

FCS Partial Site Release Survey Packages and Preparation Instructions

Andrea Barker
April 2018

FCS Partial Site Release
Survey Unit Pre-Characterization Walk-Down

L4-001
FCS PSR Unit 1
Revision 0

Survey Area: FCS 18 Partial Release 1 **Survey Unit No.:** 1 (L4-001)

Survey Unit Type: Open Land ☒ Structural Interior ☐ Structural Exterior ☐

Survey Unit Area: 184,077.7 m²

Survey Unit Description: Primarily flat, cultivated farm land (last farmed in 2017) with minimal trees around perimeter.

Physical Configuration of Survey Unit: Triangular land area bounded on the South and West by the Fort Calhoun Station property line and to the Northeast by land survey unit 2.

Walk-Down was: Performed ☒ Date: 4/19/18 By: Ryan Layman
(Name)
Not Performed ☐ Reason Walk-Down was not Performed:

Observed or Potential Hazards:

- | | | |
|--|--|--|
| <input type="checkbox"/> - Heat stress or stroke | <input type="checkbox"/> - Confined Spaces | <input type="checkbox"/> - Kinetic energy sources (moving equipment) |
| <input type="checkbox"/> - Cold work environment | <input type="checkbox"/> - Hazardous atmospheres | |
| <input checked="" type="checkbox"/> - Stinging insects | <input type="checkbox"/> - Load bearing stresses | <input type="checkbox"/> - Vehicle traffic |
| <input checked="" type="checkbox"/> - Hazardous plants and/or animal | <input type="checkbox"/> - Lack of structural integrity (structure, floor) | <input type="checkbox"/> - Overhead piping or components |
| <input checked="" type="checkbox"/> - Tripping hazards | | <input type="checkbox"/> - Exposed electrical circuitry |
| <input type="checkbox"/> - Standing water > 1 ft deep | <input type="checkbox"/> - Release of stored energy sources (hydraulic, steam, etc.) | <input type="checkbox"/> - Sharp objects or surfaces |
| <input type="checkbox"/> - Fall hazards | | <input type="checkbox"/> - Falling objects |
| <input type="checkbox"/> - Work @ height > 6ft | <input type="checkbox"/> - Buried utilities | <input type="checkbox"/> - Other _____ |
| <input type="checkbox"/> - Open excavations | <input checked="" type="checkbox"/> - Overhead power lines | <input type="checkbox"/> - Other _____ |

(Each hazard identified must be evaluated to determine if the hazard can be eliminated, avoided, or minimized, as well as the need for additional support/expertise)

Hazard(s) Mitigation Measures:

Bug spray for insects; hazardous plants briefed; tripping hazards are nature of environment and were briefed; overhead power lines were noted but will not hinder sampling safely.

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Survey Unit Pre-Characterization Walk-Down**

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Survey Unit Preparation for Characterization:

- | | | |
|---|---|--|
| <input type="checkbox"/> - Mark reference grid | <input type="checkbox"/> - Clear vegetation | <input type="checkbox"/> - Set-up Man Lift |
| <input checked="" type="checkbox"/> - GPS | <input type="checkbox"/> - Confined space permit | <input type="checkbox"/> - Extension poles |
| <input checked="" type="checkbox"/> - Mark survey unit boundaries | <input type="checkbox"/> - Set-up Temporary Ventilation | <input type="checkbox"/> - Other _____ |
| <input type="checkbox"/> - Clear equipment and/or tools | <input type="checkbox"/> - Radiation Work Permit | <input type="checkbox"/> - Other _____ |
| <input type="checkbox"/> - Clear loose material and/or debris | <input type="checkbox"/> - Erect Scaffolding | |

Preparation Details:

Survey Unit Classification:

Initial Classification: Non-Impacted ☒ Class 3 ☐ Class 2 ☐ Class 1 ☐

If the Survey Unit is a Class 2, Class 3 or Non-Impacted Survey Unit?

-
- a. Are there any posted Radiologically Controlled Areas in the survey unit? Yes ☐ No ☒
- Investigation:
- b. Is there any posted Radioactive Material Areas or labeled, tagged or bagged radioactive material or potential radioactive material in the survey unit? Yes ☐ No ☒
- Investigation:
- c. Is the survey unit in the path of a known transport route for unpackaged radioactive materials? Yes ☐ No ☒
- Investigation:
- d. Is there any observable evidence of any past remediation activities within this survey unit? Yes ☐ No ☒
- Investigation:

The initial classification for this survey unit was Class non-impacted. Based upon the visual observations of the walk-down, the initial classification of this survey unit is: ☒ is justified ☐ is not justified.

Submitted: _____

Name/Date

Reviewed: _____

Name/Date

FCS Partial Site Release
Sample Plan Cover Sheet

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GENERAL SECTION

Sample Plan #: L4-001

Survey Area No.: FCS 18 Partial Release 1	Survey Unit No.: 1
Survey Unit Name: Land Area 1	
Survey Unit Type: Non-impacted farm land	

☒ - Open Land ☐ - Structural Interior ☐ - Structural Exterior ☐ - System
Initial Classification: ☒ - Non-Impacted ☐ - Class 3 ☐ - Class 2 ☐ - Class 1

PREPARATION FOR CHARACTERIZATION ACTIVITIES

Reference Grid and/or Reference Coordinates have been established (if appropriate).

☒ Yes ☐ No Explanation: _____

A walk-down has been performed of the Survey Unit and a completed *Survey Unit Pre-Characterization Walk-Down* is included with this survey package.

☒ Yes ☐ No Explanation: _____

All survey preparation activities (clear vegetation, erect scaffolding, etc.) as identified by the *Survey Unit Pre-Characterization Walk-Down* have been completed.

☒ Yes ☐ No Explanation: _____

Area has been cleared of all non-essential materials and equipment.

☒ Yes ☐ No Explanation: _____

ABOVE MUST BE COMPLETED PRIOR TO COMMENCING SURVEY

SAMPLE PLAN APPROVAL

Prepared: Andrea Barker

(Name)

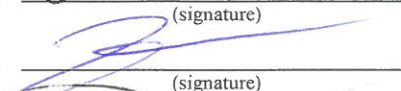


(signature)

Date: 4/12/18

Peer Review: Ryan Layman

(Name)

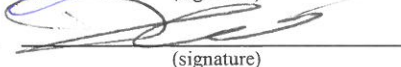


(signature)

Date: 4/17/18

Approved: Daniel Whisler

Radiation Protection Manager



(signature)

Date: 4/23/18

**FCS Partial Site Release
Characterization Data Quality Objectives and Survey
Design**

L4-001
FCS PSR Unit 1
Revision 0

Survey Unit No: 1

Sample Plan # L4-001

Survey Area **No.:** FCS 18 PR 1 **Description:** Approximately 120 acres West of tree line

Survey Unit **No.:** 1 **Description:** Triangular land area West (plant North) of PA

Survey Unit Type:

☒ - Open Land ☐ - Structural Interior ☐ - Structural Exterior ☐ - System

Survey Unit Area: 184,091.5 square meters

Survey Unit Classification:

Current Classification: ☒ - Non-Impacted ☐ - Class 3 ☐ - Class 2 ☐ - Class 1

Types of Surfaces:

- ☐ - Floor
- ☐ - Wall
- ☐ - Ceiling
- ☐ - Roof
- ☐ - Paved Road
- ☐ - Concrete Pad
- ☒ - Ground
- ☐ - Surface Water
- ☐ - System
- ☐ - Other _____
- ☐ - Other _____

Composition of Surfaces:

- ☐ - Concrete
- ☐ - Steel
- ☐ - Cinder Block
- ☐ - Brick
- ☐ - Tile
- ☐ - Wood
- ☐ - Asphalt
- ☐ - Tar
- ☒ - Soil
- ☐ - Other _____
- ☐ - Other _____

Types of Media:

- ☒ - Surface Soil
- ☐ - Subsurface Soil
- ☐ - Sediment
- ☐ - Water
- ☐ - Liquids (not water)
- ☐ - Oil
- ☐ - Volumetric Concrete
- ☐ - Volumetric Asphalt
- ☐ - Metal
- ☐ - Paint
- ☒ - Other ISOCS

Survey Unit Historical Information

Previous operational functions: Leased, row farmland. No historical operational function.

**FCS Partial Site Release
Characterization Data Quality Objectives and Survey
Design**

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Survey Unit No: 1

Sample Plan # L4-001

Basis for initial classification: Review of operational history and interviews conducted during Initial Historical Site Assessment (HSA) showed no historical operational functions or historical storage functions. Environmental samples from Initial HSA showed no environmental contaminants downstream of the land requiring remediation.

Summary of processes and incidents from Historical Site Assessment: No operational processes performed. Leased farmland only. No incidents noted from Initial HSA.

Summary of Current Radiological Condition: No current Radioactive Material Areas, Radiologically Controlled Areas, or known radiological conditions and no historical evidence of such.

Data Quality Objectives:

1. **State the Problem:** Perform characterization inspections and surveys of sufficient quality and quantity to determine the nature and extent of radioactive contamination in the survey unit in order to validate the classification of "non-impacted" as defined by NUREG-1575 (MARSSIM).

2. **Identify the Decision:** Perform radiological surveys in the survey unit to identify the potential presence of plant-related radionuclides at concentrations greater than the minimum detectable concentration (MDC) of the instruments(s) used and greater than the expected naturally-occurring background activity concentrations.

3. **Identify Inputs:**
 - a. Can the objectives of the characterization survey be achieved with reasonable confidence based on existing data? (If "Yes", then document the basis for the acceptability of the data.) Yes ☐ No ☒

Basis:

**FCS Partial Site Release
Characterization Data Quality Objectives and Survey
Design**

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Survey Unit No: 1 Sample Plan # L4-001

- b. Identify the Action Levels that will be used for the characterization of this survey unit.

☐ Isotopic Volumetric ☐ Gross Surface Activity ☒ Detectable Activity > MDCR

- c. Identify the types of measurements and/or sample to be taken for the characterization of the survey unit.

<input checked="" type="checkbox"/> Surface Soil Sample(s) <input type="checkbox"/> Subsurface Soil Sample(s) <input type="checkbox"/> Sediment Sample(s) <input type="checkbox"/> Concrete Core Sample(s) <input type="checkbox"/> Volumetric Concrete Sample(s) <input type="checkbox"/> Volumetric Asphalt Sample(s) <input type="checkbox"/> Water Sample(s)	<input type="checkbox"/> Swipe Sample(s) <input type="checkbox"/> Direct beta-gamma measurement(s) <input type="checkbox"/> Direct alpha measurement(s) <input type="checkbox"/> Surface Scans (structures) <input checked="" type="checkbox"/> Surface Scans (soils) <input checked="" type="checkbox"/> ISOCS _____ <input checked="" type="checkbox"/> Other <u>10% HTD</u>
--	--

- d. Designate the radiological instrumentation that will be used to acquire field measurements and denote the anticipated static and scan MDC for each.

