

**ATTACHMENT 4**

**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 CWC<sub>q,1</sub>  
BASE ELEVATION SURVEY OF CIRCULATING WATER PIPING EXCAVATION**

**August 24, 2006**

**43 Pages**

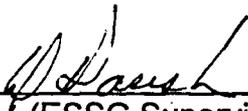
Supporting Survey, Excavated Surface  
Release Record CWC<sub>q1</sub>1

Base Elevation Survey of Circulating Water Piping Excavation

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: 8-02-06  
(ESSG Supervisor)

Signed:  Date: 8-2-06  
(ES Superintendent)

Signed:  Date: 8-7-06  
(RP & ES Manager)

## Survey Area Requirements

### Supporting Survey, Release Record CWC<sub>q1</sub>1 Base Elevation Circulating Water Piping Excavation

#### Survey Description

Supporting Survey CWC<sub>q1</sub>1 encompasses an excavated area of 2935 m<sup>2</sup> along the northeast boundary of the former Protected Area. This excavation extends approximately 6.5 meters below grade resulting from demolition and removal of subsurface piping and components from the following systems:

- Condenser cooling water intake and discharge,
- Service water,
- Liquid waste effluent,
- Well water,
- Storm drains,
- Septic system,
- Demineralized water,
- Fire water, and
- Heating boiler fuel oil supply tank

#### History

During plant power operations the grade elevation of this is survey area was a paved transport route providing access to the east gate of the Protected Area. The Historical Site Assessment did not identify any events or occurrences that resulted in subsurface contamination in this survey area (LTP, Appendix 2 – E). Additionally, soil characterization surveys and evaluations performed during subsurface removal of piping and components have not indicated the presence of residual radioactivity in this survey area.

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#### Current Radiological Status

Soil characterization surveys and radiological evaluations performed during subsurface removal of system piping components have not indicated the presence of residual radioactivity in this survey area. The radiological status of all survey units within the Protected Area has been established as Class 1. Input for this evaluation includes the following survey data:

- Characterization Survey (LTP, Appendix 2E-44),
- Survey Package CW051006,
- Survey Package CW053006,
- Survey Package 09C<sub>1</sub>1, and
- Survey Package East TBC<sub>q1</sub>1

## Post-Construction Expectations

Survey CWC<sub>q1</sub>1 will be performed in the following activity sequence:

1. Walkdown: ESSG (Environmental Services Survey Group) personnel will perform a walkdown assessment to ensure survey area preparations are complete and confirm that the following post-construction expectations have been satisfied:
  - 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. Elevation: Verification that the survey area is at or below the base elevation of original construction for any structures, components and foundations formerly located in the survey unit will be performed.
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 CWC<sub>q1</sub>1 in accordance with the survey requirements established in RM-76, *Final Status Survey Design*, and RM-77, *Final Status Survey Implementation*. Survey design will be consistent with 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 for all horizontal surfaces and accessible slopes. 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.

## DATA QUALITY OBJECTIVES

### Supporting Survey, Release Record CWC<sub>q1</sub>1 Base Elevation Circulating Water Piping 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 cooling water piping excavation 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 (Environmental Services Survey Group) team members to prepare and review the design, generate maps, coordinate field activities and evaluate data.

#### 2. IDENTIFY THE DECISION

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

*Principal Study Question (1):*

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

*Decision (1):*

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

*Actions (1):*

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

*Principal Study Question (2):*

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

*The Decision (2):*

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

*Actions (2):*

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

*Principal Study Question (3):*

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

*The Decision (3):*

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

*Actions (3):*

Alternative actions include remediation or no action required.

### 3. IDENTIFY INPUTS TO THE DECISION

*Information Needed:*

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

*Source of the Information:*

The soil sample data to be used for survey development are the radionuclide-specific measurements of soil samples collected within the affected local coordinate grids during the characterization process. This data also 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*.

Survey CWC<sub>q1</sub>1 will be conducted in accordance with LTP Chapter 5 for Class 1 areas and associated BRP FSS 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 2935 m<sup>2</sup>. The physical boundary includes all exposed and accessible soils in the excavated area identified by survey design.

*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 June 2, 2006.

*Constraints:*

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

#### 5. DEVELOP A DECISION RULE

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

*Decision Rule (1):*

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

*Decision Rule (2):*

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

*Decision Rule (3):*

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

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

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

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

7. OPTIMIZE DESIGN FOR OBTAINING DATA

Statistical Test

*Sign Test:*

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

*Number of Samples Determined:*

The number of samples required for this survey will be consistent with 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, prior to regulatory approval of the LTP a more conservative approach for investigation will be established for this survey as shown below.

**Investigation Levels for Survey CWC<sub>q1</sub>**

<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 CWC<sub>q1</sub>1  
Final Status Survey Design  
Circulating Water Piping Excavation

### Survey Unit Description

Final Status Survey CWC<sub>q1</sub>1 encompasses an excavated area of 2935 m<sup>2</sup> located east of the former containment structure. This excavation extends approximately 6.5 meters below grade elevation. All system components, piping, and demolition debris have been removed. No materials of plant origin remain at this location. Verification that the excavated area is at or below the base elevation of original construction is provided in Attachment 4.

### Soil Sample Design

The BRP LTP (Section 5.2.3.1) requires a technical justification to be performed for all Class 1 survey units that exceed the recommended size of 2000 m<sup>2</sup>. This justification is provided in the following section addressing survey unit size.

