

Rancho Seco

Final Status Survey Summary Report

April 6, 2008

Barrel Farm Berm (soil)

Survey Unit F8430021

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Reviewed By: [Signature] Date: 4/7/08  
Lead FSS Engineer

Approved By: [Signature] Date: 5-12-08  
Dismantlement Superintendent, Radiological

## FINAL STATUS SURVEY SUMMARY REPORT

### Survey Unit:

F8430021, Barrel Farm Berm (soil)

### Survey Unit Description:

Operating History: This area was the berm that surrounded the paved area that was used for the temporary storage of packaged radioactive material as well as the segregation and consolidation of waste packages.

### Survey Unit Design Information:

The Survey Unit Design Parameters are presented in Table 1 below. The survey unit and measurement locations are depicted on the maps in Attachment 1. Direct measurement locations were determined using a random-start, fixed grid pattern and 1668 m<sup>2</sup> were scanned for approximately 33% coverage. Soil samples were collected at each direct measurement location and analyzed by HPGe detector. The instrumentation used for the survey along with the MDC values are listed in Tables 2-1 and 2-2 in Attachment 2.

**Table 1. Survey Unit Design Parameters**

<b>Survey Design Parameter</b>	<b>Value</b>	<b>Comment</b>
<b>Survey Area:</b>	F843	Barrel Farm Berm (soil)
<b>Survey Unit:</b>	0021	Open Land Area
<b>Class:</b>	2	LTP Table 5-4
<b>SU Area (m<sup>2</sup>):</b>	5000	
<b>Evaluator:</b>	Erin L. Brown	
<b>DCGL Cs137 surrogate (pCi/g):</b>	51.2	
<b>Area Factor:</b>	N/A	Class 2
<b>Design DCGL<sub>emc</sub> (pCi/g):</b>	N/A	Class 2
<b>LBGR (pCi/g):</b>	25.6	Adjusted
<b>Design Sigma (pCi/g):</b>	0.034	DTBD-06-001, Table 5-4D
<b>Type I Error:</b>	0.05	
<b>Type II Error:</b>	0.05	
<b>Nuclide:</b>	Cs137	
<b>Sample Area (m<sup>2</sup>):</b>	357.1	Class 2
<b>Total Area Scanned (m<sup>2</sup>):</b>	1668	
<b>Scan Coverage (%):</b>	33.4%	Class 2
<b>Z<sub>1-α</sub>:</b>	1.645	
<b>Z<sub>1-β</sub>:</b>	1.645	
<b>Sign P:</b>	0.99865	
<b>Calculated Relative Shift:</b>	752.9	
<b>Relative Shift Used:</b>	3	Uses 3.0 if Rel Shift >3
<b>N-Value:</b>	11	
<b>Design N-Value + 20%:</b>	14	NUREG-1575 Table 5-5
<b>Grid Spacing L:</b>	18.9	Class 2

**Survey Results:**

A total of 15 direct measurements were made in F8430021. The results including mean, median, standard deviation and range are shown in Table 2. All of the direct measurements were less than the DCGL. None of the scan measurements indicated areas of elevated activity. Soil samples were counted to the MDC shown in Table 2-1 of Attachment 2.

**Table 2. Direct Measurement Results**  
(all activity values in pCi/g)

Measurement ID	Cs137 MDA	Cs137 Activity	Uncertainty
<b>Mean:</b>		5.71E-02	
<b>Median:</b>		5.68E-02	
<b>Standard Deviation:</b>		7.67E-03	
<b>Range:</b>	4.62E-02 to 7.72E-02		
F8430021S0001SS	5.21E-02	< 5.21E-02	
F8430021S0002SS	5.68E-02	< 5.68E-02	
F8430021S0003SS	5.73E-02	< 5.73E-02	
F8430021S0004SS	5.63E-02	< 5.63E-02	
F8430021S0005SS	4.88E-02	< 4.88E-02	
F8430021S0006SS	6.07E-02	< 6.07E-02	
F8430021S0007SS	5.44E-02	< 5.44E-02	
F8430021S0008SS	6.12E-02	< 6.12E-02	
F8430021S0009SS	6.27E-02	< 6.27E-02	
F8430021S0010SS	5.79E-02	< 5.79E-02	
F8430021S0011SS	5.50E-02	< 5.50E-02	
F8430021S0012SS	4.62E-02	< 4.62E-02	
F8430021S0013SS	4.71E-02	< 4.71E-02	
F8430021S0014SS	7.72E-02	< 7.72E-02	
F8430021S0015SS	6.28E-02	< 6.28E-02	

