Final Status Survey Planning Worksheet

GENERAL SECTION	
Survey Area No.: OOL-10	Survey Unit No.: 01
Survey Unit Name: ISFSI Access Exclusion Zone and Buffer Zone	
FSSP Number: YNPS-FSSP-OOL-10-01-00	

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. ☒ 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 walk down : ☒ not warranted ☐ warranted

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

OR

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

1.7 A final classification has been performed. ☒

1.8 Classification: CLASS 1 ☒ CLASS 2 ☐ CLASS 3 ☐

DATA QUALITY OBJECTIVES (DQO)

1.0 State the problem:

Survey Unit OOL-10-01 was originally classified as a Class 2 survey unit in the LTP. After review of the HSA data, personal interview's and that the adjacent area had been remediated, it has been re-classified as a Class 1 survey unit. This unit consists of an open land area that was on the west side (outside) of the RCA. It comprises approximately 1,452m^2. It was used as a transportation route for radioactive material including the spent fuel containers being delivered to the ISFSI Pad. Subsurface systems that traversed the survey unit included the west storm drain, which has been surveyed for free release and left in place.

The problem, therefore, is to determine whether the accumulation of licensed radioactive materials generated during plant operation, existing in Survey Unit OOL-10-01, 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 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
Radionuclides-of-concern:	Co^{60} and Cs^{137}

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+00	Eu^{152}	3.6E+00	Sr^{90}	6.0E-01
Nb^{94}	2.5E+00	Eu^{154}	3.3E+00	Tc^{99}	5.0E+00
Ag^{108m}	2.5E+00	Eu^{155}	1.4E+02	Pu^{238}	1.2E+01
Sb^{125}	1.1E+01	H^{3}	1.3E+02	$Pu^{239/240}$	1.1E+01
Cs^{134}	1.7E+00	C^{14}	1.9E+00	Pu^{241}	3.4E+02
Cs^{137}	3.0E+00	Fe^{55}	1.0E+04	Am^{241}	1.0E+01
		Ni^{63}	2.8E+02	$Cm^{243/244}$	1.1E+01

Survey Design / Release Criteria

Classification:	Class 1
Average Co^{60} concentration:	0.025
Standard deviation Co^{60} (σ):	0.034
Average Cs^{137} concentration:	0.075
Standard deviation Cs^{137} (σ):	0.085
Weighted sum (σ):	0.037
LBGR:	0.930 (Initial LBGR: 0.5)
$DCGL_w$ (Unity):	1
Surrogate DCGL:	N/A (a surrogate DCGL will not be used)
Number of Samples:	15 (calculated) + 10 (added), for a total of 25 samples (+ 2 QC)
Survey Unit Area:	1,452 m^2
Sample Grid Spacing:	Triangular: 8.2m
Grid Area (A/N):	58.08 m^2
$DCGL_{EMC}$: Co^{60}	2.0 pCi/g (based on AF = 1.4)
$DCGL_{EMC}$: Cs^{137}	8.7 pCi/g (based on AF = 2.9)
Investigation Level for soil samples:	• >$DCGL_{EMC}$ for either Co^{60}, and Cs^{137} -or- • A sum of $DCGL_{EMC}$ fractions > 1.0 -or- • >DCGL for Cs^{137} or Co^{60} 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.
Scan Coverage:	100% of the surface area will be scanned, either by ISOCS or by SPA-3. ISOCS scans will be on a 4m by 4m grid, to within 2 meters at the edges.

Investigation Level for ISOCS measurements:

- 0.18 pCi/g for Co^{60}
- 0.7 pCi/g for Cs^{137}

-or- a sum of their fractions >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.

SPA-3 Gamma Scan Coverage:

SPA-3 scans will be performed in areas where restricted access prevents the use of ISOCS. These scans will cover 100% of the surface area that is not covered by ISOCS scans.

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 ($24.6m^2$) or a 2.8-m radius around the FSS sample location. SPA-3 MDCRs and MDCs are shown in Attachment 1.

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 15,000 cpm and 25,000 cpm.

Radionuclides for analysis:

All LTP nuclides with the focus on Co^{60} and Cs^{137}.

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.	
MDCR for SPA-3:	The accompanying MDC/MDCR table in Attachment 1 provides MDCR values by various background levels.	
MDC ($fDCGL_{surveyor-emc}$) for SPA-3 scans:	The accompanying MDC/MDCR table in Attachment 1 provides MDC values by various background levels.	
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 DP-8852 requirements.) • One soil sample QC Recount 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:

YNPS has been divided into multiple survey areas and units with relatively homogeneous characteristics based on information collected during the years of plant operation, the HSA and post-remediation activities. The area of interest has been named OOL-10 and the survey unit is 01. The medium of interest is described as soil. The radiological characteristics of this unit classify it as a Class 1 area with a $\leq 2{,}000m^2$ guidance. The total surface area is $1{,}452m^2$, which is within the $\leq 2{,}000m^2$ guidance. The maximum length is 137m and the maximum width is 12.5m. Soil is surveyed to a depth of 15cm.