NOTE: Static and Scan MDC for scanning structures and soil will be determined in accordance with Radiological Analysis.

	Instrument Type:	Detector Type:	Static MDC:	Scan MDC:
1	NaI Probe	Scintillation		4.5 pCi/g
2	ISOCS	HPGe (semi-conductor)	0.19 pCi/g	N/A
3				
4				

Are the static and scan MDCs for the instruments and detectors listed above less than the Action Levels selected? (If "No", then document the reason why the instrument will continue to be used for this survey and the impact on data quality.)

Yes ☒ No ☐

Explanation:

- e. Determine the type of analyses that will be performed on volumetric material sample(s).

Analyses

☒ Gross Beta Gamma ☒ Gross Alpha ☒ Gamma Spectroscopy
☒ Liquid Scintillation ☒ Alpha Spectroscopy

Analyses Details: All surface soil samples collected will be analyzed by on-site gamma spectroscopy equipment for plant-derived gamma emitting radionuclides. Count times utilized achieve an isotopic MDC equal to or less than 0.4 pCi/g for Cs-137. Ten percent (10%) of samples will be sent to an off-site laboratory for HTD analysis with the full suite of nuclides defined in FC-18-002.

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Characterization Data Quality Objectives and Survey
Design**

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Survey Unit No: 1

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4. Determine Number & Type of Judgmental Measurements and/or Samples:

- a. Specify the number of judgmental measurements and/or samples that will be taken in this survey unit to adequately address the objectives of the survey.

<p>* _____ Surface Soil Sample(s)</p> <p>_____ Subsurface Soil Sample(s)</p> <p>_____ Sediment Sample(s)</p> <p>_____ Concrete Core Sample(s)</p> <p>_____ Volumetric Concrete Sample(s)</p> <p>_____ Volumetric Asphalt Sample(s)</p>	<p>_____ Water Sample(s)</p> <p>_____ Swipe Sample(s)</p> <p>_____ Direct beta-gamma measurement(s)</p> <p>_____ Direct alpha measurement(s)</p> <p>_____ Other _____</p> <p>_____ Other _____</p>
--	--

- b. Designate the locations of the judgmental samples and the location coordinates on "Sample/Measurement Identification and Coordinates" and on the map.
- c. Explain the basis for the determination of the judgmental measurement and/or sample population size and the selection of the measurement and/or sample locations.

Basis: *Randomized points fell in areas where judgmental samples were identified to be taken. As the survey is executed, additional judgmental samples may be collected at any areas of elevated activity identified.

5. List Decision Rules:

"If"

- 1 Gamma scan reading exceeds MDCR plus Background
- 2 Gamma spectroscopy analysis of surface soil indicates presence of plant-derived radionuclide concentrations greater than background and spatial extent is not bounded
- 3 Gamma spectroscopy analysis of surface soil indicates presence of plant-derived radionuclide concentrations greater than background and spatial extent is bounded.

"Then"

Bound area of elevated activity and obtain judgmental soil sample at highest reading. Confirm and bound area(s) with additional sampling. Consider analysis for HTD beta and alpha ROC.

Reclassify the identified area(s) as "impacted" and assign an appropriate classification (Class 1, 2 or 3) based upon the classification definitions provided in NUREG-1575 (MARSSIM).

6. Determine Number & Type of Random-Based Measurements and/or Samples:

NOTE: If the survey unit is an impacted or non-impacted open land survey unit or a structural survey unit that will be subjected to FSS, then a random-based direct measurement and/or sample population should be established.

- a. Is the survey unit classified as Class 1? Yes ☐ No ☒

(If "Yes", then random-based samples are not required unless specifically compelled by the survey objectives. If random-based samples are not required, then proceed to "Scan Coverage" section. Otherwise, proceed to the next step.)

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Survey Unit No: 1

Sample Plan # L4-001

b. What is the current classification of the survey unit?

Class:

Non-
impacted

c. What type of survey unit

☒ - Open Land

☐ - Structural

☐ - System

(If the survey unit is classified as non-impacted or Class 3 open land area, then the minimum number of random-based direct measurements and/or samples (n) will be 14 based on MARSSIM guidance, Cs-137 DCGL, LGBR = 0.5 DCGL, $\sigma = 30$, $\Delta/\sigma > 3.0$, Sign $p = 1$, $\alpha = 0.05$, $\beta = 0.05$, and using the Sign test)

d. Specify the number of random-based measurements and/or samples that will be taken in this survey unit to adequately address the objectives of the survey.

 14 Surface Soil Sample(s)

 Water Sample(s)

 Subsurface Soil Sample(s)

 Swipe Sample(s)

 Sediment Sample(s)

 Direct beta-gamma measurement(s)

 Concrete Core Sample(s)

 Direct alpha measurement(s)

 Volumetric Concrete Sample(s)

 14 ISOCS

 Volumetric Asphalt Sample(s)

 1 Other: HTD Soil sample

e. Designate the locations of the random-based measurement and/or samples and the location coordinates on, "Sample/Measurement Identification and Coordinates" and on the map.

f. Designate at random, 10% of the random-based measurement and/or sample locations as QC split samples or replicate measurement locations and denote the selected QC samples on the survey map.

7. Survey Unit Scan Coverage:

a. Designate the scan coverage requirements for this survey unit.----- 1%

b. Is less than 100% scan coverage required?

Yes ☒ No ☐

(If "Yes", then designate the areas to be scanned using the reference coordinate system that equates to the required total area that is to be scanned and document below the basis of why that area was selected.)

Basis: 1% of the total land unit area will be divided among the unit sample locations and scanned in a rectangular manner around the center of each location.

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- c. Designate the locations of the scan areas and the location coordinates on the map.
- d. Establish *a priori* alarm set-points and/or action levels for scanning.

☐ Structures (beta-gamma) _____ units


☒ Open Land (gamma) _____ units

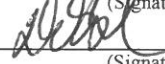
8. Additional Comments:

Survey Design Review

Prepared by: Andrea Barker
(Print Name)

Peer Reviewed by: David Brehm
(Print Name)

 4/19/18
(Signature) (Date)

 4/23/2018
(Signature) (Date)

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Survey Instructions
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Revision 0

Sample Plan No.: L4-001

Survey Area No.: FCS 18 PR 1

Description: FCS 2018 Partial Release 1

Survey Unit No.: 1

Description: Triangular land area West (plant North) of PA

Survey Unit Type:

☒ - Open Land ☐ - Structure Interior ☐ - Structure Exterior ☐ - System

Survey Unit Classification:

Initial Classification: ☒ - Non-Impacted ☐ - Class 3 ☐ - Class 2 ☐ - Class 1

General Instructions:

1. Personnel will follow all relevant safety directives and procedures while performing this work.
2. Survey and sampling will be performed by Chemistry and RP technicians under the direction of Chemistry and RP Supervision.
3. Instrumentation used in the field will be used in accordance with applicable procedures.
4. Detailed field notes and observations will be documented during survey and sampling.
5. Photographs should be taken as necessary to clarify survey and sampling activities or survey constraints.
6. Samples will be provided to the Environmentalist or other personnel designated by RP Supervision.
7. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.
8. Sample & measurement locations will be identified using coordinates consistent with the established reference coordinate system. Sample and measurement locations will be identified by marks or flags prior to and during survey implementation.

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Revision 0

Sample Plan No.: L4-001

Survey Area No.: FCS 18 PR 1 **Description:** Approximately 120 West of tree line

Survey Unit No.: 1 **Description:** Triangular land area West (plant North) of PA

Specific Instructions:

1. Proceed to the survey unit.
2. Initialize and utilize the data point log on the following page. Steps or samples do NOT need to be performed and completed in the order written.
3. The end cap on the ISOCS unit MUST be removed prior to shots being acquired. The cap SHALL be replaced prior to moving the next survey unit area. The basket on the ISOCS cart can be utilized to store the wingnuts for the end cap and the end cap itself, while removed. A bag may also be provided.
4. NaI scans MUST be completed prior collection of soil samples in a given sample point area.
5. Place a flag in the soil at the location of observed, elevated dose rates, as applicable from the NaI scan. Note – if all areas have the same background reading, a flag MAY be placed within approximately 1 meter of the center stake for that area or no flag may be used to indicate the center stake is the point of interest.
6. Soil samples should be taken at the area with observed elevated dose rates, as applicable, from the NaI scans. Note – if all areas have the same background reading, collect the soil sample within approximately 1 meter of the center stake for that area.
7. To minimize cross-contamination, the shovel and tools should be rinsed in between sample point location digging.

Comments: _____

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Survey Instructions
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Revision 0

Sample Plan No: L4-001

Survey Unit No: 001

Sample Point	Coordinates: (Lateral)	(Longitudinal)	Date	Time	Technician Initials
L4-001-001D	41.52746389	96.09181872	4/23/18	091145	S
L4-001-001S			4/24/18	1510	S
L4-001-001N			4/23/18	1505	TW
L4-001-001HS					
L4-001-002D	41.52487385	96.09222719	4/23/18	1040	S
L4-001-002S	41.048863	96.0922104	4/24/18	1445	R
L4-001-002N			4/23/18	1007	TW
L4-001-002HS					
L4-001-003D	41.5247299	96.089104	4/24/18	1020	S
L4-001-003S			4/24/18	1040	S
L4-001-003N			4/24/18	1035	TW
L4-001-003HS					
L4-001-004D	41.53027878	96.09267161	4/24/18	0810	S
L4-001-004S			4/24/18	0835	S
L4-001-004N			4/24/18	0830	TW
L4-001-004HS					
L4-001-005D	41.52902872	96.09202292	4/24/18	0905	S
L4-001-005S			4/24/18	0930	S
L4-001-005N			4/24/18	0925	TW
L4-001-005HS					
L4-001-006D	41.5302518	96.09286383	4/24/18	0840	S
L4-001-006S			4/24/18	0810	S
L4-001-006N			4/24/18	0805	TW
L4-001-006HS					
L4-001-007D	41.52781463	96.09223917	4/23/18	1520	S