### Scoping Data

Scoping survey measurements conducted in the cooling water piping excavation area only identified MDA values or background levels of residual radioactivity. As a conservative measure, input values for survey design utilized estimates based on characterization measurements conducted prior to removal of adjoining piping connections in Survey Unit 9 (LTP, Appendix 2-E).

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

Radionuclides	Cs-137	Co-60
$\sigma$	0.41	0.41
DCGL	11.93	3.21

### Weighted Sum Standard Deviation

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:

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

$$\sigma = \sqrt{\left(\frac{0.41}{11.93}\right)^2 + \left(\frac{0.41}{3.21}\right)^2}$$

$$\sigma = 0.13$$

### 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<sub>w</sub>.

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

$$\text{Relative Shift} = \frac{1 - 0.74}{0.13}$$

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

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). As a conservative measure a minimum of 30 sample data points 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
0.073906	0.087224

CWC<sub>q1</sub>1 Survey Dimensions: X (E/W) = 40.0 meters  
Y (N/S) = 105.0 meters

Random Start Location X = (0.073906)(40.0) = 3.0 meters  
With SW Corner Origin: Y = (0.087224)(105.0) = 9.2 meters

The survey unit origin is located in Grid 345 of the site coordinate system at X=3.8 meters, Y= 5.2 meters. The random start location for this survey is located in Grid 333 at X= 3.0 meters Y= 9.2 meters from origin.

### Sample Spacing

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

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

$n = \text{number of samples.}$

$$L = \sqrt{\frac{2935}{30}} = 9.9 \text{ meters}$$

Sample spacing will be conservatively established at 8 meters ensuring 32 data point locations available for survey as identified in Attachment 1.

Survey Unit Size

At 2935 m<sup>2</sup>, this excavation exceeds the maximum size requirement for a Class1 survey area. However, considerations for worker safety, weather, groundwater management/removal, and potentially unstable embankments led to the decision to perform Survey CWC<sub>q1</sub>1 as a single Class 1 area. Class 1 survey design requirements will be satisfied by maintaining sample size, spacing, and density consistent with values established for a standard Class 1 area of 2000 m<sup>2</sup>. A comparison of the design parameters for development of Survey CWC<sub>q1</sub>1 with the regulatory guidance provided in Table 3 below demonstrates verification that the design values in this survey meet or exceed Class1 survey requirements.

Table 3  
Design Parameter Comparison

Survey*	Sample Size	Spacing	Sample Density
Standard Requirements Class 1 Area 2000 m <sup>2</sup>	15	11.5	0.75 samples/100 m <sup>2</sup>
Survey CWC <sub>q1</sub> 1 Class 1 Area 2935 m <sup>2</sup>	32	8	1.09 samples/100 m <sup>2</sup>

\*Survey Unit Relative Shift = 2.0

**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 4  
Random Numbers Generated for QA/QC

QA/QC Soil Samples	Random Sample Number	Verification Scan	Random Sample Number
Split Sample:	5	Start Point:	5
Sample Recount:	13	Scan Towards :	14
Sample Recount:	15	Minimum Scan Area Requirement:	294 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 2.

The investigation level for identification of potential areas of elevated activity in this survey area will be the Scan<sub>DCGL</sub> as defined by the following:

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

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

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

Where:<sup>1</sup>

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

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

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

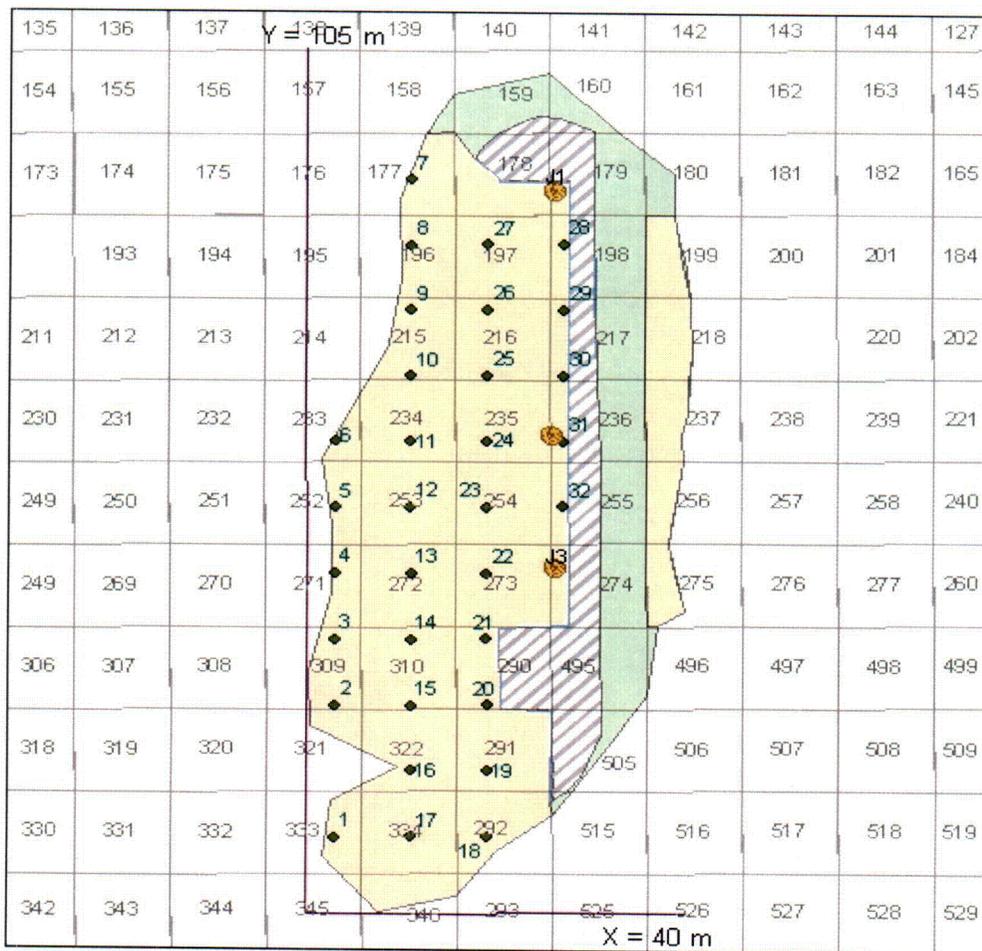
The DCGL<sub>w</sub> for Co-60 is the most limiting value for scanning measurements performed to identify areas of potentially elevated activity. Scanning conducted for this Final Status Survey will assume all residual radioactivity to originate from Co-60 and the instrument response at the Co-60 DCGL<sub>w</sub> (1818 cpm) will be used as the scanning investigation level for Survey CWC<sub>q1</sub>1.