See attached GPS coordinates and maps that demonstrate the measurement locations, survey unit boundaries and unit relationship to the YNPS site.

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 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-10-01 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-10-01 fails to meet the release criteria).

(d) If the average concentration of identified LTP-listed nuclide is less than $DCGL_w$ and the sum of their $DCGL_w$ fractions are less than 1, but some individual measurements exceed the $DCGL_w$, then apply the statistical test as the basis for accepting or rejecting the null hypothesis.

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 OOL-10-01 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 LBGR = 0.5 calculated, 0.930 adjusted

7.0 Optimize Design:

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

Number and Location of Samples: 25 soil samples will be collected at locations based on a random start, systematic triangular grid (refer to accompanying DPF-8853.2).

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. Soil samples will be collected in accordance with DP-8120.
3. Chain of Custody forms 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: 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. 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 and boulders is the cause of an increased count rate during a SPA-3 scan, record that finding. If it is demonstrated that the rocks and boulders 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.
9. The job hazards associated with the survey described in this package are addressed in the accompanying Job Hazard Assessment (JHA) for OOL-10-01.
10. 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 25 1-liter soil samples in accordance with DP-8120. Two of the 25 random soil samples will be analyzed as a QC split sample 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-10-01-001-F through OOL-10-01-025-F corresponding to FSS sample locations 001 through 025.
Biased soil samples:	None.
QC split samples:	OOL-10-01-008-F-S and OOL-10-01-017-F-S to be designated as QC split samples.
Recount samples:	OOL-10-01-007-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 packaged in 1-liter Marinelli's. 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-10-01-001-F through OOL-10-01-025-F for gamma-emitting nuclides.
   - YNPS Chemistry will analyze OOL-10-01-008-F-S and OOL-10-01-017-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. Ensure that the lid to the 1-liter Marinelli container is secured and sealed with electrical tape to prevent loss of moisture during shipping.
   - YNPS Chemistry will analyze OOL-10-01-007-F as a sample recount. The recounted sample will possess the naming convention OOL-10-01-007-F-RC.
   - 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.
   - 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.

     (2) A maximum spacing of 2 meters from any survey unit boundary.

- ISOCS assays are designated as OOL-10-01-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 scan grid area 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.

     Note: Notify FSS Supervisor or FSS Engineer for further instructions if Background exceeds 30,000 cpm.

     Note: When scan speeds are <0.25 m/s, the FSS Field Supervisor shall monitor and time scan speeds for at least 50% of scanned areas to ensure that the assigned scan speed is maintained.

   - 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-10-01-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-10-01-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 areas:
     - Perform and record a 1-minute scaler mode SPA-3 measurement. Designate the reading as "OOL-10-01-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-10-01-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-10-01-xxx-F-G-I" where "xxx" continues sequentially from the last number assigned to an FSS measurement.

NOTIFICATION POINTS:
None.

Prepared by _____ Date 7/18/06
FSS Radiological Engineer

Reviewed by _____ Date 7-19-2006
FSS Radiological Engineer

Approved by _____ Date 7/19/06
FSS Project Manager

YNPS-FSSP-OOL-10-01-00
Attachment 1
SPA-3 Scan Tables

Max Background

BKG(cpm)	MDCR	MDC(fDCGLemc)
4,000	639	5.09E-01
5,000	715	5.69E-01
6,000	783	6.23E-01
7,000	845	6.73E-01
8,000	904	7.20E-01
9,000	959	7.64E-01
10,000	1,011	8.05E-01
11,000	1,060	8.44E-01
12,000	1,107	8.82E-01
13,000	1,152	9.18E-01
14,000	1,196	9.52E-01
15,000	1,238	9.86E-01
16,000	1,278	1.02E+00
17,000	1,318	1.05E+00
18,000	1,356	1.08E+00
19,000	1,393	1.11E+00
20,000	1,429	1.14E+00
21,000	1,464	1.17E+00
22,000	1,499	1.19E+00
23,000	1,533	1.22E+00
24,000	1,565	1.25E+00
25,000	1,598	1.27E+00
26,000	1,629	1.30E+00
27,000	1,660	1.32E+00
28,000	1,691	1.35E+00
30,000	1,750	1.39E+00
32,000	1,808	1.44E+00
34,000	1,863	1.48E+00
36,000	1,917	1.53E+00
38,000	1,970	1.57E+00
40,000	2,021	1.61E+00

Scan Speed

In/Sec	m/Sec	BKG (cpm)
39	1.00	3,000
20	0.50	7,000
13	0.33	11,000
10	0.25	15,000
8	0.20	19,000
5	0.13	30,000
4	0.10	38,000

SE 2/17/06

GENERAL SECTION

Survey Area No.: OOL-10 Survey Unit No.: 02

Survey Unit Name: ISFSI Perimeter

FSSP No.: YNPS-FSSP-OOL-10-02-00

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.	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 2	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-10-02 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-10-02 below the 8.73 mr/yr release criterion?

