Final Status Survey Planning Worksheet

GENERAL SECTION	
Survey Area #: OOL-02	Survey Unit #: 01
Survey Unit Name: Turbine Building Survey Unit 1 – Soil Locations	
FSSP Number: YNPS-FSSP-OOL-02-01-00	

PREPARATION FOR FSS ACTIVITIES

Check marks in the boxes below signify affirmative responses and completion of the action.

1.1 Files have been established for survey unit FSS records. ☒

1.2 ALARA review has been completed for the survey unit (ref Att.1). ☒ See YA-REPT-00-003-05

1.3 The survey unit has been turned over for final status survey. ☒

1.4 An initial DP-8854 walkdown has been performed and a copy of the completed Survey Unit Walkdown Evaluation is in the survey area file. ☒

1.5 Activities conducted within area since turnover for FSS have been reviewed. ☒

Based on reviewed information, subsequent walkdown: ☒ not warranted ☐ warranted

If warranted, subsequent walkdown has been performed and documented per DP-8854. ☐

OR

The basis has been provided to and accepted by the FSS Project Manager for not performing a subsequent walkdown. ☒

1.6 A final classification has been performed. ☒

Classification: CLASS 1 ☒ CLASS 2 ☐ CLASS 3 ☐

DATA QUALITY OBJECTIVES (DQO)

1.0 State the problem:

Survey Area OOL-02 is the exposed land area remaining from the demolition of the concrete pad, which is the structure remaining from the Turbine Building. The above-grade structural part of the Turbine Building has been demolished and removed. The remaining footprint includes the at-grade concrete floor slab, miscellaneous excavations which expose underlying soil and/or concrete, and the exposed soil grade.

Events and conditions during operations and decommissioning have introduced radioactive materials into the survey area. Examples include the following.

- Contaminated drain piping was removed from under the concrete pad exposing soil underneath.
- Radioactive contaminated soil from various excavations were stored in the area, contaminating the concrete pad as well as exposed soil in cratered areas. This includes the SFP excavation and the sweeper truck residues.
- These areas have been posted Radioactive Materials and Contaminated Areas.

The original HSA and surveys prompted a LTP MARSSIM Classification of 3. Since that time, OOL-02 has been reclassified to Class 1 due to the reasons listed above.

OOL-02-01 is a soil (open land) survey unit of 927 m^2. It consists of non-contiguous craters in the concrete pad which expose soil as well as a large contiguous soil area.

Final Status Survey Planning Worksheet

The problem is to determine if the residual plant related activity remaining in the soil meets the release criterion.

The planning team for this effort consists of the FSS Project Manager, FSS Radiological Engineer, FSS Field Supervisor, and FSS Technicians. The FSS Radiological Engineer will make primary decisions with the concurrence of the FSS Project Manager.

2.0 Identify the decision:

Does residual plant-related radioactivity, if present in the survey unit, exceed the LTP release criteria?

Alternative actions that may be employed are investigation, remediation and re-survey.

3.0 Identify the inputs to the decision:

Inputs to the decision include various information that will be required in the decision making process:

Sample media: soil

Types of measurements: ISOCS gamma scans, direct measurements obtained via soil sampling.

Radionuclides-of-concern: All LTP-listed radionuclides are of concern, with the primary focus on Co-60 ~~and Cs-137~~.

$DCGL_W$: Table 1 below indicates the DCGLw for Co-60 and Cs-137.

$DCGL_{SURR}$: After evaluating SFP soil sample results for both ETD as well as HTD nuclides, IX pit soil sample results, HSA data for the Turbine Building, it was concluded that the most representative radiological data relative to calculating nuclide fractions useful for developing surrogate DCGLs is the Ion Exchanger Pit soil sample (SFP-CB-02-01) obtained in October 2003. Thus the Co-60 surrogate DCGLw was calculated relative to the inferred radionuclide Ni-63, and the Cs-137 surrogate DCGLw was calculated relative to the inferred radionuclides H-3 and Sr-90.

$DCGL_{EMC}$: Based on a contaminated source area of 1 m^2 (see Table 1) for use during ISOCS scans. If necessary, the $DCGL_{EMC}$ will be recalculated if an actual area of elevated concentration is discovered with a source area greater than 1 m^2.

Table 1. MDC, $DCGL_W$, $DCGL_{EMC}$, Investigation Level: gamma analysis of soil and ISOCS measurements

Nuclide	DCGLw Soil (pCi/g) at 8.73 mrem/y	DCGLw Surrogate (pCi/g) at 8.73 mrem/y	DCGLemc Soil Surrogate (pCi/g) at 8.73 mrem/y with AF based on LTP App.6Q	Range of Soil Sample MDC (pCi/g) from desired (10% DCGL) to required (50% DCGL)	$DCGL_{EMC}$ ISOCS (based on source area = $1m^2$)		Investigation Level ISOCS (based on source area = $1m^2$, 2m, 90d collimated)
					Soil (pCi/g)	Surrogate (pCi/g)	Soil (Surrogate) (pCi/g)
Co-60	1.4E+00	1.3E+00	2.0E+00	1.4E-01 to 7.0E-01	1.5E+01	1.5E+01	0.96
Nb-94	2.5E+00			2.5E-01 to 1.2E+00	2.3E+01		
Ag-108m	2.5E+00			2.5E-01 to 1.2E+00	2.3E+01		
Sb-125	1.1E+01			1.1E+00 to 5.5E+00	1.0E+02		
Cs-134	1.7E+00			1.7E-01 to 8.0E-01	2.8E+01		
Cs-137	3.0E+00	2.8E+00	8.7E+00	3.0E-01 to 1.4E+00	6.6E+01	6.3E+01	4.10
Eu-152	3.6E+00			3.6E-01 to 1.7E+00	3.4E+01		
Eu-154	3.3E+00			3.3E-01 to 1.6E+00	3.2E+01		
Eu-155	1.4E+02			1.4E+01 to 6.9E+01	1.1E+03		

Investigation Level ISOCS: The investigation level for ISOCS scans is calculated from the surrogate $DCGL_{EMC}$ as shown by Table 1 above (ref YA-REPT-00-018-05; see Attachment 4 for the calculations). It is derived by multiplying the surrogate $DCGL_{EMC}$ associated with a 1 m^2 area by the ratio of the MDCs for the full field of view (i.e. 12.6 m^2 for a 2m height above the surface) to the 1 m^2 area at the edge of the field of view. Thus for example the calculated 0.96 pCi/g investigation level for Co-60 is sensitive enough to detect the surrogate $DCGL_{EMC}$ of 14.7 pCi/g (derived from a non-surrogate $DCGL_{EMC}$ of 15.5 pCi/g).

The SPA-3 surrogated $DCGL_{EMC}$ calculated below of 2.3 pCi/g (Co-60) and 13.7 pCi/g (Cs-137) yields a surrogated gross activity SPA-3 $DCGL_{EMC}$ of 9.2 pCi/g. The ISOCS Investigation Level is conservatively calculated for a 1 m^2 area at the edge of the 12.6 m^2 field-of-view. Thus it's detection capability is comparable to the SPA-3 $DCGL_{EMC}$.

If other LTP-listed gamma-emitting radionuclides are identified in the ISOCS assays, the investigation level will be evaluated using the same criteria.

Investigation Level SPA-3 Scans: The investigation level for SPA-3 scans is a reproducible indication above background using the audible feature with headphones.

Investigation Level Soil Sample Direct Measurements: The investigation level for soil sample direct measurements is equivalent to the $DCGL_{EMC}$ (see above) or when any reading is above the $DCGL_W$ (see above) and is a statistical outlier.

Radionuclides for analysis: All LTP nuclides with the focus on Co-60 ~~and Cs-137.~~ After evaluating SFP soil sample results for both ETD as well as HTD nuclides, IX pit soil sample results, HSA data for the Turbine Building, it was concluded that the most representative radiological data relative to calculating nuclide fractions useful for developing surrogate DCGLs is the Ion Exchanger Pit soil sample (SFP-CB-02-01) obtained in October 2003.

ISOCS Nuclide Library: Library will include all gamma emitters listed in Table 1 above.

MDCs for ETD nuclides in soil samples and ISOCS: The desired MDCs for ISOCS as well as laboratory analysis of FSS soil samples should be 10% of the $DCGL_W$. If it is impractical to achieve those, the 50% DCGL values must be achieved. Refer to Table1 above.

MDCs for HTD nuclides in soil samples: In addition to the MDC values listed in Table 1, the MDC values in Table 2 will also be transmitted to the outside laboratory via the chain-of-custody form accompanying the FSS soil samples. See Attachment 3 for the MDC calculations.

Soil Sample $DCGL_{EMC}$: As noted in Table 1 above, the surrogate soil sample ***$DCGL_{EMC}$*** has been calculated based on the geometry of the sampling grid, utilizing LTP Appendix 6Q to determine the Area Factor. The Co-60 and Cs-137 DCGLemc have been used to determine the Surrogate Gross Activity DCGLemc of 6.5 pCi/g.

Table 2. MDCs for Hard-To-Detect Nuclides in Soil Samples

Nuclide	DCGLw Soil (pCi/g) at 8.73 mrem/y	Range of MDC (pCi/g) from desired (10% DCGL) to required (50% DCGL)
H-3	1.3E+02	1.3E+01 to 6.4E+01
C-14	1.9E+00	1.9E-01 to 9.0E-01
Fe-55	1.0E+04	1.0E+03 to 5.0E+03
Ni-63	2.8E+02	2.8E+01 to 1.4E+02
Sr-90	6.0E-01	6.0E-02 to 3.0E-01
Tc-99	5.0E+00	5.0E-01 to 2.4E+00
Pu-238	1.2E+01	1.2E+00 to 5.8E+00
Pu-239	1.1E+01	1.1E+00 to 5.2E+00
Pu-241	3.4E+02	3.4E+01 to 1.7E+02
Am-241	1.0E+01	1.0E+00 to 5.0E+00
Cm-243	1.1E+01	1.1E+00 to 5.5E+00

SPA-3 Scan MDCR and MDC($fDCGL_{EMC}$): Refer to Attachment 2 for SPA-3 scan MDC values given a range of background values.

SPA-3 Surrogated $DCGL_{EMC}$: Refer to Attachment 2 for the following, which calculates:

- The SPA-3 scan Area Factors for Co-60 and Cs-137 at the LTP App. 6Q Area of Source of 25m^2 (next highest relative to 21.8 m^2 calculated source area) for this survey unit.
- The SPA-3 surrogated $DCGL_{EMC}$ of 2.3 pCi/g (Co-60) and 13.7 pCi/g (Cs-137).
- Finally yielding a surrogated gross activity SPA-3 $DCGL_{EMC}$ of 9.2 pCi/g.

Scan Survey coverage: ISOCS scans will overlap so as to provide a 100% coverage of the survey area.

QC checks and measurements: QC checks for survey instruments will be performed in accordance with DP-8534. QC checks for the ISOCS will be in accordance with DP-8869 and DP-8871.

4.0 **Define the boundaries of the survey:**

OOL-02-01 is a discontinuous array of open land areas representing:

- Craters within and around the Turbine Building concrete pad.
- Excavations after the removal of the concrete pad.
- The edge of the Turbine Building concrete pad, where concrete was removed to accommodate excavation for PCB soil or for grading purposes.

The Survey Unit OOL-02-01 is bounded by survey areas OOL-02 to the northeast, survey area OOL-01 to the west and NOL-01 and NOL-06 to the south. The survey of OOL-02-01 will be performed during daylight hours when weather conditions will not adversely affect data acquisition.

The soil sample locations will be defined by a random-start systematic grid. The ISOCS scans are 100% of the survey unit.

5.0 Develop a decision rule:

a. If all of the sample data show that the soil concentrations of all plant-related nuclides are below the DCGLs and the sum of fractions for these nuclides are less than unity, reject the null hypothesis (i.e. the Survey Unit meets the release criteria).

b. If the investigation levels are exceeded, perform an investigation survey. This may include the use of a statistical test.

c. If the average of the direct measurements is below the $DCGL_W$, but some individual measurements exceed the $DCGL_W$, then apply a statistical test as the basis for accepting or rejecting the null hypothesis.

d. If the average concentration exceeds the $DCGL_W$ then accept the null hypothesis (i.e. the Survey Area does not meet the release).

6.0 Specify tolerable limits on decision errors:

Null hypothesis: The null hypothesis (H_o), as required by MARSSIM, is stated and tested in the negative form: "Residual licensed radioactive materials in the Survey Unit exceeds the release criterion.
Probability of type I (α) error: 0.05
Probability of type II (β) error: 0.05

LBGR: 0.65 pCi/g

7.0 Optimize Design:

Type of statistical test: WRS Test ☐ Sign Test ☒

Background to be applied: media-specific ☐ ambient ☐ none ☒

If WRS test is specified, record background reference area location: _____

Basis including background reference location (if WRS test is specified): N/A

Number of direct measurements: Twenty direct measurement soil samples will be taken, with the triangular grid laid out from a random start point. In addition, biased samples will be obtained in each of the two holes which resulted from the Condensate Pumps and Heaters and the hole in the southwest corner for a total of at least 23 soil samples.