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

# Attachment 1 Soil Sample Locations

## Release Record CWC<sub>q1</sub>1



- Survey CWCQ1\_1
- Near Vertical Slope
- Engulfment Hazard
- Sample Locations
- Sumps



Sample No.	Grid #	X Coord.	Y Coord.	Sample No.	Grid #	X Coord.	Y Coord.
1	333	7.2	4.5	17	334	5.1	4.5
2	309	7.2	0.4	18	292	3.2	4.5
3	309	7.2	8.5	19	291	3.2	2.5
4	271	7.2	6.4	20	290	3.2	0.4
5	252	7.2	4.4	21	290	3.2	8.5
6	233	7.2	2.4	22	273	3.2	6.4
7	177	5.1	4.4	23	254	3.2	4.4
8	196	5.1	6.4	24	235	3.2	2.4
9	215	5.1	8.5	25	216	3.2	0.4
10	215	5.1	0.4	26	216	3.2	8.5
11	234	5.1	2.4	27	197	3.2	6.4
12	253	5.1	4.4	28	198	1.5	6.4
13	272	5.1	6.4	29	217	1.5	8.5
14	310	5.1	8.5	30	217	1.5	0.4
15	310	5.1	0.4	31	236	1.5	2.4
16	322	5.1	2.5	32	255	1.5	4.4

\*Sample no. 1 is the random start location

Sample spacing is 8 meters

**Cooling Water Piping Excavation Area  
Attachment 2**

**Scan MDC In Varying Backgrounds**

Background	d'	I	s <sub>i</sub>	CPM	MDER $\mu\text{R/hr}$		Scan MDC $\text{pCi/g}$	
				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
<b>2500</b>	<b>2.48</b>	<b>4</b>	<b>32.02</b>	<b>679.18</b>	<b>0.57</b>	<b>1.20</b>	<b>2.30</b>	<b>1.20</b>
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
<b>5000</b>	<b>2.48</b>	<b>4</b>	<b>45.28</b>	<b>960.50</b>	<b>0.80</b>	<b>1.70</b>	<b>3.26</b>	<b>1.69</b>
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
<b>7500</b>	<b>2.48</b>	<b>4</b>	<b>55.45</b>	<b>1,176.37</b>	<b>0.98</b>	<b>2.08</b>	<b>3.99</b>	<b>2.07</b>
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
<b>10000</b>	<b>2.48</b>	<b>4</b>	<b>64.03</b>	<b>1,358.35</b>	<b>1.13</b>	<b>2.40</b>	<b>4.61</b>	<b>2.39</b>
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
<b>12500</b>	<b>2.48</b>	<b>4</b>	<b>71.59</b>	<b>1,518.68</b>	<b>1.27</b>	<b>2.69</b>	<b>5.15</b>	<b>2.67</b>
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
<b>15000</b>	<b>2.48</b>	<b>4</b>	<b>78.42</b>	<b>1,663.63</b>	<b>1.39</b>	<b>2.94</b>	<b>5.64</b>	<b>2.93</b>
<b>Modeled Exposure (<math>\mu\text{R/hr}</math>) @ 5 <math>\text{pCi/g}</math></b>								
	<b>Cs-137</b>	<b>1.23E+00</b>						
	<b>Co-60</b>	<b>5.03E+00</b>						