D = Direct Scan; S = Soil; N = NaI Scan; HS = HTD Soil Sample

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Revision 0

Sample Plan No: L4-001

Survey Unit No: 001

Sample Point	Coordinates: (Lateral)	(Longitudinal)	Date	Time	Technician Initials
L4-001-007S			4/24/18	0930	S
L4-001-007N			4/24/18	0945	TW
L4-001-007HS			4/24/18	0930	S
L4-001-008D	41.52781463	96.09223917	4/23/18	0910	S
L4-001-008S	41.023834	96.092147	4/24/18	1440	R
L4-001-008N			23 APR 18	0934	TW
L4-001-008HS					
L4-001-009D	41.52383963	96.09211909	4/23/18	0943	S
L4-001-009S	41.0238439	96.0917217	4/24/18	1440	R
L4-001-009N			23 APR 18	0934	TW
L4-001-009HS					
L4-001-010D	41.52459503	96.09014908	4/23/18	1400	S
L4-001-010S	41.0245955	96.0901515	4/24/18	1425	R
L4-001-010N			23 APR 18	1105	TW
L4-001-010HS					
L4-001-011D	41.52617785	96.09104994	4/23/18	1425	S
L4-001-011S	41.0261787	96.0910487	4/24/18	1420	R
L4-001-011N			23 APR 18	1440	TW
L4-001-011HS	41.0261787	96.0910487	4/24/18	1420	R
L4-001-012D	41.5244062	96.09173469	4/23/18	1012	S
L4-001-012S	41.0244064	96.09173488	4/24/18	1430	R
L4-001-012N			23 APR 18	1007	TW
L4-001-012HS					
L4-001-013D	41.52378561	96.08906802	4/27/18	1830	S

D = Direct Scan; S = Soil; N = NaI Scan; HS = HTD Soil Sample

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Sample Plan No: L4-001

Survey Unit No: 001

Sample Point	Coordinates: (Lateral)	(Longitudinal)	Date	Time	Technician Initials
L4-001-013S	41.0237845	96.0590859	4/24/18	1430	R
L4-001-013N			23 APR 18	1335	TW
L4-001-013HS					
L4-001-014D	41.52420833	96.09049745	4/23/18	1105	S
L4-001-014S	41.0241903	96.0905029	4/24/18	1435	R
L4-001-014N			23 APR 18	1335	TW
L4-001-014HS					
L4-001-QC1*					
L4-001-QC2*					
L4-001-QC3*					
*Additional as needed					

D = Direct Scan; S = Soil; N = NaI Scan; HS = HTD Soil Sample

Judgemental Samples:

Sample Point	Coordinates: (Lateral)	(Longitudinal)	Date	Time	Technician Initials
L4-001-__J					
L4-001-__J					
L4-001-__J					
L4-001-__J					
L4-001-__J					
L4-001-__J					

D = Direct Scan; S = Soil; N = NaI Scan; HS = HTD Soil Sample

FCS Partial Site Release
Scan Area Identification & Coordinates

L4-001
FCS PSR Unit 1
Revision 0

Survey Area No.: FCS 18 PR 1 **Description:** FCS 2018 Partial Release 1 **Sample Plan No.:** L4-001
Survey Unit No.: 1 **Description:** Triangular land area West (plant North) of PA

Scan Area No.:	Surface Area (m2)	% of Total Survey Unit Area	Coordinates									
			Corner 1		Corner 2		Center Point		Corner 3		Corner 4	
			Northing	Easting	Northing	Easting	Northing	Easting	Northing	Easting	Northing	Easting
L4001-001	132	0.072	41.52751556	96.09174971	41.52741223	96.09174971	41.52746389	96.09181872	41.52741223	96.09188773	41.52751556	96.09188773
L4001-002	132	0.072	41.52492551	96.09215818	41.52482219	96.09215818	41.52487385	96.09222719	41.52482219	96.09229619	41.52492551	96.09229619
L4001-003	132	0.072	41.52470517	96.08949329	41.52460185	96.08949329	41.52465351	96.08956229	41.52460185	96.0896313	41.52470517	96.0896313
L4001-004	132	0.072	41.53033044	96.0926026	41.53022711	96.0926026	41.53027878	96.09267161	41.53022711	96.09274063	41.53033044	96.09274063
L4001-005	132	0.072	41.52908038	96.09195391	41.52897705	96.09195391	41.52902872	96.09202292	41.52897705	96.09209193	41.52908038	96.09209193
L4001-006	132	0.072	41.53030346	96.09279482	41.53020013	96.09279482	41.5302518	96.09286383	41.53020013	96.09293284	41.53030346	96.09293284
L4001-007	132	0.072	41.52786629	96.09217016	41.52776297	96.09217016	41.52781463	96.09223917	41.52776297	96.09230817	41.52786629	96.09230817
L4001-008	132	0.072	41.52389129	96.09205009	41.52378797	96.09205009	41.52781463	96.09223917	41.52378797	96.0921881	41.52389129	96.0921881
L4001-009	132	0.072	41.52389129	96.09159363	41.52378796	96.09159363	41.52383963	96.09211909	41.52378796	96.09173164	41.52389129	96.09173164
L4001-010	132	0.072	41.52464669	96.09008007	41.52454337	96.09008007	41.52459503	96.09014908	41.52454337	96.09021808	41.52464669	96.09021808
L4001-011	132	0.072	41.52622952	96.09098094	41.52612619	96.09098094	41.52617785	96.09104994	41.52612619	96.09111895	41.52622952	96.09111895
L4001-012	132	0.072	41.52445786	96.09166569	41.52435454	96.09166569	41.5244062	96.09173469	41.52435454	96.0918037	41.52445786	96.0918037
L4001-013	132	0.072	41.52383727	96.08899902	41.52373394	96.08899902	41.52378561	96.08906802	41.52373394	96.08913703	41.52383727	96.08913703
L4001-014	132	0.072	41.52425999	96.09042844	41.52415667	96.09042844	41.52420833	96.09049745	41.52415667	96.09056645	41.52425999	96.09056645
Totals:	1848	1.00%										

FCS Partial Site Release
Survey Unit Pre-Characterization Walk-Down

L4-002
FCS PSR Unit 1
Revision 0

Survey Area: FCS 18 Partial Release 1 **Survey Unit No.:** 2 (L4-002)

Survey Unit Type: Open Land ☒ Structural Interior ☐ Structural Exterior ☐

Survey Unit Area: 149,383.9 m²

Survey Unit Description: Primarily flat, cultivated farm land (last farmed in 2017) with minimal trees around perimeter.

Physical Configuration of Survey Unit: Triangular land area bounded on the North by the Fort Calhoun Station property line and the Missouri River; the East by a treeline running North-South; and on the Southwest by land survey unit 1.

Walk-Down was: Performed ☒ Date: 4/19/18 By: Ryan Layman w/ Dara Slaven
(Name)
Not Performed ☐ Reason Walk-Down was not Performed:

Observed or Potential Hazards:

- | | | |
|--|--|--|
| <input type="checkbox"/> - Heat stress or stroke | <input type="checkbox"/> - Confined Spaces | <input type="checkbox"/> - Kinetic energy sources (moving equipment) |
| <input type="checkbox"/> - Cold work environment | <input type="checkbox"/> - Hazardous atmospheres | |
| <input checked="" type="checkbox"/> - Stinging insects | <input type="checkbox"/> - Load bearing stresses | <input type="checkbox"/> - Vehicle traffic |
| <input checked="" type="checkbox"/> - Hazardous plants and/or animal | <input type="checkbox"/> - Lack of structural integrity (structure, floor) | <input type="checkbox"/> - Overhead piping or components |
| <input checked="" type="checkbox"/> - Tripping hazards | | <input type="checkbox"/> - Exposed electrical circuitry |
| <input type="checkbox"/> - Standing water > 1 ft deep | <input type="checkbox"/> - Release of stored energy sources (hydraulic, steam, etc.) | <input type="checkbox"/> - Sharp objects or surfaces |
| <input type="checkbox"/> - Fall hazards | | <input type="checkbox"/> - Falling objects |
| <input type="checkbox"/> - Work @ height > 6ft | <input type="checkbox"/> - Buried utilities | <input type="checkbox"/> - Other _____ |
| <input type="checkbox"/> - Open excavations | <input checked="" type="checkbox"/> - Overhead power lines | <input type="checkbox"/> - Other _____ |

(Each hazard identified must be evaluated to determine if the hazard can be eliminated, avoided, or minimized, as well as the need for additional support/expertise)

Hazard(s) Mitigation Measures:

Bug spray for insects; hazardous plants and environmental trip hazards briefed; overhead power lines were noted, but will not hinder sampling safely.

FCS Partial Site Release Land Area 1
Survey Unit Pre-Characterization Walk-Down

L4-002
FCS PSR Unit 1
Revision 0

Survey Unit Preparation for Characterization:

- | | | |
|---|---|--|
| <input type="checkbox"/> - Mark reference grid | <input type="checkbox"/> - Clear vegetation | <input type="checkbox"/> - Set-up Man Lift |
| <input checked="" type="checkbox"/> - GPS | <input type="checkbox"/> - Confined space permit | <input type="checkbox"/> - Extension poles |
| <input checked="" type="checkbox"/> - Mark survey unit boundaries | <input type="checkbox"/> - Set-up Temporary Ventilation | <input type="checkbox"/> - Other _____ |
| <input type="checkbox"/> - Clear equipment and/or tools | <input type="checkbox"/> - Radiation Work Permit | <input type="checkbox"/> - Other _____ |
| <input type="checkbox"/> - Clear loose material and/or debris | <input type="checkbox"/> - Erect Scaffolding | |

Preparation Details:

Survey Unit Classification:

Initial Classification: Non-Impacted ☒ Class 3 ☐ Class 2 ☐ Class 1 ☐

If the Survey Unit is a Class 2, Class 3 or Non-Impacted Survey Unit?

-
- a. Are there any posted Radiologically Controlled Areas in the survey unit? Yes ☐ No ☒
Investigation:
- b. Is there any posted Radioactive Material Areas or labeled, tagged or bagged radioactive material or potential radioactive material in the survey unit? Yes ☐ No ☒
Investigation:
- c. Is the survey unit in the path of a known transport route for unpackaged radioactive materials? Yes ☐ No ☒
Investigation:
- d. Is there any observable evidence of any past remediation activities within this survey unit? Yes ☐ No ☒
Investigation:

The initial classification for this survey unit was Class Non-impacted. Based upon the visual observations of the walk-down, the initial classification of this survey unit is: ☐ is justified ☐ is not justified.

Submitted: _____

4/19/18
Name/Date

x10887

Reviewed: _____

4/19/18 x13743
Name/Date

FCS Partial Site Release
Sample Plan Cover Sheet

L4-002
FCS PSR Unit 1
Revision 0

GENERAL SECTION

Sample Plan #: L4-002

Survey Area No.: FCS 18 Partial Release 1	Survey Unit No.: 2
Survey Unit Name: Land Area 2	
Survey Unit Type: Non-impacted farm land	

☒ - Open Land ☐ - Structural Interior ☐ - Structural Exterior ☐ - System
Initial Classification: ☒ - Non-Impacted ☐ - Class 3 ☐ - Class 2 ☐ - Class 1

PREPARATION FOR CHARACTERIZATION ACTIVITIES

Reference Grid and/or Reference Coordinates have been established (if appropriate).

