CP4-ES-2410 FRev. 4	**TITLE**: Sampling of Fissile/Potentially Fissile Material	Page 1 of 21

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REVISION/CHANGE LOG

Revision/ Change Letter	Description of Changes	Pages Affected	Date of Revision/ Change	Approved By (signature on file)
FR0	Initial FRNP release	All	10/20/2017	Documentation on File
FR1	General Revision	All	1/2/2018	
FR1A	Intent Change to update definition of Fissile Material to new definition issued.	17	2/5/2019	
FR2	Add controls to sample from equipment and flowdown of JHA-11236.	All	12/16/2020	
FR2A	Periodic Review has been completed with no changes identified in procedure technical content. Nonintent change to correct FA, SMA, SME, Approver, and dates has been incorporated per CP3-NS-2001. Date for review cycle has been reset.	All	10/25/2022	
FR2B	Intent change to address multiple comments to update sampling requirements.	4-17, 20	10/19/2023	
FR2C	Intent change for implementation of NCSE WMO-100.	3, 4, 7-10, 16, 17, 20	8/30/2025	
FR3	Revision to incorporate hazards and JHA controls for closure of CAPA #005693 in Issues Management.	All	12/3/2025	
FR4	Revision to clarify sampling activities and update NCS controls.	All	11/5/2026	Mike Dunn

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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure outlines the steps required for sampling of fissile/potentially fissile (PF) material.

1.2 Scope

This procedure implements Nuclear Criticality Safety (NCS) requirements for sampling of fissile/PF material excluding process gas equipment and piping.

When uranium metal with an enrichment of greater than 0.93 wt. % 235U, or uranium oxide compounds (for example, UO_2, U_3O_8, UO_3) greater than 0.96 wt. % 235U is encountered, the limits and controls of this procedure may **NOT** apply. NCS shall be notified for guidance in these situations.

2.0 REFERENCES

2.1 Use References

- CP2-HS-2000, *Worker Safety and Health Program for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-HS-2040, *Asbestos Controls Program at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP3-ES-0043, *Temperature Control for Sample Storage*
- CP3-ES-1034, *Nuclear Criticality Safety Requirements for Sample Labeling, Handling, and Assay Smears*
- CP3-ES-2700, *Sample and Miscellaneous Data Forms*
- CP3-ES-2709, *Chain-of-Custody Forms, Sample Labels, and Custody Seals*
- CP3-HS-0006, *Portable Equipment, Hand Tools and Handheld Power Tools*
- CP3-HS-2010, *Instructions for Lockout/Tagout*
- CP3-HS-2011, *Portable Ladders*
- CP3-HS-2012, *Construction and Work Zone Barricades and Signs*
- CP3-HS-2014, *Fall Prevention and Protection*
- CP3-HS-2036, *Aerial Devices*
- CP3-HS-2055, *Confined Space*
- CP3-SM-0003, *Use of High Efficiency Filter Equipped Vacuum Cleaners*
- CP3-SM-0004, *Operation of 1000 and 2000 CFM Negative Air Machines*
- CP3-WM-1017, *Safe Handling and Opening of Sealed Containers*
- CP3-WM-1036, *Nuclear Criticality Safety Implementation Requirements for Handling and Storage of Fissile and Potentially Fissile Materials*
- CP3-WM-9503, *Off-Site Shipments by Air Transport*

- CP4-ES-2704, *Trip, Equipment and Field Blank Preparation*

2.2 Source References

- CP3-NS-1033, *Enrichment and Exempt Waste Verification*
- CP3-WM-2110, *Waste Container Handling, Overpacking, and Transportation*
- CP4-ES-2702, *Decontamination of Sampling Equipment and Devices*
- JHA-10222, *Asbestos Air Sampling, Bulk Sampling, and Filter Counting*
- JHA-25601, *Sampling of Fissile/Potentially Fissile Material*
- U.S. Environmental Protection Agency Region 4 Science and Ecosystem Support Field Sampling Procedure, *Waste Sampling*

3.0 COMMITMENTS

- CP1-NS-3001, *Technical Safety Requirements for the Department of Energy Paducah Site Deactivation and Remediation Project*
- NCSE GEN-01, *General Limits Used at the Paducah Gaseous Diffusion Plant*
- NCSE GEN-31, *The Collection and Handling of Fissile/Potentially Fissile Waste Samples*
- NCSE WMO-100, *Nuclear Criticality Safety Evaluation for Site-Wide Waste Management*

4.0 PRECAUTIONS AND LIMITATIONS

4.1 Precautions

NCSE WMO-100

4.1.1 Drums in a Temporary Fissile Storage Area (TFSA) or Temporary Staging Area (TSA) may be opened only for the purpose of withdrawing samples for waste characterization **or** returning excess/unused sample to the original container.