**Survey Unit Data Assessment:**

The survey design required 15 direct measurements for the Sign Test. The critical value and the results of the Sign Test are presented in Table 3. The sample mean and median values were less than the DCGL. The sample standard deviation was less than the design standard deviation so no additional samples were required.

**Table 3. Data Assessment Results**

<b>Survey Results Parameter</b>	<b>Value</b>	<b>Comment</b>
<b>Actual Direct Measurements (N):</b>	15	
<b>Median (pCi/g):</b>	5.68E-02	
<b>Mean (pCi/g):</b>	5.71E-02	
<b>Standard Deviation (pCi/g):</b>	7.67E-03	
<b>Maximum (pCi/g):</b>	7.72E-02	
<b>Sign Test Final N Value:</b>	15	
<b>S+ Value:</b>	15	
<b>Critical Value:</b>	11	
<b>Sufficient Samples Collected:</b>	Yes	
<b>Maximum Value &lt; DCGL:</b>	Yes	
<b>Median Value &lt; DCGL:</b>	Yes	
<b>Mean Value &lt; DCGL:</b>	Yes	
<b>Maximum Value &lt; DCGL<sub>emc</sub>:</b>	N/A	Class 2
<b>Standard Deviation &lt;= Sigma:</b>	Yes	
<b>Pass the Sign Test?</b>	Yes	
<b>Reject the Null Hypothesis?</b>	Yes	
<b>The survey unit passes all conditions?</b>	Yes	

### **Survey Unit Investigations and Results:**

No investigations were required for either direct or scan measurements and no investigation results are reported.

### **ALARA Statement:**

As stated in Chapter 4 of the LTP, as long as the residual activity within the survey unit is less than the DCGL (i.e. the survey unit average activity is less than the DCGL and the EMC criterion has been met), the ALARA criterion has been met.

### **Changes in Initial Survey Unit Assumptions:**

The survey unit was designed as a Class 2 land survey and the sample results are consistent with that classification. The variability of the survey results was less than the characterization data used for survey design. No potential areas of elevated activity were detected.

### **Conclusion:**

The FSS of this survey unit was properly designed as a Class 2 survey based on Table 5-4 of the LTP. The required number of direct measurements was made and the scan coverage met the requirement of Table 5-6 of the LTP. All of the direct measurements were less than the DCGL. No investigations were required.

The direct measurement data support rejection of the null hypothesis, providing high confidence that the survey unit satisfied the release criteria and that the data quality objectives were met.

It is concluded that survey unit F8430021 meets the release criteria of 10CFR20.1402.