☒ Yes ☐ No Explanation: _____

A walk-down has been performed of the Survey Unit and a completed *Survey Unit Pre-Characterization Walk-Down* is included with this survey package.

☒ Yes ☐ No Explanation: _____

All survey preparation activities (clear vegetation, erect scaffolding, etc.) as identified by the *Survey Unit Pre-Characterization Walk-Down* have been completed.


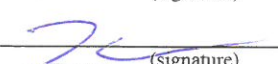
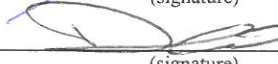
☒ Yes ☐ No Explanation: _____

Area has been cleared of all non-essential materials and equipment.

☒ Yes ☐ No Explanation: _____

ABOVE MUST BE COMPLETED PRIOR TO COMMENCING SURVEY

SAMPLE PLAN APPROVAL

Prepared:	Andrea Barker		Date:	4/19/18
	(Name)	(signature)		
Peer Review:	Ryan Layman		Date:	4/19/18
	(Name)	(signature)		
Approved:	Daniel Whisler		Date:	4/23/18
	Radiation Protection Manager	(signature)		

**FCS Partial Site Release
Characterization Data Quality Objectives and Survey
Design**

L4-002
FCS PSR Unit 1
Revision 0

Survey Unit No: 1

Sample Plan # L4-002

Survey Area **No.:** FCS 18 PR 1 **Description:** Approximately 120 acres West of tree line

Survey Unit **No.:** 2 **Description:** Triangular land area West (plant North) of PA

Survey Unit Type:

☒ - Open Land ☐ - Structural Interior ☐ - Structural Exterior ☐ - System

Survey Unit Area: 149,383.9 square meters

Survey Unit Classification:

Current Classification: ☒ - Non-Impacted ☐ - Class 3 ☐ - Class 2 ☐ - Class 1

Types of Surfaces:

☐ - Floor
☐ - Wall
☐ - Ceiling
☐ - Roof
☐ - Paved Road
☐ - Concrete Pad
☒ - Ground
☐ - Surface Water
☐ - System
☐ - Other _____
☐ - Other _____

Composition of Surfaces:

☐ - Concrete
☐ - Steel
☐ - Cinder Block
☐ - Brick
☐ - Tile
☐ - Wood
☐ - Asphalt
☐ - Tar
☒ - Soil
☐ - Other _____
☐ - Other _____

Types of Media:

☒ - Surface Soil
☐ - Subsurface Soil
☐ - Sediment
☐ - Water
☐ - Liquids (not water)
☐ - Oil
☐ - Volumetric Concrete
☐ - Volumetric Asphalt
☐ - Metal
☐ - Paint
☒ - Other ISOCS

Survey Unit Historical Information

Previous operational functions: Leased, row farmland. No historical operational function.

**FCS Partial Site Release
Characterization Data Quality Objectives and Survey
Design**

L4-002
FCS PSR Unit 1
Revision 0

Survey Unit No: 2 Sample Plan # L4-002

Basis for initial classification: Review of operational history and interviews conducted during Initial Historical Site Assessment (HSA) showed no historical operational functions or historical storage functions. Environmental samples from Initial HSA showed no environmental contaminants downstream of the land requiring remediation.

Summary of processes and incidents from Historical Site Assessment: No operational processes performed. Leased farmland only. No incidents noted from Initial HSA.

Summary of Current Radiological Condition: No current Radioactive Material Areas, Radiologically Controlled Areas, or known radiological conditions and no historical evidence of such.

Data Quality Objectives:

1. **State the Problem:** Perform characterization inspections and surveys of sufficient quality and quantity to determine the nature and extent of radioactive contamination in the survey unit in order to validate the classification of “non-impacted” as defined by NUREG-1575 (MARSSIM).
2. **Identify the Decision:** Perform radiological surveys in the survey unit to identify the potential presence of plant-related radionuclides at concentrations greater than the minimum detectable concentration (MDC) of the instruments(s) used and greater than the expected naturally-occurring background activity concentrations.
3. **Identify Inputs:**
 - a. Can the objectives of the characterization survey be achieved with reasonable confidence based on existing data? (If “Yes”, then document the basis for the acceptability of the data.) Yes ☐ No ☒

Basis:

**FCS Partial Site Release
Characterization Data Quality Objectives and Survey
Design**

L4-002
FCS PSR Unit 1
Revision 0

Survey Unit No: 2 Sample Plan # L4-002

b. Identify the Action Levels that will be used for the characterization of this survey unit.

☐ Isotopic Volumetric ☐ Gross Surface Activity ☒ Detectable Activity > MDCR

c. Identify the types of measurements and/or sample to be taken for the characterization of the survey unit.

<input checked="" type="checkbox"/> Surface Soil Sample(s) <input type="checkbox"/> Subsurface Soil Sample(s) <input type="checkbox"/> Sediment Sample(s) <input type="checkbox"/> Concrete Core Sample(s) <input type="checkbox"/> Volumetric Concrete Sample(s) <input type="checkbox"/> Volumetric Asphalt Sample(s) <input type="checkbox"/> Water Sample(s)	<input type="checkbox"/> Swipe Sample(s) <input type="checkbox"/> Direct beta-gamma measurement(s) <input type="checkbox"/> Direct alpha measurement(s) <input type="checkbox"/> Surface Scans (structures) <input checked="" type="checkbox"/> Surface Scans (soils) <input checked="" type="checkbox"/> ISOCS _____ <input checked="" type="checkbox"/> Other <u>10% HTD</u>
--	--

d. Designate the radiological instrumentation that will be used to acquire field measurements and denote the anticipated static and scan MDC for each.

NOTE: Static and Scan MDC for scanning structures and soil will be determined in accordance with Radiological Analysis.

	Instrument Type:	Detector Type:	Static MDC:	Scan MDC:
1	NaI Probe	Scintillation		4.5 pCi/g
2	ISOCS	HPGe (semi-conductor)	0.19 pCi/g	N/A
3				
4				

Are the static and scan MDCs for the instruments and detectors listed above less than the Action Levels selected? (If "No", then document the reason why the instrument will continue to be used for this survey and the impact on data quality.)

Yes ☒ No ☐

Explanation:

e. Determine the type of analyses that will be performed on volumetric material sample(s).

Analyses

☒ Gross Beta Gamma ☒ Gross Alpha ☒ Gamma Spectroscopy
☒ Liquid Scintillation ☒ Alpha Spectroscopy

Analyses Details: All surface soil samples collected will be analyzed by on-site gamma spectroscopy equipment for plant-derived gamma emitting radionuclides. Count times utilized achieve an isotopic MDC equal to or less than 0.4 pCi/g for Cs-137. Ten percent (10%) of samples will be sent to an off-site laboratory for HTD analysis with the full suite of nuclides defined in FC-18-002.

**FCS Partial Site Release
Characterization Data Quality Objectives and Survey
Design**

L4-002
FCS PSR Unit 1
Revision 0

Survey Unit No: 2 Sample Plan # L4-002

4. Determine Number & Type of Judgmental Measurements and/or Samples:

- a. Specify the number of judgmental measurements and/or samples that will be taken in this survey unit to adequately address the objectives of the survey.

<p>* Surface Soil Sample(s) _____</p> <p>_____ Subsurface Soil Sample(s)</p> <p>_____ Sediment Sample(s)</p> <p>_____ Concrete Core Sample(s)</p> <p>_____ Volumetric Concrete Sample(s)</p> <p>_____ Volumetric Asphalt Sample(s)</p>	<p>_____ Water Sample(s)</p> <p>_____ Swipe Sample(s)</p> <p>_____ Direct beta-gamma measurement(s)</p> <p>_____ Direct alpha measurement(s)</p> <p>_____ Other _____</p> <p>_____ Other _____</p>
--	--

- b. Designate the locations of the judgmental samples and the location coordinates on "Sample/Measurement Identification and Coordinates" and on the map.
- c. Explain the basis for the determination of the judgmental measurement and/or sample population size and the selection of the measurement and/or sample locations.

Basis: *Randomized points fell in areas where judgmental samples were identified to be taken. As the survey is executed, additional judgmental samples may be collected at any areas of elevated activity identified.

5. List Decision Rules:

"If"	"Then"
1 Gamma scan reading exceeds MDCR plus Background	Bound area of elevated activity and obtain judgmental soil sample at highest reading.
2 Gamma spectroscopy analysis of surface soil indicates presence of plant-derived radionuclide concentrations greater than background and spatial extent is not bounded	Confirm and bound area(s) with additional sampling. Consider analysis for HTD beta and alpha ROC.
3 Gamma spectroscopy analysis of surface soil indicates presence of plant-derived radionuclide concentrations greater than background and spatial extent is bounded.	Reclassify the identified area(s) as "impacted" and assign an appropriate classification (Class 1, 2 or 3) based upon the classification definitions provided in NUREG-1575 (MARSSIM).

6. Determine Number & Type of Random-Based Measurements and/or Samples:

NOTE: If the survey unit is an impacted or non-impacted open land survey unit or a structural survey unit that will be subjected to FSS, then a random-based direct measurement and/or sample population should be established.

- a. Is the survey unit classified as Class 1? Yes ☐ No ☒

(If "Yes", then random-based samples are not required unless specifically compelled by the survey objectives. If random-based samples are not required, then proceed to "Scan Coverage" section. Otherwise, proceed to the next step.)

**FCS Partial Site Release
Characterization Data Quality Objectives and Survey
Design**

L4-002
FCS PSR Unit 1
Revision 0

Survey Unit No: 2 Sample Plan # L4-002

- b. What is the current classification of the survey unit? Class: _____ Non-impacted _____
- c. What type of survey unit ☒ - Open Land ☐ - Structural ☐ - System

(If the survey unit is classified as non-impacted or Class 3 open land area, then the minimum number of random-based direct measurements and/or samples (n) will be 14 based on MARSSIM guidance, Cs-137 DCGL, LGBR = 0.5 DCGL, $\sigma = 30$, $\Delta/\sigma > 3.0$, Sign $p = 1$, $\alpha = 0.05$, $\beta = 0.05$, and using the Sign test)

- d. Specify the number of random-based measurements and/or samples that will be taken in this survey unit to adequately address the objectives of the survey.

