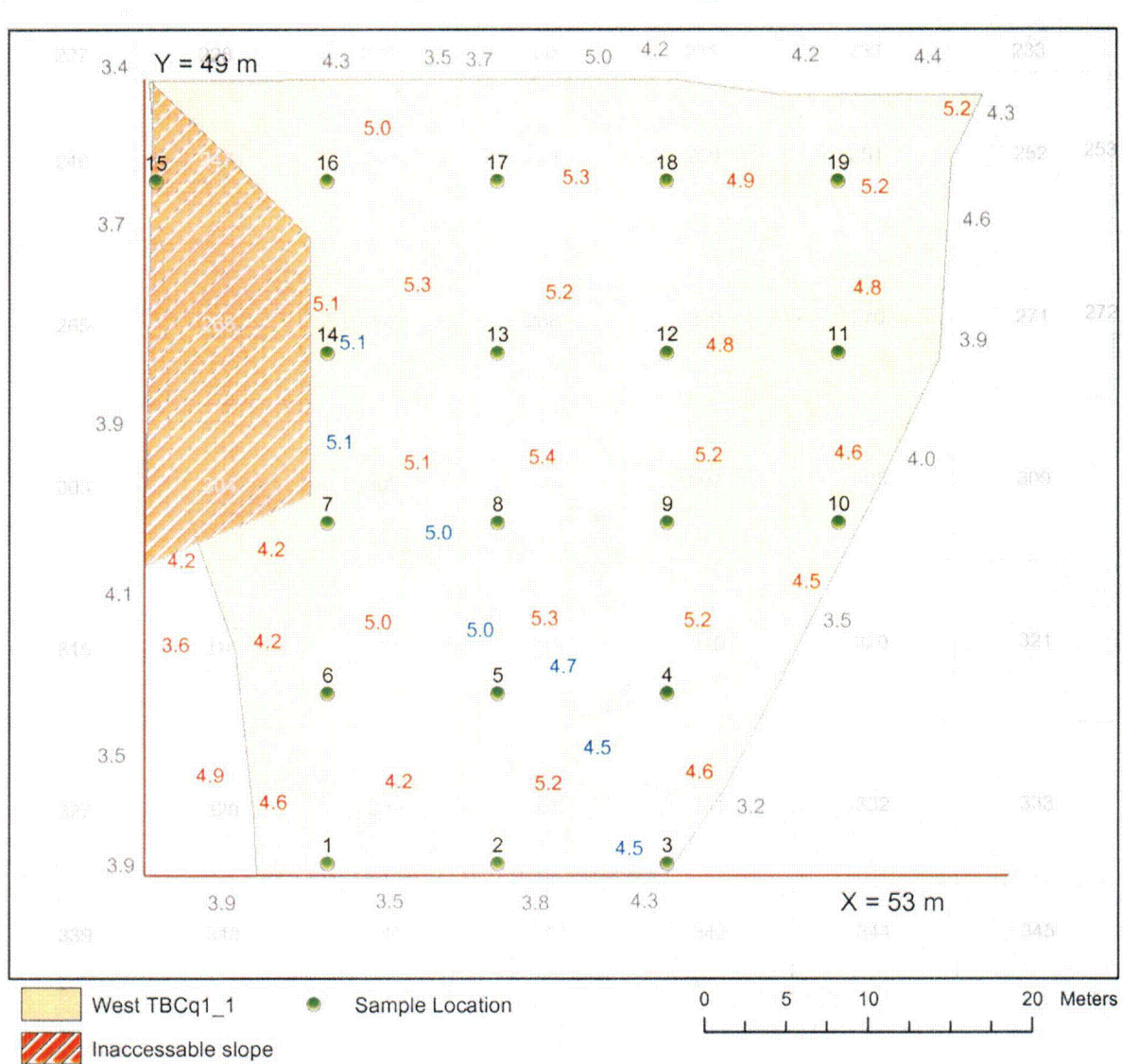
| | | <u>Initial</u> | <u>Date</u> |
|---|--|-------------------------|-----------------|
| 3.2 | Laboratory Analysis: | | |
| <input checked="" type="checkbox"/> | Isotopic analyses are complete. The spectroscopy report requires a signature of completion by the laboratory analyst and a signature of evaluation documenting that a second level review has been performed (Step 6.4.2). | <u>JLR</u> ESSG | <u>07-07-06</u> |
| 3.3 | Sample Control and Documentation: | | |
| <input checked="" type="checkbox"/> | Chain of custody documentation exhibits control of soil samples (Step 6.4.3). | <u>JLR</u> ESSG | <u>07-07-06</u> |
| <u>Jodie L. Read</u> Reviewed by | | <u>07-07-06</u> Date | |