TSR 5.5.10.1

4.1.2 Fissile or potentially fissile samples in conveyance with greater than or equal to (≥) 250 g of ^{235}U with an enrichment of 1.0 wt. % ^{235}U or greater may only be transported in the approved travel locations shown in Appendix B, *Approved Travel Locations for Fissile Material ≥ 250g ^{235}U*, unless less than (<) 250 g ^{235}U or in full compliance with U.S. Department of Transportation requirements for samples being shipped off-site.

4.1.3 The sampling personnel performing the task of material sampling shall comply with the requirements of the CP2-HS-2000, *Worker Safety and Health Program for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*.

4.1.4 The sampling personnel also shall comply with additional requirements in the Job Hazard Analysis (JHA) and applicable Industrial Hygiene Work Permit(s) (IHWP), and the Radiological Work Permit (RWP), if required.

4.1.5 Containers are inspected for leaks or over pressurization and any abnormality should be reported to the Plant Shift Superintendent (PSS).

4.1.6 Requirements of the RWP are followed during sampling activities.

4.1.7 **If** sampling solid material that may produce airborne contaminants, such as particulates or volatile vapors in sufficient volumes to be a hazard to human health, **then** Safety personnel are contacted for the project to determine the potential hazards and appropriate controls.

4.1.8 Personnel shall be aware of the potential for chemical hazards in the area and shall follow the "See and Flee" policy **and** evacuate the area **and** notify supervision if they suspect chemical exposure, such as: strange smell, vapor cloud, burning or itching sensation, spill of unknown liquid, or broken lines or damage to equipment that may contain hazardous chemicals.

4.1.9 A two-way radio and/or cell phone is kept at the sampling site during any sampling event for communication purposes.

4.1.10 A minimum of two people must be present and within visual range of each other at all times during any sampling activity.

4.1.11 Personnel shall wear the appropriate personal protective equipment (PPE) as directed by an IHWP and/or RWP.

4.1.12 **If** there is a potential for exposure to the hazard Trichloroethylene (TCE), **then** Industrial Hygiene (IH) shall be contacted for potential periodic monitoring.

4.1.13 The Supreno EC Microflex Nitrile or Showa 730 gloves **must** also be worn when handling TCE contaminated liquid or carbon within the breakthrough time periods (Supreno EC Microflex is 2 hours and Showa 730 is 4 hours for TCE).

4.1.14 **If** working with PCB materials, **then** skin contact/contamination shall be avoided and PPE requirements shall include an impermeable apron, impermeable sleeves, shoe scuffs with tear-away booties, and double gloves consisting of inner and outer gloves (4H, neoprene, or nitrile).

4.1.15 When working with a potential exposure to hydrogen fluoride (HF) or hazardous metals, the job-specific IHWP shall be referred to for engineering controls, administrative controls, and PPE.

4.1.16 The requirements of CP3-HS-2012, *Construction and Work Zone Barricades and Signs* shall be followed when establishing a work area.

4.1.17 Personnel shall contact IH prior to disturbing fiberglass insulation to determine if respiratory protection, PPE and/or any IH monitoring will need to be required.

4.1.18 All LOTO guidance and instruction shall be followed, as required, according to CP3-HS-2010, *Instructions for Lockout/Tagout.*

4.1.19 Standing or climbing on containers shall **NOT** be permitted for any sampling activity. Ladders shall be used according to CP3-HS-2011, *Portable Ladders*.

4.1.20 **If** working on elevated work surfaces, such as aerial lifts or scissor lifts, **then** a 360-degree inspection shall be performed prior to use **and** the requirements of CP3-HS-2014, *Fall Prevention and Protection* and CP3-HS-2036, *Aerial Devices* shall be followed.