<u> 14 </u> Surface Soil Sample(s) <u> </u> Subsurface Soil Sample(s) <u> </u> Sediment Sample(s) <u> </u> Concrete Core Sample(s) <u> </u> Volumetric Concrete Sample(s) <u> </u> Volumetric Asphalt Sample(s)	<u> </u> Water Sample(s) <u> </u> Swipe Sample(s) <u> </u> Direct beta-gamma measurement(s) <u> </u> Direct alpha measurement(s) <u> 14 </u> ISOCS <u> 1 </u> Other: <u> HTD Soil sample </u>
---	---

- e. Designate the locations of the random-based measurement and/or samples and the location coordinates on, "Sample/Measurement Identification and Coordinates" and on the map.
- f. Designate at random, 10% of the random-based measurement and/or sample locations as QC split samples or replicate measurement locations and denote the selected QC samples on the survey map.

7. Survey Unit Scan Coverage:

- a. Designate the scan coverage requirements for this survey unit.----- 1%
- b. Is less than 100% scan coverage required? Yes ☒ No ☐

(If "Yes", then designate the areas to be scanned using the reference coordinate system that equates to the required total area that is to be scanned and document below the basis of why that area was selected.)

Basis: 1% of the total land unit area will be divided among the unit sample locations and scanned in a rectangular manner around the center of each location.

**FCS Partial Site Release
Characterization Data Quality Objectives and Survey
Design**

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FCS PSR Unit 1
Revision 0

Survey Unit No: 2 Sample Plan # L4-002

- c. Designate the locations of the scan areas and the location coordinates on the map.
- d. Establish *a priori* alarm set-points and/or action levels for scanning.

☐ Structures (beta-gamma) _____ units

☒ Open Land (gamma) _____ units

8. Additional Comments:

Survey Design Review

Prepared by: Andrea Barker
(Print Name)

Peer Reviewed by: David Brehm
(Print Name)


(Signature)


(Signature)

4/23/18
(Date)

4/23/2018
(Date)

FCS Partial Site Release
Survey Instructions
Page 1 of 5

L4-002
Revision 0

Sample Plan No.: L4-002

Survey Area No.: FCS 18 PR 1

Description: FCS 2018 Partial Release 1

Survey Unit No.: 2

Description: Triangular land area West (plant North) of PA

Survey Unit Type:

☒ - Open Land ☐ - Structure Interior ☐ - Structure Exterior ☐ - System

Survey Unit Classification:

Initial Classification: ☒ - Non-Impacted ☐ - Class 3 ☐ - Class 2 ☐ - Class 1

General Instructions:

1. Personnel will follow all relevant safety directives and procedures while performing this work.
2. Survey and sampling will be performed by Chemistry and RP technicians under the direction of Chemistry and RP Supervision.
3. Instrumentation used in the field will be used in accordance with applicable procedures.
4. Detailed field notes and observations will be documented during survey and sampling.
5. Photographs should be taken as necessary to clarify survey and sampling activities or survey constraints.
6. Samples will be provided to the Environmentalist or other personnel designated by RP Supervision.
7. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.
8. Sample & measurement locations will be identified using coordinates consistent with the established reference coordinate system. Sample and measurement locations will be identified by marks or flags prior to and during survey implementation.

FCS Partial Site Release
Survey Instructions
Page 2 of 5

L4-002
Revision 0

Sample Plan No.: L4-002

Survey Area No.: FCS 18 PR 1 **Description:** Approximately 120 West of tree line

Survey Unit No.: 2 **Description:** Triangular land area West (plant North) of PA

Specific Instructions:

1. Proceed to the survey unit.
2. Initialize and utilize the data point log on the following page. Steps or samples do NOT need to be performed and completed in the order written.
3. The end cap on the ISOCS unit MUST be removed prior to shots being acquired. The cap SHALL be replaced prior to moving the next survey unit area. The basket on the ISOCS cart can be utilized to store the wingnuts for the end cap and the end cap itself, while removed. A bag may also be provided.
4. NaI scans MUST be completed prior collection of soil samples in a given sample point area.
5. Place a flag in the soil at the location of observed, elevated dose rates, as applicable, from the NaI scan. Note – if all areas have the same background reading, a flag MAY be placed within approximately 1 meter of the center stake for that area or no flag may be used to indicate the center stake is the point of interest.
6. Soil samples should be taken at the area with observed elevated dose rates, as applicable, from the NaI scans. Note – if all areas have the same background reading, collect the soil sample within approximately 1 meter of the center stake for that area.
7. To minimize cross-contamination, the shovel and tools should be rinsed in between sample point location digging.

Comments:

FCS Partial Site Release
Survey Instructions
Page 3 of 5

L4-002
Revision 0

Sample Plan No: L4-002

Survey Unit No: 002

Sample Point	Coordinates: (Lateral)	(Longitudinal)	Date	Time	Technician Initials
L4-002-001D	41.52808439	96.08990866	4/24/18	1320	S
L4-002-001S	41.0247293	96.0887388	4-24-18	0815	R
L4-002-001N			4-24-18	0900	J.R.
L4-002-001HS	41.0247293	96.0887388	4-24-18	0815	R
L4-002-002D	41.52673538	96.08898375	4/24/18	1350	S
L4-002-002S	41.026737	96.088303	4/23/18	1050	R
L4-002-002N			4/23/18	1040	JRM
L4-002-002HS					
L4-002-003D	41.53085433	96.09171054	N/A	N/A	AB
L4-002-003S	41.0308502	96.09182815	4/24/18	0935	R
L4-002-003N			4/24/18	0930	J.R. + J.K.M.
L4-002-003HS					
L4-002-004D	41.52541336	96.08858743	4-25-18	1125	JRM
L4-002-004S	41.0254175	96.0885556	4/23/18	0940	R
L4-002-004N			4/23/18	0920	JRM
L4-002-004HS					
L4-002-005D	41.53044962	96.09054526	N/A	N/A	AB
L4-002-005S	41.03009145	96.09086995	4/24/18	1315	R
L4-002-005N			4/24/18	1300	J.K.M.
L4-002-005HS					
L4-002-006D	41.52649215	96.08962123	4/24/18	1450	S
L4-002-006S	41.0265061	96.0896410	4/23/18	1030	R
L4-002-006N			4/23/18	1020	JRM
L4-002-006HS					
L4-002-007D	41.52550332	96.08923609	4-25-18	1225	JRM

D = Direct Scan; S = Soil; N = NaI Scan; HS = HTD Soil Sample

FCS Partial Site Release
Survey Instructions
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L4-002
 Revision 0

Sample Plan No: L4-002

Survey Unit No: 002

Sample Point	Coordinates: (Lateral)	(Longitudinal)	Date	Time	Technician Initials
L4-002-007S	41.0254998	96.089175	4/23/18	1005	R
L4-002-007N			4/23/18	0950	J.R.
L4-002-007HS					
X L4-002-008D	41.52841709	96.0885632	N/A	N/A	AB
L4-002-008S	41.0284268	96.0884276	4/23/18	1340	R
L4-002-008N			4/23/18	1325	JMM
L4-002-008HS					
X L4-002-009D	41.52868695	96.09050928	N/A	N/A	AB
L4-002-009S	41.0289491	96.0905722	4/24/18	1020	R
L4-002-009N			4/24/18	1000	JMM
L4-002-009HS			4/24/18	1005	R
X L4-002-010D	41.52825524	96.0891158	N/A	N/A	AB
L4-002-010S	41.0282140	96.0891502	4/23/18	1352	R
L4-002-010N			4/23/18	1343	JMM
L4-002-010HS					
O L4-002-011D	41.52517971	96.08891111	4-25-18	1155	JMM
L4-002-011S	41.025245	96.088906	4/23/18	0945	R
L4-002-011N			4/23/18	0935	J.R.
L4-002-011HS					
L4-002-012D	41.52424433	96.08862397	4/24/18	1045	S
L4-002-012S	41.024306	96.088600	4-24-18	0845	R
L4-002-012N			4-24-18	0835	J.R.
L4-002-012HS					
L4-002-013D	41.52452161	96.08850677	4/24/18	1145	S

D = Direct Scan; S = Soil; N = NaI Scan; HS = HTD Soil Sample

4 to Plot

7 Soil
 7 NaI
 4/23/18

FCS Partial Site Release

Survey Instructions

Page 5 of 5L4-002
Revision 0Sample Plan No: L4-002Survey Unit No: 001

Handwritten notes: 140, 1425, 4/24/18, L4-2-15 Direct

Sample Point	Coordinates: (Lateral)	(Longitudinal)	Date	Time	Technician Initials
L4-002-013S	41.024541	96.0884683	4-24-18	0830	JR
L4-002-013N			4-24-18	0820	J.R.
L4-002-013HS					
<input checked="" type="checkbox"/> L4-002-014D	41.52917601	96.0892429	N/A	NA	AB
L4-002-014S	41.0293037	96.089258	4/24/18	1350	JR
L4-002-014N			4/24/18	1335	JM
L4-002-014HS					
L4-002-QC1*					
L4-002-QC2*					
L4-002-QC3*					
*Additional as needed					

D = Direct Scan; S = Soil; N = NaI Scan; HS = HTD Soil Sample

Judgemental Samples:

Sample Point	Coordinates: (Lateral)	(Longitudinal)	Date	Time	Technician Initials
L4-002-015/D			4/24/18	1425	
L4-002-__J					
L4-002-__J					
L4-002-__J					
L4-002-__J					
L4-002-__J					

D = Direct Scan; S = Soil; N = NaI Scan; HS = HTD Soil Sample

**FCS Partial Site Release
Scan Area Identification & Coordinates**

L4-002
FCS PSR Unit 1
Revision 0

Survey Area No.: FCS 18 PR 1 **Description:** FCS 2018 Partial Release 1 **Sample Plan No.:** L4-002
Survey Unit No.: 2 **Description:** Triangular land area West (plant North) of PA