INSTRUCTIONS

1. The FSS Field Supervisor is responsible to notify QA of date and time of the pre-survey briefing, commencement of direct measurements and any other activities subject to QA notification.
2. The FSS Field Supervisor is responsible to brief on the Job Hazards Assessment.
   - 2.1. The job hazards associated with the FSS in Survey Area TBN-01 and OOL-02 are addressed in the accompanying JHA.
3. Locate and mark the measurement points at the locations shown on the attached map(s).
   - 3.1. If a measurement location is obstructed such that the measurement can not be collected, select an alternate location in accordance with DP-8856.
4. Designation of survey points including investigations are as follows.
   - 4.1. ISOCS
     - 4.1.1. Start with OOL-02-01-100-F-G and increment as needed.
     - 4.1.2. For investigations, append terms as follows.
       - 4.1.2.1. For example, if ISOCS point OOL-02-01-123-F-G is to be investigated:
         - 4.1.2.1.1. Use OOL-02-01-123-F-I-G-001 for the first ISOCS investigation survey of ISOCS point number 123.
         - 4.1.2.1.2. Use OOL-02-01-123-F-I-SC-001 for the first SPA-3 investigation scan of ISOCS point number 123.
         - 4.1.2.1.3. Use OOL-02-01-123-F-I-SS-001 for the first investigation soil sample of ISOCS point number 123.
   - 4.2. Soil Samples
     - 4.2.1. Start with OOL-02-01-001-F and increment the soil sample number as needed.
     - 4.2.2. For soil sample recounts, append "-RC" as follows.
       - 4.2.2.1. If fixed point measurement OOL-02-01-016-F is to be recounted, use OOL-02-01-016-F-RC.
     - 4.2.3. For soil sample splits, append "-S" as follows.
       - 4.2.3.1. If soil sample OOL-02-01-014-F is to be split, use OOL-02-01-014-F-S.
     - 4.2.4. For investigations, append terms as follows.
       - 4.2.4.1. For example, if soil sample OOL-02-01-014-F is to be investigated and OOL-02-01-001-F through OOL-02-01-024-F have been taken or are planned:
         - 4.2.4.1.1. Use OOL-02-01-014-F-I-G-001 for the first ISOCS investigation survey of soil sample number 014.
         - 4.2.4.1.2. Use OOL-02-01-014-F-I-SC-001 for the first SPA-3 investigation scan of soil sample number 014.
         - 4.2.4.1.3. Use OOL-02-01-025-F-I for the first investigation soil sample of soil sample number 014. NOTE that this is an incremented number with the "I" appended.
   - 4.3. Any other measurement designations will be determined by the FSS Engineer.
5. Collect soil sample direct measurements at the 20 locations specified on the map, as well as biased locations in each of the two holes which resulted from the Condensate Pumps and Heaters as well as the hole in the southwest corner, for a total of at least 23 soil samples.

5.1. Soil samples are collected in accordance with DP-8120. Remove extraneous vegetation, debris, rocks, etc prior to placing the soil into the one-liter marinelli beaker.

5.2. Soil samples are to be received and prepared in accordance with DP-8813.

5.2.1. Soil samples are to be analyzed onsite for easy-to-detect nuclides and associated MDCs as listed in Table 1 above.

5.3. One soil sample (OOL-02-01-016-F) will be counted twice and the results evaluated in accordance with DP-8864.

5.4. One soil sample (OOL-02-01-014-F) will be split:

5.4.1. The results will be evaluated in accordance with DP-8864.

5.4.2. The Chain-of-Custody will be maintained in accordance with DP-8123.

5.5. Send the following soils to the offsite lab for analysis of hard-to-detect nuclides and associated MDCs as listed in Table 2 above.

5.5.1. The split soil sample specified above.

5.5.2. Any biased soil samples obtained from holes such as the Condensate Pumps and Heaters as well as the hole in the southwest corner.

5.6. The direct measurement locations may be identified using GPS.

5.6.1. If the location cannot be determined directly using GPS, an offset will be used to describe the distance and bearing from a known GPS location.

5.6.2. Each location will be marked either prior to or at the time of the sampling.

5.6.3. The FSS Radiological Engineer or FSS Field Supervisor will guide the FSS Technician to the sample locations as necessary.

6. Scan 100% of the soil area using ISOCS at a 2m height with a 90^0 collimator at the locations specified on the ISOCS map.

6.1. Operation of the Portable ISOCS will be in accordance with DP-8871, with QC checks performed once per shift in accordance with DP-8869 and DP-8871. Resolve flags encountered prior to survey.

6.2. Lay out the grid by placing parallel rows of markers forming a square pattern at a maximum distance of 2.6m apart and a maximum of 1.3m from the edge of each surface area.

6.2.1. Angle the detector as necessary perpendicular to the scan surface and perform an analysis in accordance with DP-8871 using a preset count time sufficient to meet the MDAs referenced in the survey plan.

6.2.2. Using the 90 degree collimator, position the ISOCS detector directly above each marker 2m from the surface to be scanned.

6.2.3. Add additional scan points closer than 2.6m apart as necessary.

6.2.4. In deep holes, such as where the Condensate Heater piping was removed, ISOCS may be used to survey vertical or sloping surfaces. As with horizontal surfaces, the ISOCS should be positioned perpendicularly 2m from the surface.

6.3. Review the report ensuring that the MDAs have been met.

6.4. Review the report for identified nuclides and compare values against the $DCGL_{EMC}$.

7. Operation of the E-600 will be in accordance with DP-8535

7.1. QC checks will be performed in accordance with DP-8540.

7.2. Resolve flags encountered prior to survey.

8. All personnel participating in this survey shall be trained in accordance with DP-8868.

9. If an ISOCS measurement needs to be investigated, obtain additional radiological data as follows.
   - 9.1. Scan the ISOCS footprint with a SPA-3 at approximately 2" – 3" per second in rate-meter mode with audible on.
   - 9.2. If the SPA-3 background exceeds 17000 cpm, contact the FSS Engineer.
   - 9.3. Mark the boundaries around any detected elevated areas in the soil.
   - 9.4. Identify the boundaries on the survey map.
   - 9.5. Measure the total area of each outlined area in square centimeters.
   - 9.6. Indicate on the map and the actual location the highest identified activity among all of the elevated areas.
   - 9.7. Indicate the highest reading on the map for each elevated area.
   - 9.8. At the highest reading in each elevated area:
     - 9.8.1. First, perform and record a SPA-3 reading.
     - 9.8.2. Second, obtain a soil sample at that location.
     - 9.8.3. Third, obtain a second SPA-3 reading in the same location and manner as the first.
   - 9.9. Re-perform the ISOCS measurement.
10. If a direct measurement needs to be investigated, obtain additional radiological data as follows.
   - 10.1. Review ISOCS data which may or may not confirm that the soil sample direct measurement was in fact above the investigation level. Because direct measurement locations are usually not coincidentally directly below an ISOCS shot, one or more ISOCS shots may indicate the need to investigate a single or multiple direct measurement locations.
   - 10.2. Scan a 2-meter radius footprint around the direct measurement location using a SPA-3 at approximately 2" – 3" per second in rate-meter mode with audible on.
   - 10.3. If the background exceeds 17000 cpm, contact the FSS Engineer.
   - 10.4. Mark the boundaries around any detected elevated areas in the soil.
   - 10.5. Identify the boundaries on the survey map.
   - 10.6. Measure the total area of each outlined area in square centimeters.
   - 10.7. Indicate on the map and the actual location the highest identified activity among all of the elevated areas.
   - 10.8. Indicate the highest reading on the map for each elevated area.
   - 10.9. At the highest reading in each elevated area:
     - 10.9.1. First, perform and record a SPA-3 reading.
     - 10.9.2. Second, obtain a soil sample at that location.
     - 10.9.3. Third, obtain a second SPA-3 reading in the same location and manner as the first.
   - 10.10. Obtain a second soil sample around and below the hole from where the first soil sample was obtained.
   - 10.11. Re-perform the ISOCS measurement.
11. Document investigative actions on DPF-8856.2.
12. Upon completion of the survey:
   - 12.1. Verify that MDAs have been met.
   - 12.2. Assess nuclides listed in the LTP through the use of the unity rule.
   - 12.3. Perform an investigation as indicated by the results of the actions listed above.

Final Status Survey Planning Worksheet

NOTIFICATION POINTS	
QA notification* point(s) (y/n) YES	
(1)Date/time of initial pre-survey briefing	
_____/_____	QA Signature/Date: (1)_____
(2)Date/time of daily pre-shift briefing	
_____/_____	QA Signature/Date: (2)_____
(3)Date/time of commencement of soil samples	
_____/_____	QA Signature/Date: (3)_____
(4)Date/time of first ISOCS measurement	
_____/_____	QA Signature/Date: (4)_____
FSI point(s) (y/n) NO	
(1)	
_____/_____	
(2)	
_____/_____	
*Voice mail or email notification to Trudeau@yankeerowe.com and copy to Calsyn@yankeerowe.com .	

Prepared by_____ Date 20. OCT. 05
FSS Radiological Engineer

Reviewed by_____ Date 10/20/05
FSS Radiological Engineer

Approved by_____ Date 10/21/05
FSS Project Manager

YNPS-FSSP-OOL-02-04-00
Attachment 1

SPA-3 Scan Table

BKG(cpm)	MDCR	MDC(fDCGLemc)
7000	756	4.78E-01
8000	808	5.11E-01
9000	857	5.43E-01
10000	903	5.72E-01
11000	947	6.00E-01
12000	989	6.26E-01
13000	1030	6.52E-01
14000	1069	6.77E-01
15000	1106	7.00E-01
16000	1142	7.23E-01
17000	1177	7.46E-01
18000	1212	7.67E-01
19000	1245	7.88E-01
20000	1277	8.09E-01
21000	1309	8.29E-01
22000	1340	8.48E-01
23000	1370	8.67E-01
24000	1399	8.86E-01

Attachment 1.1
ALARA Analysis $Cost_R$
YNPS-FSSP-OOL-02-01-00

Equipment rental[1]	$1,920	2 jackhammers for a day $200 air compressor for a day $60
2 construction specialists[2]	$1,120	2X8hrsX$70/hr
1 RP Support [3]	$400	1X8hrsX$50/hr
1 Rad Waste Shipper[4]	$400	1X8hrsX$50
Total	$3,840	

[1] Based on interview of Al Stevens of Cianbro
[2] Based on interview of Al Stevens of Cianbro
[3] Based on Duratek supplying RP Personnel
[4] Based on Duratek supplying Rad Waste Shipper

Attachment 1.2
ALARA Action Levels
YNPS-FSSP-OOL-02-01-00

Calculation of ALARA Action Level (AL)

1. Removable fraction for remediation action being evaluated 1
2. Monetary discount rate 0.07 y^{-1}
3. Number of years over which the collective dose is calculated 70 y
4. Population density for the critical group 0.09 people/m^2
5. Survey unit area 1 m^2

Radionuclide	AL
H-3	<MDA
C-14	<MDA
Fe-55	<MDA
Co-60	2.68E+03
Ni-63	<MDA
Sr-90	<MDA
Nb-94	<MDA
Tc-99	<MDA
Ag-108m	<MDA
Sb-125	<MDA
Cs-134	<MDA
Cs-137	1.89E+03
Eu-152	<MDA
Eu-154	<MDA
Eu-155	<MDA
Pu-238	<MDA
Pu-239/240	<MDA
Pu-241	<MDA
Am-241	<MDA
Cm-243/244	<MDA

Sum of Als	4.57E+03

DCGL Fraction < ALARA AL?	**YES**

Attachment 1.3
DCGL Fractions for ALARA Analysis
YNSP-FSSP-OOL-02-01-00

Radionuclide	Ave. Conc (pCi/g)	DCGL *(pCi/g)*	Relative Fractio	DCGL Fraction
H-3	0.00E+00		0.00	0.0000
C-14	0.00E+00		0.00	0.0000
Fe-55	0.00E+00		0.00	0.0000
Co-60*	1.3	1.3	0.32	1.0000
Ni-63	0.00E+00		0.00	0.0000
Sr-90	0.00E+00		0.00	0.0000
Nb-94	0.00E+00		0.00	0.0000
Tc-99	0.00E+00		0.00	0.0000
Ag-108m	0.00E+00		0.00	0.0000
Sb-125	0.00E+00		0.00	0.0000
Cs-134	0.00E+00		0.00	0.0000
Cs-137*	2.8	2.8	0.68	1.0000
Eu-152	0.00E+00		0.00	0.0000
Eu-154	0.00E+00		0.00	0.0000
Eu-155	0.00E+00		0.00	0.0000
Pu-238	0.00E+00		0.00	0.0000
Pu-239	0.00E+00		0.00	0.0000
Pu-241	0.00E+00		0.00	0.0000
Am-241	0.00E+00		0.00	0.0000
Cm-243	0.00E+00		0.00	0.0000
	Total Concentration	4.10E+00		

Total DCGL Fraction	2.00

* Co-60 and Cs-137 concentrations assumed to be at the worst case (I.e. at their DCGL values). Concentrations at or above these levels automatically warrant remediation.