Alternative actions: If residual radioactivity in OOL-10-02 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-10-02 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: 15 samples from historical data was sufficient to develop the DQOs for OOL-10-02. 20 new data measurements will be acquired to support DQAs.

Direct measurement technique: Soil and asphalt samples will be collected and analyzed on site for all ETD LTP listed radionuclides, 1 soil 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, and/or ISOCS Assays.

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: Cs-137, Co-60

Sample Quantity 15 (calculated) + 5 (added), for a total of 20 samples. (+1 QC)

Gridded Sample Area Size 344.9 m2 (Survey Unit Area/N)

Sample Grid Spacing: Triangular: 20m

MR P-3-06

Survey Area No.: OOL-10	Survey Unit No.: 02
Survey Unit Name: ISFSI Perimeter	
FSSP No.: YNPS-FSSP-OOL-10-02-00	

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-10, and the survey unit is 02. The medium of interest is described as Soil. The radiological characteristics of this unit classify it as a Class 2 area. Which has > 2,000 m2, ≤ 10,000 m2 as a surface area guidance. The total surface area is 6,898 m2, which is in compliance with the Class 2 guidance. The maximum length is 122m, and the maximum width is 100m. 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:	OOL-10-02 is an open land area and forms the perimeter of the ISFSI up to the "security" fence. The Survey Unit is composed of sod, grasses, and asphalt. It is bounded on the south and west by OOL-08-02, on the east by OOL-09-03 and on the north by OOL-10-04. It is not believed that OOL-10-02 was affected by plant operation and fuel transfer, but may have been minimally impacted by runoff from adjacent unit OOL-10-04, therefore characterization data from OOL-10-04 has been used for nuclide identification and statistical values for the planning of this Survey

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:	> DCGLw
Scan measurements:	> DCGLw or > MDC
Parameter of interest:	If there are no investigation issues, and the the residual radioactivity in OOL-10-02 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 6 of the 20 samples are above the DCGLw, the Survey Units passes.

8-3-06

Survey Area No.: OOL-10	Survey Unit No.: 02
Survey Unit Name: ISFSI Perimeter	
FSSP No.: YNPS-FSSP-OOL-10-02-00	

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
Alternative Hypothesis (H_a):	The residual radioactivity in the survey unit data is less 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:	0.8998 (Initial LBGR: 0.5)
Relative shift (Δ/σ):	2
Sigma (σ):	0.0501
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: 20 samples will be collected at locations based on a random start, systematic Triangular grid (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. 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 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-10-02.
8. All personnel participating in this survey shall be trained in accordance with DP-8868.
9. Collect ISOCS measurements in accordance with DP-8871 to provide at least 10% (689.8 m2) scan coverage of the survey unit.

SPECIFIC INSTRUCTIONS

1. *SPA-3 Scans:*
   - Move the SPA-3 in rate-meter mode at a speed of 0.1m 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.
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.

P-3-86

Survey Area No.: OOL-10	Survey Unit No.: 02
Survey Unit Name: ISFSI Perimeter	
FSSP No.: YNPS-FSSP-OOL-10-02-00	

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 20 samples in accordance with DP-8120. 1 of the 20 samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852. The same QC split sample will be analyzed for HTD nuclides in accordance with section 5.6.3.2.1 of the LTP and DP-8856.

Biased samples: No biased samples will be collected.

5 *Sample Designation:*

FSS soil samples: OOL-10-02-001-F through OOL-10-02-020-F corresponding to FSS sample locations 001 through 020.

Biased soil samples: No biased samples will be collected.

Asphalt Samples: **Note: Do not exceed a sample of depth of 10" from the asphalt surface when collecting samples within the ISFSI "Nuisance" fence to prevent contacting the underlying security mat.** Some sample locations will fall on asphalt surfaces. In these locations the asphalt surface will be collected in addition to the underlying soil. The asphalt sample will be denoted as such by adding the letter "A" to the sample identification (e.g. At location 004, the soil sample will be identified as OOL-10-02-004-F and the asphalt sample will be identified as OOL-10-02-004-F-A. Adequate asphalt material should be collected to fill a 500 ml marinelli following preparation.

QC split samples: OOL-10-02-007-F-S is to be designated as QC split sample. This sample will be sent to the off-site laboratory (do not dry).