4.1.21 **If** entering a confined space, **then** the requirements of CP3-HS-2055, *Confined Space* shall be followed.

4.1.22 Safety glasses with side shields shall be worn in designated areas or when in the vicinity of work that could produce flying particles and/or debris.

4.1.23 ANSI rated A3 cut resistant gloves (or other S&H approved) shall be used when working with Category II knives and scrapers, sharp edges, and pinch points to avoid hand injuries; safety glasses shall also be worn.

4.1.24 Nitrile rubber gloves shall be worn when using sample bottles with prepackaged acid present.

4.1.25 **If** any Hydrochloric Acid, Nitric Acid or Sulfuric Acid comes in contact with nitrile gloves, **then** gloves shall be disposed of **and** a new pair obtained.

4.1.26 Company-issued clothing shall be worn when opening waste containers or working with chemical hazards.

4.1.27 A hard hat shall be worn as required, if there are known hazards that may cause a head injury.

4.1.28 To prevent injuries from use of tools, power, pneumatic, and hand tools shall be used according to CP3-HS-0006, *Portable Equipment, Hand Tools and Handheld Power Tools.*

4.1.29 Asbestos Containing Material (ACM)/Potentially Asbestos Containing Material (PACM) must be performed by trained asbestos workers **ONLY**, according to CP2-HS-2040, *Asbestos Controls Program at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* and JHA-10222, *Asbestos Air Sampling, Bulk Sampling and Filter Counting.*

4.1.30 Respiratory protection may be downgraded upon the approval by an Industrial Hygiene Specialist after an exposure assessment has been completed.

4.1.31 Negative Air Machines (NAMs) shall be handled according to CP3-SM-0004, *Operation of 1000 and 2000 CFM Negative Air Machines.*

4.1.32 High-Efficiency Particulate Air (HEPA) vacuums shall be handled according to CP3-SM-0003, *Use of High Efficiency Filter Equipped Vacuum Cleaners*.

4.1.33 Eyewash station must be available and operational near the work location when there is a potential hazard for eye or skin irritation. The eye wash station with drench hose attached may be a gravity-fed portable emergency or pressure-activated portable eyewash unit.

4.1.34 Environmental Compliance shall be contacted prior to working in a Solid Waste Management Unit (SWMU).

4.1.35 A trenching/excavation/penetration permit **must** be obtained when breaching or penetrating (i.e., auguring, drilling, coring) a surface as follows: any building surface more than 1-1/4 inches, concrete or blacktop paving more than 3 inches, or earth's surface more than 12 inches.

4.1.36 Wet methods or dust collection are required to be used when breaking or drilling into concrete.

4.1.37 Personnel shall contact IH for an evaluation if there is a potential for exposure to silica and a need for an IHWP.

4.2 Limitations

NCSE GEN-31

4.2.1 Sampling operations are limited to a maximum of 5.5 wt. % ^{235}U.

4.2.2 The combined internal volume of sampling equipment being used to collect sample material shall be limited to a maximum of 1.2 liters at a time in a waste container storage array.

4.2.3 The combined internal volume of a batch of sample container(s) being filled with sample material is limited to a maximum of 1.2 liters in a waste container storage array.

4.2.4 A maximum of one batch of samples shall be present in a waste container storage array.

4.2.5 **NO** spacing is required between a batch of sample containers (with a maximum combined internal volume of 1.2 liters) and sampling equipment (with a maximum combined internal volume of 1.2 liters) within a waste container storage array.

4.2.6 **NO** spacing is required between a batch of sample containers (with a maximum combined internal volume of 1.2 liters) and waste containers (with a maximum internal volume of 32 gallons) within a waste storage array.

4.2.7 **NO** spacing is required between sampling equipment (with a maximum combined internal volume of 1.2 liters) and waste containers (with a maximum internal volume of 32 gallons) within a waste storage array.

4.2.8 Sampling equipment must be visually inspected after each sampling operation to ensure that gross quantities of sample material have been removed.

4.2.9 **NO** NCS spacing requirements are necessary for the storage of the sampling equipment after inspection has shown that the sample material has been removed.

TSR 5.5.10.1

4.2.10 Fissile or PF samples in conveyance with greater than or equal to (≥) 250 g of ^{235}U with an enrichment of 1.0 wt. % ^{235}U or greater may only be transported in the approved travel locations shown in Appendix B.