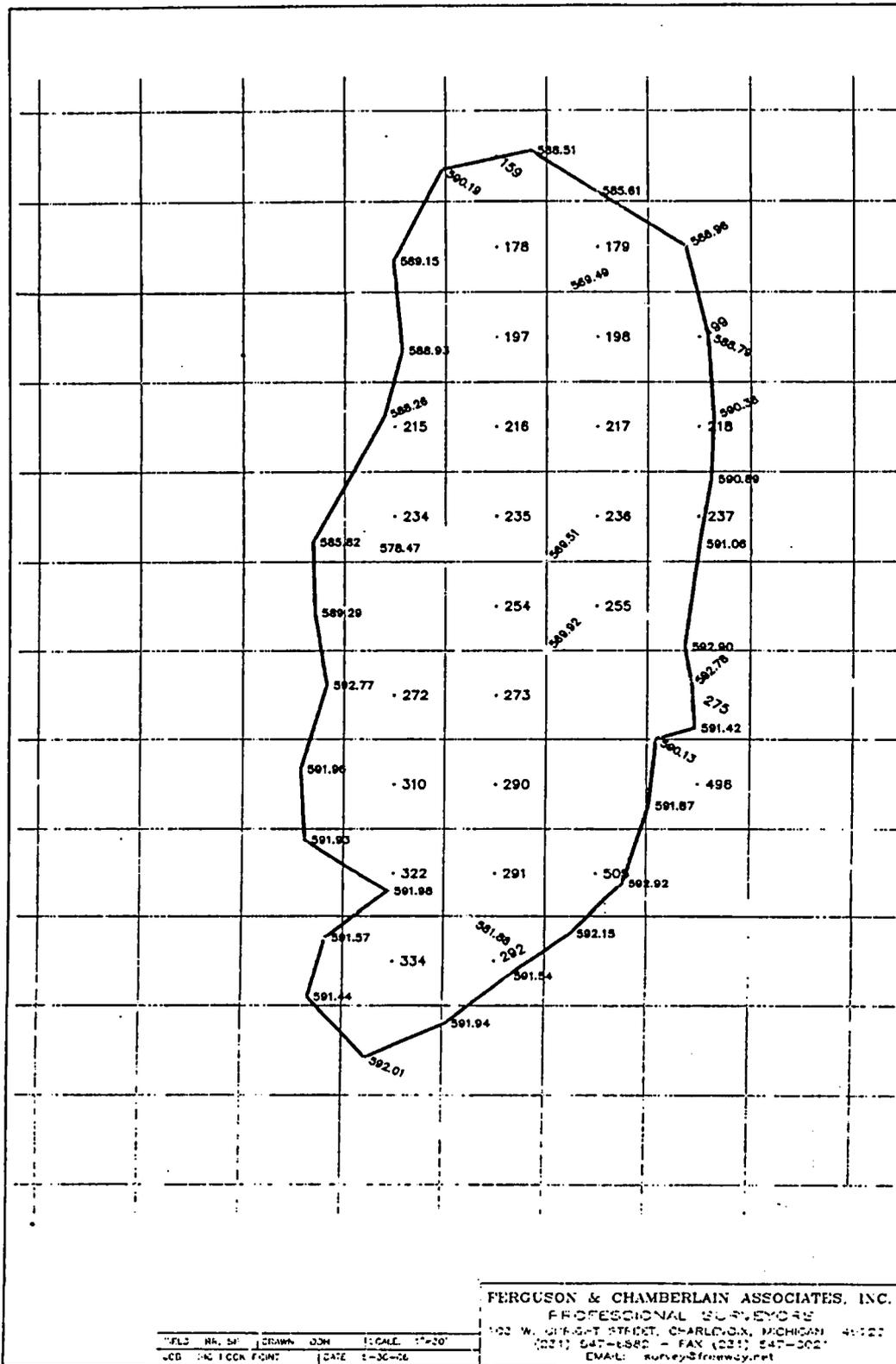
### Attachment 3

#### Area Factors for Open Land Survey Evaluation

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

# Attachment 4

## Survey Grade Elevations



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

Survey Code CWC<sub>q1</sub>1

Survey Area Description:

Supporting Survey CWC<sub>q1</sub>1 encompasses an excavated area of 2935 m<sup>2</sup> east of the former Containment Structure. This excavation area extends approximately 6.5 meters below grade resulting from demolition and removal of subsurface piping components. This is a Class 1 survey area.

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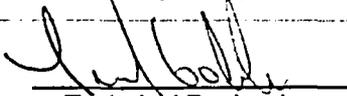
The survey area is authorized for Final Status Survey Implementation.



Designed by

06/02/06

Date



Technical Review by

6/2/06

Date

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

Step  
(+)  
1.0

Initial      Date

PREPARATION FOR SURVEY CWCg.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.

[Signature]  
ESSG      06-01-06

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

[Signature]  
ESSG      06-01-06

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)

[Signature]  
ESSG      6-01-06

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).	<u>ESSG</u>	<u>06-02-06</u>
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).	<u>ESSG</u>	<u>06-02-06</u>
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). <i>No elevated areas present in survey unit</i>	<u>ESSG</u>	<u>06-02-06</u>
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.	<u>ESSG</u>	<u>06-05-06</u>