Recount samples: OOL-10-02-006-F-RC 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 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-10-02-001-F through OOL-10-02-020-F for gamma-emitting nuclides.
- YNPS Chemistry will analyze OOL-10-02-006-F as a sample recount. The recounted sample will possess the naming convention OOL-10-02-006-F-RC.
- YNPS Chemistry will analyze OOL-10-02-007-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.

7 *ISOCS Assays:*

- Collect at least 55 ISOCS measurements in accordance with DP-8871 to provide at least 10% (689.8 m2) scan coverage of the survey unit.
- ISOCS assays are designated as OOL-10-02-xxx -F-G where "xxx" continues sequentially from the last number assigned to an FSS measurement.
- QC checks shall be performed at least daily in accordance with DP-8869 and DP-8871. Resolve flags encountered prior to survey.
- ISOCS assays to be performed with 90° collimator at 2m 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 titles "ISOCS Scans", position the detector downward facing keeping the detector perpendicular to the ground.

MP 2-3-06

Survey Area No.: OOL-10	Survey Unit No.: 02
Survey Unit Name: ISFSI Perimeter	
FSSP No.: YNPS-FSSP-OOL-10-02-00	

- 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.
- Remove standing water prior to performance of ISOCS assays. Indicate in the survey log when assays are performed on saturated soil. Contact the FSS Engineer for directions if conditions are such that standing water cannot be removed.
- Indicate in the survey log when materials other than soil, such as asphalt, jersey barriers, etc., are in the ISOCS Field-of-View
- If the results on any ISOCS assay indicate plant related radionuclides, investigate the area within the field of view (4m diameter, 12.6 m2 area) for that assay.
  Investigation may include qualitative use of ISOCS performed by suspending the detector 1 meter from the reference plain with the 90° columator in place. The original scan area will be rescanned in 4 quadrants.
  The isolated quadrant (3.14m2) with positive indications of plant related nuclides will be investigated using a shielded SPA-3 scan method as defined in steps 1 & 2 of this section.

Prepared by Robert Tozzie — FSS Radiological Engineer — Date August 3, 2006

Reviewed by Michael D.Rennhack — FSS Radiological Engineer — Date August 3, 2006

Approved by Martin Erickson — FSS Project Manager — Date August 3, 2006

YNPS-FSSP-OOL-10-02-00
Attachment 1
SPA-3 Scan Tables

Max Background

BKG(cpm)	MDCR	MDC(fDCGL)
4,000	404	7.27E-01
5,000	452	8.13E-01
6,000	495	8.90E-01
7,000	535	9.62E-01
8,000	571	1.03E+00
9,000	606	1.09E+00
10,000	639	1.15E+00
11,000	670	1.21E+00
12,000	700	1.26E+00
13,000	728	1.31E+00
14,000	756	1.36E+00
15,000	783	1.41E+00
16,000	808	1.45E+00
17,000	833	1.50E+00
18,000	857	1.54E+00
19,000	881	1.59E+00
20,000	904	1.63E+00
21,000	926	1.67E+00
22,000	948	1.71E+00
23,000	969	1.74E+00
24,000	990	1.78E+00
25,000	1,010	1.82E+00
26,000	1,030	1.85E+00
27,000	1,050	1.89E+00
28,000	1,069	1.92E+00
30,000	1,107	1.99E+00
32,000	1,143	2.06E+00
34,000	1,178	2.12E+00
36,000	1,212	2.18E+00
38,000	1,246	2.24E+00
40,000	1,278	2.30E+00

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YNPS-FSSP-OOL-10-02-00
Attachment 2

DCGL MDC Table

Nuclide	Soil 0.73 mrem/yr (pCi/g)	10% MDC (pCi/L)	50% MDC (pCi/L)	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

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Survey Unit	DQIRO Parameter	Value	Basis
OOL-10-02	Survey Unit Area	6898 m2	Class 2, Soil, > 2,000 m2, ≤ 10,000 m2
	Number of Direct Measurements	15 (calculated) + 5 (added) Total: 20	α (Type I) = 0.05 β (Type II) = 0.05 σ: 0.0501 Relative Shift: 2 DCGLw (Unity): 1 LBGR: 0.8998
	Area Factor:	N/A	Class: 2 - N/A
	Critical Value	14 for Sign test.	(20/2)+(1.645/2)*Square Root (20)
	Gridded Sample Area Size Factor	344.9m2	Area / Number of Samples (6898 m2/20)
	Sample Grid Spacing:	Triangular: 20m	Square Root (6898 m2/(0.866*20))
	Direct Measurement Investigation Level	> DCGLw	Class 2 Area.
	Scanning Coverage Requirements	689.8 m2	Class 2 Soil Area: 10-100% systematic &
	Scan Investigation Level	Co-60: 2.9E3 dpm/100cm2 Cs-137 : 1.1E4 dpm/100cm2	Class 2 Area: > DCGLw or > MDC

MP 8-3-06

Final Status Survey Planning Worksheet

GENERAL SECTION

Survey Area No.: OOL-10	Survey Unit No.: 03

Survey Unit Name: West RCA Buffer Zone

FSSP Number: YNPS-FSSP-OOL10-03-01

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-10-03 consists of an approximately 1,346 sq m surface area, and is located within the western portion of the RCA buffer zone. During decommissioning a settling pond was established in survey unit OOL-10-03 to support water control throughout the RCA. 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.