ATTACHMENT RM-59-1
SAMPLING AND ANALYSIS REPORT

| | | | |
|---|---------------------------|-------------------------------------|---|
| Date: 07-05-2006 | Time: 1600 | Location: West TBC _{q1} 1 | Tech: <i>Shirley, Rucker, Rucker, 130 20000</i> |
| SURVEY IDENTIFICATION / DESCRIPTION | | | |
| <u>Survey West TBC_{q1}1 encompasses an excavated area of 1988 m² of the Turbine Building demolition area located immediately southwest of Containment. This is an open excavation approximately seven meters below grade that results from demolition and removal of the Turbine Building and subsurface components.</u> | | | |
| SURVEY TYPE | | | |
| Survey Type: | Characterization <u>X</u> | Scan (Motive) | |
| | Remediation | | |
| | Final <u>X</u> | Scan (Static) | |
| | | Trenching and Digging (use RM-59-4) | |
| SURVEY DESIGN | | | |
| Sample Collection: | <u>X</u> Judgmental | <u>X</u> Systematic | |
| Scan Coverage: | 100% | | |
| ANALYSIS | | | |
| Inst.SN/Cal Due <u>#186201 / 9/30/06</u> | DAILY CHECK: <u>✓</u> | SAT | UNSAT INIT: <u>JP</u> |
| Inst.SN/Cal Due <u>#186185 / 7/23/06</u> | DAILY CHECK: <u>✓</u> | SAT | UNSAT INIT: <u>JP</u> |
| Inst.SN/Cal Due <u>#186202 / 7/31/06</u> | DAILY CHECK: <u>✓</u> | SAT | UNSAT INIT: <u>JP</u> |
| Inst.SN/Cal Due _____ | DAILY CHECK: _____ | SAT | UNSAT INIT: _____ |
| Inst.SN/Cal Due _____ | DAILY CHECK: _____ | SAT | UNSAT INIT: _____ |
| Investigation of Unidentified Peaks: | <u>✓</u> | SAT | UNSAT INIT: <u>JP</u> |
| Minimum Detectable Activity (Section 5.3.2) | <u>✓</u> | SAT | UNSAT INIT: <u>JP</u> |
| COMMENTS | | | |
| <u>Survey West TBC_{q1}1 was performed in a random start, square grid, systematic sampling pattern with samples collected at 19 data point locations. Four judgmental samples were collected and split with the NRC for comparison. Laboratory analyses did not identify residual radioactivity above trace levels of the DCGL value.</u> | | | |
| <u>Surface scanning at 100% coverage identified no areas of elevated residual radioactivity. The results of the QA/QC verification scanning (10% coverage) were consistent with the scan values identified in the survey. See RM-78-3, Attachment 2.</u> | | | |
| Technician Signature: <u><i>Shirley Rucker</i></u> Date: <u>7/5/06</u> | | | |
| Second Level Review: <u><i>Shirley Rucker</i></u> Date: <u>7/19/06</u> | | | |

Surface Scan Summary

Release Record West TBC_{q1} Base Elevation Survey of 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)

NO AREAS OF ELEVATED ACTIVITY WERE IDENTIFIED.
 SEE RM-78-3, ATTACHMENT 2.

Primary Scan : 100 %

Technician Signature: [Signature]