Attachment 1.4
ALARA Analysis Cost Estimate
YNPS-FSSP-OOL-02-01-00

Survey Area: OOL-02 **Survey Unit:** 01	
1. Cost of performing remediation work ($Cost_R$)	$3,840
2. Cost of waste disposal ($Cost_{WD}$)= (2.a) * (2.b) a. estimated waste volume 1 m^3 b. cost of waste disposal 810 $/m^3$	$810
3. Cost of workplace accident ($Cost_{ACC}$) = $3,000,000 $person^{-1}$ * 4.2 x 10^{-8} h^{-1} * (3.a) a. time to perform remediation action 32 person-hours	$4
4. Cost of traffic fatality ($Cost_{TF}$) = {$3,000,000 * 3.8 x 10^{-8} km^{-1} * (2.a) * (4.a)}/(4.b) a. total distance traveled per shipment 1481 km b. waste volume per shipment 13.6 m^3, if unknown, use 13.6m^3 as a default value	$12
5. Cost of worker dose ($Cost_{WDose}$) = $2,000 per person-rem * (5.a) * (5.b) a. worker TEDE 0.00001 rem/h b. remediation exposure time 32 person-hour	$0
$Cost_T$	$4,666

Attachment 2 SPA-3 Scan
YNPS-FSSP-OOL-02-01-00

SOIL SAMPLES CALCULATION

Inputs: MDCR = 1.38*sqrt(b)/sqrt(p)*t

Where:

b =		background counts in time t
p =	0.5	surveyor efficiency
Scan speed:	0.25	m/s
Localized contam dia:	56	cm
t(sec) det above local activity	2.24	dia / scan speed
	0.0373	time (min)

$$MDC(fDCGL_{EMC}) = MDCR\sum(f^i / E_i AF^i DCGL^i)$$

(DP-8853)

AF= Area Factor

E_i = Scanning instrument efficiency (YA-REPT-00-015-04)

f = radionuclide fraction

	Cs-137	Co-60	
E_i =	188	379	
DCGL	2.8	1.3	
f =	0.9	0.1	
AF =	3.1	1.5	LTP App 6Q

BKG (cpm)	BKG/t	MDCR (cpm)	MDC ($fDCGL_{emc}$)
7000	261.3	845	5.80E-01
8000	298.7	903	6.21E-01
9000	336.0	958	6.58E-01
10000	373.3	1010	6.94E-01
11000	410.7	1059	7.28E-01
12000	448.0	1106	7.60E-01
13000	485.3	1152	7.91E-01
14000	522.7	1195	8.21E-01
15000	560.0	1237	8.50E-01
16000	597.3	1278	8.78E-01
17000	634.7	1317	9.05E-01
18000	672.0	1355	9.31E-01
19000	709.3	1392	9.56E-01
20000	746.7	1428	9.81E-01
21000	784.0	1464	1.01E+00
22000	821.3	1498	1.03E+00
23000	858.7	1532	1.05E+00
24000	896.0	1565	1.07E+00
25000	933.3	1597	1.10E+00

Attachment 3
Derivation of MDCs for ISOCS and Soil Samples
YNPS-FSSP-OOL-02-01-00

	DCF	LTP App.6E Soil DCGL (25 mrem/y)	DCGL (8.73 mrem/y)	Range of MDC (pCi/g)
Nuclide	(mrem/y per pCi/g)	(pCi/g)	(pCi/g)	from Desired (10% DCGL) to Required (50% DCGL)
H-3	0.0679	368.1885125	128.5714	1.3E+01 to 6.4E+01
C-14	4.52	5.530973451	1.931416	1.9E-01 to 9.0E-01
Fe-55	0.000857	29171.52859	10186.7	1.0E+03 to 5.0E+03
Co-60	6.21	4.025764895	1.405797	1.4E-01 to 7.0E-01
Ni-63	0.0307	814.3322476	284.3648	2.8E+01 to 1.4E+02
Sr-90	14.5	1.724137931	0.602069	6.0E-02 to 3.0E-01
Nb-94	3.46	7.225433526	2.523121	2.5E-01 to 1.2E+00
Tc-99	1.76	14.20454545	4.960227	5.0E-01 to 2.4E+00
Ag-108m	3.44	7.26744186	2.537791	2.5E-01 to 1.2E+00
Sb-125	0.782	31.96930946	11.16368	1.1E+00 to 5.5E+00
Cs-134	5.02	4.980079681	1.739044	1.7E-01 to 8.0E-01
Cs-137	2.92	8.561643836	2.989726	3.0E-01 to 1.4E+00
Eu-152	2.43	10.28806584	3.592593	3.6E-01 to 1.7E+00
Eu-154	2.63	9.505703422	3.319392	3.3E-01 to 1.6E+00
Eu-155	0.0629	397.4562798	138.7917	1.4E+01 to 6.9E+01
Pu-238	0.748	33.42245989	11.67112	1.2E+00 to 5.8E+00
Pu-239	0.83	30.12048193	10.51807	1.1E+00 to 5.2E+00
Pu-241	0.0254	984.2519685	343.7008	3.4E+01 to 1.7E+02
Am-241	0.859	29.10360885	10.16298	1.0E+00 to 5.0E+00
Cm-243	0.785	31.84713376	11.12102	1.1E+00 to 5.5E+00

Attachment 4
Derivation of ISOCS Surrogated Adjusted Investigation Level - Soil
YNPS-FSSP-OOL-02-01-00

Nuclide	Field* MDA (pCi/g) 12.6 m2 FOV	Field* MDA (pCi/g) 1.0 m2 FOV (1m offset)	2m90d adjust factor	DCGL (8.73 mrem/y) (pCi/g)	Soil (1m2) DCGLemc (pCi/g)	Adjust Invest Level (pCi/g)	IX Pit Soil Sample Mix (pCi/g)	LTP Eq 5-6 Surrogate DCGL (pCi/g)	Surrogated Soil (1m2) DCGLemc (pCi/g)	Surrogated ISOCS (1m2) Adjust Invest Level (pCi/g)
H-3				128.57	192857.14		2.26			
Co-60	0.12	1.86	0.07	1.41	15.46	1.01	5.49	1.34	14.70	**0.96**
Ni-63				284.36	1080586.32		57.40			
Sr-90				0.60	782.69		0.18			
Nb-94			0.07	2.52	23.47	1.53	0.05	0.10	0.94	0.06
Ag-108m	0.18	2.82	0.07	2.54	23.35	1.52	7.22	2.15	19.76	1.29
Cs-134	0.19	2.90	0.07	1.74	27.82	1.81	MDA			
Cs-137	0.18	2.78	0.07	2.99	65.77	4.31	18.60	2.85	62.61	**4.10**

Attachment 5
Random Generator for QA Replicates, Splits, Recounts
YNPS-FSSP-OOL-02-01-00

OOL-02-01
Random Split Sample Determination

20 samples (minimum required)
1 number of splits required

	Selected Sample Designation
Replicate Fixed Point	**OOL-02-01-06**
Split Soil Sample	**OOL-02-01-14**
Soil Sample Recount	**OOL-02-01-16**

Random numbers generated 19-Oct-05 using Microsoft Excel.

Attachment 6
Calculation of DCGLemc, N, L for Soil
YNPS-FSSP-OOL-02-01-00

CALCULATION OF DCGLemc FOR SOIL

	Cs-137	Co-60	
DCGLw	2.8	1.3	pCi/g - Table 1
nuclide f	0.9	0.1	
L		7.3	m
Area of triangle * L2		0.433	m2
Area of diamond * L2		0.866	m2
Calc Area of Source		46.35	m2
Area of Source		50	m2 - LTP App.6Q
Area Factor	3.1	1.5	
DCGLemc	8.7	2.0	pCi/g
GA DCGLemc	6.5		pCi/g

CALCULATION OF N AND L

Survey Unit Area	927	m2
Type 1 Error	0.05	
Type 2 Error	0.05	
Stdev - Char	0.09	pCi/g - TBN TOC
DCGLw	1.3	pCi/g
LBGR	0.65	0.5*DCGLw
Shift	0.65	DCGLw - LBGR
Rel Shift	7.2	Shift / stdev
Adj Rel Shift	2	DP-8853
N	15	DP-8853 Att A
adj N	20	for mapping purposes
L (triangular grid)	7.3	m

LTP App 6Q - soil

Area of Source (m2)	Co-60 Area Factor	Cs-137 Area Factor
1	1.1E+01	2.2E+01
2	6.5E+00	1.3E+01
4	4.1E+00	8.5E+00
6	3.2E+00	6.6E+00
8	2.7E+00	5.6E+00
10	2.4E+00	4.9E+00
25	1.8E+00	3.7E+00
50	1.5E+00	3.1E+00
75	1.4E+00	2.9E+00
100	1.4E+00	2.8E+00
250	1.3E+00	2.4E+00
500	1.2E+00	2.1E+00
750	1.2E+00	1.9E+00
1000	1.1E+00	1.7E+00
2500	1.1E+00	1.6E+00
5000	1.1E+00	1.4E+00
7500	1.0E+00	1.2E+00
10000	1.0E+00	1.1E+00
11500	1.0E+00	1.1E+00
13022	1.0E+00	1.0E+00

Final Status Survey Planning Worksheet

GENERAL SECTION	
Survey Area No.: OOL-02	Survey Unit No.: 02
Survey Unit Name: Service Building Sub Slab in Survey Area OOL-02	
FSSP Number: YNPS-FSSP-OOL02-02-00	

PREPARATION FOR FSS ACTIVITIES

Check marks in the boxes below signify affirmative responses and completion of the action.

1.1 Files have been established for survey unit FSS records. ☑

1.2 ALARA review has been completed for the survey unit. ☑ Refer to YA-REPT-00-003-05

1.3 The survey unit has been turned over for final status survey. ☑

1.4 An initial DP-8854 walkdown has been performed and a copy of the completed Survey Unit Walkdown Evaluation is in the survey area file. ☑

1.5 Activities conducted within area since turnover for FSS have been reviewed. ☑

Based on reviewed information, subsequent walkdown: ☑ not warranted ☐ warranted

If warranted, subsequent walkdown has been performed and documented per DP-8854. ☐

OR

The basis has been provided to and accepted by the FSS Project Manager for not performing a subsequent walkdown. ☐

1.6 A final classification has been performed. ☑

Classification: CLASS 1 ☑ CLASS 2 ☐ CLASS 3 ☐

DATA QUALITY OBJECTIVES (DQO)

1.0 State the problem:

Survey Unit OOL-02-02 consists of an approximately 1,643 sq m surface area, and is located within the northern portion of the site Industrial Area. Sections of the survey unit were formerly within the Radiologically Controlled Area (RCA). Survey Unit 02 is a Class 1 open land area that is predominantly a level surface, with several excavation trenches. OOL-02-02 encompasses the sub slab soil – post-demolition and removal of the former Service Building and Service Building Annex. The post-demolition condition of OOL-02-02 includes some remnants of concrete associated with foundation walls along the survey unit perimeter. Subsurface systems that traverse or connect within Survey Unit 02 have been removed. The data collected under this plan will be used to determine whether or not residual plant-related radioactivity in soil of Survey Unit OOL-02-02 meets the LTP release criteria.

The problem as defined by this survey plan is to demonstrate that the years of plant operation did not result in an accumulation of plant-related radioactivity that exceeds the release criteria.

The planning team for this effort consists of the FSS Project Manager, FSS Radiological Engineer, FSS Field Supervisor, and FSS Technicians. The FSS Radiological Engineer will make primary decisions with the concurrence of the FSS Project Manager.

2.0 Identify the decision:

Does residual plant-related radioactivity, if present in the survey unit, exceed the release criteria? Alternative

actions may include no action, investigation, resurvey, remediation and reclassification.

3.0 Identify the inputs to the decision:

Sample media:	Soil
Types of measurements:	Soil samples, ISOCS Assays and gamma scans
Radionuclide-of-concern:	Cs-137, Co-60 and Sb-125

Applicable DCGL:		The DCGLs applied under this survey plan correspond to annual doses of 8.73 mrem/y (the 10-mrem/y DCGL adjusted for the dose contributions from sub-surface concrete structures and tritium in ground water).			
Nuclide	DCGL (pCi/g)	Nuclide	DCGL (pCi/g)	Nuclide	DCGL (pCi/g)
Co-60	1.4E+0	Eu-152	3.6E+0	Sr-90	6.0E-1
Nb-94	2.5E+0	Eu-154	3.3E+0	Tc-99	5.0E+0
Ag108m	2.5E+0	Eu-155	1.4E+2	Pu-238	1.2E+1
Sb125	1.1E+1	H-3	1.3E+2	Pu-239/240	1.1E+1
Cs-134	1.7E+0	C-14	1.9E+0	Pu-241	3.4E+2
Cs-137	3.0E+0	Fe-55	1.0E+4	Am-241	1.0E+1
		Ni-63	2.8E+2	Cm-243/244	1.1E+1

Fifteen samples obtained during the FSS of Survey Unit NOL-01-04 were used to provide the characterization data for Survey Unit OOL-02-02. The data is sufficient to support the FSSP for Survey Unit OOL-02-02 because NOL-01-04 is directly adjacent to Survey Unit OOL-02-02, shares the same classification and should represent a conservative data set.