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

Initial      Date

3.2      Laboratory Analysis:

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

ESSG      06-05-06

3.3      Sample Control and Documentation:

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

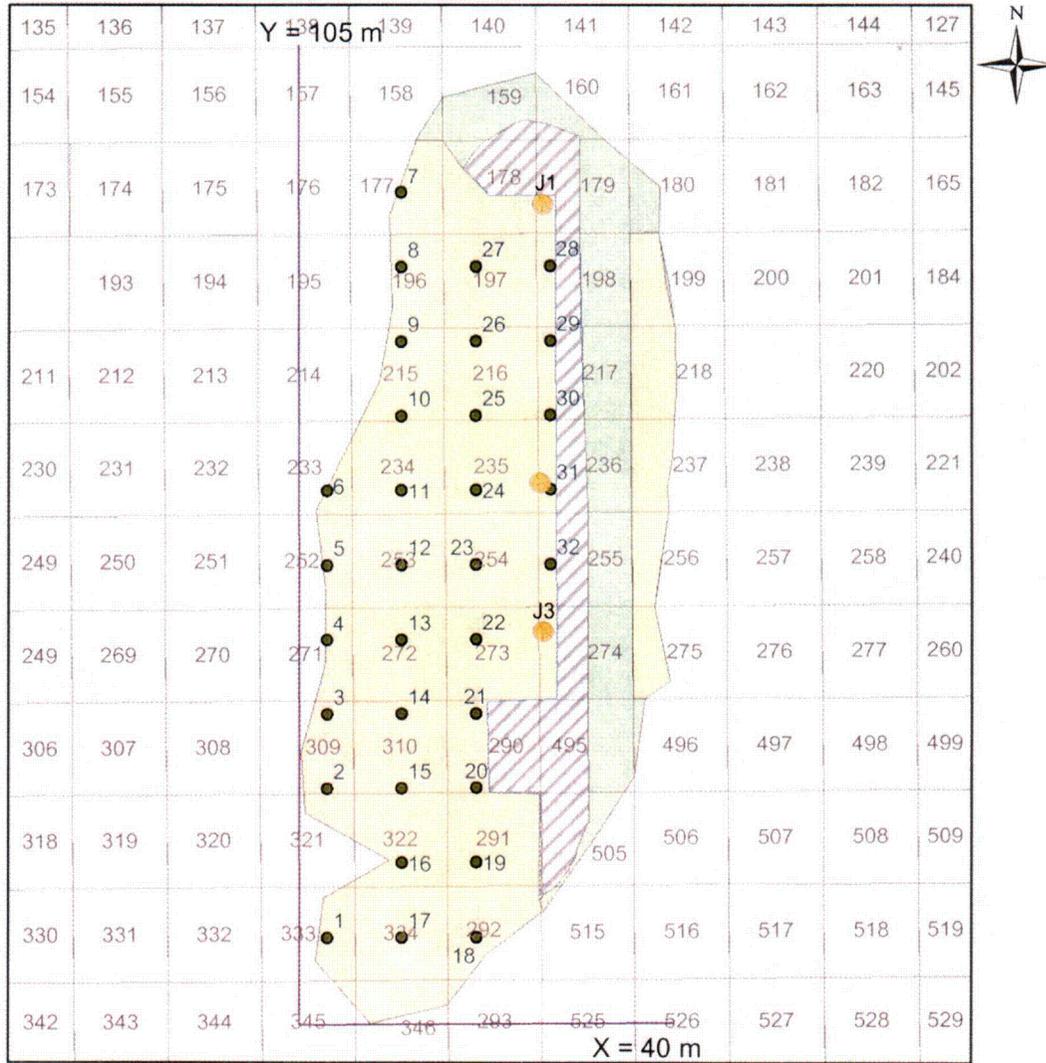
ESSG      06-05-06

Judith L. Reed      06-07-06  
Reviewed by                      Date



# Activity Summary

## Release Record CWC<sub>q1</sub> Base Elevation Survey of Circulating Water Piping Excavation



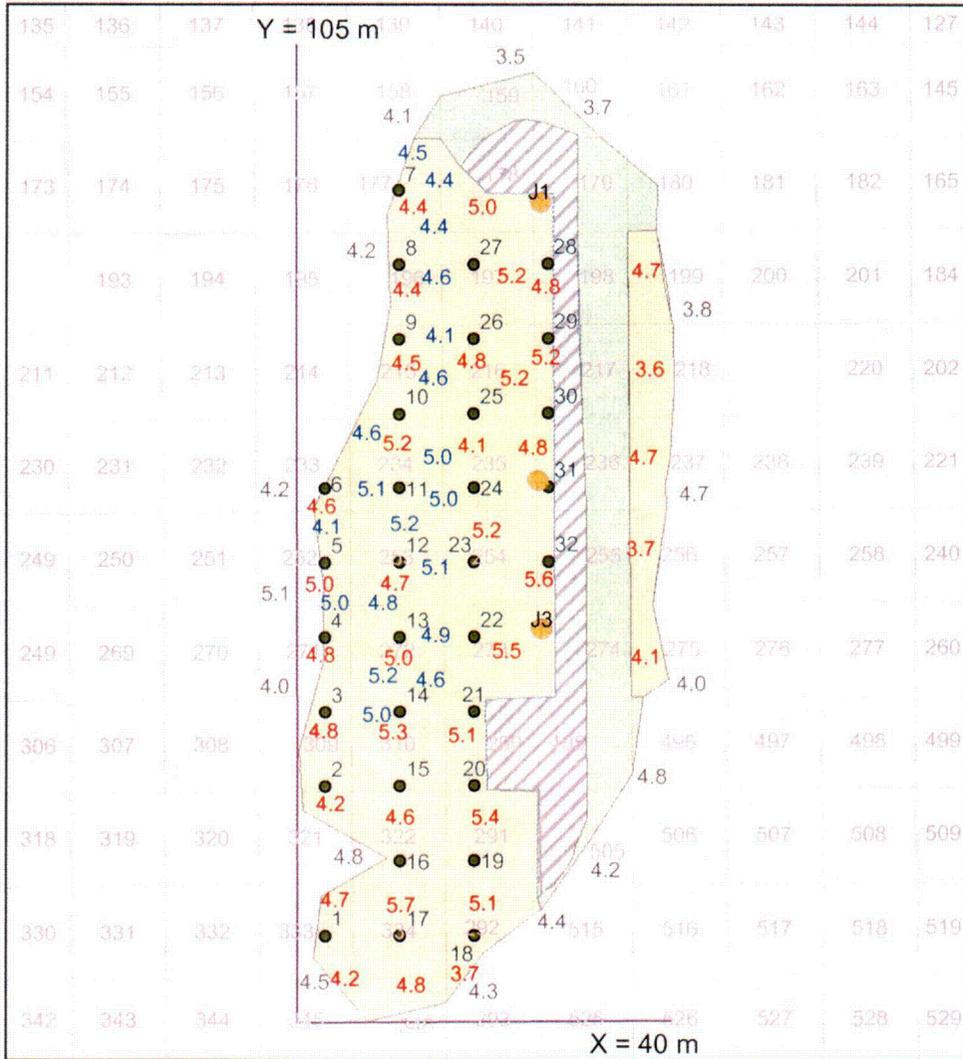
Sample No.	X Coord.	Y Coord.	Cs-137 (pCi/g)		Co-60 (pCi/g)		Sample No.	X Coord.	Y Coord.	Cs-137 (pCi/g)		Co-60 (pCi/g)	
			Activity	MDA	Activity	MDA				Activity	MDA	Activity	MDA
1	7.2	4.5	0.0846		*0.0119	0.0651	19	3.2	2.5	*0.0050	0.0503	*-0.0011	0.0665
2	7.2	0.4	0.1081		*0.0054	0.0639	20	3.2	0.4	*0.0069	0.0459	*-0.0411	0.0423
3	7.2	8.5	*-0.0026	0.0505	*0.0187	0.0693	21	3.2	8.5	*-0.0000	0.0415	*0.0104	0.0502
4	7.2	6.4	*-0.0043	0.0442	*-0.0230	0.0560	22	3.2	6.4	*-0.0173	0.0368	*-0.0004	0.0695
5	7.2	4.4	*0.0461	0.0659	*-0.0053	0.0521	23	3.2	4.4	*-0.0051	0.0394	*-0.0011	0.0652
6	7.2	2.4	*0.0116	0.0446	*0.0147	0.0596	24	3.2	2.4	*0.0131	0.0514	*-0.0455	0.0588
7	5.1	4.4	*0.0277	0.0602	*-0.0071	0.0653	25	3.2	0.4	*-0.0023	0.0365	*-0.0087	0.0506
8	5.1	6.4	*-0.0071	0.0344	*-0.0091	0.0477	26	3.2	8.5	*0.0246	0.0573	*-0.0150	0.0640
9	5.1	8.5	*-0.0149	0.0389	*0.0276	0.0655	27	3.2	6.4	*0.0300	0.0553	*0.0108	0.0630
10	5.1	0.4	0.0256		*0.0112	0.0361	28	1.5	6.4	*-0.0019	0.0403	*-0.0196	0.0589
11	5.1	2.4	*0.0040	0.0395	*-0.0019	0.0483	29	1.5	8.5	*0.0070	0.0495	*0.0044	0.0650
12	5.1	4.4	*-0.0004	0.0431	*-0.0100	0.0538	30	1.5	0.4	*0.0228	0.0486	*0.0254	0.0762
13	5.1	6.4	*0.0121	0.0492	*0.0255	0.0714	31	1.5	2.4	*-0.0095	0.0410	*-0.0009	0.0570