This supplemental plan is designed to provide instruction on the collection of additional ISOCS scans and biased soil samples to account for water infiltrating the bottom of the trench excavation. Dams were constructed and bypass pump were insufficient to keep water from flowing through the bottom of the trench.

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:	Co^{60}, Cs^{137}

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+00	Eu^{152}	3.6E+00	Sr^{90}	6.0E-01
Nb^{94}	2.5E+00	Eu^{154}	3.3E+00	Tc^{99}	5.0E+00
Ag^{108m}	2.5E+00	Eu^{155}	1.4E+02	Pu^{238}	1.2E+01
Sb^{125}	1.1E+01	H^{3}	1.3E+02	$Pu^{239/240}$	1.1E+01
Cs^{134}	1.7E+00	C^{14}	1.9E+00	Pu^{241}	3.4E+02
Cs^{137}	3.0E+00	Fe^{55}	1.0E+04	Am^{241}	1.0E+01
		Ni^{63}	2.8E+02	$Cm^{243/244}$	1.1E+01

Thirty-five samples, obtained during the FSS of Survey Units NOL-01-02 and NOL-01-04, were used to provide the characterization data for Survey Unit OOL-10-03. The data is sufficient to support the FSSP for Survey Unit OOL-10-03 because: 1) Survey Unit OOL-10-03 resided outside the RCA during operation of the plant; 2) During decommissioning Survey Unit OOL-10-03 was incorporated into the RCA and use of the area was consistent with NOL-01-02 and NOL-01-04 (i.e., lay down area); 3) A settling pond was created in Survey Unit OOL-10-03 to hold surface water pumped from the post remediation areas of NOL-01-02 and NOL-01-04; 4) FSS data for NOL-01-02 and NOL-01-04 is consistent with the original HSA data for OOL-10-03.

Based on a review of the characterization data, Co^{60} and Cs^{137} were the only positively identified plant-related radionuclides present at average levels greater than 1% of their respective DCGLs. The results from the characterization data are summarized below:

- Co^{60} (17 detects) — Co^{60} is present in 49% of the characterization samples. The maximum value was 71% of the 8.73-mrem/y Co^{60} DCGL of 1.4 pCi/g while the average value was 9%.

  Note: Review of the HSA shows one sample that exceeded the 8.73-mrem/y Co^{60} DCGL with an activity of 1.73 pCi/g. This sample was located along the plant operations RCA boundary.
- Cs^{137} (22 detects) — Cs^{137} is present in 63% of the characterization samples. The maximum value was 65% of the 8.73-mrem/y Cs^{137} DCGL of 3.0 pCi/g while the average value was 7%.
- Ag^{108m} (2 detects) — Ag^{108m} is present in 6% of the characterization samples. The maximum value was 11% of the 8.73-mrem/y Ag^{108} DCGL of 2.5 pCi/g while the average value was <1%. Ag^{108m} is not expected to pose a concern in subsequent sampling.
- Sb^{125} (4 detects) — Sb^{125m} is present in 11% of the characterization samples. The maximum value was <2% of the 8.73-mrem/y Sb^{125} DCGL of 11 pCi/g while the average value was <1%. Sb^{125} is not expected to pose a concern in subsequent sampling.

• Cs^{134} (1 detect)	Cs^{134} is present in 3% of the characterization samples. The maximum value was 2% of the 8.73-mrem/y Cs^{134} DCGL of 1.7 pCi/g while the average value was <1%. Cs^{134} is not expected to pose a concern in subsequent sampling.
• Eu^{152} (2 detects)	Eu^{152} is present in 6% of the characterization samples. The maximum value was 5% of the 8.73-mrem/y Eu^{152} DCGL of 3.6 pCi/g while the average value was <1%. Eu^{152} is not expected to pose a concern in subsequent sampling.
• Other YNPS ETD	There were no other easy-to-detect (ETD) radionuclides identified >MDA.
• YNPS HTD	Sixteen samples from NOL-01-02 and four samples from NOL-01-04 were analyzed for hard-to-detect (HTD) radionuclides. No positive results above MDA were detected. Though there is no sample data available, Sr^{90} and H^3 were identified as radionuclides of concern during the characterization (See HSA – OOL-10).