Based on a review of the characterization data, plant-related radionuclides Co-60, Cs-137 and SB-125 were positively identified in more than 25% of the samples. The results from the characterization data are summarized below:

- Co-60 (5 detects) — Co-60 is present in 33% of the characterization samples. No samples exceeded the 8.73-mrem/y Co-60 DCGL (1.4 pCi/g) and only one sample exceeded 50% of this value.
- Cs-137 (4 detects) — Cs-137 is present in 27% of the characterization samples. No samples exceeded the 8.73-mrem/y Cs-137 DCGL (3.0 pCi/g) with the highest less than 5% of this value.
- SB-125 (4 detects) — Sb-125 is present in 27% of the characterization samples. No samples exceeded the 8.73-mrem/y Sb-125 DCGL (11.0 pCi/g) with the highest less than 2% of this value.
- Ag-108m (1 detect) — The activity concentration from this sample represents a small fraction (11%) of the 8.73-mrem/y Ag-108m DCGL (2.5 pCi/g). Ag-108m is not expected to pose a concern in subsequent sampling.
- Cs-134 (1 detects) — The activity concentration from this sample represents a small fraction (<3%) of the 8.73-mrem/y Cs-134 DCGL (1.7 pCi/g). Cs-134 is not expected to pose a concern in subsequent sampling.

• Eu-152 (2 detects)	The activity concentrations from these samples represent a small fraction (<5%) of the 8.73-mrem/y Eu-152 DCGL (3.6 pCi/g). Eu-152 is not expected to pose a concern in subsequent sampling.
• Other YNPS ETD	There were no other easy to detect nuclides identified >MDA.
• YNPS HTD	There were no hard to detect nuclides identified in the four samples analyzed.

The presence of all LTP-listed radionuclides (gamma-emitters, HTD beta-emitters, and TRUs) in the soil will be evaluated under this survey plan. The YNPS Chemistry Dept. will analyze each FSS soil sample for all LTP-listed gamma-emitting nuclides, except Cm-243/244. In addition, 2 FSS soil samples will be sent to an independent laboratory for analyses of gamma-emitters, HTD beta-emitting radionuclides, and alpha-emitting radionuclides, which will include Cm-243/244.

Survey Design / Release Criteria

Classification:	Class 1
Average Cs-137 concentration:	0.041 pCi/g
Standard deviation Cs-137 (σ):	0.04 pCi/g
Average Co-60 concentration:	0.107 pCi/g
Standard deviation Co-60 (σ):	0.251 pCi/g
Average Sb-125 concentration:	0.094 pCi/g
Standard deviation Sb-125 (σ):	0.044 pCi/g
Weighted sum (σ):	0.18
DCGL$_{GA}$:	~~2.45 pCi/g~~ 1 unity
Surrogate DCGL:	N/A (a surrogate DCGL will not be used)
LBGR	Initial = 0.5xDCGL = ~~1.22~~ 0.5 ~~Adjusted = 2.09~~
Number of Samples	Calculated = 15 Adjusted = 20 (professional judgment)
Survey Unit Area	1643 m^2
Grid Area (A/N)	82.15 m^2
DCGL$_{EMC}$*: Cs-137*	8.4 pCi/g (based on AF = 2.8)
DCGL$_{EMC}$*: Co-60*	1.96 pCi/g (based on AF = 1.4)
DCGL$_{EMC}$*: Sb-125*	13.2 pCi/g (based on AF = 1.2)
Investigation Level for soil samples:	• >DCGL$_{EMC}$ for either Cs-137, Co-60 or Sb-125 -or- • A sum of DCGL$_{EMC}$ fractions > 1.0 -or- • >DCGL for Cs-137, Co-60 or Sb-125 and a statistical outlier as defined in the LTP. Note: The same criteria will be applied to any other LTP-listed nuclide if identified in the soil samples.
ISOCS Assay Coverage:	100% of the surface area, ensured by overlapping field-of-views using ISOCS in the 1m-detector height with 180° open collimation configuration.

Investigation Level for ISOCS measurements:

- 0.28 pCi/g Co-60
- 1.20 pC/g Cs-137
- 1.81 pCi/g SB-125
- -or- a sum of their fractions >1.0

Note: The investigation levels for the ISOCS assays were derived by multiplying the $DCGL_{EMC}$ associated with a $1m^2$ area by the ratio of the MDC for the full field of view ($38.5m^2$) to the MDC for a $1m^2$ area at the edge of the full field of view. Additional details regarding the investigation levels for ISOCS assays can be found in YA-REPT-00-018-05. The investigation levels developed in this manner are sensitive enough to detect the $DCGL_{EMC}$ values based on the grid area.

MDCs for ISOCS measurements:

Nuclide	MDC (pCi/g)	Nuclide	MDC (pCi/g)	Nuclide	MDC (pCi/g)
Co-60	0.197	Sb-125	1.34	Eu-152	0.431
Nb-94	0.303	Cs-134	0.348	Eu-154	0.398
Ag-108m	0.305	Cs-137	0.837	Eu-155	16.7

Note: The MDCs listed in the above table are 10% of the $DCGL_{EMC}$ values (based on nuclide-specific AF value for 100 m^2 from LTP, Appendix 6Q). If the MDC values in the above table cannot be achieved in a reasonable count time, then an MDC no greater than 5X the table value must be achieved.

SPA-3 Gamma Scan Coverage:

SPA-3 scans will be performed for surface soil within the field-of-view of an ISOCS assay or surrounding a FSS sample location that exceeds the investigation criteria. The SPA-3 scan will cover 100% of the ISOCS assay total field-of-view area ($38.5m^2$) or a 1-m radius around the FSS sample location ($3.14m^2$).

Investigation Level for SPA-3 Scans:

Reproducible indication above background using SPA-3 and audible discrimination. The expected background range for SPA-3 scans is between 7,000 cpm and 15,000 cpm.

Radionuclides for analysis:

All LTP nuclides with the focus on Cs-137, Co-60 and Sb-125

MDCs for gamma analysis of soil samples:

Nuclide	10% - 50% of DCGL (pCi/g)
Co-60	1.4E-01 - 7.0E-01
Nb-94	2.5E-01 - 1.3E+00
Ag-108m	2.5E-01 - 1.3E+00
Sb-125	1.1E+00 - 5.6E+00
Cs-134	1.7E-01 - 8.7E-01
Cs-137	3.0E-01 - 1.5E+00
Eu-152	3.6E-01 - 1.8E+00
Eu-154	3.3E-01 - 1.7E+00
Eu-155	1.4E+01 - 6.9E+01

The desired MDCs in the laboratory analyses of FSS soil samples will be the 10% DCGL values. If it is impractical to achieve those, the 50% DCGL values must be achieved in the laboratory analyses of the FSS soil samples.

MDCs for HTD nuclide:

Nuclide	10% - 50% DCGL (pCi/g)
H-3	1.3E+01 - 6.4E+01
C-14	1.9E-01 - 9.7E-01
Fe-55	1.0E+03 - 5.1E+03
Ni-63	2.8E+01 - 1.4E+02
Sr-90	6.0E-02 - 3.0E-01
Tc-99	5.0E-01 - 2.5E+00
Pu-238	1.2E+00 - 5.8E+00
Pu-239	1.1E+00 - 5.3E+00
Pu-241	3.4E+01 - 1.7E+02
Am-241	1.0E+00 - 5.1E+00
Cm-243	1.1E+00 - 5.6E+00

The MDC values for difficult to detect nuclides will be conveyed to the outside laboratory via the sample chain-of-custody form DPF-8823.1 which will accompany the soil samples.

QC checks and measurements:

- QC checks for ISOCS will be in accordance with DP-8869 and DP-8871.
- QC checks for the Leica GPS will be performed in accordance with DP-8859.
- QC checks for the SPA-3 will be performed in accordance with DP-8504.
- Two QC split samples will be collected (note: this is in accordance with and exceeds DP-8852 requirements.)
- One QC recount for soil samples will be performed by the YNPS Chemistry Lab (note: this is in accordance with DP-8852 requirements.)

4.0 Define the boundaries of the survey:

- Boundaries of Survey Unit OOL-02-02 are as shown on the attached map. Survey Unit 02 is located at the north end of the site industrial area within the bounds of survey area OOL-02. Survey Unit 02 is bordered to the north by the north site industrial road, to the west by OOL-02-01, to the south by NOL-01-04 and to the east by OMB-04 and the remainder of the OOL-02 survey area.

- The survey will be performed under appropriate weather conditions (as defined by instrumentation limitations and human tolerance). Surveys may be performed on any shift of work.

5.0 Develop a decision rule:

Upon review of the FSS data collected under this survey plan:

(a) If all the sample data show that the soil concentrations of plant related nuclides are below the 8.73 mrem/year DCGLs and the sum of fractions of nuclides are below unity, then reject the null hypothesis (i.e., Survey Unit OOL-02-02 meets the release criteria).

(b) If the investigation levels are exceeded, then perform an investigation survey.

(c) If the average concentration of any LTP-listed nuclide exceeds its respective $DCGL_w$ or the average sum of fractions for any LTP-listed nuclide exceeds one, then accept the null hypothesis (i.e., Survey Unit OOL-02-02 fails to meet the release criteria).

Note: Alternate actions beyond investigations are not expected to be necessary within this survey unit.

6.0 Specify tolerable limits on decision errors:

Null hypothesis:	Residual plant-related radioactivity in Survey Unit OOL-0202 exceeds the release criteria.
Probability of type I error:	0.05
Probability of type II error:	0.05
LBGR:	The applicable soil (8.73-mrem/y) DCGL ÷ 2 DCGL~~Original~~ Unity/2 = ~~(2.45 pCi/g)/2 = 1.22~~ 0.5 ~~Adjusted = 2.09~~

7.0 Optimize Design:

Type of statistical test: WRS Test ☐ Sign Test ☑ (background will not be subtracted)

Number and Location of Samples: 20 soil samples will be collected at locations based on a random start, systematic triangular gird (refer to accompanying DPF-8853.2).

Biased samples: No biased samples will be collected under this survey plan. The determination to forgo collection of biased samples is based on: The number of statistical points was increased to 20 to provide greater statistical power and reduce grid size; this area consists of sub slab soil; systems underlying the slab have been removed and surrounding soil was excavated.

GENERAL INSTRUCTIONS

1. Where possible, measurement locations will be identified using GPS in accordance with DP-8859. Each location will be marked to assist in identifying the location. Any locations that are not suitable for soil sampling will be relocated to the nearest suitable location and documented in the field log in accordance with DP-8856.
2. Soil samples will be collected in accordance with DP-8120.
3. Chain of Custody form will be used in accordance with DP-8123 for all soil samples sent to an off-site laboratory.
4. All soil samples will be received and prepared in accordance with DP-8813. Note: Split samples to be sent to an off-site lab will not be dried prior to counting on site or shipping.
5. Collect ISOCS measurements in accordance with DP-8871 to provide 100% scan coverage of the survey unit.
6. Survey instrument: Operation of the E-600 w/SPA-3 will be in accordance with DP-8535 with QC checks performed in accordance with DP-8504. The instrument response checks shall be performed before issue and after use.
7. All SPA-3 scans will be performed with the audible feature activated. FSS Technicians will listen for upscale readings to which they will respond by slowing down or stopping the probe to distinguish between random fluctuations in the background and greater than background readings.
8. The job hazards associated with the Survey described in this package are addressed in the accompanying Job Hazard Assessment (JHA) for OOL-02-02.
9. All personnel participating in this survey shall be trained in accordance with DP-8868.

SPECIFIC INSTRUCTIONS

1. All designated measurement locations will be identified by GPS per DP-8859 or by use of reference points and tape measure as necessary. If a designated sample location is obstructed for any reason, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856. A detailed description of the alternate location will be recorded on form DPF-8856.2, the survey unit map will be annotated appropriately, and the alternate location will be conspicuously marked to facilitate re-visiting to identify and record the coordinates with GPS in accordance with DP-8859 or by measurement from a known reference point when GPS is not available.

2. Sample Requirements:

   - Collect 20 random 1-liter soil samples in accordance with DP-8120. Two of the 20 random soil samples will be analyzed as QC split samples to fulfill the QC requirement of DP-8852. The same QC split samples will also be analyzed for Hard-to-Detect nuclides in accordance with section 5.6.3.2.1 of the LTP and DP-8856.

3. Soil Sample Designation:

FSS soil samples:	OOL-02-02-001-F through OOL-02-02-020-F corresponding to FSS sample locations 001 through 020.
QC split samples:	OOL-02-02-002-F-S and OOL-02-02-010-F-S are to be designated as QC split samples. These samples will be sent to the off-site laboratory as collected from the field (i.e., without drying). YNPS Chemistry will count these samples in the "wet" condition prior to shipment to the offsite laboratory.
Recount samples:	OOL-02-02-019-F-RC is to be counted twice on site. The results will be compared in accordance with DP-8864.