Date: 7/5/06
 Time: 1700

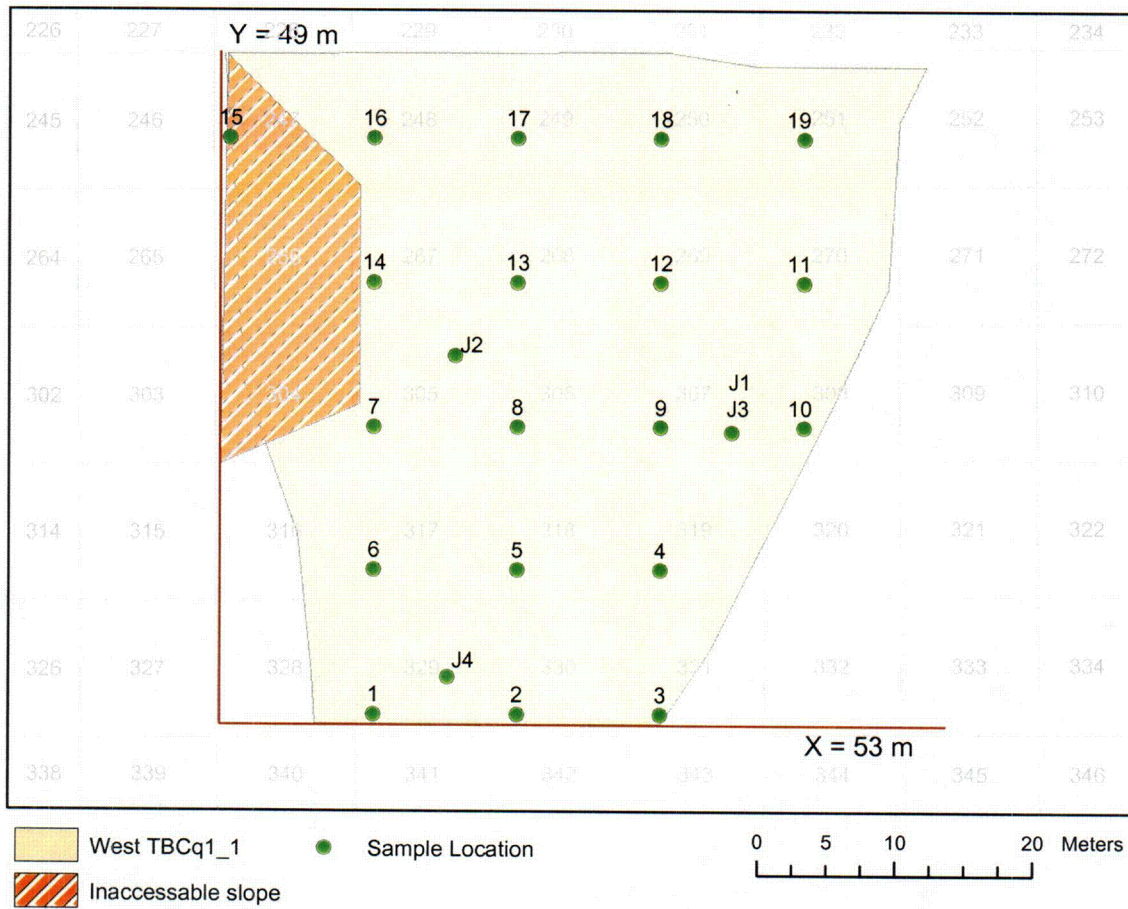
QC Verification Scan: 10 %

Technician Signature: [Signature]

Date: 7-5-06
 Time: 1700

Activity Summary

Release Record West TBC_{q1} Base Elevation Survey of Turbine Building Excavation Area



| Sample No. | Grid # | X Coord. | Y Coord. | Cs-137 (pCi/g) | | Co-60 (pCi/g) | |
|------------|--------|----------|----------|----------------|--------|---------------|--------|
| | | | | Activity | MDA | Activity | MDA |
| 1 | 329 | 1.5 | 1.5 | 1.7710 | | 0.2299 | |
| 2 | 330 | 2.0 | 1.5 | 0.0806 | | *0.0079 | 0.0570 |
| 3 | 331 | 2.5 | 1.5 | *0.0116 | 0.0575 | *0.0230 | 0.0756 |
| 4 | 319 | 2.5 | 2.0 | *0.0186 | 0.0632 | *-0.0011 | 0.0661 |
| 5 | 318 | 2.0 | 2.0 | 0.1743 | | *0.0759 | 0.0972 |
| 6 | 317 | 1.5 | 2.0 | 0.1218 | | *0.0658 | 0.0940 |
| 7 | 305 | 1.5 | 2.5 | 0.1486 | | *0.0513 | 0.0824 |
| 8 | 306 | 2.0 | 2.5 | 0.2988 | | 0.1446 | |
| 9 | 307 | 2.5 | 2.5 | *0.0120 | 0.0473 | *0.0073 | 0.0696 |
| 10 | 308 | 3.0 | 2.5 | 0.1102 | | *0.0035 | 0.0643 |
| 11 | 270 | 3.0 | 3.0 | 0.0747 | | *0.0378 | 0.0760 |
| 12 | 269 | 2.5 | 3.0 | *0.0136 | 0.0524 | *0.0196 | 0.0659 |
| 13 | 268 | 2.0 | 3.0 | 0.2668 | | 0.2341 | |
| 14 | 267 | 1.5 | 3.0 | 0.3171 | | 0.2435 | |
| 15 | 247 | 1.0 | 3.5 | *0.0079 | 0.0478 | *0.0092 | 0.0575 |
| 16 | 248 | 1.5 | 3.5 | 0.1539 | | 0.1056 | |
| 17 | 249 | 2.0 | 3.5 | 0.0590 | | *0.0398 | 0.0790 |
| 18 | 250 | 2.5 | 3.5 | *0.0117 | 0.0582 | *0.0389 | 0.0782 |
| 19 | 251 | 3.0 | 3.5 | 0.0547 | | *0.0066 | 0.0758 |
| J1 | 307 | 7.8 | 2.1 | ^DP | | ^DP | |
| J2 | 305 | 7.0 | 7.0 | 0.7617 | | 0.4931 | |
| J3 (0-15) | 307 | 7.8 | 2.1 | 0.1473 | | *0.0046 | 0.0587 |
| J3(15-30) | 307 | 7.8 | 2.1 | *0.0285 | 0.0649 | *0.0159 | 0.0692 |
| J4 | 329 | 6.0 | 3.8 | *0.0156 | 0.0470 | *0.0110 | 0.0570 |