4.2.11 Sampling personnel that handle and transport PF samples must comply according to CP3-ES-1034, *Nuclear Criticality Safety Requirements for Sample Labeling, Handling, and Assay Smears*.

4.2.12 Extreme weather conditions may limit or preclude the conduct of certain types of fieldwork.

4.2.13 Outdoor sampling is avoided during dusty or wet conditions to prevent changing the composition of the material being sampled or contamination of the surrounding area.

4.2.14 Drums shall be inspected prior to sampling for signs of pressure (i.e., swollen or bulging drum) and **ONLY** one container shall be opened and sampled at any time.

4.2.15 Compliance with all posted requirements is required pertaining to any given sampling location, if applicable.

5.0 PREREQUISITES

Sampler

5.1 Notify Radiological Control (RADCON) and Safety and Health personnel before initiating sampling to determine required surveys and monitoring requirements for RWP and IHWP.

5.2 Obtain sample request form (CP3-ES-1034-F01, *Sample Request Form*), chain-of-custody (COC) forms, sample data forms, and sample labels as necessary from Sample Management Office (SMO).

5.3 **If** applicable, **then** prepare quality control samples according to CP4-ES-2704, *Trip, Equipment and Field Blank Preparation*.

5.4 Notify the following parties prior to the start of field activities:

- Facility Manager
- Health and Safety Specialist
- RADCON

5.5 Read **and** sign off on the RWP and IHWP, if required, **and** review task-specific JHA prior to beginning work.

5.6 Limit preparation and collection of samples to those individuals who have the necessary training **and** are knowledgeable of field procedures applicable to the preparation and collection of samples.

6.0 INSTRUCTIONS

6.1 General Requirements for Sampling of Fissile/Potentially Fissile Material

Sampling Lead

NOTE:

Project-specific documents include, as applicable, JHAs, sampling and analysis plan/sampling and analysis event plan (SAP/SAEP), Health and Safety Plan, Quality Assurance Project Plan, Waste Management Plan, and necessary permits. A copy of any applicable project-specific document shall be available before the onset of field activities. These documents should be consulted, as necessary, and reviewed by the sampling personnel to obtain specific information regarding equipment and supplies, health and safety precautions, sample collection and identification, sample packaging, and decontamination.

6.1.1 **If** Fissile/Potentially Fissile samples are collected, **then** handle according to the requirements of CP3-ES-1034.

6.1.2 **If** Fissile/Potentially Fissile samples are taken for NCS purposes, **then** collect and handle according to CP3-ES-1034.

6.1.3 Ensure that field personnel are familiar with project-specific documents.

6.1.4 Ensure that field personnel are knowledgeable of the latest version of the procedures listed in Section **2.1** of this procedure.

NOTE:

The choice of specific sample container size and type should be coordinated with the laboratory that will be performing the analysis to ensure that adequate samples are received in the proper condition for the analytical procedures.

6.1.5 Choose appropriate sampling equipment depending on the characteristics of the material and the type of analysis to be performed.

6.1.6 Notify the Facility Manager (or other parties responsible for the material to be sampled) of the schedule and scope of the proposed sampling event.

6.1.7 Notify Health and Safety personnel and RADCON personnel to request and schedule any required support for monitoring during the sampling activities.

6.1.8 Communicate the sampling schedule to a waste engineer **and** notify the Waste Certification Official **if** waste is destined for the Nevada National Security Site (consult waste engineer), **prior** to opening any sealed waste containers.

Sampler

6.1.9 Unless new, verify that all reusable sampling equipment has been decontaminated prior to use.

6.1.10 **If** needed, **then** coordinate with Waste Management to obtain **and** label a sampling debris collection container according to CP3-WM-1036*, Nuclear Criticality Safety Implementation Requirements for Handling and Storage of Fissile and Potentially Fissile Materials*.

NOTE:

The volume restriction for sample containers placed on top of waste containers as stated in NCSE WMO-100, *Nuclear Criticality Safety Evaluation for Site-Wide Waste Management*, was reduced from a maximum of one gallon to a maximum of 1.2 liters to be consistent with the requirements of NCSE GEN-31.