4. Sample Analysis:

   - Gamma analysis will be performed on all soil samples. If any of the gamma analyses show that an investigation level has been exceeded an investigation survey will be conducted at that sample location as directed in specific instruction # 6.
   - YNPS Chemistry will analyze OOL-02-02-001-F through OOL-02-02-020-F for gamma-emitting nuclides.
   - YNPS Chemistry will analyze OOL-02-02-019-F as a sample recount. The recounted sample will possess the naming convention OOL-02-02-019-F-RC.
   - YNPS Chemistry will analyze OOL-02-02-002-F-S and OOL-02-02-010-F-S for gamma-emitting nuclides prior to being sent to the off-site laboratory. These samples will be analyzed for gamma-emitting nuclides and HTD at the off-site laboratory.
   - On-site gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan. The MDCs will be communicated to the laboratory using an attachment to the Chain-of-Custody form.

5. ISOCS Assays.

   - Collect 149 (or more as determined necessary in the field) ISOCS measurements in accordance with DP-8871 to provide 100% scan coverage of the survey unit.

- ISOCS assays are designated as OOL-02-02-101-F-G through OOL-02-02-249-F-G.

- QC checks shall be performed at least once per shift in accordance with DP-8869 and DP-8871. Resolve flags encountered prior to survey.

- ISOCS assays to be performed with 180° collimator at 1m unless otherwise directed by the FSS Engineer. Make note on the daily survey journal (DPF-8856.2) if other geometries are used.

- For ISOCS assay locations shown on map "ISOCS Scan Areas #1", position the detector downward facing. For locations shown on map "ISOCS Scan Areas #2" and for additional locations determined in the field, position the detector ~~perpendicular~~ appropriately to the area being surveyed.

- Designate additional assay locations in continuing sequence from the last number assigned to an FSS measurement. Record detailed information about additional assay locations on the daily survey journal.

- If the results on any ISOCS assay exceed an investigation level, investigate the area within the field of view (7m diameter – 38.5m^2 area for 180°-1m) for that assay as directed in Specific Instruction # 7.

- Remove standing water prior to performance of ISOCS assays. Contact the FSS Engineer for directions if conditions are such that standing water cannot be removed.

6. If the results of any FSS sample (statistical and/or biased points) analysis exceed an investigation level, perform a first level investigation as follows:

   Note: Detailed descriptions of investigation actions shall be recorded in the daily survey journal (DPF-8856.2).

   - Review ISOCS data for assays in which the sample requiring investigation may have been in the field of view.

   - Scan a 1m radius footprint around the sample location with a SPA-3 in rate-meter mode moving the detector at a speed of 0.25m or less per second, keeping the probe at a distance of approximately 3" from the surface and following a serpentine path that includes at least 3 passes across each square meter. The area of scan should be increased as necessary to bound any areas of elevated activity identified.

   - Mark the boundaries around any detected elevated areas in the soil and identify the boundaries on a survey map. Measure the total area of each outlined area in square centimeters.

   - Mark the location of the highest identified activity for each of the elevated areas in the soil and on the survey map.

   - At each of the highest identified activity area

     - Perform and record a 1-minute scaler mode SPA-3 measurement. Designate the reading as "OOL-02-02-xxx-F-SC-I" where "xxx" continues sequentially from the last number assigned to an FSS measurement.

     - Obtain a soil sample at the location. Designate the sample as "OOL-02-02-xxx-F-I" where "xxx" continues sequentially from the last number assigned to an FSS

measurement.

- Perform and record a post sample 1-minute SPA-3 measurement. Designate the reading as described above.

7. If the results of an ISOCS assay exceed an investigation level, perform a first level investigation as follows:

   Note: Detailed descriptions of investigation actions shall be recorded in the daily survey journal (DPF-8856.2).

   - Scan the ISOCS footprint with a SPA-3 in rate-meter mode moving the detector at a speed of 0.25m or less per second, keeping the probe at a distance of approximately 3" from the surface and following a serpentine path that includes at least 3 passes across each square meter.
   - Mark the boundaries around any detected elevated areas in the soil and identify the boundaries on a survey map. Measure the total area of each outlined area in square centimeters.
   - Mark the location of the highest identified activity for each of the elevated areas in the soil and on the survey map.
   - At each of the highest identified activity area
     - Perform and record a 1-minute scaler mode SPA-3 measurement. Designate the reading as "OOL-02-02-xxx-F-SC-I" where "xxx" continues sequentially from the last number assigned to an FSS measurement.
     - Obtain a soil sample at the location. Designate the sample as "OOL-02-02-xxx-F-I" where "xxx" continues sequentially from the last number assigned to an FSS measurement.
     - Perform and record a post sample 1-minute SPA-3 measurement. Designate the reading as described above.
   - Re-perform the ISOCS assay. Designate the assay as "OOL-02-02-xxx-F-G-I" where "xxx" continues sequentially from the last number assigned to an FSS measurement.

Prepared by Tozzie Date 4/24/06
FSS Radiological Engineer

Reviewed by N. TOZZIE Date 4/24/06
FSS Radiological Engineer

Approved by Date 4/24/06
FSS Project Manager

YNPS-FSSP-OOL-02-04-00
Attachment 1

SPA-3 Scan Table

BKG(cpm)	MDCR	MDC(fDCGLemc)
7000	756	4.78E-01
8000	808	5.11E-01
9000	857	5.43E-01
10000	903	5.72E-01
11000	947	6.00E-01
12000	989	6.26E-01
13000	1030	6.52E-01
14000	1069	6.77E-01
15000	1106	7.00E-01
16000	1142	7.23E-01
17000	1177	7.46E-01
18000	1212	7.67E-01
19000	1245	7.88E-01
20000	1277	8.09E-01
21000	1309	8.29E-01
22000	1340	8.48E-01
23000	1370	8.67E-01
24000	1399	8.86E-01

GENERAL SECTION

Survey Area No.: OOL-02 Survey Unit No.: 03

Survey Unit Name: Land Around Gatehouse

FSSP No.: YNPS-FSSP-OOL-02-03-00

PREPARATION FOR FSS ACTIVITIES

Check marks in the boxes below signify affirmative responses and completion of the action.

1.1	Files have been established for survey unit FSS records.	X
1.2	ALARA review has been completed for the survey unit.	X
1.3	The survey unit has been turned over for final status survey.	X
1.4	An initial DP-5554 walk down has been performed and a copy of the completed Survey Unit Walk down Evaluation is in the survey area file.	X
1.5	Activities conducted within area since turnover for FSS have been reviewed.	X
	Based on reviewed information, subsequent walk down: X not warranted _____ warranted	
	If warranted, subsequent walk down has been performed and documented per DP-8854.	_____
	OR	
	The basis has been provided to and accepted by the FSS Project Manager for not performing a subsequent walk down.	_____
1.6	A final classification has been performed. Classification: Class 3	X

DATA QUALITY OBJECTIVES (DQO)

1.0 State the problem:

Define the problem so that the focus of the survey will be unambiguous.

Members of the planning team: FSS Project manager, Radiological Engineer, Field Supervisor, and Technicians.

Primary decision maker/method: FSS Radiological Engineer with concurrence of the FSS Project Manager.

Available resources/deadlines: N/A

Concise description of problem: Release of OOL-02-03 to demonstrate compliance with YNPS LTP release criterion.

2.0 Identify the decision:

Define the question that the survey will attempt to resolve and identify alternative actions that may be taken based on the outcome of the survey.

Principal study question: Is the residual radioactivity in OOL-02-03 below the 8.73 mr/yr release criterion?

Alternative actions: If residual radioactivity in OOL-02-03 exceeds the 8.73 mr/yr release criterion, investigations will be performed, potentially resulting in remediation, reclassification or resurveys.

Decision statement: Determine whether or not OOL-02-03 satisfies the 8.73 mr/yr release criterion.

3.0 Identify the inputs to the decision:

Informational inputs needed to resolve the decision statement and environmental variables that will be measured.

Sources of information: 12 samples from historical data was sufficient to develop the DQOs for OOL-02-03. 25 new data measurements will be acquired to support DQAs.

Direct measurement technique: Soil samples will be collected and analyzed on site for all ETD LTP listed radionucluides, 1 sample will be sent to an independent lab for analyses of all LTP listed radionuclides.

Scan measurement technique: Surfaces will be scanned via a SPA-3 probe.

Sample matrix: Soil

Radionuclide(s) of concern: Based on a review of YNPS historical data, the following radionuclides are the only facility related radionuclides of concern: Co-60, Cs-137

Sample Quantity 15 (calculated) + 10 (added), for a total of 25 samples. (+1 QC)

Gridded Sample Area Size N/A (Class 3)

Sample Grid Spacing: No Grid

Detection Limits:	For direct measurements and sample analyses, Minimum Detectable Concentrations (MDCs) less than 10% of the DCGL are prefered, while MDCs up to 50% of the DCGL are acceptable. See Attachment 2 for MDC Table.
MDC (fDCGL):	The accompanying MDCR/MDC table in Attachment 1 provides MDC values, as a fraction of DCGL, for various background levels.
MDCR(surveyor):	The accompanying MDCR/MDC table in Attachment 1 provides MDCR values for various background levels.
Background Measurements:	No reference area (background) measurements are required, the Sign Test will be used.
Release criteria DCGL based on:	8.73 mr/yr for Soil. See Attachment 2 for radionuclide specific breakdown of DCGLs.

4.0 Define the boundaries of the survey:

Define the spatial and temporal boundaries that will be covered by the decision statement so data can be easily interpreted.

Temporal boundaries:	The data are used to reflect the condition of radionuclides leaching into the ground water over a period of 1,000 years. The survey may be performed under appropriate weather conditions (as defined by instrument tolerance and personnel safety) on any shift of work.
Spatial Boundaries:	YNPS has been divided into multiple survey areas and units with relatively homogeneous characteristics based on information collected during the years of facility operation, the HSA, and post remediation activities. The area of interest has been named OOL-02, and the survey unit is 03. The medium of interest is described as Soil. The radiological characteristics of this unit classify it as a Class 3 area. Which has no restrictions as a surface area guidance. The total surface area is 2,648 m2, which is in compliance with the Class 3 guidance. The maximum length is 66m, and the maximum width is 46m. Soil is surveyed to a depth of 15 cm. See included GPS coordinates and maps that demonstrate the measurement locations, the survey unit boundaries and unit relationship to site.
Detailed description of unit:	This is an area is bordered by OOL-04-04 and OOL-05-04 to the north, OOL-08-06 to the south, OOL-06-02 and OOL-06-03 to the west, OOL-10-01 and OOL-02-05 to the east. Also located inside of this survey area unit is the security gatehouse and its diesel generater (OMB-02), which is not part of this survey unit.

5.0 Develop a decision rule:

Define the parameter of interest, specify action levels, and the DCGL.

Investigation Levels:	If an investigation level below is exceeded, then perform an investigation survey.
Direct measurements:	> 50% DCGLw
Scan measurements:	Detectable over background
Parameter of interest:	If there are no investigation issues, and the the residual radioactivity in OOL-02-03 systematic samples is less than the DCGLw then the survey unit is in compliance with the release criterion (8.73 mr/yr).
Critical Value:	If the average concentration is less than DCGLw, the sum of fractions is less than 1, and less than 8 of the 25 samples are above the DCGLw, the Survey Units passes.

Survey Area No.: OOL-02	Survey Unit No.: 03
Survey Unit Name: Land Around Gatehouse	
FSSP No.: YNPS-FSSP-OOL-02-03-00	

6.0 Specify limits on decision errors:

Specify the decision maker's limits on decision errors, used to establish performance goals for the data collection design.

Null Hypothesis (H_0):	The residual radioactivity in the survey unit data is greater than the DCGLw
Tolerance for Error:	Type I Error: 0.05 (probability of rejecting the null hypothesis when it is true.) Type II Error: 0.05 (probability of accepting the null hypothesis when it is false.)
DCGLw (Unity):	1
LBGR:	0.9008 (Initial LBGR: 0.5)
Relative shift (Δ/σ):	2
Sigma (σ):	0.0496
Power of survey design:	See attachment for prospective power curve.

7.0 Optimize Design:

Type of statistical test: WRS Test _____ Sign Test ___X___

(background will not be subtracted)

Design optimization is included in the DQO process, and reflected in the data published in this plan.

Number & Location of Samples: 25 Soil samples will be collected at locations based on random and judgmental locatons (refer to accompanying DPF-8853.2). See map for specific locations.