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, two FSS split soil samples and two biased 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 Co^{60} concentration:	0.121 pCi/g
Standard deviation Co^{60} (σ):	0.18 pCi/g
Average Cs^{137} concentration:	0.222 pCi/g
Standard deviation Cs^{137} (σ):	0.34 pCi/g
Weighted sum (σ):	0.174 ✓ 11/9/06
$DCGL_{GA}$ ✓ 11/9/06 Unity *	~~2.14 pCi/g~~ ✓ 1
Surrogate DCGL:	N/A (a surrogate DCGL will not be used)
LBGR	Initial = 0.5x$DCGL_{GA}$ ✓ 11/9/06 unity = 0.5
Number of Samples	Calculated = 15, 20 will be obtained
Survey Unit Area	1,346 m^2
Grid Area (A/N)	67.3 m^2
$DCGL_{EMC}$: Co^{60}	1.97 pCi/g (based on AF = 1.4)
$DCGL_{EMC}$: Cs^{137}	8.67 pCi/g (based on AF = 2.9)
Investigation Level for soil samples:	• >$DCGL_{EMC}$ for either Co^{60} or Cs^{137} -or- • A sum of $DCGL_{EMC}$ fractions > 1.0 -or- • >DCGL for Co^{60} or Cs^{137} 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.

* Incorrect use of gross activity DCGL. Pen and Ink change reflects use of $DCGL_W$ (unity) for multiple nuclides. Resulting relative shift of 2.89 results in calculation of 15 samples required. 20 samples were taken as instructed. ✓ 11/9/06

✓ = R. Tozzie

Investigation Level for ISOCS measurements:

- 1.8E-01 pCi/g Co^{60}
- 7.0E-01 pC/g Cs^{137}
- -or- a sum of their fractions >1.0

Note: The investigation levels for the ISOCS assays were derived using geometry adjustment factors as stated in YA-EVAL-00-001-06.

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.

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). SPA-3 MDCRs and MDCs are shown in Attachment 1.

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} and Co^{60}.

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.) • YNPS Chemistry Lab will perform one QC recount for soil samples. (note: this is in accordance with DP-8852 requirements.)	

4.0 Define the boundaries of the survey:

- Boundaries of Survey Unit OOL-10-03 are as shown on the attached map. Survey Unit 03 is located to the west of the former Turbine and Reactor buildings. Survey unit OOL-10-03 is bounded by survey unit OOL-02-01 to the East, NOL-06-02 to the east and south, OOL-10-01 to the west and OOL-02-04 to the north.

- 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 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-10-03 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-10-03 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-10-03 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 LBGR = ~~1.07 calculated, 1.79 adjusted~~ 1 11/9/06 = 0.5

7.0 Optimize Design:

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

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

Biased samples: Two biased samples, to be analyzed for hard-to-detect radionuclides, will be collected in the area of the settling pond.

Rev. 1 Supplement to OOL-10-03 FSS Plan

Discussion: **Attempts made to totally remove the standing water at the bottom of the trench excavation were unsuccessful. Although the standing water is limited to a narrow path at the bottom of the trench it has been determined that this water could compromise the ISOCS scan results. To account for these conditions each ISOCS scan will be supplemented with a biased soil sample. A biased soil sample will be collected at each ISOCS location where standing water has been identified. Their designation will be assigned a number in the sequence OOL-10-03-XXX-F-B, where XXX is the next number after the last soil sample number. Those locations will be determined accurately using GPS or a tape measure and will be documented in the Daily Survey Journal, DPF-8856.2.**

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 forms 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 and biased 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-10-03.
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. Soil sample locations are shown on map "FSS Samples". ISOCS scan locations are shown on map "ISOCS Scans #1"

2. Sample Requirements:

   - Collect twenty 1-liter soil samples and two biased location soil samples in accordance with DP-8120. Two of the twenty FSS soil samples will be analyzed as QC split samples to fulfill the QC requirement of DP-8852. The QC split samples and the biased location 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-10-03-001-F through OOL-10-03-020-F corresponding to FSS sample locations 001 through 020.
QC split samples:	OOL-10-03-002-F-S and OOL-10-03-010-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-10-03-008-F-RC is to be counted twice on site. The results will be compared in accordance with DP-8864.
Biased samples:	OOL-10-03-021-F-B and OOL-10-03-022-F-B are biased location samples.

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-10-03-001-F through OOL-10-03-020-F for gamma-emitting nuclides.
   - YNPS Chemistry will analyze OOL-10-03-008-F as a sample recount. The recounted sample will possess the naming convention OOL-10-03-008-F-RC.
   - YNPS Chemistry will analyze OOL-10-03-002-F-S, OOL-10-03-010-F-S, OOL-10-03-021-F-B and OOL-10-03-022-F-B 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:

   - 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.