14	5.1	8.5	*-0.0088	0.0399	*0.0248	0.0668	32	1.5	4.4	*0.0191	0.0501	*-0.0055	0.0638
15	5.1	0.4	*0.0066	0.0512	*0.0262	0.0775	J1	10.0	4.0	*0.0062	0.0510	*0.0041	0.0483
16	5.1	2.5	0.0669		*-0.0022	0.0578	J3	10.0	8.0	*-0.0005	0.0444	*0.0102	0.0592
17	5.1	4.5	*0.0004	0.0391	*0.0105	0.0537							
18	3.2	4.5	*-0.0025	0.0408	*-0.0077	0.0556							

\*Forced-count values

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

# Surface Scan Summary

## Release Record CWC<sub>q11</sub> Base Elevation Survey of Circulating Water Piping Excavations



- Legend**
- Sumps
  - Sample Locations
  - Sump
  - Survey CWC<sub>q11</sub>
  - Near Vertical Slope
  - Equipment Hazard

0 5 10 20 Meters

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

No areas of elevated activity identified  
 Primary Scan: 100 %

Technician Signature: T. Schlueter Date: 6-2-06  
 Time: 1700

QC Verification Scan: 10 %  
 Technician Signature: J. Puchett Date: 6/2/06  
 Time: 1700

Scan investigation level not exceeded.







CWC<sub>q1</sub>1  
RM-72-1  
CHAIN-OF-CUSTODY RECORD

Sample Number	Sampling Location	Date	Time	Final Disposition of Sample
1	Grid 333 (7.2)(4.5)	6-2-06	0938	Permanent Storage
2	Grid 309 (7.2)(0.4)	6-2-06	0942	Soil Storage Locker
3	Grid 309 (7.2)(8.5)	6-2-06	0945	↓
4	Grid 271 (7.2)(6.4)	6-2-06	0947	
5	Grid 252 (7.2)(4.4)	6-2-06	0949	
5 QA Split	Grid 252 (7.2)(4.4)	6-2-06	0949	
6	Grid 233 (7.2)(2.4)	6-2-06	0954	
7	Grid 177 (5.1)(4.4)	6-2-06	0959	
8	Grid 196 (5.1)(6.4)	6-2-06	1001	
9	Grid 215 (5.1)(8.5)	6-2-06	1004	
10	Grid 215 (5.1)(0.4)	6-2-06	1007	
11	Grid 234 (5.1)(2.4)	6-2-06	1010	
12	Grid 253 (5.1)(4.4)	6-2-06	1012	
13	Grid 272(5.1)(6.4)	6-2-06	1016	
14	Grid 310 (5.1)(8.5)	6-2-06	1020	
15	Grid 310 (5.1)(0.4)	6-2-06	1024	
16	Grid 322 (5.1)(2.5)	6-2-06	1029	
17	Grid 334 (5.1)(4.5)	6-2-06	1035	
18	Grid 292 (3.2)(4.5)	6-2-06	1038	
19	Grid 291(3.2)(2.5)	6-2-06	1040	