GENERAL INSTRUCTIONS

1 Where possible, measurement locations will be identified using GPS in accordance with DP-8859. Each location will be marked to assist in identifying the location.
2 Soil samples will be collected in accordance with DP-8120.
3 Chain of Custody form will be used in accordance with DP-8123 for all soil samples sent to an off-site laboratory.
4 All soil samples will be received and prepared in accordance with DP-8813. Note: Split samples to be sent to an off-site lab will not be dried prior to counting on site or shipping.
5 Survey instrument: Operation of the E-600 w/SPA-3 will be in accordance with DP-8535 with QC checks performed in accordance with DP-8504. The instrument response checks shall be performed before issue and after use.
6 All SPA-3 scans will be performed with the audible feature activated. Listen for upscale readings and respond by slowing down or stopping the probe to distinguish between random fluctuations in the background and greater than background readings. Investigate any reproducible upscale readings as described in the specific instructions.
7 The job hazards associated with the survey described in this package are addressed in the accompanying Job Hazard Assessment (JHA) for OOL-02-03.
8 All personnel participating in this survey shall be trained in accordance with DP-8868.

SPECIFIC INSTRUCTIONS

1 *SPA-3 Scans:*

- Move the SPA-3 in rate-meter mode at a speed of 0.25m or less per second, keeping the probe at a distance of ≤ 3" from the surface and following a serpentine path that includes at least 3 passes across each square meter.
- Scan the $1m^2$ area surrounding each sample point prior to collecting a sample.
- Perform 11 biased scans 1m wide by 10m long.

2 *Scan Investigations:*

Note: *Detailed descriptions of investigation actions shall be recorded in the daily survey journal (DPF-8856.2) and locations marked on a map.*

- Scan a 1m radius footprint around the investigation location in accordance with the scan requirements above. The area of scan should be increased as necessary to bound any areas of elevated activity identified. Perform a sample investigation as noted below.

Survey Area No.: OOL-02	Survey Unit No.: 03
Survey Unit Name: Land Around Gatehouse	
FSSP No.: YNPS-FSSP-OOL-02-03-00	

3 *Sample Locations:*

All designated measurement locations will be identified by GPS per DP-8859 or by use of reference points, tape measure and compass as necessary. If a designated sample location is obstructed for any reason, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856. A detailed description of the alternate location will be recorded on form DPF-8856.2, the survey unit map will be annotated appropriately, and the alternate location will be conspicuously marked to facilitate re-visiting to identify and record the coordinates with GPS in accordance with DP-8859 or by measurement from a known reference point when a GPS is not available.

4 *Sample Requirements:* Collect 25 samples in accordance with DP-8120. ~~1~~ 2 of the 25 samples will be analyzed as a QC split sample~~s~~ to fulfill the QC requirement of DP-8852. The same QC split sample~~s~~ will be analyzed for HTD nuclides in accordance with section 5.6.3.2.1 of the LTP and DP-8856. 9/5/06

Biased samples: No biased samples will be collected.

5 *Sample Designation:*

FSS soil samples: OOL-02-03-001-F through OOL-02-03-025-F corresponding to FSS sample locations 001 through 025.

Biased soil samples: No biased samples will be collected.

QC split samples: OOL-02-03-004-F-S and OOL-02-03-008-F-S ~~A~~ are to be designated as QC split sample~~s~~. This sample~~s~~ will be sent to the off-site laboratory (do not dry). 9/5/06

Recount samples: OOL-02-03-007-F will be counted twice on site. The results will be compared in accordance with DP-8864.

6 *Sample Analysis:*

- Gamma analysis will be performed on all soil samples. If any of the gamma analyses show that an investigation level has been exceeded an investigation survey will be conducted at that sample location as directed by the radiological engineer.
- YNPS Chemistry will analyze OOL-02-03-001-F through OOL-02-03-025-F for gamma-emitting nuclides.
- YNPS Chemistry will analyze OOL-02-03-007-F as a sample recount. The recounted sample will possess the naming convention OOL-02-03-007-F-RC. 9/5/06
- YNPS Chemistry will analyze OOL-02-03-008-F-S and OOL-02-03-004-F-S for gamma-emitting nuclides prior to being sent to the off-site laboratory. These samples will be analyzed for gamma-emitting nuclides and HTD at the off-site laboratory.
- All gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan. The MDC's will be communicated to the laboratory using an attachment to the Chain-of- Custody form.

Prepared by John Grinley — FSS Radiological Engineer — Date August 14, 2006

Reviewed by Larry Dockins — FSS Radiological Engineer — Date Aug. 16, 2006

Approved by Martin Erickson — FSS Project Manager — Date 8/16/06

YNPS-FSSP-OOL-02-03-00
Attachment 1
SPA-3 Scan Tables

Max Background

BKG(cpm)	MDCR	MDC(fDCGL)
4,000	639	1.14E+00
5,000	715	1.27E+00
6,000	783	1.39E+00
7,000	845	1.50E+00
8,000	904	1.61E+00
9,000	959	1.70E+00
10,000	1,011	1.79E+00
11,000	1,060	1.88E+00
12,000	1,107	1.97E+00
13,000	1,152	2.05E+00
14,000	1,196	2.12E+00
15,000	1,238	2.20E+00
16,000	1,278	2.27E+00
17,000	1,318	2.34E+00
18,000	1,356	2.41E+00
19,000	1,393	2.47E+00
20,000	1,429	2.54E+00
21,000	1,464	2.60E+00
22,000	1,499	2.66E+00
23,000	1,533	2.72E+00
24,000	1,565	2.78E+00
25,000	1,598	2.84E+00
26,000	1,629	2.89E+00
27,000	1,660	2.95E+00
28,000	1,691	3.00E+00
30,000	1,750	3.11E+00
32,000	1,808	3.21E+00
34,000	1,863	3.31E+00
36,000	1,917	3.40E+00
38,000	1,970	3.50E+00
40,000	2,021	3.59E+00

JG 8/15/06

YNPS-FSSP-OOL-02-03-00
Attachment 2

DCGL MDC Table

Nuclide	Soil 8.73 mr/yr (pCi/g)	10% MDC DCGL	50% MDC DCGL	Easy to Detect?
Co-60	1.4E+00	1.4E-01	7.0E-01	ETD
Nb-94	2.5E+00	2.5E-01	1.3E+00	ETD
Ag-108m	2.5E+00	2.5E-01	1.3E+00	ETD
Sb-125	1.1E+01	1.1E+00	5.6E+00	ETD
Cs-134	1.7E+00	1.7E-01	8.7E-01	ETD
Cs-137	3.0E+00	3.0E-01	1.5E+00	ETD
Eu-152	3.6E+00	3.6E-01	1.8E+00	ETD
Eu-154	3.3E+00	3.3E-01	1.7E+00	ETD
Eu-155	1.4E+02	1.4E+01	6.9E+01	ETD
Am-241	1.0E+01	1.0E+00	5.1E+00	ETD
H-3	1.3E+02	1.3E+01	6.4E+01	HTD
C-14	1.9E+00	1.9E-01	9.7E-01	HTD
Fe-55	1.0E+04	1.0E+03	5.1E+03	HTD
Ni-63	2.8E+02	2.8E+01	1.4E+02	HTD
Sr-90	6.0E-01	6.0E-02	3.0E-01	HTD
Tc-99	5.0E+00	5.0E-01	2.5E+00	HTD
Pu-238	1.2E+01	1.2E+00	5.8E+00	HTD
Pu-239	1.1E+01	1.1E+00	5.3E+00	HTD
Pu-241	3.4E+02	3.4E+01	1.7E+02	HTD
Cm-243	1.1E+01	1.1E+00	5.6E+00	HTD

JCC 8/15/06

Final Status Survey Planning Worksheet

GENERAL SECTION

Survey Area #: OOL-02	Survey Unit #: 04
Survey Unit Name: Yankee Non-Rad Yard Area - SW	
FSSP Number: YNPS-FSSP-OOL02-04-00	

PREPARATION FOR FSS ACTIVITIES

Check marks in the boxes below signify affirmative responses and completion of the action.

1.1 Files have been established for survey unit FSS records. ☑

1.2 ALARA review has been completed for the survey unit. ☑ (YA-REPT-00-003-05)

1.3 The survey unit has been turned over for final status survey. ☐

1.4 An initial DP-8854 walkdown has been performed and a copy of the completed Survey Unit Walkdown Evaluation is in the survey area file. ☐

1.5 Activities conducted within area since turnover for FSS have been reviewed. ☐

Based on reviewed information, subsequent walkdown: ☐ not warranted ☐ warranted

If warranted, subsequent walkdown has been performed and documented per DP-8854. ☐

OR

The basis has been provided to and accepted by the FSS Project Manager for not performing a subsequent walkdown. ☐

1.6 A final classification has been performed. ☐

Classification: CLASS 1 ☑ CLASS 2 ☐ CLASS 3 ☐

DATA QUALITY OBJECTIVES (DQO)

1.0 Statement of problem:

Survey Unit OOL02-04 is located inside the industrial area fence, and outside the RCA. It consists of a portion of soil area that lies north of and adjacent to the turbine building and service building footprints (survey areas TBN-01, SVC-01, and SVC-03). The unit shares its north, west. And east boundaries with survey unit OOL-02-05. Its south boundary is formed with survey units OOL-02-01 and –02, and with OOL-10-01. The survey unit is approximately 1,912 m^2 (20,580 ft^2).

Historically, the unit represents part of the travel path for personnel and material entering and leaving the Yankee site. During operation of the plant, the unit was not used for storing radioactive material or processing radioactive waste. However, decommissioning waste and debris may have been stored temporarily in the unit. The unit may have been subject to low-level contamination resulting from traffic of personnel and equipment during operations and decommissioning activities. Additionally, inadvertent run-off from the RCA yard areas may have introduced low levels of contamination.

The unit has been impacted by D&D activities. Materials (soil, debris) has been placed in and removed from the unit as necessary to support decommissioning of the site.

The data collected under this plan will be used to determine whether or not residual plant-related radioactivity in soil of Survey Unit OOL02-04 meet LTP release criteria.

The planning team for this effort consists of the FSS Project Manager, FSS Radiological Engineer, FSS Field Supervisor, and FSS Technicians. The FSS Rad. Engineer will make primary decisions with the concurrence of the FSS Project Manager.

2.0 Identify the decision:

Does residual plant-related radioactivity, if present in the survey unit, exceed LTP release criteria? Alternative actions that may be implemented in this effort are investigations and remediation followed by re-surveying.

3.0 Identify the inputs to the decision:

Sample media: soil

Types of measurements: soil samples, ISOCS measurements, and supplemental SPA-3 scans.

Radionuclide-of-concern: Cs-137

Characterization data contained in the Yankee HSA were used in the FSS planning for unit OOL02-04. Cesium-137 was the most frequently identified easy-to-detect plant-related radionuclide in the surface soil samples collected within the unit in mid

to late 1990s. The decay-adjusted average Cs-137 concentration, 0.15 pCi/g, is well below the DCGL value for Cs-137 (3.0 pCi/g).

a. Soil Samples:

For planning purposes, only Cs-137 was selected as the radionuclide-of-concern for the unit. However, the presence of all LTP-listed radionuclides (gamma-emitters, HTD beta-emitters, and TRUs) in the soil will be evaluated under this survey plan. The YNPS Chemistry Dept. will analyze each soil sample for all LTP-listed gamma-emitting nuclides (excluding Am-241 and Cm-243). At least 2 soil samples will be sent to an independent laboratory for analyses of gamma-emitters and HTD radionuclides (these analyses will include Am-241 and Cm-243).

Applicable DCGL: The DCGLs applied under this survey plan correspond to annual doses of 8.73 mrem/y (the 10-mrem/y DCGL adjusted for the dose contributions from sub-surface concrete structures and tritium in ground water).

Nuclide	DCGL (pCi/g)	Nuclide	DCGL (pCi/g)	Nuclide	DCGL (pCi/g)
Co-60	1.4E+0	Eu-152	3.5E+0	Sr-90	5.9E-1
Nb-94	2.5E+0	Eu-154	3.3E+0	Tc-99	4.8E+0
Ag108m	2.5E+0	Eu-155	1.4E+2	Pu-238	1.1E+1
Sb125	1.1E+1	H-3	1.3E+2	Pu-239/240	1.0E+1
Cs-134	1.7E+0	C-14	1.9E+0	Pu-241	3.4E+2
Cs-137	3.0E+0	Fe-55	1.0E+4	Am-241	1.0E+1
		Ni-63	2.8E+2	Cm-243/244	1.1E+1

Average concentration: Cs-137 = 0.15 pCi/g

Standard deviation (σ): Cs-137 = 0.084 pCi/g

$DCGL_{EMC}$: Cs-137 = 8.4 pCi/g (based on AF = 2.8)

Investigation Level for soil samples: (a) >$DCGL_{EMC}$ for Cs-137, or

(b) a sum of $DCGL_{EMC}$ fractions >1.0, or

(c) >DCGL for Cs-137 and a statistical outlier as defined in the LTP

Note: the same criteria will be applied to any other LTP-listed if identified in the FSS soil samples.

MDCs for gamma analysis of soil samples:

Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)
Co-60	1.4E-1	Sb125	1.1E+0	Eu-152	3.5E-1
Nb-94	2.5E-1	Cs-134	1.7E-1	Eu-154	3.3E-1
Ag108m	2.5E-1	Cs-137	3.0E-1	Eu-155	1.4E+1

Note: If a target MDC value cannot be achieved in analysis, then a value no greater than 5X the listed value must be achieved in the analysis.