Scan Area No.:	Surface Area (m2)	% of Total Survey Unit Area	Coordinates									
			Corner 1		Corner 2		Center Point		Corner 3		Corner 4	
			Northing	Easting	Northing	Easting	Northing	Easting	Northing	Easting	Northing	Easting
L4002-001	132	0.088	41.52813605	96.08983965	41.52803273	96.08983965	41.52808439	96.08990866	41.52803273	96.08997767	41.52813605	96.08997767
L4002-002	132	0.088	41.52678704	96.08891475	41.52668372	96.08891475	41.52673538	96.08898375	41.52668372	96.08905276	41.52678704	96.08905276
L4002-003	132	0.088	41.530906	96.09164153	41.53080267	96.09164153	41.53085433	96.09171054	41.53080267	96.09177955	41.530906	96.09177955
L4002-004	132	0.088	41.52546502	96.08851842	41.5253617	96.08851842	41.52541336	96.08858743	41.5253617	96.08865643	41.52546502	96.08865643
L4002-005	132	0.088	41.53050128	96.09047624	41.53039796	96.09047624	41.53044962	96.09054526	41.53039796	96.09061427	41.53050128	96.09061427
L4002-006	132	0.088	41.52654381	96.08955223	41.52644048	96.08955223	41.52649215	96.08962123	41.52644048	96.08969024	41.52654381	96.08969024
L4002-007	132	0.088	41.52555498	96.08916709	41.52545165	96.08916709	41.52550332	96.08923609	41.52545165	96.0893051	41.52555498	96.0893051
L4002-008	132	0.088	41.52841709	96.0885632	41.52836543	96.08849419	41.52841709	96.0885632	41.52836543	96.08863221	41.52846876	96.08863221
L4002-009	132	0.088	41.52873861	96.09044027	41.52863529	96.09044027	41.52868695	96.09050928	41.52863529	96.09057829	41.52873861	96.09057829
L4002-010	132	0.088	41.5283069	96.08904679	41.52820357	96.08904679	41.52825524	96.0891158	41.52820357	96.08918481	41.5283069	96.08918481
L4002-011	132	0.088	41.52523137	96.08884211	41.52512804	96.08884211	41.52517971	96.08891111	41.52512804	96.08898012	41.52523137	96.08898012
L4002-012	132	0.088	41.524296	96.08855496	41.52419267	96.08855496	41.52424433	96.08862397	41.52419267	96.08869297	41.524296	96.08869297
L4002-013	132	0.088	41.52457327	96.08843777	41.52446994	96.08843777	41.52452161	96.08850677	41.52446994	96.08857578	41.52457327	96.08857578
L4002-014	132	0.088	41.52922767	96.08917389	41.52912435	96.08917389	41.52917601	96.0892429	41.52912435	96.08931191	41.52922767	96.08931191
Totals:	1848	1.2%										

FCS Partial Site Release
Survey Unit Pre-Characterization Walk-Down

L4-003
FCS PSR Unit 1
Revision 0

Survey Area: FCS 18 Partial Release 1 **Survey Unit No.:** 3 (L4-003)

Survey Unit Type: Open Land ☒ Structural Interior ☐ Structural Exterior ☐

Survey Unit Area: 153,460 m²

Survey Unit Description: Primarily flat, cultivated farm land (last farmed in 2017) with minimal trees around perimeter.

Physical Configuration of Survey Unit: Triangular land area bounded on the North by the Fort Calhoun Station property line and the Missouri River; the East by a treeline running North-South; and on the Southwest by land survey unit 1.

Walk-Down was: Performed ☒ Date: 4/26/18 By: Jillian A Ryan
(Name)
Not Performed ☐ Reason Walk-Down was not Performed:

Observed or Potential Hazards:

- | | | |
|---|--|--|
| <input type="checkbox"/> - Heat stress or stroke | <input type="checkbox"/> - Confined Spaces | <input type="checkbox"/> - Kinetic energy sources (moving equipment) |
| <input type="checkbox"/> - Cold work environment | <input type="checkbox"/> - Hazardous atmospheres | |
| <input checked="" type="checkbox"/> - Stinging insects | <input type="checkbox"/> - Load bearing stresses | <input type="checkbox"/> - Vehicle traffic |
| <input type="checkbox"/> - Hazardous plants and/or animal | <input type="checkbox"/> - Lack of structural integrity (structure, floor) | <input type="checkbox"/> - Overhead piping or components |
| <input checked="" type="checkbox"/> - Tripping hazards | | <input type="checkbox"/> - Exposed electrical circuitry |
| <input type="checkbox"/> - Standing water > 1ft deep | <input type="checkbox"/> - Release of stored energy sources (hydraulic, steam, etc.) | <input checked="" type="checkbox"/> - Sharp objects or surfaces |
| <input checked="" type="checkbox"/> - Fall hazards | | <input type="checkbox"/> - Falling objects |
| <input type="checkbox"/> - Work @ height > 6ft | <input type="checkbox"/> - Buried utilities | <input type="checkbox"/> - Other _____ |
| <input type="checkbox"/> - Open excavations | <input checked="" type="checkbox"/> - Overhead power lines | <input type="checkbox"/> - Other _____ |

(Each hazard identified must be evaluated to determine if the hazard can be eliminated, avoided, or minimized, as well as the need for additional support/expertise)

Hazard(s) Mitigation Measures:

a.r.
Bug spray for ~~the~~ insects; sunscreen for sun protection
Eyes on path for cornstalks. Overhead power lines were noted, will not hinder sampling safety

**FCS Partial Site Release Land Area 1
Survey Unit Pre-Characterization Walk-Down**

L4-003
FCS PSR Unit 1
Revision 0

Survey Unit Preparation for Characterization:

- | | | |
|---|---|--|
| <input type="checkbox"/> - Mark reference grid | <input type="checkbox"/> - Clear vegetation | <input type="checkbox"/> - Set-up Man Lift |
| <input checked="" type="checkbox"/> - GPS | <input type="checkbox"/> - Confined space permit | <input type="checkbox"/> - Extension poles |
| <input checked="" type="checkbox"/> - Mark survey unit boundaries | <input type="checkbox"/> - Set-up Temporary Ventilation | <input type="checkbox"/> - Other _____ |
| <input type="checkbox"/> - Clear equipment and/or tools | <input type="checkbox"/> - Radiation Work Permit | <input type="checkbox"/> - Other _____ |
| <input type="checkbox"/> - Clear loose material and/or debris | <input type="checkbox"/> - Erect Scaffolding | |

Preparation Details:

Survey Unit Classification:

Initial Classification: Non-Impacted ☒ Class 3 ☐ Class 2 ☐ Class 1 ☐

If the Survey Unit is a Class 2, Class 3 or Non-Impacted Survey Unit?

-
- a. Are there any posted Radiologically Controlled Areas in the survey unit? Yes ☐ No ☒
Investigation:
- b. Is there any posted Radioactive Material Areas or labeled, tagged or bagged
radioactive material or potential radioactive material in the survey unit? Yes ☐ No ☒
Investigation:
- c. Is the survey unit in the path of a known transport route for unpackaged
radioactive materials? Yes ☐ No ☒
Investigation:
- d. Is there any observable evidence of any past remediation activities within this
survey unit? Yes ☐ No ☒
Investigation:

The initial classification for this survey unit was Class Non-Impacted. Based upon the visual observations of the walk-down, the initial classification of this survey unit is: ☐ is justified ☐ is not justified.

Submitted: Julia C. Peña 4/26/18 X1424 Reviewed: [Signature] 4/26/18 X10887
Name/Date Name/Date

FCS Partial Site Release
Sample Plan Cover Sheet

L4-003
FCS PSR Unit 1
Revision 0

GENERAL SECTION

Sample Plan #: L4-003

Survey Area No.: FCS 18 Partial Release 1	Survey Unit No.: 3
Survey Unit Name: Land Area 3	
Survey Unit Type: Non-impacted farm land	

☒ - Open Land ☐ - Structural Interior ☐ - Structural Exterior ☐ - System
Initial Classification: ☒ - Non-Impacted ☐ - Class 3 ☐ - Class 2 ☐ - Class 1

PREPARATION FOR CHARACTERIZATION ACTIVITIES

Reference Grid and/or Reference Coordinates have been established (if appropriate).

☒ Yes ☐ No Explanation: _____

A walk-down has been performed of the Survey Unit and a completed *Survey Unit Pre-Characterization Walk-Down* is included with this survey package.

☒ Yes ☐ No Explanation: _____

All survey preparation activities (clear vegetation, erect scaffolding, etc.) as identified by the *Survey Unit Pre-Characterization Walk-Down* have been completed.

☒ Yes ☐ No Explanation: _____

Area has been cleared of all non-essential materials and equipment.

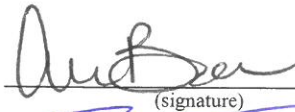
☒ Yes ☐ No Explanation: _____

ABOVE MUST BE COMPLETED PRIOR TO COMMENCING SURVEY

SAMPLE PLAN APPROVAL

Prepared: Andrea Barker

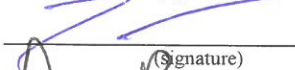
(Name)


(signature)

Date: 4/26/18

Peer Review: Ryan Layman

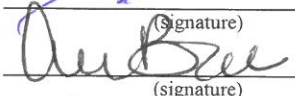
(Name)


(signature)

Date: 4/28/18

Approved: Daniel Whisler

Radiation Protection Manager


(signature)

Date: 4/26/18

for D. Whisler per
telecom

**FCS Partial Site Release
Characterization Data Quality Objectives and Survey
Design**

L4-003
FCS PSR Unit 1
Revision 0

Survey Unit No: 1

Sample Plan # L4-003

Survey Area **No.:** FCS 18 PR 1 **Description:** Approximately 120 acres West of tree line

Survey Unit **No.:** 3 **Description:** Rectangular land area West (plant North) of PA

Survey Unit Type:

☒ - Open Land ☐ - Structural Interior ☐ - Structural Exterior ☐ - System

Survey Unit Area: 153,460 square meters

Survey Unit Classification:

Current Classification: ☒ - Non-Impacted ☐ - Class 3 ☐ - Class 2 ☐ - Class 1

Types of Surfaces:

- ☐ - Floor
- ☐ - Wall
- ☐ - Ceiling
- ☐ - Roof
- ☐ - Paved Road
- ☐ - Concrete Pad
- ☒ - Ground
- ☐ - Surface Water
- ☐ - System
- ☐ - Other _____
- ☐ - Other _____

Composition of Surfaces:

- ☐ - Concrete
- ☐ - Steel
- ☐ - Cinder Block
- ☐ - Brick
- ☐ - Tile
- ☐ - Wood
- ☐ - Asphalt
- ☐ - Tar
- ☒ - Soil
- ☐ - Other _____
- ☐ - Other _____

Types of Media:

- ☒ - Surface Soil
- ☐ - Subsurface Soil
- ☐ - Sediment
- ☐ - Water
- ☐ - Liquids (not water)
- ☐ - Oil
- ☐ - Volumetric Concrete
- ☐ - Volumetric Asphalt
- ☐ - Metal
- ☐ - Paint
- ☒ - Other ISOCS

Survey Unit Historical Information

Previous operational functions: Leased, row farmland. No historical operational function.

**FCS Partial Site Release
Characterization Data Quality Objectives and Survey
Design**

L4-003
FCS PSR Unit 1
Revision 0

Survey Unit No: 3

Sample Plan # L4-003

Basis for initial classification: Review of operational history and interviews conducted during Initial Historical Site Assessment (HSA) showed no historical operational functions or historical storage functions. Environmental samples from Initial HSA showed no environmental contaminants downstream of the land requiring remediation.

Summary of processes and incidents from Historical Site Assessment: No operational processes performed. Leased farmland only. No incidents noted from Initial HSA.

Summary of Current Radiological Condition: No current Radioactive Material Areas, Radiologically Controlled Areas, or known radiological conditions and no historical evidence of such.