(2) A maximum spacing of 2 meters from any survey unit boundary.

- Collect ISOCS assays in accordance with DP-8871 to provide 100% scan coverage of the survey unit.
- ISOCS assays are designated as OOL-10-03-xxx-F-G where xxx corresponds to the 3-digit location indicated on survey map "ISOCS Scans #1".
- 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.
- 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.
- Make note of any conditions within the ISOCS field of view that may affect analysis of ISOCS assay data such as mud, concrete, etc.
- 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.

Bypass pumps and dam measures have failed to keep up with ground water infiltration, COLLECT a soil sample at each ISOCS location. 3 6/26/06

- **Sample designations will be assigned a number in the sequence OOL-03-02-XXX-F-B, where XXX is the next number after the last ISOCS scan location.**
- **Determined the sample location accurately using GPS or a tape measure.**
- **Document the sample locations in the Daily Survey Journal, DPF-8856.2.**

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-10-03-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-10-03-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-10-03-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-10-03-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-10-03-xxx-F-G-I" where "xxx" continues sequentially from the last number assigned to an FSS measurement.

Prepared by M L Rennhack Date 6-23-06

Reviewed by _____ FSS Radiological Engineer Date 23 Jun 06

Approved by _____ FSS Radiological Engineer Date 6-23-06

FSS Project Manager
for
Marty Erickson

GENERAL SECTION

Survey Area No.: OOL-10	Survey Unit No.: 04

Survey Unit Name: ISFSI Access Exclusion Zone and Buffer Zone

FSSP Number: YNPS-FSSP-OOL-10-04-00

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. ☒ 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 walk down : ☒ not warranted ☐ warranted

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

OR

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

1.7 A final classification has been performed. ☒

1.8 Classification: CLASS 1 ☒ CLASS 2 ☐ CLASS 3 ☐

DATA QUALITY OBJECTIVES (DQO)

1.0 State the problem:

Survey Unit OOL-10-04 was originally classified as a Class 2 survey unit in the LTP. After review of the HSA data, personal interview's and that the adjacent area had been remediated, it has been re-classified as a Class 1 survey unit. This unit consists of an open land area that was on the west and south side (outside) of the RCA. It comprises approximately 1,857m^2. It was used as a transportation route for radioactive material including the spent fuel containers being delivered to the ISFSI Pad. Subsurface systems that traversed the survey unit included the west storm drain, which has been surveyed for free release and left in place.

The problem, therefore, is to determine whether the accumulation of licensed radioactive materials generated during plant operation, existing in Survey Unit OOL-10-04, 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 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
Radionuclides-of-concern:	Co^{60} and Cs^{137}

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+00	Eu^{152}	3.6E+00	Sr^{90}	6.0E-01
Nb^{94}	2.5E+00	Eu^{154}	3.3E+00	Tc^{99}	5.0E+00
Ag^{108m}	2.5E+00	Eu^{155}	1.4E+02	Pu^{238}	1.2E+01
Sb^{125}	1.1E+01	H^{3}	1.3E+02	$Pu^{239/240}$	1.1E+01
Cs^{134}	1.7E+00	C^{14}	1.9E+00	Pu^{241}	3.4E+02
Cs^{137}	3.0E+00	Fe^{55}	1.0E+04	Am^{241}	1.0E+01
		Ni^{63}	2.8E+02	$Cm^{243/244}$	1.1E+01

Survey Design / Release Criteria

Classification:	Class 1
Average Co^{60} concentration:	0.025
Standard deviation Co^{60} (σ):	0.034
Average Cs^{137} concentration:	0.075
Standard deviation Cs^{137} (σ):	0.085
Weighted sum (σ):	0.037
LBGR:	0.930 (Initial LBGR: 0.5)
$DCGL_w$ (Unity):	1
Surrogate DCGL:	N/A (a surrogate DCGL will not be used)
Number of Samples:	15 (calculated) + 10 (added), for a total of 25 samples (+ 2 QC)
Survey Unit Area:	1,857 m^2
Sample Grid Spacing:	Triangular: 9.3m
Grid Area (A/N):	74.28 m^2
$DCGL_{EMC}$: Co^{60}	2.0 pCi/g (based on AF = 1.4)
$DCGL_{EMC}$: Cs^{137}	8.7 pCi/g (based on AF = 2.9)
Investigation Level for soil samples:	• >$DCGL_{EMC}$ for either Co^{60}, and Cs^{137} -or- • A sum of $DCGL_{EMC}$ fractions > 1.0 -or- • >DCGL for Cs^{137} or Co^{60} 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.