MDCs for analyses of HTD nuclides:

Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)
H-3	1.3E+1	Sr-90	5.9E-2	Pu-241	3.4E+1
C-14	1.9E-1	Tc-99	4.8E-1	Am-241	1.0E+0
Fe-55	1.0E+3	Pu-238	1.1E+0	Cm-243/244	1.1E+0
Ni-63	2.8E+1	Pu-239/240	1.0E+0		

Note: If a target MDC value cannot be achieved in analysis, then a value no greater than 5X the listed value must be achieved in the analysis.

b. Scan Coverage:

Scanning for 100% of the surface area within OOL02-04 will be accomplished through ISOCS measurements and supplemental SPA-3 scans. SPA-3 scans, as deemed necessary by the FFS Field Supervisor, will be performed to supplement ISOCS measurements or to provide scan coverage for surface area not included in the ISOCS measurements.

Investigation Level for ISOCS measurements: 0.7 pCi/g for Cs-137, or a sum of the fractions for detected LTP nuclides >1.0

Note: The investigation levels developed in this manner (in accordance with YA-EVAL-00-001-06) are sensitive enough to detect the $DCGL_{EMC}$ values based on the grid area.

MDCs for ISOCS measurements:

Nuclide	MDC (pCi/g)	Nuclide	MDC (pCi/g)	Nuclide	MDC (pCi/g)
Co-60	1.8E-01	Sb-125	1.0E+00	Eu-152	4.1E-01
Nb-94	2.6E-01	Cs-134	3.0E-01	Eu-154	3.8E-01
Ag-108m	2.5E-01	Cs-137	7.0E-01	Eu-155	1.1E+01

Note: The MDCs listed in the above table are equal to the investigation level for ISOCS measurements. Contact the FSSE if the MDC values in the above table cannot be achieved in a reasonable count time.

Investigation Level for scan: >background indication using an audible signal with headphones

MDCR for SPA-3: Attachment 1 provides MDCR values by various background levels.

MDC(fDCGL$_{EMC}$) for SPA-3 scans: The accompanying table also provides MDC values by various background levels.

c. QC checks and measurements: QC checks for the SPA-3 will be performed in accordance with DP-8504. QC checks for ISOCS will be in accordance with DP-8869 and DP- 8871. QC checks for the Leica GPS will be performed in accordance with DP-8859. Two QC split samples will be collected, and QC recounts for 2 soil samples will be performed by the YNPS Chemistry Lab.

4.0 Define the boundaries of the survey:

Boundaries of OOL02-04 are as shown on the attached map. The survey will be performed under appropriate weather conditions (as defined by instrumentation limitations and human tolerance). Surveys may be performed on any shift of work.

5.0 Decision Rules:

Upon review of the FSS data collected under this survey plan:

(a) If all the sample data show that the soil concentrations of LTP-listed nuclides are below the 8.73 mrem/year DCGLs and the sum of fractions of LTP-listed nuclides are below unity, then reject the null hypothesis (i.e., Survey Unit OOL-02-04 meets the release criteria).

(b) If the investigation levels are exceeded, then perform an investigation survey.

(c) If the average of the direct measurements is below the DCGL$_W$, but some individual measurements exceed the DCGL$_W$, then apply a statistical test as the basis for accepting or rejecting the null hypothesis.

(d) If the average concentration of any LTP-listed nuclide exceeds its respective DCGL$_w$ or the average sum of fractions of LTP-listed nuclides exceeds unity, then accept the null hypothesis (i.e., Survey Unit OOL-02-04 fails to meet the release criteria).

Note: Alternate actions include investigations, reclassification, remediation and resurvey.

6.0 Specify tolerable limits on decision errors:

Null hypothesis: Residual plant-related radioactivity in Survey Unit OOL02-04 exceeds the release criteria.

Probability of type I error: 0.05

Probability of type II error: 0.05

LBGR: 1.5

7.0 Optimize Design:

Type of statistical test: WRS Test ☐ Sign Test ☑

Basis including background reference location (if WRS test is specified): N/A

Number samples (per DP-8853): 15. Note: the sample number was increased by 5 for added statistical power.

Biased samples: None

GENERAL INSTRUCTIONS

1. Where possible, measurement locations will be identified using GPS in accordance with DP-8859. Each location will be marked to assist in identifying the location. Any locations that are not suitable for soil sampling will be relocated to the nearest suitable location and documented in the field log in accordance with DP-8856.
2. Standing water must be removed prior to the collection of any FSS measurement in that area.
3. Soil samples shall be collected in accordance with DP-8120.
4. Chain of Custody forms shall be used in accordance with DP-8123 for all soil samples sent to an off-site laboratory.
5. All soil samples shall be received and prepared in accordance with DP-8813. Note: Split samples to be sent to an off-site lab will not be dried prior to counting on site or shipping.
6. Collect ISOCS measurements in accordance with DP-8871 to provide 100% scan coverage of the survey unit. Perform a

SPA-3 scan for 100% of any area excluded by the ISOCS measurements.

7. Survey instrument: Operation of the E-600 w/SPA-3 will be in accordance with DP-8535 with QC checks performed in accordance with DP-8504. The instrument response checks shall be performed before issue and after use.

8. All SPA-3 scans will be performed with the audible feature activated. FSS Technicians will listen for upscale readings to which they will respond by slowing down or stopping the probe to distinguish between random fluctuations in the background and greater than background readings.

9. The job hazards associated with the survey described in this package are addressed in the accompanying Job Hazard Assessment (JHA) for OOL-02-04.

All personnel participating in this survey shall be trained in accordance with DP-8868.

SPECIFIC INSTRUCTIONS

1. All designated measurement locations will be identified by GPS per DP-8859 or by use of reference points and tape measure as necessary. If a designated sample location is obstructed for any reason, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856. A detailed description of the alternate location will be recorded on form DPF-8856.2, the survey unit map will be annotated appropriately, and the alternate location will be conspicuously marked to facilitate re-visiting to identify and record the coordinates with GPS in accordance with DP-8859 or by measurement from a known reference point when GPS is not available.

2. Sample Requirements:

   Collect 20 (1-liter) soil samples in accordance with DP-8120. Two of the 20 soil samples will be analyzed as QC split samples to fulfill the QC requirement of DP-8852. The same QC split samples will also be analyzed for Hard-to-Detect nuclides in accordance with section 5.6.3.2.1 of the LTP and DP-8856.

3. Soil Sample Designations:

FSS soil samples:	OOL-02-04-001-F through OOL-02-04-020-F corresponding to FSS sample locations 001 through 020.
QC split samples:	OOL-02-04-003-F-S and OOL-02-04-015-F-S are to be designated as QC split samples.
Recount samples:	OOL-02-04-007-F-RC and OOL-02-04-020-F-RC are to be counted twice on site. The results will be compared in accordance with DP-8864.

4. Sample Analysis:

   - Gamma analysis will be performed on all soil samples. If any of the gamma analyses show that an investigation level has been exceeded an investigation survey will be conducted at that sample location as directed in specific instruction # 6.
   - YNPS Chemistry will analyze OOL-02-04-007-F and OOL-02-04-020-F as sample recounts. The recounted samples will be identified as OOL-02-04-007-F-RC and OOL-02-04-020-F-RC, respectively.
   - On-site gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan. The MDCs will be communicated to the laboratory using an attachment to the Chain-of- Custody form.
   - The off-site laboratory will analyze OOL-02-04-003-F-S and OOL-02-04-015-F-S for all LTP nuclides. Each sample will be prepared in accordance with DP-8813, "Sample Receipt and Preparation," but the samples are not to be dried prior to shipment.

   Note: Ensure that the lid of the container is secured and sealed with electrical tape to prevent loss of moisture during shipping.

5. ISOCS Assays:

   - ISOCS investigation levels are based on specific spacing of ISOCS assays. ISOCS assays, when using the 180° collimator at 1-meter, are restricted to:

     (1) A maximum spacing of 4 meters between assay locations. A maximum spacing of 2 meters from any survey unit boundary.

   - ISOCS assays are designated as OOL-02-04-xxx-F-G where xxx corresponds to the 3-digit location indicated on survey map "ISOCS Scans".

- QC checks shall be performed daily in accordance with DP-8869 and DP-8871. Resolve flags encountered prior to survey.

- ISOCS assays to be performed with 180° collimator at 1m unless otherwise directed by the FSS Engineer. Make note on the daily survey journal (DPF-8856.2) if other geometries are used.

- Designate additional assay locations in continuing sequence from the last number assigned to an FSS measurement. Record detailed information about additional assay locations on the daily survey journal.

- If the results on any ISOCS assay exceed an investigation level, investigate the area within the field of view (7m diameter – 38.5m^2 area for 180°-1m) for that assay as directed in Specific Instruction # 7.

- Remove standing water prior to performance of ISOCS assays. Contact the FSS Engineer for directions if conditions are such that standing water cannot be removed.

6. If the results of an ISOCS assay exceed an investigation level, perform a first level investigation as follows:

   - Note: Detailed descriptions of investigation actions shall be recorded in the daily survey journal (DPF-8856.2). Scan the ISOCS footprint with a SPA-3 in rate-meter mode moving the detector at a speed of 0.25m or less per second, keeping the probe at a distance of approximately 3" from the surface and following a serpentine path that includes at least 3 passes across each square meter.

   - Mark the boundaries around any detected elevated areas in the soil and identify the boundaries on a survey map. Measure the total area of each outlined area in square centimeters.

   - Mark the location of the highest identified activity for each of the elevated areas in the soil and on the survey map.

   - At each of the highest identified activity areas:

   - Perform and record a 1-minute scaler mode SPA-3 measurement. Designate the reading as "OOL-02-04-xxx-F-SC-I" where "xxx" continues sequentially from the last number assigned to an FSS measurement.

     - Obtain a soil sample at the location. Designate the sample as "OOL-02-04-xxx-F-I" where "xxx" continues sequentially from the last number assigned to an FSS measurement.

     - Perform and record a post sample 1-minute SPA-3 measurement. Designate the reading as described above.

     - Re-perform the ISOCS assay. Designate the assay as "OOL-02-04-xxx-F-G-I" where "xxx" continues sequentially from the last number assigned to an FSS measurement.

7. If the results for any FSS soil sample exceed an investigation level, an investigation survey will be performed under a revision to this plan.

Prepared by _____ Date 8/17/06
FSS Radiological Engineer

Reviewed by _____ Date 8/17/06
FSS Radiological Engineer

Approved by _____ Date 8/17/06
FSS Project Manager

YNPS-FSSP-OOL-02-04-00
Attachment 1

SPA-3 Scan Table

BKG(cpm)	MDCR	MDC(fDCGLemc)
7000	756	8.37E-01
8000	808	8.95E-01
9000	857	9.49E-01
10000	[illegible]	[illegible]
11000	947	[illegible]
12000	[illegible]	[illegible]
13000	[illegible]	[illegible]
14000	[illegible]	[illegible]
15000	[illegible]	[illegible]
16000	[illegible]	[illegible]
17000	[illegible]	[illegible]
18000	1212	[illegible]
19000	[illegible]	[illegible]
20000	1277	[illegible]
21000	[illegible]	[illegible]
22000	[illegible]	[illegible]
23000	[illegible]	[illegible]
24000	[illegible]	[illegible]

Final Status Survey Planning Worksheet

GENERAL SECTION

Survey Area #: OOL-02	Survey Unit #: 05
Survey Unit Name: Yankee Non-Rad Yard Area - N	
FSSP Number: YNPS-FSSP-OOL02-05-00	

PREPARATION FOR FSS ACTIVITIES

Check marks in the boxes below signify affirmative responses and completion of the action.

1.1 Files have been established for survey unit FSS records. ☑

1.2 ALARA review has been completed for the survey unit. ☑ (YA-REPT-00-003-05)

1.3 The survey unit has been turned over for final status survey. ☑

1.4 An initial DP-8854 walkdown has been performed and a copy of the completed Survey Unit Walkdown Evaluation is in the survey area file. ☑

1.5 Activities conducted within area since turnover for FSS have been reviewed. ☑

Based on reviewed information, subsequent walkdown: ☑ not warranted ☐ warranted

If warranted, subsequent walkdown has been performed and documented per DP-8854. ☐

OR

The basis has been provided to and accepted by the FSS Project Manager for not performing a subsequent walkdown. ☐

1.6 A final classification has been performed. ☑

Classification: CLASS 1 ☐ CLASS 2 ☑ CLASS 3 ☐

DATA QUALITY OBJECTIVES (DQO)

1.0 Statement of problem:

Survey Unit OOL02-05 is located inside the industrial area fence, and outside the RCA. It consists of a portion of soil area located to the north of survey unit OOL-02-04. The survey unit is approximately 5,953 m^2 (64,075 ft^2).

A portion of the unit historically represents part of the travel path for personnel and material entering and leaving the Yankee site. During operation of the plant, the unit was not used for storing radioactive material or processing radioactive waste. However, the unit may have been subject to low-level contamination resulting from traffic of personnel and equipment during operations and decommissioning activities. Additionally, inadvertent run-off from the RCA yard areas may have introduced low levels of contamination. Characterization soil samples indicated that the soil concentrations of plant-related radioactivity is not expected to exceed DCGLs. Therefore, the unit has been classified as a Class 2 unit.