Data Quality Objectives:

1. **State the Problem:** Perform characterization inspections and surveys of sufficient quality and quantity to determine the nature and extent of radioactive contamination in the survey unit in order to validate the classification of "non-impacted" as defined by NUREG-1575 (MARSSIM).
2. **Identify the Decision:** Perform radiological surveys in the survey unit to identify the potential presence of plant-related radionuclides at concentrations greater than the minimum detectable concentration (MDC) of the instruments(s) used and greater than the expected naturally-occurring background activity concentrations.
3. **Identify Inputs:**
 - a. Can the objectives of the characterization survey be achieved with reasonable confidence based on existing data? (If "Yes", then document the basis for the acceptability of the data.) Yes ☐ No ☒

Basis:

**FCS Partial Site Release
Characterization Data Quality Objectives and Survey
Design**

L4-003
FCS PSR Unit 1
Revision 0

Survey Unit No: 3 Sample Plan # L4-003

b. Identify the Action Levels that will be used for the characterization of this survey unit.

☐ Isotopic Volumetric ☐ Gross Surface Activity ☒ Detectable Activity > MDCR

c. Identify the types of measurements and/or sample to be taken for the characterization of the survey unit.

<input checked="" type="checkbox"/> Surface Soil Sample(s) <input type="checkbox"/> Subsurface Soil Sample(s) <input type="checkbox"/> Sediment Sample(s) <input type="checkbox"/> Concrete Core Sample(s) <input type="checkbox"/> Volumetric Concrete Sample(s) <input type="checkbox"/> Volumetric Asphalt Sample(s) <input type="checkbox"/> Water Sample(s)	<input type="checkbox"/> Swipe Sample(s) <input type="checkbox"/> Direct beta-gamma measurement(s) <input type="checkbox"/> Direct alpha measurement(s) <input type="checkbox"/> Surface Scans (structures) <input checked="" type="checkbox"/> Surface Scans (soils) <input checked="" type="checkbox"/> ISOCS _____ <input checked="" type="checkbox"/> Other <u>10% HTD</u>
--	--

d. Designate the radiological instrumentation that will be used to acquire field measurements and denote the anticipated static and scan MDC for each.

NOTE: Static and Scan MDC for scanning structures and soil will be determined in accordance with Radiological Analysis.

	Instrument Type:	Detector Type:	Static MDC:	Scan MDC:
1	NaI Probe	Scintillation		4.5 pCi/g
2	ISOCS	HPGe (semi-conductor)	0.19 pCi/g	N/A
3				
4				

Are the static and scan MDCs for the instruments and detectors listed above less than the Action Levels selected? (If "No", then document the reason why the instrument will continue to be used for this survey and the impact on data quality.)

Yes ☒ No ☐

Explanation:

e. Determine the type of analyses that will be performed on volumetric material sample(s).

Analyses

☒ Gross Beta Gamma ☒ Gross Alpha ☒ Gamma Spectroscopy
☒ Liquid Scintillation ☒ Alpha Spectroscopy

Analyses Details: All surface soil samples collected will be analyzed by on-site gamma spectroscopy equipment for plant-derived gamma emitting radionuclides. Count times utilized achieve an isotopic MDC equal to or less than 0.4 pCi/g for Cs-137. Ten percent (10%) of samples will be sent to an off-site laboratory for HTD analysis with the full suite of nuclides defined in FC-18-002.

**FCS Partial Site Release
Characterization Data Quality Objectives and Survey
Design**

L4-003
FCS PSR Unit 1
Revision 0

Survey Unit No: 3

Sample Plan # L4-003

4. Determine Number & Type of Judgmental Measurements and/or Samples:

- a. Specify the number of judgmental measurements and/or samples that will be taken in this survey unit to adequately address the objectives of the survey.

<u> * </u> Surface Soil Sample(s) <u> </u> Subsurface Soil Sample(s) <u> </u> Sediment Sample(s) <u> </u> Concrete Core Sample(s) <u> </u> Volumetric Concrete Sample(s) <u> </u> Volumetric Asphalt Sample(s)	<u> </u> Water Sample(s) <u> </u> Swipe Sample(s) <u> </u> Direct beta-gamma measurement(s) <u> </u> Direct alpha measurement(s) <u> </u> Other <u> </u> <u> </u> Other <u> </u>
--	---

- b. Designate the locations of the judgmental samples and the location coordinates on "Sample/Measurement Identification and Coordinates" and on the map.
- c. Explain the basis for the determination of the judgmental measurement and/or sample population size and the selection of the measurement and/or sample locations.

Basis: *Randomized points fell in areas where judgmental samples were identified to be taken. As the survey is executed, additional judgmental samples may be collected at any areas of elevated activity identified.

5. List Decision Rules:

"If"	"Then"
1 Gamma scan reading exceeds MDCR plus Background	Bound area of elevated activity and obtain judgmental soil sample at highest reading.
2 Gamma spectroscopy analysis of surface soil indicates presence of plant-derived radionuclide concentrations greater than background and spatial extent is not bounded	Confirm and bound area(s) with additional sampling. Consider analysis for HTD beta and alpha ROC.
3 Gamma spectroscopy analysis of surface soil indicates presence of plant-derived radionuclide concentrations greater than background and spatial extent is bounded.	Reclassify the identified area(s) as "impacted" and assign an appropriate classification (Class 1, 2 or 3) based upon the classification definitions provided in NUREG-1575 (MARSSIM).

6. Determine Number & Type of Random-Based Measurements and/or Samples:

NOTE: If the survey unit is an impacted or non-impacted open land survey unit or a structural survey unit that will be subjected to FSS, then a random-based direct measurement and/or sample population should be established.

- a. Is the survey unit classified as Class 1? Yes ☐ No ☒

(If "Yes", then random-based samples are not required unless specifically compelled by the survey objectives. If random-based samples are not required, then proceed to "Scan Coverage" section. Otherwise, proceed to the next step.)

**FCS Partial Site Release
Characterization Data Quality Objectives and Survey
Design**

L4-003
FCS PSR Unit 1
Revision 0

Survey Unit No: 3

Sample Plan # L4-003

b. What is the current classification of the survey unit?

Class:

Non-
impacted

c. What type of survey unit

☒ - Open Land

☐ - Structural

☐ - System

(If the survey unit is classified as non-impacted or Class 3 open land area, then the minimum number of random-based direct measurements and/or samples (n) will be 14 based on MARSSIM guidance, Cs-137 DCGL, LGBR = 0.5 DCGL, $\sigma = 30$, $\Delta/\sigma > 3.0$, Sign $p = 1$, $\alpha = 0.05$, $\beta = 0.05$, and using the Sign test)

d. Specify the number of random-based measurements and/or samples that will be taken in this survey unit to adequately address the objectives of the survey.

 14 Surface Soil Sample(s)
 Subsurface Soil Sample(s)
 Sediment Sample(s)
 Concrete Core Sample(s)
 Volumetric Concrete Sample(s)
 Volumetric Asphalt Sample(s)

 Water Sample(s)
 Swipe Sample(s)
 Direct beta-gamma measurement(s)
 Direct alpha measurement(s)
 14 ISOCS
 1 Other: HTD Soil sample

e. Designate the locations of the random-based measurement and/or samples and the location coordinates on, "Sample/Measurement Identification and Coordinates" and on the map.

f. Designate at random, 10% of the random-based measurement and/or sample locations as QC split samples or replicate measurement locations and denote the selected QC samples on the survey map.

7. Survey Unit Scan Coverage:

a. Designate the scan coverage requirements for this survey unit.----- 1%

b. Is less than 100% scan coverage required?

Yes ☒ No ☐

(If "Yes", then designate the areas to be scanned using the reference coordinate system that equates to the required total area that is to be scanned and document below the basis of why that area was selected.)

Basis: 1% of the total land unit area will be divided among the unit sample locations and scanned in a rectangular manner around the center of each location.

**FCS Partial Site Release
Characterization Data Quality Objectives and Survey
Design**

L4-003
FCS PSR Unit 1
Revision 0

Survey Unit No: 3 Sample Plan # L4-003

- c. Designate the locations of the scan areas and the location coordinates on the map.
- d. Establish *a priori* alarm set-points and/or action levels for scanning.

☐ Structures (beta-gamma) _____ units

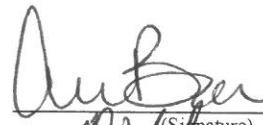
☒ Open Land (gamma) _____ units

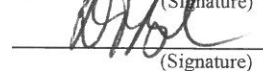
8. Additional Comments:

Survey Design Review

Prepared by: Andrea Barker
(Print Name)

Peer Reviewed by: David Brehm
(Print Name)


(Signature)


(Signature)

4/26/18
(Date)

4/26/2018
(Date)

FCS Partial Site Release
Survey Instructions
Page ____ of ____

L4-003
Revision 0

Sample Plan No.: L4-003

Survey Area No.: FCS 18 PR 1 **Description:** FCS 2018 Partial Release 1

Survey Unit No.: 3 **Description:** Rectangular land area West (plant North) of PA

Survey Unit Type:

☒ - Open Land ☐ - Structure Interior ☐ - Structure Exterior ☐ - System

Survey Unit Classification:

Initial ☒ - Non- ☐ - Class 3 ☐ - Class 2 ☐ - Class 1
Classification: Impacted

General Instructions:

1. Personnel will follow all relevant safety directives and procedures while performing this work.
2. Survey and sampling will be performed by Chemistry and RP technicians under the direction of Chemistry and RP Supervision.
3. Instrumentation used in the field will be used in accordance with applicable procedures.
4. Detailed field notes and observations will be documented during survey and sampling.
5. Photographs should be taken as necessary to clarify survey and sampling activities or survey constraints.
6. Samples will be provided to the Environmentalist or other personnel designated by RP Supervision.
7. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.
8. Sample & measurement locations will be identified using coordinates consistent with the established reference coordinate system. Sample and measurement locations will be identified by marks or flags prior to and during survey implementation.

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Survey Instructions
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L4-003
Revision 0

Sample Plan No.: L4-003

Survey Area No.: FCS 18 PR 1 **Description:** FCS 2018 Partial Release 1

Survey Unit No.: 3 **Description:** Rectangular land area West (plant North) of PA

Survey Unit Type:

☒ - Open Land ☐ - Structure Interior ☐ - Structure Exterior ☐ - System

Survey Unit Classification:

Initial Classification: ☒ - Non-Impacted ☐ - Class 3 ☐ - Class 2 ☐ - Class 1

General Instructions:

1. Personnel will follow all relevant safety directives and procedures while performing this work.
2. Survey and sampling will be performed by Chemistry and RP technicians under the direction of Chemistry and RP Supervision.
3. Instrumentation used in the field will be used in accordance with applicable procedures.
4. Detailed field notes and observations will be documented during survey and sampling.
5. Photographs should be taken as necessary to clarify survey and sampling activities or survey constraints.
6. Samples will be provided to the Environmentalist or other personnel designated by RP Supervision.
7. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.
8. Sample & measurement locations will be identified using coordinates consistent with the established reference coordinate system. Sample and measurement locations will be identified by marks or flags prior to and during survey implementation.