NCSE GEN-31
NCSE WMO-100

6.1.11 **If** sampling fissile/potentially fissile material from a 5.5 gallon drum, **then** ensure **NO** more than one sample container is placed on each NCS approved 5.5 gallon maximum capacity drum, **and** the sample container does **NOT** exceed 1.2 liter capacity.

NCSE GEN-31

6.1.12 Ensure the combined internal volume of the sampling equipment to be used is a maximum of 1.2 liters in a waste container storage array.

6.1.13 Ensure the combined internal volume of the batch of sample container(s) to be filled is a maximum of 1.2 liters in a waste container storage array.

6.1.14 Ensure that all needed materials are readily available to take to the field and are in good working condition.

CAUTION: Sealed and marked intrinsically safe radios and/or cell phones may be used when working in facilities or areas that may contain a potentially explosive atmosphere.

6.1.15 Gather the following items as needed:

- Analyte-free water
- Appropriate containers for material
- Camera
- COC forms and sample labels
- Container closure parts (bungs, lids, lid seals, locking rings, bolts)
- Container grounding straps (if opening ignitable or volatile materials)
- Custody seals, as required
- Decontamination equipment and supplies
- Hammer and chisel
- Ice bags and cooler (as required)
- Lab wipes
- Lid restraint devices (fork lift truck, restraining devices)
- Sample data forms, COC forms, and black indelible ink pens
- Hand tools (ratchets, sockets, adjustable, and end wrenches)
- Measuring tape
- Non-sparking tools (bung wrench, hand pick, pickaxe, spike, pry bar, drum de-header)
- Plastic sheeting
- Plastic zip-lock bags
- Personal protective equipment (PPE)
- Sample containers with lids (including extra sample containers with lids), pre-preserved if necessary
- Sampling device(s)
- Sampling equipment
- Steel and/or Teflon-lined spatulas, pans, trays, and bowls
- Two-way radio or cellular phone
- Eyewash Station

NOTES:

Other sampling methods may be necessary to obtain representative or conservative sample results.

Rags and absorbent pads may be used during sampling operations.

NCSE GEN-01

6.1.16 Obtain **and** label representative **or** conservative sample(s) according to CP3-ES-1034.

6.2 Collection of Samples

Sampler

6.2.1 Prepare the necessary sample containers according to CP3-ES-2709, *Chain-of-Custody Forms, Sample Labels, and Custody Seals*.

6.2.2 Communicate the sampling schedule to a waste engineer **and** notify the Waste Certification Official **if** waste is destined for the Nevada National Security Site (consult waste engineer), **prior** to opening any sealed waste containers.

NOTE:

Removal of a tamper indicating device (TID), opening of a waste container, or sampling of the material from waste container requires the presence of a waste engineer/field engineer/field coordinator and/or may require a waste package certifier, if deemed necessary by the waste engineer.

6.2.3 Before sampling, verify that each sample location is the correct container or material scheduled for sampling (for example, check container label information against sampling request or SAP/SAEP **and** resolve discrepancy before proceeding).

6.2.4 Don all appropriate PPE according to the applicable IHWP **and**/**or** at the direction of Health and Safety personnel, Industrial Hygiene, **or** RADCON **and** as stated in the RWP.

WARNING:

Containers with contents that have the potential to be pressurized can pose hazards (for example, fire or explosions) that may require immediate action and notification to the PSS. Containers may rupture without any warning and result in personnel injury, equipment or facility damage, or environmental contamination.

6.2.5 **If** sampling a container, **then** visually inspect each container for obvious signs of pressurization, such as bulged lids or escaping gases.

6.2.6 **If** a container exhibits signs of pressurization, **then** stop work, leave the area immediately **and** notify PSS, Front-Line Manager (FLM) and Safety and Health.

6.2.7 **If** sampling a container, **then** open each container individually according to CP3-WM-1017, *Safe Handling and Opening of Sealed Containers* **and** sample one container at a time.

NCSE WMO-100

6.2.8 Close the container before opening the next.

6.2.9 Record field and sampling information on the appropriate Project Environmental Measurements System (PEMS) generated sample data form according to CP3-ES-2700, *Sample and Miscellaneous Data Forms.*

6.2.10 Collect samples according to the appropriate method.

NCSE
WMO-100

6.2.11 **If** sampling a container, **then** close **and** secure the material container(s) according to CP3-WM-1017.