Scan Coverage:

100% of the surface area will be scanned, either by ISOCS or by SPA-3. ISOCS scans will be on a 4m by 4m grid, to within 2 meters at the edges.

Investigation Level for ISOCS measurements:

- 0.18 pCi/g for Co^{60}
- 0.7 pCi/g for Cs^{137}

-or- a sum of their fractions >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.

SPA-3 Gamma Scan Coverage:

SPA-3 scans will be performed in areas where restricted access prevents the use of ISOCS. These scans will cover 100% of the surface area that is not covered by ISOCS scans.

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 ($24.6m^2$) or a 2.8-m radius around the FSS sample location. SPA-3 MDCRs and MDCs are shown in Attachment 1.

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 15,000 cpm and 25,000 cpm.

Radionuclides for analysis:

All LTP nuclides with the focus on Co^{60} and Cs^{137}.

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.	
MDCR for SPA-3:	The accompanying MDC/MDCR table in Attachment 1 provides MDCR values by various background levels.	
MDC ($fDCGL_{surveyor\text{-}emc}$) for SPA-3 scans:	The accompanying MDC/MDCR table in Attachment 1 provides MDC values by various background levels.	
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 DP-8852 requirements.) • One soil sample QC Recount 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:

YNPS has been divided into multiple survey areas and units with relatively homogeneous characteristics based on information collected during the years of plant operation, the HSA and post-remediation activities. The area of interest has been named OOL-10 and the survey unit is 04. The medium of interest is described as soil. The radiological characteristics of this unit classify it as a Class 1 area with a $\leq 2{,}000m^2$ guidance. The total surface area is $1{,}857m^2$, which is within the $\leq 2{,}000m^2$ guidance. The maximum length is 118.7m and the maximum width is 30.3m. Soil is surveyed to a depth of 15cm.

See attached GPS coordinates and maps that demonstrate the measurement locations, survey unit boundaries and unit relationship to the YNPS site.

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 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-10-04 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-10-04 fails to meet the release criteria).

(d) If the average concentration of identified LTP-listed nuclide is less than $DCGL_w$ and the sum of their $DCGL_w$ fractions are less than 1, but some individual measurements exceed the $DCGL_w$, then apply the statistical test as the basis for accepting or rejecting the null hypothesis.

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 OOL-10-04 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 LBGR = 0.5 calculated, 0.930 adjusted

7.0 Optimize Design:

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

Number and Location of Samples: 25 soil samples will be collected at locations based on a random start, systematic triangular grid (refer to accompanying DPF-8853.2).

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. Soil samples will be collected in accordance with DP-8120.
3. Chain of Custody forms 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: 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. 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 and boulders is the cause of an increased count rate during a SPA-3 scan, record that finding. If it is demonstrated that the rocks and boulders 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.
9. The job hazards associated with the survey described in this package are addressed in the accompanying Job Hazard Assessment (JHA) for NOL-03-02.
10. 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 25 1-liter soil samples in accordance with DP-8120. Two of the 25 random soil samples will be analyzed as a QC split sample 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-10-04-001-F through OOL-10-04-025-F corresponding to FSS sample locations 001 through 025.
Biased soil samples:	None.
QC split samples:	OOL-10-04-008-F-S and OOL-10-04-017-F-S to be designated as QC split samples.
Recount samples:	OOL-10-04-007-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 packaged in 1-liter Marinelli's. 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-10-04-001-F through OOL-10-04-025-F for gamma-emitting nuclides.
   - YNPS Chemistry will analyze OOL-10-04-008-F-S and OOL-10-04-017-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. Ensure that the lid to the 1-liter Marinelli container is secured and sealed with electrical tape to prevent loss of moisture during shipping.
   - YNPS Chemistry will analyze OOL-10-04-007-F as a sample recount. The recounted sample will possess the naming convention OOL-10-04-007-F-RC.
   - 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.
   - 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.

(2) A maximum spacing of 2 meters from any survey unit boundary.

- ISOCS assays are designated as OOL-10-04-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 scan grid area 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.

     Note: Notify FSS Supervisor or FSS Engineer for further instructions if Background exceeds 30,000 cpm.

     Note: When scan speeds are <0.25 m/s, the FSS Field Supervisor shall monitor and time scan speeds for at least 50% of scanned areas to ensure that the assigned scan speed is maintained.

   - 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-10-04-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-10-04-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.

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 areas:
     - Perform and record a 1-minute scaler mode SPA-3 measurement. Designate the reading as "OOL-10-04-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-10-04-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-10-04-xxx-F-G-I" where "xxx" continues sequentially from the last number assigned to an FSS measurement.

NOTIFICATION POINTS:

None.

Prepared by _____ Date 7/18/06
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Reviewed by _____ Date 7-18-2006
FSS Radiological Engineer

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