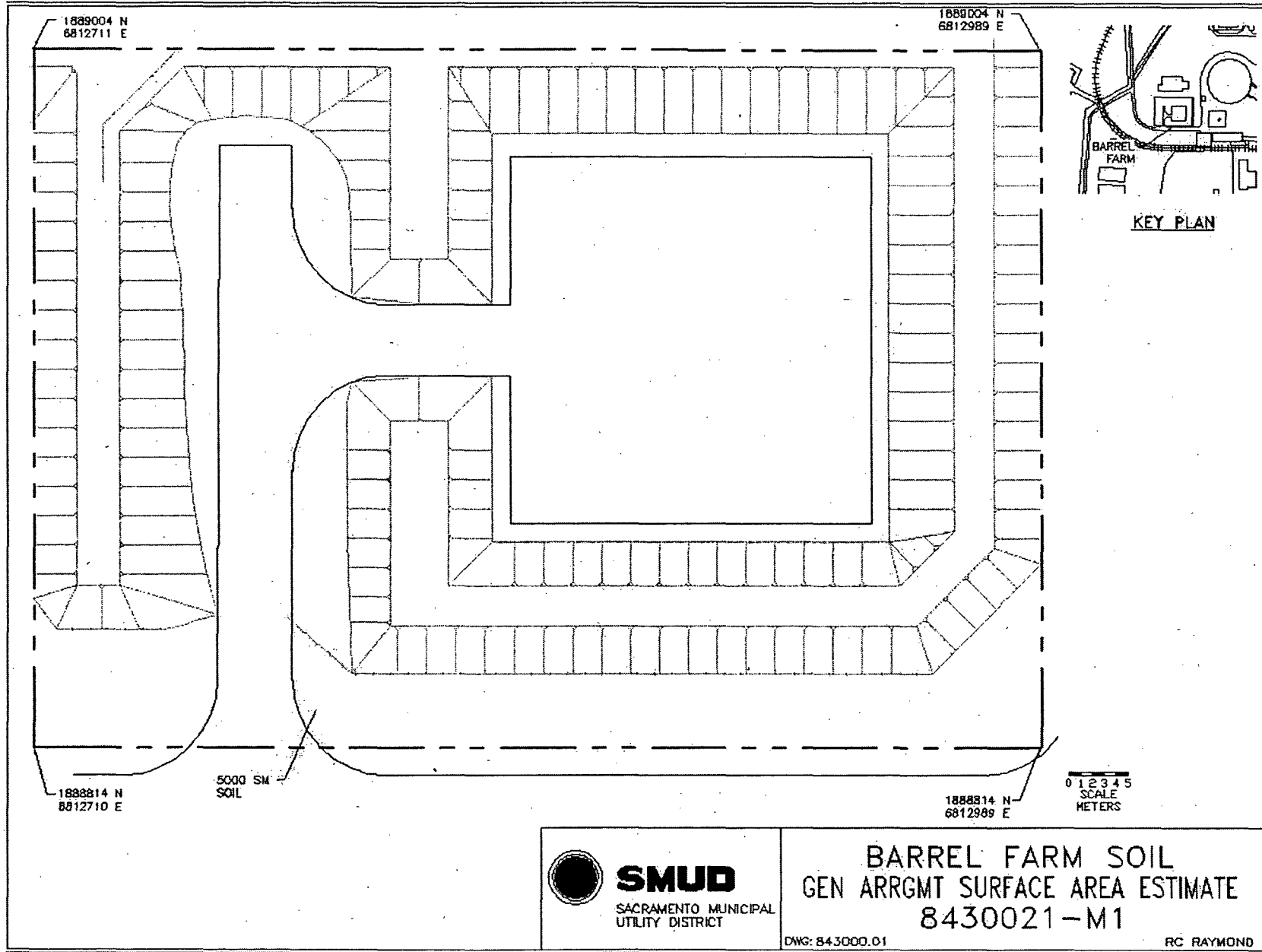
**Attachment 1**

**Maps**

**April 6, 2008**

**Survey Unit F8430021**

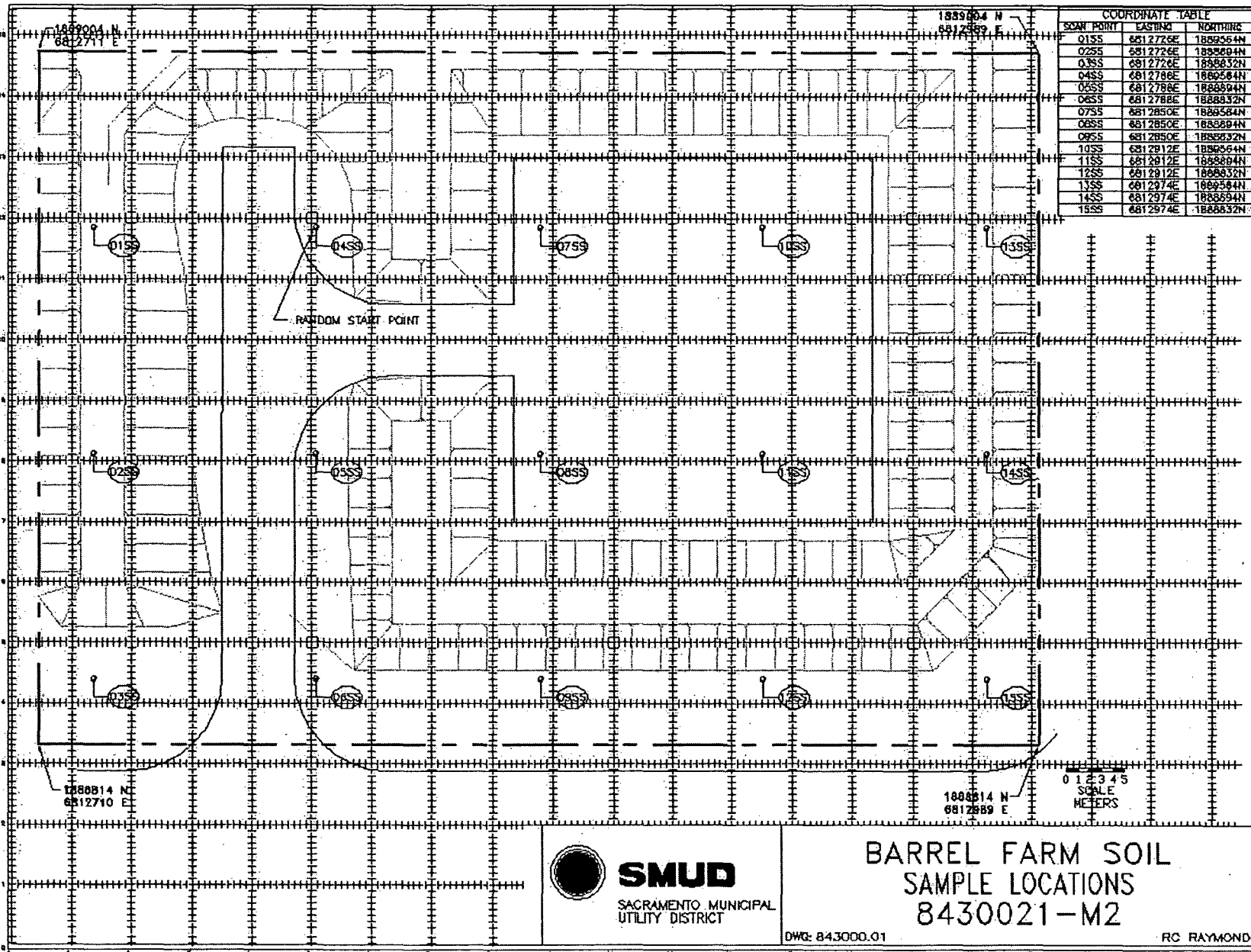




BARREL FARM SOIL  
GEN ARRGMT SURFACE AREA ESTIMATE  
8430021-M1

DWG: 843000.01

RC RAYMOND



COORDINATE TABLE		
SOIL POINT	EASTING	NORTHING
01SS	6812726E	1888564N
02SS	6812726E	1888564N
03SS	6812726E	1888532N
04SS	6812786E	1888564N
05SS	6812786E	1888594N
06SS	6812786E	1888532N
07SS	6812850E	1888564N
08SS	6812850E	1888594N
09SS	6812850E	1888532N
10SS	6812912E	1888564N
11SS	6812912E	1888594N
12SS	6812912E	1888532N
13SS	6812974E	1888564N
14SS	6812974E	1888594N
15SS	6812974E	1888532N