*Forced-count values

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

^ Discrete Particle Evaluation, see RM-78-3, Attachment 1

West TBC_{q1}
RM-72-1
CHAIN-OF-CUSTODY RECORD

| Sample Number | Sampling Location | Date | Time | Final Disposition of Sample |
|---------------|-----------------------|----------|------|-----------------------------|
| 1 | Grid # 329 (1.5)(1.5) | 07-05-06 | 1229 | PERMANENT STORAGE SEAWARD |
| 2 | Grid # 330 (2.0)(1.5) | 07-05-06 | 1231 | |
| 3 | Grid # 331 (2.5)(1.5) | 07-05-06 | 1234 | |
| 4 | Grid # 319 (2.5)(2.0) | 07-05-06 | 1236 | |
| 5 | Grid # 318 (2.0)(2.0) | 07-05-06 | 1239 | |
| 5 QA Split | Grid # 318 (2.0)(2.0) | 07-05-06 | 1239 | |
| 6 | Grid # 317 (1.5)(2.0) | 07-05-06 | 1243 | |
| 7 | Grid # 305 (1.5)(2.5) | 07-05-06 | 1245 | |
| 8 | Grid # 306 (2.0)(2.5) | 07-05-06 | 1247 | |
| 9 (R) | Grid # 307 (2.5)(2.5) | 07-05-06 | 1251 | |
| 10 | Grid # 308 (3.0)(2.5) | 07-05-06 | 1256 | |
| 11 | Grid # 270 (3.0)(3.0) | 07-05-06 | 1259 | |
| 12 (R) | Grid # 269 (2.5)(3.0) | 07-05-06 | 1303 | |
| 13 | Grid # 268 (2.0)(3.0) | 07-05-06 | 1310 | |
| 14 | Grid # 267 (1.5)(3.0) | 07-05-06 | 1313 | |
| 15 | Grid # 247 (1.0)(3.5) | 07-05-06 | 1335 | |
| 16 | Grid # 248 (1.5)(3.5) | 07-05-06 | 1316 | |
| 17 | Grid # 249 (2.0)(3.5) | 07-05-06 | 1320 | |
| 18 | Grid # 250 (2.5)(3.5) | 07-05-06 | 1324 | |
| 19 | Grid # 251 (3.0)(3.5) | 07-05-06 | 1327 | |

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

| | | | |
|--|-----------------|--------------|---|
| 1. Relinquished by: <i>B. Storglund</i> | Date 7-5-06 | Time 1410 | Received in good condition by: <i>John L. Reed (LOKED IN OVER)</i> |
| 2. Relinquished by: <i>Joe S. Reed</i> | Date 7/19/06 | Time 1030 | Received in good condition by: TO PERMANENT STORAGE SEAWARD |
| 3. Relinquished by: | Date | Time | Received in good condition by: |
| 4. Relinquished by: | Date | Time | Received in good condition by: |

[illegible]