FCS Partial Site Release
Survey Instructions
Page 2 of 5

L4-003
Revision 0

Sample Plan No.: L4-003

Survey Area No.: FCS 18 PR 1 **Description:** Approximately 120 West of tree line

Survey Unit No.: 3 **Description:** Rectangular land area West (plant North) of PA

Specific Instructions:

1. Proceed to the survey unit.
2. Initialize and utilize the data point log on the following page. Steps or samples do NOT need to be performed and completed in the order written.
3. The end cap on the ISOCS unit MUST be removed prior to shots being acquired. The cap SHALL be replaced prior to moving the next survey unit area. The basket on the ISOCS cart can be utilized to store the wingnuts for the end cap and the end cap itself, while removed. A bag may also be provided.
4. NaI scans MUST be completed prior collection of soil samples in a given sample point area.
5. Place a flag in the soil at the location of observed, elevated dose rates, as applicable, from the NaI scan. Note – if all areas have the same background reading, a flag MAY be placed within approximately 1 meter of the center stake for that area or no flag may be used to indicate the center stake is the point of interest.
6. Soil samples should be taken at the area with observed elevated dose rates, as applicable, from the NaI scans. Note – if all areas have the same background reading, collect the soil sample within approximately 1 meter of the center stake for that area.
7. To minimize cross-contamination, the shovel and tools should be rinsed in between sample point location digging.

Comments: _____

FCS Partial Site Release
Survey Instructions
Page 3 of 5

L4-003
Revision 0

Sample Plan No: L4-003

Survey Unit No: 003

Sample Point	Coordinates: (Lateral)	(Longitudinal)	Date	Time	Technician Initials
L4-003-001D	41.522730		4/30/2018	09:19	R
L4-003-001S	41.522730	96.0885658	4/27/18	1300	JTM
L4-003-001N			4/27/18	0805	J.R.
L4-003-001HS	NIA	NIA	NIA	NIA	NIA
L4-003-002D			4/27/18	1545	R
L4-003-002S	41.5200531	96.088620	4/27/18	1350	JTM
L4-003-002N			4/27/18	0855	JTM
L4-003-002HS					
L4-003-003D			4/27/18	1030	R
L4-003-003S	41.5194049	96.0905257	4/27/18	1250	JTM
L4-003-003N			4/27/18	1035	J.R.
L4-003-003HS					
L4-003-004D			4/27/18	1050	R
L4-003-004S	41.519317	96.088465	4/27/18	1030	JTM
L4-003-004N			4/27/18	1010	JTM
L4-003-004HS					
L4-003-005D			4/27/18	0950	R
L4-003-005S	41.5175911	96.0902957	4/26/18	1450	R
L4-003-005N			4/26/18	1440	J.R.
L4-003-005HS	41.5175911	96.0902957	4/26/18	1455	R
L4-003-006D			4/27/18	1415	R
L4-003-006S	41.5219284	96.09040435	4/27/18	1305	JTM
L4-003-006N			4/27/18	0825	JTM
L4-003-006HS					
L4-003-007D			4/30/2018	10:15	R

D = Direct Scan; S = Soil; N = NaI Scan; HS = HTD Soil Sample

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Revision 0

Sample Plan No: L4-003

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Survey Unit No: 003

Sample Point	Coordinates: (Lateral)	(Longitudinal)	Date	Time	Technician Initials
L4-003-007S	41.522858 41.5227307	96.085900 96.085658	4/27/18	1305 1300	JRM
L4-003-007N			4/27/18	0825	J.R.
L4-003-007HS					
L4-003-008D			4/30/2018	0945	R
L4-003-008S	41.5224232	96.086752	4/27/18	1255	JRM
L4-003-008N			4/27/18	0805	JRM
L4-003-008HS					
L4-003-009D			4/27/18	0920	R
L4-003-009S	41.517174	96.090488	4/26/18	1430	R
L4-003-009N			4/26/18	1420	J.R.
L4-003-009HS	NIA	NIA	NIA	NIA	NIA
L4-003-010D			4/27/18	0851	R
L4-003-010S	41.516835	96.080439	4/26/18	1410	R
L4-003-010N			4/26/18	1400	J.R.
L4-003-010HS					
L4-003-011D			4/27/18	1245	R
L4-003-011S	41.5185645	96.0883927	4/27/18	1020	J.R.
L4-003-011N			4/28/18	1005	J.R.
L4-003-011HS	41.5185645	96.0883927	4/22/19	1025	J.R.
L4-003-012D			4/27/18	1355	R
L4-003-012S	41.52109175	96.0904058	4/27/18	1310	JRM
L4-003-012N			4/27/18	0845	J.R.
L4-003-012HS					
L4-003-013D			4/27/18	1315	R

D = Direct Scan; S = Soil; N = NaI Scan; HS = HTD Soil Sample

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Sample Plan No: L4-003

Survey Unit No: 003

Sample Point	Coordinates: (Lateral)	(Longitudinal)	Date	Time	Technician Initials
L4-003-013S	41.5212155	96.0883920	4/27/18	1320	JM
L4-003-013N			4/27/18	0915	JM
L4-003-013HS					
L4-003-014D			4/27/18	0821	R
L4-003-014S	41.5168185	96.089042	4-26-18	1354	R
L4-003-014N			4-26-18	1348	J.R.
L4-003-014HS					
L4-003-QC1*					
L4-003-QC2*					
L4-003-QC3*					
*Additional as needed					

D = Direct Scan; S = Soil; N = NaI Scan; HS = HTD Soil Sample

Judgemental Samples:

Sample Point	Coordinates: (Lateral)	(Longitudinal)	Date	Time	Technician Initials
L4-003-__J					
L4-003-__J					
L4-003-__J					
L4-003-__J					
L4-003-__J					
L4-003-__J					

D = Direct Scan; S = Soil; N = NaI Scan; HS = HTD Soil Sample

**FCS Partial Site Release
Scan Area Identification & Coordinates**

L4-003
FCS PSR Unit 1
Revision 0

Survey Area No.: FCS 18 PR 1 **Description:** FCS 2018 Partial Release 1 **Sample Plan No.:** L4-003
Survey Unit No.: 3 **Description:** Rectangular land area West (plant North) of PA

Scan Area No.:	Surface Area (m2)	% of Total Survey Unit Area	Coordinates									
			Corner 1		Corner 2		Center Point		Corner 3		Corner 4	
			Northing	Easting	Northing	Easting	Northing	Easting	Northing	Easting	Northing	Easting
L4003-001	116	0.075	41.52278181	96.08845085	41.52268495	96.08845085	41.52273338	96.08851554	41.52268495	96.08858023	41.52278181	96.08858023
L4003-002	116	0.075	41.52010186	96.08918374	41.520005	96.08918374	41.52005343	96.08924842	41.520005	96.08931311	41.52010186	96.08931311
L4003-003	116	0.075	41.5194274	96.09049301	41.51933054	96.09049301	41.51937897	96.09055769	41.51933054	96.09062237	41.5194274	96.09062237
L4003-004	116	0.075	41.51938237	96.08841506	41.51928551	96.08841506	41.51933394	96.08847974	41.51928551	96.08854443	41.51938237	96.08854443
L4003-005	116	0.075	41.51763775	96.09025286	41.51754089	96.09025286	41.51758932	96.09031754	41.51754089	96.09038222	41.51763775	96.09038222
L4003-006	116	0.075	41.52196349	96.09037279	41.52186663	96.09037279	41.52191506	96.09043748	41.52186663	96.09050216	41.52196349	96.09050216
L4003-007	116	0.075	41.52294372	96.08936375	41.52284686	96.08936375	41.52289529	96.08942844	41.52284686	96.08949312	41.52294372	96.08949312
L4003-008	116	0.075	41.52246705	96.08858301	41.52237019	96.08858301	41.52241862	96.08864769	41.52237019	96.08871238	41.52246705	96.08871238
L4003-009	116	0.075	41.51722406	96.090385	41.5171272	96.090385	41.51717563	96.09044968	41.5171272	96.09051436	41.51722406	96.09051436
L4003-010	116	0.075	41.5169093	96.09040903	41.51681244	96.09040903	41.51686087	96.09047371	41.51681244	96.09053839	41.5169093	96.09053839
L4003-011	116	0.075	41.51856257	96.08831767	41.51846571	96.08831767	41.51851414	96.08838236	41.51846571	96.08844704	41.51856257	96.08844704
L4003-012	116	0.075	41.52110014	96.09033679	41.52100328	96.09033679	41.52105171	96.09040148	41.52100328	96.09046616	41.52110014	96.09046616
L4003-013	116	0.075	41.52131436	96.08833684	41.5212175	96.08833684	41.52126593	96.08840152	41.5212175	96.08846621	41.52131436	96.08846621
L4003-014	116	0.075	41.51690287	96.08896442	41.51680601	96.08896442	41.51685444	96.0890291	41.51680601	96.08909378	41.51690287	96.08909378
Totals:	1624	1.05%										

**FCS Partial Site Release
Sample Preparation Guidelines**

FCS PSR Unit 1
Revision 0

These guidelines are to ensure that samples for Partial Site Release are prepared uniformly for onsite gamma spectroscopy analysis. All preparation methods for off-site samples will be determined and validated by the vendor laboratory. These guidelines were developed with MARLAP considerations, Fort Calhoun Radiological Engineer and other subject matter expert guidance, and general laboratory practices.

For each sample, the following items should be completed prior to gamma spectroscopy counting:

1. Remove soil sample from sample container.
2. Remove rocks, gravel, and organic material from the soil sample, as best as is possible.

NOTE: Sample may be placed in a clean bucket at this time to aid in removal of excess moisture prior to oven drying methods.

3. Transfer sample to drying pan(s).
4. Place drying pan(s) in the drying oven, preheated to approximately 100° C.

PRECAUTION: Sample and drying pan will be hot while oven drying is occurring. Use care when testing the dryness of the sample.

5. Dry sample until the sample is dry to the touch. Drying times will vary depending on existing moisture content and thickness of sample within drying pan.
6. Remove the sample from the drying oven using appropriate PPE to avoid heat injury and place the sample on heat appropriate surface to cool.
7. Once cooled, return the sample to an appropriate container for further analysis (i.e. – mass determination, gamma spectroscopy, etc.).