**SMUD**

SACRAMENTO MUNICIPAL  
UTILITY DISTRICT

**BARREL FARM SOIL  
SAMPLE LOCATIONS  
8430021-M2**

DWG: 843000.01

RC RAYMOND

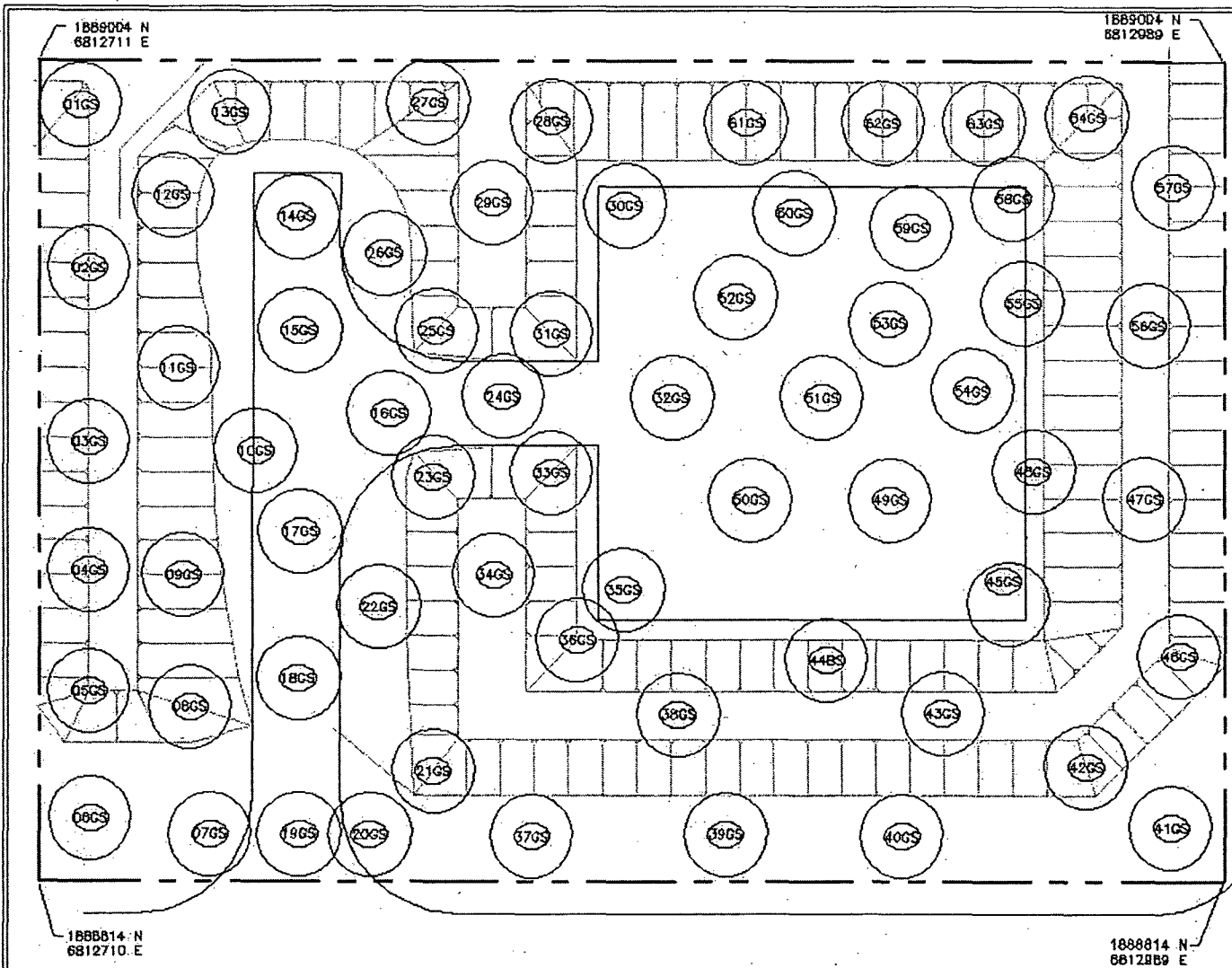
0 1 2 3 4 5  
SCALE  
METERS

1889004 N  
6812711 E

1889004 N  
6812889 E

1888814 N  
6812710 E

1888814 N  
6812889 E



COORDINATE TABLE		
SCAN POINT	EASTING	NORTHING
01GS	6812721E	1888844N
02GS	6812723E	1888856N
03GS	6812725E	1888868N
04GS	6812727E	1888880N
05GS	6812729E	1888892N
06GS	6812731E	1888904N
07GS	6812733E	1888916N
08GS	6812735E	1888928N
09GS	6812737E	1888940N
10GS	6812739E	1888952N
11GS	6812741E	1888964N
12GS	6812743E	1888976N
13GS	6812745E	1888988N
14GS	6812747E	1888999N
15GS	6812749E	1889011N
16GS	6812751E	1889023N
17GS	6812753E	1889035N
18GS	6812755E	1889047N
19GS	6812757E	1889059N
20GS	6812759E	1889071N
21GS	6812761E	1889083N
22GS	6812763E	1889095N
23GS	6812765E	1889107N
24GS	6812767E	1889119N
25GS	6812769E	1889131N
26GS	6812771E	1889143N
27GS	6812773E	1889155N
28GS	6812775E	1889167N
29GS	6812777E	1889179N
30GS	6812779E	1889191N
31GS	6812781E	1889203N
32GS	6812783E	1889215N
33GS	6812785E	1889227N
34GS	6812787E	1889239N
35GS	6812789E	1889251N
36GS	6812791E	1889263N
37GS	6812793E	1889275N
38GS	6812795E	1889287N
39GS	6812797E	1889299N
40GS	6812799E	1889311N
41GS	6812801E	1889323N
42GS	6812803E	1889335N
43GS	6812805E	1889347N
44GS	6812807E	1889359N
45GS	6812809E	1889371N
46GS	6812811E	1889383N
47GS	6812813E	1889395N
48GS	6812815E	1889407N
49GS	6812817E	1889419N
50GS	6812819E	1889431N
51GS	6812821E	1889443N
52GS	6812823E	1889455N
53GS	6812825E	1889467N
54GS	6812827E	1889479N
55GS	6812829E	1889491N
56GS	6812831E	1889503N