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

1. Relinquished by: <i>J. Schreiner</i> <sup>to Soil Storage Scalant</sup>	Date 6-6-06	Time 1400	Received in good condition by: <i>Permanent Soil Storage</i>
2. Relinquished by:	Date	Time	Received in good condition by:
3. Relinquished by:	Date	Time	Received in good condition by:
4. Relinquished by:	Date	Time	Received in good condition by:

CWC<sub>q1</sub>1  
 RM-72-1  
CHAIN-OF-CUSTODY RECORD

Sample Number	Sampling Location	Date	Time	Final Disposition of Sample
20	Grid 290 (3.2)(0.4)	6-2-06	1044	Permanent Storage Locker
21	Grid 290 (3.2)(8.5)	6-2-06	1047	
22	Grid 273 (3.2)(6.4)	6-2-06	1050	
23	Grid 254 (3.2)(4.4)	6-2-06	1052	
24	Grid 235 (3.2)(2.4)	6-2-06	1055	
25	Grid 216 (3.2)(0.4)	6-2-06	1058	
26	Grid 216 (3.2)(8.5)	6-2-06	1059	
27	Grid 197 (3.2)(6.4)	6-2-06	1102	
28	Grid 198 (1.5)(6.4)	6-2-06	1120	
29	Grid 217 (1.5)(8.5)	6-2-06	1123	
30	Grid 217 (1.5)(0.4)	6-2-06	1126	
31	Grid 236 (1.5)(2.4)	6-2-06	1130	
32	Grid 255 (1.5)(4.4)	6-2-06	1135	
J1	North Sump	6-2-06	1117	✓
J3	South Sump	6-2-06	1135	

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

1. Relinquished by: <i>To Soil Storage Sealand</i> <i>J. Schuster</i>	Date 6-6-06	Time 1400	Received in good condition by: <i>Permanent Soil Storage</i>
2. Relinquished by:	Date	Time	Received in good condition by:
3. Relinquished by:	Date	Time	Received in good condition by:
4. Relinquished by:	Date	Time	Received in good condition by:

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

FINAL STATUS SURVEY: ChCg1

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

Jode L. Reed  
Assessor

7-14-06  
Date

RM-78-3  
DATA ASSESSMENT REPORT  
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2.0 DATA VALIDATION

2.1 Documentation Review:

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

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

2.2 Detection Limit Review:

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

2.3 Quality Control (QC) Data Review:

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

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DATA ASSESSMENT REPORT  
Page 4 of 8

2.4 Qualification of Data:

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

- a. Total number of statistical samples planned for the survey: 30
- b. Total number of statistical samples determined as valid: 32
- c. Calculate % Completeness:  $\frac{b \times 120}{a} = \underline{128\%}$

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

Jessie L. Reed      06-07-06  
Assessor                      Date

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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:

- 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 32
- b. Calculation of the Mean 0.0014
- c. Calculation of the Median 0.0010
- d. Calculation Standard Deviation 0.0062

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.

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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. *No investigation levels exceeded.*

3.4.2 Evaluation for Unrestricted Release

Select applicable conclusion:

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

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

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

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

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

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

Data Quality Assessment Completed:  Yes  No

Comments Statistical quantities provided in Attachment 1.

Jessie L. Reed 06-07-05  
Assessor Date

Reviews:  
[Signature] 7/26/06  
Technical Review Date  
[Signature] 7-26-06  
ES Superintendent Date  
[Signature] 8-7-06  
RP&ES Manager Date

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

**Release Record CWC<sub>q1</sub>  
Base Elevation Survey of Circulating Water Piping Excavation**

Sample Number	Cs-137 (pCi/gm)	Co-60 (pCi/gm)	Weighted Sum (SOR)	**Weighted Sum <DCGLw?	DCGL-W. Sum	Sign
1	0.0846	0.0119	0.0108	yes	0.9892	+1
2	0.1081	0.0054	0.0107	yes	0.9893	+1
3	-0.0026	0.0187	0.0056	yes	0.9944	+1
4	-0.0043	-0.0230	-0.0075	yes	0.9925	+1
5	0.0461	-0.0053	0.0022	yes	0.9978	+1
6	0.0116	0.0147	0.0056	yes	0.9944	+1
7	0.0277	-0.0071	0.0001	yes	0.9999	+1
8	-0.0071	-0.0091	-0.0034	yes	0.9966	+1
9	-0.0149	0.0276	0.0073	yes	0.9927	+1
10	0.0256	0.0112	0.0056	yes	0.9944	+1
11	0.0040	-0.0019	-0.0003	yes	0.9997	+1
12	-0.0004	-0.0100	-0.0031	yes	0.9969	+1
13	0.0121	0.0255	0.0090	yes	0.9910	+1
14	-0.0088	0.0248	0.0070	yes	0.9930	+1
15	0.0066	0.0262	0.0087	yes	0.9913	+1
16	0.0669	-0.0022	0.0049	yes	0.9951	+1
17	0.0004	0.0105	0.0033	yes	0.9967	+1
18	-0.0025	-0.0077	-0.0026	yes	0.9974	+1
19	0.0050	-0.0011	0.0001	yes	0.9999	+1
20	0.0069	-0.0411	-0.0122	yes	0.9878	+1
21	0.0000	0.0104	0.0032	yes	0.9968	+1
22	-0.0173	-0.0004	-0.0016	yes	0.9984	+1
23	-0.0051	-0.0011	-0.0008	yes	0.9992	+1
24	0.0131	-0.0455	-0.0131	yes	0.9869	+1
25	-0.0023	-0.0087	-0.0029	yes	0.9971	+1
26	0.0246	-0.0150	-0.0026	yes	0.9974	+1
27	0.0300	0.0108	0.0059	yes	0.9941	+1
28	-0.0019	-0.0196	-0.0063	yes	0.9937	+1
29	0.0070	0.0044	0.0020	yes	0.9980	+1
30	0.0228	0.0254	0.0098	yes	0.9902	+1
31	-0.0095	-0.0009	-0.0011	yes	0.9989	+1
32	0.0191	-0.0055	-0.0001	yes	0.9999	+1
Std. Dev	0.0281	0.0179	0.0062			
Mean	0.0139	0.0007	0.0014			
Median	0.0058	-0.0010	0.0010			