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

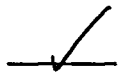
| | | | |
|---|-----------------|--------------|---|
| 1. Relinquished by: <i>[Signature]</i> | Date 7/5/06 | Time 1700 | Received in good condition by: <i>Chantel J. Schleuter</i> |
| 2. Relinquished by: <i>[Signature]</i> | Date 7/19/06 | Time 1030 | Received in good condition by: REEMAN FORDOR SCOVAND |
| 3. Relinquished by: | Date | Time | Received in good condition by: |
| 4. Relinquished by: | Date | Time | Received in good condition by: |

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DATA ASSESSMENT REPORT
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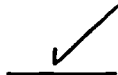
FINAL STATUS SURVEY: West TBC g, 1

1.0 DATA VERIFICATION

1.1 Data Acceptance

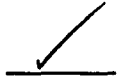


Review the Implementation Checklist (RM-77-1) to verify that survey isolation and control measures were executed prior to FSS and are being maintained.



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.

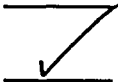


Verify daily QC source checks for Canberra gamma spectroscopy detector properly logged prior to soil sample analysis.

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 _____

Jodie L. Reed
Assessor

05-01-20
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.

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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: 18
- b. Total number of statistical samples determined as valid: 19
- c. Calculate % Completeness: $\frac{b \times 120}{a} = \underline{126\%}$

☒ 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: _____

Joshua L. Reed
Assessor

07-07-04
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 19
- b. Calculation of the Mean 0.0384 (soil)
- c. Calculation of the Median 0.0173 (soil)
- d. Calculation Standard Deviation 0.0534 (soil)

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 is 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
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☒ 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. *See RM-78-3, Attachment 2*

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.

NA 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_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 provided in Attachment 1.

Jodie Reed 07-07-06
Assessor Date

Reviews:

| | |
|--------------------------|----------------|
| <u>S. E. [Signature]</u> | <u>8/7/06</u> |
| Technical Review | Date |
| <u>[Signature]</u> | <u>8-8-06</u> |
| ES Superintendent | Date |
| <u>[Signature]</u> | <u>8-14-06</u> |
| RP&ES Manager | Date |

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

**Release Record West TBC_{q1}1
Base Elevation Survey of Turbine Building Structure Excavation**

| Sample Number | Cs-137 (pCi/gm) | Co-60 (pCi/gm) | Weighted Sum (SOR) | **Weighted Sum <DCGLw? | DCGL-W. Sum | Sign |
|---------------|-----------------|----------------|--------------------|------------------------|-------------|------|
| 1 | 1.7710 | 0.2299 | 0.2201 | yes | 0.7799 | +1 |
| 2 | 0.0806 | 0.0079 | 0.0092 | yes | 0.9908 | +1 |
| 3 | 0.0116 | 0.0230 | 0.0081 | yes | 0.9919 | +1 |
| 4 | 0.0186 | -0.0011 | 0.0012 | yes | 0.9988 | +1 |
| 5 | 0.1743 | 0.0759 | 0.0383 | yes | 0.9617 | +1 |
| 6 | 0.1218 | 0.0658 | 0.0307 | yes | 0.9693 | +1 |
| 7 | 0.1486 | 0.0513 | 0.0284 | yes | 0.9716 | +1 |
| 8 | 0.2988 | 0.1446 | 0.0701 | yes | 0.9299 | +1 |
| 9 | 0.0120 | 0.0073 | 0.0033 | yes | 0.9967 | +1 |
| 10 | 0.1102 | 0.0035 | 0.0103 | yes | 0.9897 | +1 |
| 11 | 0.0747 | 0.0378 | 0.0180 | yes | 0.9820 | +1 |
| 12 | 0.0136 | 0.0196 | 0.0072 | yes | 0.9928 | +1 |
| 13 | 0.2668 | 0.2341 | 0.0953 | yes | 0.9047 | +1 |
| 14 | 0.3171 | 0.2435 | 0.1024 | yes | 0.8976 | +1 |
| 15 | 0.0079 | 0.0092 | 0.0035 | yes | 0.9965 | +1 |
| 16 | 0.1539 | 0.1056 | 0.0458 | yes | 0.9542 | +1 |
| 17 | 0.0590 | 0.0398 | 0.0173 | yes | 0.9827 | +1 |
| 18 | 0.0117 | 0.0389 | 0.0131 | yes | 0.9869 | +1 |
| 19 | 0.0547 | 0.0066 | 0.0066 | yes | 0.9934 | +1 |

| | | | |
|----------|--------|--------|--------|
| Std. Dev | 0.3942 | 0.0825 | 0.0534 |
| Mean | 0.1951 | 0.0707 | 0.0384 |
| Median | 0.0806 | 0.0389 | 0.0173 |