57GS	6812833E	1889515N
58GS	6812835E	1889527N
59GS	6812837E	1889539N
60GS	6812839E	1889551N
61GS	6812841E	1889563N
62GS	6812843E	1889575N
63GS	6812845E	1889587N
64GS	6812847E	1889599N
65GS	6812849E	1889611N
66GS	6812851E	1889623N
67GS	6812853E	1889635N
68GS	6812855E	1889647N
69GS	6812857E	1889659N
70GS	6812859E	1889671N
71GS	6812861E	1889683N
72GS	6812863E	1889695N
73GS	6812865E	1889707N
74GS	6812867E	1889719N
75GS	6812869E	1889731N
76GS	6812871E	1889743N
77GS	6812873E	1889755N
78GS	6812875E	1889767N
79GS	6812877E	1889779N
80GS	6812879E	1889791N
81GS	6812881E	1889803N
82GS	6812883E	1889815N
83GS	6812885E	1889827N
84GS	6812887E	1889839N



0 1 2 3 4 5  
SCALE  
METERS



BARREL FARM SOIL  
GAMMA SCAN  
ACTIVITY MEASUREMENT LOCATIONS  
8430021-M3  
OWG: 843000.01  
RC RAYMOND

**Attachment 2**

**Instrumentation**

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**Survey Unit F8430021**

**Table 2-1. Survey Unit Instrumentation**

<b>Instrument</b>	<b>Detector Model No.</b>	<b>Detector Serial No.</b>	<b>MDC</b>
HPGe	N/A	05047773	Soil – 0.06 pCi/g Cs-137
HPGe	N/A	05069128	Soil – 0.06 pCi/g Cs-137
ISOCS	N/A	2983947	Soil – 0.2 pCi/g Cs-137 Soil – 0.3 pCi/g Co-60

**Table 2-2. Investigation Criteria and DCGL**

<b>Instrument</b>	<b>Parameter</b>	<b>Value</b>
ISOCS	Investigation Criteria - Scan	Soil – 20 pCi/g Cs-137 Soil – 5.7 pCi/g Co-60
All	DCGL <sub>W</sub>	51.2 Cs-137 12.6 Co-60
All	DCGL <sub>EMC</sub>	N/A

**Attachment 3**

**Investigation**

**April 6, 2008**

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**(none required)**

**Attachment 4**

**Data Assessment**

**April 6, 2008**

**Survey Unit F8430021**