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 # CWCg,1

QC Package # CWCg,1

QC Measurement Type	Acceptance Criteria Met*?	Reference
<input checked="" type="checkbox"/> 1. Replicate Scan	<input checked="" type="checkbox"/> 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="checkbox"/> 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="checkbox"/> 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 # 5 = QA split; Sample # 13 & # 15 = Recounts  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Reviews:

<u>Joseph Reed</u> Evaluator	<u>06-07-06</u> Date
<u>W. Paul L.</u> Technical Review	<u>7/26/06</u> Date

**QA Verification  
Split Sample Analysis**

Date: 6/5/2006  
 QA: CWC<sub>01</sub> Base Elevation Circ. Water Piping Exc.  
 Type: Split Sample  
 Lab: In-House

Table 1

Acceptance Criteria	
Resolution	Ratio
<4	N/A
4-7	0.5-2.0
8-15	0.6-1.68
16-50	0.75-1.33
51-200	0.8-1.25
>200	0.85-1.18

		A	B	C	D	E	F	G		
Sample	Radionuclide	BRP Result Below MDA	BRP Results (pCi/g)	BRP % Error (Sigma)	BRP Resolution	Acceptance Ratio (Table 1)	Split Results Below MDA	Split Results (pCi/g)	Comparison Ratio F/A	Results in Agreement Compare G with D)
5	Co-60	<	0.0521	n/a	n/a	n/a	<	0.0640	1.23	YES
5	Cs-137	<	0.0659	n/a	n/a	n/a		0.0712	1.08	YES

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

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

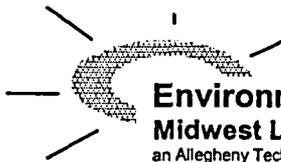


**Tritium in Soil  
Data Results  
Final Status SurveyCWC<sub>q1</sub>1**

<b>Sample Number</b>	<b>Tritium in Soil pCi/g</b>
<b>5</b>	<b>0.037</b>
<b>13</b>	<b>0.114</b>
<b>15</b>	<b>0.043</b>

Mean: 0.065  
Median: 0.043  
St. Dev: 0.043

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



**Environmental, Inc.**  
**Midwest Laboratory**  
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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. 8022-100-221-2  
 DATE: 07-07-2006  
 SAMPLES RECEIVED: 06-27-2006  
 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)
# 5 (7.2)(4.4)	06-02-06	BRSO-4189	0.037 ± 0.006	< 0.009
#13 (5.1)(6.4)	06-02-06	BRSO-4190	0.114 ± 0.010	< 0.012
#15 (5.1)(0.4)	06-02-06	BRSO-4191	0.043 ± 0.011	< 0.017

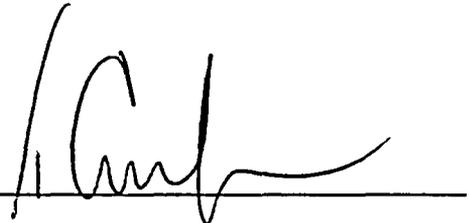
The error given is the probable counting error at 95 % confidence level.

Sincerely,



Brenda Grob,  
 Laboratory Manager

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



Tony Coorlim,  
 Quality Assurance

RM-72  
SAMPLE CHAIN-OF-CUSTODY

Revision 0  
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*CWC<sub>g1-1</sub>*

RM-72-2

CHAIN-OF-CUSTODY RECORD FOR SAMPLES SHIPPED OFF-SITE

Sample Number	Sampling Location	Date	Time	Final Disposition of Sample
5	(7.2)(4.4)	06/02/06	0949	
13	(5.1)(6.4)	06/02/06	1016	
15	(5.1)(0.4)	06/02/06	1024	

Comments: Samples from Soil Survey CWC<sub>g1</sub> to be analyzed for tritium.

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1. Relinquished by: <i>[Signature]</i>	Date 6-22-06	Time 1300	Received in good condition by:
2. Relinquished by:	Date 6-12-06	Time 1000	Received in good condition by: <i>Lucy Barck</i>

RETURN THIS FORM WITH  
ANALYSIS RESULTS TO:

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

*8022-100 -*

RM-72.doc