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**

**Release Record West TBC_{q1}1
Base Elevation Survey of Turbine Building Structure Excavation
Judgmental Samples**

| Sample Number | Cs-137 (pCi/gm) | Co-60 (pCi/gm) | Weighted Sum (SOR) | Weighted Sum <DCGLw? | DCGL-W. Sum |
|-----------------|-----------------|-----------------|--------------------|----------------------|-------------|
| J1 [^] | [^] DP | [^] DP | [^] DP | yes | n/a |
| J2 | 0.7617 | 0.4931 | 0.2175 | yes | 0.7825 |
| J3(0-15) | 0.1473 | 0.0046 | 0.0138 | yes | 0.9862 |
| J3(15-30) | 0.0285 | 0.0159 | 0.0073 | yes | 0.9927 |
| J4 | 0.0156 | 0.0110 | 0.0047 | yes | 0.9953 |

| | | | |
|----------|--------|--------|--------|
| Std. Dev | 0.3539 | 0.2413 | 0.1045 |
| Mean | 0.2383 | 0.1312 | 0.0608 |
| Median | 0.0879 | 0.0135 | 0.0106 |

[^] Discrete Particle Evaluation, RM-78-3 Attachment 3

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

RM-78-3, Attachment 2:
Analysis of Judgmental Data Results
FSS West TBC_{q1}1

Final Status Survey West TBC_{q1}1
Action Level Investigation

A surface scan and judgmental sampling evaluation identified a discrete particle of elevated activity approximately 3 cm below the surface on the west slope of the demolition load-out road (data point J1). The total residual radioactivity of the particle was measured to be 1.82 E-02 uCi Cs-137 and 9.46 E-2 uCi Co-60. An investigation was initiated to identify the origin of contamination and determine potential lateral and vertical extents of residual radioactivity at this location¹. This investigation resulted in the following findings:

- An historical review of process knowledge and survey data from this survey unit verifies the radiological status as provided in the survey design. The load-out road was a staging location and transport pathway for off-site removal of concrete debris during demolition of the Containment structure. Remediation efforts were required during excavation and removal of the load-out roadway.
- An investigation was initiated that included depth profile sampling and intensive surface scanning of the surrounding area; no further discrete particles or areas of elevated activity were identified.
- The residual radioactivity identified in this particle was compared to the model value developed to determine the residual radioactivity of a discrete particle necessary to exceed the dose criterion for unrestricted release of the survey area (EA-BRP-RAE-0405). The total residual radioactivity measured in this particle is less than 2% of the maximum allowable concentration for unrestricted release of the survey area.

Conclusion

The discrete particle identified in this investigation is determined to be an anomaly that originated from the staging and transport of demolition debris along the former load-out roadway. The identification and removal of this particle does not impact a decision for unrestricted release of the survey area.

¹ Final Status survey Design, RM-76

RM-79-1
FSS QUALITY CONTROL EVALUATION RESULTS

FSS Package # West TBCg, 1

QC Package # West TBCg, 1

| QC Measurement Type | Acceptance Criteria Met*? | Reference |
|-----------------------------|---------------------------|--------------|
| <u>✓</u> 1. Replicate Scan | <u>Yes</u> No | Step 5.1.3 |
| <u>✓</u> 2. Sample Recounts | | Step 5.1.4.1 |
| <u>✓</u> a. In-house | <u>Yes</u> / No | |
| <u>N/A</u> b. Third party | Yes / No | |
| <u>✓</u> 3. Split Samples | | Step 5.1.4.2 |
| <u>✓</u> c. In-house | <u>Yes</u> 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 # 5 = QA Split; Sample # 9 + #12 =
QA Recounts

Reviews:

J. L. Reed
Evaluator

8-3-06
Date

S. S.
Technical Review

8-7-06
Date

QA Verification Split Sample Analysis

Date: 7/5/2006

QA: West TBC_n1 TB Excavation

Type: Split Sample

Lab: In-House

Table 1

| Acceptance Criteria | |
|---------------------|-----------|
| Resolution | Ratio |
| 34 | N/A |
| 47 | 0.5-2.0 |
| 6-15 | 0.6-1.66 |
| 16-50 | 0.75-1.33 |
| 51-200 | 0.8-1.25 |
| 200 | 0.85-1.18 |