The data collected under this plan will be used to determine whether or not residual plant-related radioactivity in soil of Survey Unit OOL02-05 meet LTP release criteria.

The planning team for this effort consists of the FSS Project Manager, FSS Radiological Engineer, FSS Field Supervisor, and FSS Technicians. The FSS Rad. Engineer will make primary decisions with the concurrence of the FSS Project Manager.

2.0 Identify the decision:

Does residual plant-related radioactivity, if present in the survey unit, exceed LTP release criteria? Alternative actions that may be implemented in this effort are investigations and remediation followed by re-surveying.

3.0 Identify the inputs to the decision:

Sample media: soil

Types of measurements: soil samples and SPA-3 scans.

Radionuclide-of-concern: Cs-137

Characterization data contained in the Yankee HSA were used in the FSS planning for unit OOL02-05. Cesium-137 was the most frequently identified easy-to-detect plant-related radionuclide in the surface soil samples collected within the unit in mid to late 1990s. The decay-adjusted average Cs-137 concentration, 0.15 pCi/g, is well below the DCGL value for Cs-137 (3.0

pCi/g).

a. Soil Samples:

For planning purposes, Cs-137 was selected as the radionuclide-of-concern for the unit. However, the presence of all LTP-listed radionuclides (gamma-emitters, HTD beta-emitters, and TRUs) in the soil will be evaluated under this survey plan. The YNPS Chemistry Dept. will analyze each soil sample for all LTP-listed gamma-emitting nuclides (excluding Am-241 and Cm-243). Two soil samples will be sent to an independent laboratory for analyses of gamma-emitters and HTD radionuclides (these analyses will include Am-241 and Cm-243).

Applicable DCGL: The DCGLs applied under this survey plan correspond to annual doses of 8.73 mrem/y (the 10-mrem/y DCGL adjusted for the dose contributions from sub-surface concrete structures and tritium in ground water).

Nuclide	DCGL (pCi/g)	Nuclide	DCGL (pCi/g)	Nuclide	DCGL (pCi/g)
Co-60	1.4E+0	Eu-152	3.5E+0	Sr-90	5.9E-1
Nb-94	2.5E+0	Eu-154	3.3E+0	Tc-99	4.8E+0
Ag108m	2.5E+0	Eu-155	1.4E+2	Pu-238	1.1E+1
Sb125	1.1E+1	H-3	1.3E+2	Pu-239/240	1.0E+1
Cs-134	1.7E+0	C-14	1.9E+0	Pu-241	3.4E+2
Cs-137	3.0E+0	Fe-55	1.0E+4	Am-241	1.0E+1
		Ni-63	2.8E+2	Cm-243/244	1.1E+1

Average concentration: Cs-137 = 0.15 pCi/g

Standard deviation (σ): Cs-137 = 0.19 pCi/g

$DCGL_{EMC}$: Cs-137 = 6.3 pCi/g (based on AF = 2.1)

Investigation Level for soil samples: (a) >$DCGL_{EMC}$ for Cs-137, or

(b) a sum of $DCGL_{EMC}$ fractions >1.0, or

(c) >DCGL for Cs-137 and a statistical outlier as defined in the LTP

Note: the same criteria will be applied to any other LTP-listed if identified in the FSS soil samples.

MDCs for gamma analysis of soil samples:

Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)
Co-60	1.4E-1	Sb125	1.1E+0	Eu-152	3.5E-1
Nb-94	2.5E-1	Cs-134	1.7E-1	Eu-154	3.3E-1
Ag108m	2.5E-1	Cs-137	3.0E-1	Eu-155	1.4E+1

Note: If a target MDC value cannot be achieved in analysis, then a value no greater than 5X the listed value must be achieved in the analysis.

MDCs for analyses of HTD nuclides:

Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)
H-3	1.3E+1	Sr-90	5.9E-2	Pu-241	3.4E+1
C-14	1.9E-1	Tc-99	4.8E-1	Am-241	1.0E+0
Fe-55	1.0E+3	Pu-238	1.1E+0	Cm-243/244	1.1E+0
Ni-63	2.8E+1	Pu-239/240	1.0E+0		

Note: If a target MDC value cannot be achieved in analysis, then a value no greater than 5X the listed value must be achieved in the analysis.

b. Scan Coverage: (as a minimum, 10% - 50% of the unit surface area)

Scanning within OOL02-05 will be accomplished using SPA-3/E600 scans. SPA-3 scans will be performed primarily on the principle travel paths for personnel, equipment and material through the unit and may also include biased scans of non-perimeter areas, as deemed necessary by the FFS Field Supervisor.

Investigation Level for SPA-3 scan: >background indication using an audible signal with headphones

MDCR for SPA-3: Attachment 1 provides MDCR values by various background levels.

MDC(f$DCGL_{EMC}$) for SPA-3 scans: Attachment 1 also provides MDC values by various background levels.

c. QC checks and measurements: QC checks for the SPA-3 will be performed in accordance with DP-8504. QC checks for the Leica GPS will be performed in accordance with DP-8859. Two QC split samples will be collected, and QC recounts for 2 soil samples will be performed by the YNPS Chemistry Lab.

4.0 Define the boundaries of the survey:

Boundaries of OOL02-05 are as shown on the attached map. The survey will be performed under appropriate weather conditions (as defined by instrumentation limitations and human tolerance). Surveys may be performed on any shift of work.

5.0 Decision Rules:

Upon review of the FSS data collected under this survey plan:

(a) If all the sample data show that the soil concentrations of LTP-listed nuclides are below the $DCGL_w$ and the sum of fractions of LTP-listed nuclides are below unity, then reject the null hypothesis (i.e., Survey Unit OOL-02-05 meets the release criteria).

(b) If the investigation levels are exceeded, then perform an investigation survey.

(c) If the average concentration of any LTP-listed nuclide exceeds its respective $DCGL_w$ or the average sum of fractions of LTP-listed nuclides exceeds unity, then accept the null hypothesis (i.e., Survey Unit OOL-02-05 fails to meet the release criteria).

Note: Alternate actions include investigations, reclassification, remediation and resurvey.

6.0 Specify tolerable limits on decision errors:

Null hypothesis: Residual plant-related radioactivity in Survey Unit OOL02-05 exceeds the release criteria.

Probability of type I error: 0.05

Probability of type II error: 0.05

LBGR: 1.5 adjusted LBGR 2.6216 MR 8-23-06

7.0 Optimize Design:

Type of statistical test: WRS Test ☐ Sign Test ☑

Basis including background reference location (if WRS test is specified): N/A

Number samples (per DP-8853): 15 + 5 samples for added statistical power.

Biased samples: None

GENERAL INSTRUCTIONS

1. Where possible, measurement locations will be identified using GPS in accordance with DP-8859. Each location will be marked to assist in identifying the location. Any locations that are not suitable for soil sampling will be relocated to the nearest suitable location and documented in the field log in accordance with DP-8856.
2. Standing water must be removed prior to the collection of any FSS measurement in that area.
3. Soil samples shall be collected in accordance with DP-8120.
4. Chain of Custody forms shall be used in accordance with DP-8123 for all soil samples sent to an off-site laboratory.
5. All soil samples shall be received and prepared in accordance with DP-8813. Note: Split samples to be sent to an off-site lab will not be dried prior to counting on site or shipping.
6. Survey instrument: Operation of the E-600 w/SPA-3 will be in accordance with DP-8535 with QC checks performed in accordance with DP-8504. The instrument response checks shall be performed before issue and after use.
7. All SPA-3 scans will be performed with the audible feature activated. FSS Technicians will listen for upscale readings to which they will respond by slowing down or stopping the probe to distinguish between random fluctuations in the background and greater than background readings.
8. The job hazards associated with the survey described in this package are addressed in the accompanying Job Hazard Assessment (JHA) for OOL-02-05.

All personnel participating in this survey shall be trained in accordance with DP-8868.

SPECIFIC INSTRUCTIONS

1. All designated measurement locations will be identified by GPS per DP-8859 or by use of reference points and tape measure as necessary. If a designated sample location is obstructed for any reason, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856. A detailed description of the alternate

location will be recorded on form DPF-8856.2, the survey unit map will be annotated appropriately, and the alternate location will be conspicuously marked to facilitate re-visiting to identify and record the coordinates with GPS in accordance with DP-8859 or by measurement from a known reference point when GPS is not available.

2. Sample Requirements:

   Collect 20 (1-liter) soil samples in accordance with DP-8120. Two of the 20 soil samples will be analyzed as QC split samples to fulfill the QC requirement of DP-8852. The same QC split samples will also be analyzed for Hard-to-Detect nuclides in accordance with section 5.6.3.2.1 of the LTP and DP-8856.

3. Soil Sample Designations:

FSS soil samples:	OOL-02-05-001-F through OOL-02-05-020-F corresponding to FSS sample locations 001 through 020.
QC split samples:	OOL-02-05-006-F-S and OOL-02-05-008-F-S are to be designated as QC split samples.
Recount samples:	OOL-02-05-002-F-RC and OOL-02-05-013-F-RC are to be counted twice on site. The results will be compared in accordance with DP-8864.

4. Sample Analysis:

   - Gamma analysis will be performed on all soil samples. If any of the gamma analyses show that an investigation level has been exceeded an investigation survey will be conducted under a revision to this survey plan.
   - YNPS Chemistry will analyze OOL-02-05-002-F and OOL-02-05-013-F as sample recounts. The recounted samples will be identified as OOL-02-05-002-F-RC and OOL-02-05-013-F-RC, respectively.
   - On-site gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan. The MDCs will be communicated to the laboratory using an attachment to the Chain-of- Custody form.
   - The off-site laboratory will analyze OOL-02-05-006-F-S and OOL-02-05-008-F-S for all LTP nuclides. Each sample will be prepared in accordance with DP-8813, "Sample Receipt and Preparation," but the samples are not to be dried prior to shipment.

   Note: Ensure that the lid of the container is secured and sealed with electrical tape to prevent loss of moisture during shipping.

5. SPA-3 scans: SPA-3 scans, using a probe speed of no greater than 0.1m/s (approximately 4 inches/s), will be performed primarily on the principle travel paths for personnel, equipment and material through the unit. Additionally, as identified by the FFS Field Supervisor, SPA-3 scans will be performed for locations such as drainage paths and collection points.

   - The SPA-3 scan will be observed by the FSS Field Supervisor and documented on DPF-8856.2. Documentation should include the location of any non-perimeter SPA-3 scan and an estimate of the scanned area.
   - For the SPA-3 scans, a first level investigation may be conducted to determine if the observed increase above background levels in the scan measurement is due to the presence of rocks. SPA-3 scans performed in non-impacted areas have shown that rock formations accounted for increased count rates. If it can be demonstrated that the presence of rocks is the cause of an increased count rate during a SPA-3 scan, record that finding on form DPF-8856.2. If it is demonstrated that the rocks do not account for an above background SPA-3 measurement, a soil sample will be collected at the point of the highest SPA-3 reading in the scanned area. Obtain a (pre-soil sampling and post soil sampling) 1 minute scalar reading at point of the highest SPA-3 reading in the scanned area. Detailed descriptions of investigation actions will be recorded on form DPF-8856.2 and the location of the above background scan and sample will be recorded on the survey map. The location description must include sufficient detail to revisit the spot at a later time. If a soil sample is collected during the first level investigation, the sample designation will continue the soil sample numbering sequence plus the letter "I" (for investigation).

Prepared by _____ Date 8/23/2006
FSS Radiological Engineer

Reviewed by _____ Date 8-23-06
FSS Radiological Engineer

Approved by _____ Date 8/23/06
FSS Project Manager

YNPS-FSSP-OOL-02-05-00
Attachment 1
SPA-3 Scan Tables

Max Background

BKG(cpm)	MDCR	MDC(fDCGL)
4,000	404	7.16E-01
5,000	452	8.01E-01
6,000	495	8.78E-01
7,000	535	9.48E-01
8,000	571	1.01E+00
9,000	606	1.08E+00
10,000	639	1.13E+00
11,000	670	1.19E+00
12,000	700	1.24E+00
13,000	728	1.29E+00
14,000	756	1.34E+00
15,000	783	1.39E+00
16,000	808	1.43E+00
17,000	833	1.48E+00
18,000	857	1.52E+00
19,000	881	1.56E+00
20,000	904	1.60E+00
21,000	926	1.64E+00
22,000	948	1.68E+00
23,000	969	1.72E+00
24,000	990	1.76E+00
25,000	1,010	1.79E+00
26,000	1,030	1.83E+00
27,000	1,050	1.86E+00
28,000	1,069	1.90E+00
30,000	1,107	1.96E+00
32,000	1,143	2.03E+00
34,000	1,178	2.09E+00
36,000	1,212	2.15E+00
38,000	1,246	2.21E+00
40,000	1,278	2.27E+00

scan speed = 4 in/s