[illegible]

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

< 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: 7/5/2006

QA: West TBC, 1 TB Excavated Area

Type: Sample Recounts

Lab: In- House

Table 1

| Acceptance Criteria | |
|---------------------|-----------|
| Resolution | Ratio |
| 2-3 | 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 | < | 0.0696 | n/a | n/a | n/a | < | 0.0732 | 1.05 | YES |
| 9 | Cs-137 | < | 0.0473 | n/a | n/a | n/a | < | 0.0458 | 0.97 | YES |
| 12 | Co-60 | < | 0.0659 | n/a | n/a | n/a | < | 0.0575 | 0.87 | YES |
| 12 | Cs-137 | < | 0.0524 | n/a | n/a | n/a | < | 0.0514 | 0.98 | YES |
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$$\text{Resolution C} = \frac{A}{(A \times B / 100)}$$

< Indicates results less than the MDA.

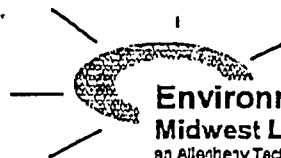
*Note Results are considered in agreement for MDA and near-MDA measurement comparisons
Results that fail agreement must be investigated per RM-79.

**Tritium in Soil
Data Results
Final Status West TBC_{q1}1**

| Sample Number | Tritium in Soil pCi/g |
|---------------|--------------------------|
| 5 | 0.918 |
| 9 | 2.766 |
| 12 | 0.249 |

Mean: 1.311
Median: 0.918
St. Dev: 1.304

Note: The DCGL for Tritium is 327 pCi/g.
Sample results are less than 1% 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. 8022-100-224-1
DATE: 07-28-2006
SAMPLES RECEIVED: 07-21-2006
PURCHASE ORDER NO: _____

Below are the results of the analyses for tritium on three soil samples. *Survey WEST TBC 8.1*

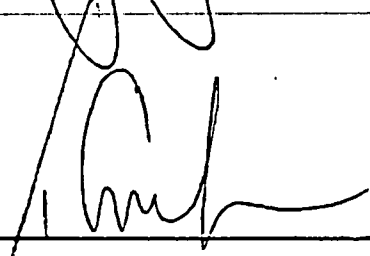
| Sample Description | Collection Date | Lab Code | Concentration (pCi/g of soil) H-3 | MDA (pCi/g of soil) |
|--------------------|-----------------|-----------|--------------------------------------|---------------------|
| 5 | 07-05-06 | BRSO-5009 | 0.918 ± 0.016 | < 0.006 |
| 9 | 07-05-06 | BRSO-5010 | 2.766 ± 0.032 | < 0.008 |
| 12 | 07-05-06 | BRSO-5011 | 0.249 ± 0.011 | < 0.009 |

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

Sincerely,


Brenda Grob,
Laboratory Manager

APPROVED BY _____


Tony Coorlim,
Quality Assurance

RM-72-2
CHAIN-OF-CUSTODY RECORD FOR SAMPLES SHIPPED OFF-SITE

| Sample Number | Sampling Location | Date | Time | Final Disposition of Sample |
|---------------|-----------------------|--------|------|-----------------------------|
| 5 | Grid # 318 (2.0)(2.0) | 7/5/06 | 1239 | RELEASED TO |
| 9 | Grid # 307 (2.5)(2.5) | 7/5/06 | 1251 | OFF-SITE INDEPENDENT |
| 12 | Grid # 269 (2.5)(3.0) | 7/5/06 | 1303 | LABORATORY |
| | | | | |

Comments: Samples from Survey West TBC₀₁ to be analyzed for tritium. (pCi/g)

| | | | |
|--|-----------------|--------------|---|
| 1. Relinquished by: <i>J. Puchett</i> | Date 7/20/06 | Time 1245 | Received in good condition by: <i>Tomson</i> |
| 2. Relinquished by: <i>Ons</i> | Date 7/20/06 | Time 1420 | Received in good condition by: <i>Abareh 7/21/06</i> |

RETURN THIS FORM WITH
ANALYSIS RESULTS TO:

CHARACTERIZATION SUPERVISOR
CONSUMERS ENERGY
BIG ROCK POINT
10269 U.S. 31 NORTH
CHARLEVOIX, MICHIGAN 49720