6.2.12 Ensure sample bottle closure lids are properly secured **and** place the samples in a cooler with bagged ice, if required, **prior** to transport to storage locations.

6.2.13 Return work area to acceptable housekeeping standards.

6.2.14 Complete COC form **and** maintain custody of the samples according to CP3-ES-2709, *Chain-of-Custody Forms, Sample Labels, and Custody Seals.*

6.2.15 **If** all required samples have been collected, **then** notify waste to apply tamper-indicating device or other appropriate seal, as appropriate, **and** proceed to Section **6.8**.

NOTE:

Sections **6.3** through **6.7** contain descriptions of sampling devices and methods.

Other sampling methods, tools, or techniques may be used as specified in the SAP/SAEP.

6.3 Collection of Liquid/Sludge Samples Using Glass Tubes (Thief)

NOTES:

This method provides for a quick, relatively inexpensive means of collecting material. The major disadvantage is from potential sample loss, which is especially prevalent when sampling low viscosity fluids. Splashing also can be a problem, and proper protective clothing should always be worn. Do **NOT** attempt this method with less than a two-man sampling crew.

Liquid samples from opened containers (example, 55 gallon drums) are collected using lengths of glass tubing (thief). The glass tubes normally are 122 centimeters (48 inches) in length and have an inside diameter of 6 to 16 millimeters (0.24 to 0.63 inches). Larger diameter tubes may be needed for more viscous fluids. Tubing should be long enough so that at least 30 centimeters (11.8 inches) of tubing extends above the top of the container.

Sampler

6.3.1 Remove the lid from the sample container, if necessary.

6.3.2 **If** a reaction is observed when the glass tube is inserted (violent agitation, smoke, light, etc.), **then** stop, leave the area immediately **and** notify the PSS, FLM and Safety personnel.

NOTE:

Cloudy or smoky glass tubing could indicate the presence of hydrofluoric acid.

6.3.3 **If** the glass tube becomes cloudy **or** smoky after insertion into the material being sampled, **then** stop, leave the area immediately, **and** notify the PSS, FLM and Safety personnel.

6.3.4 Insert glass tubing almost to the bottom of the material or until a solid layer is encountered.

6.3.5 **If** a sample of liquid **and** bottom sludge is desired, **then** gently push the tube into the sludge layer, but do **NOT** force it. Alternatively, the material may be collected with a disposable scoop attached to a length of wooden or plastic rod.

6.3.6 Allow the material being sampled to reach its natural level in the tube **and** cap the top of the tube with a safety-gloved thumb or stopper, ensuring that liquid does **NOT** come into contact with the stopper or gloved thumb.

6.3.7 Carefully remove the capped tube from the material **and** insert the uncapped end into the sample container, being careful **NOT** to spill liquid on the outside of the sample container.

6.3.8 Release the gloved thumb or stopper on the top of the tube **and** allow the sample container to fill to approximately 90% of its capacity, unless otherwise specified.

6.3.9 **If** necessary, **then** the sludge plug in the bottom of the tube (if collected) can be dislodged with the aid of the stainless steel laboratory spatula.

6.3.10 Remove the tube from the sample container.

6.3.11 **If** enough volume has been collected, **then** discard the tube and any material left over into an appropriate disposal container according to CP3-WM-1036.

6.3.12 **If** more volume is needed to fill the sample container(s), **then** repeat Steps **6.3.2** through **6.3.6**.

6.3.13 Cap the sample container tightly **and** proceed to Step **6.2.12.**

6.4 Collection of Liquid Samples Using a Composite Liquid Waste Sampler (COLIWASA)

NOTE:

The COLIWASA is a sampler designed to permit representative sampling of multi-phase material from drums and other containers. The COLIWASA sampler is commercially available in a variety of materials including Polyvinyl Chloride (PVC), glass, or Teflon. The COLIWASA consists of two sections of tubing. The smaller diameter inner rod has a stopper at one end. Manipulation of the inner rod opens and closes the sampler by raising and lowering the stopper.

Sampler

6.4.1 Remove the lid from the sample container, if necessary.

NOTE:

Check to make sure the sampler is functioning properly.

6.4.2 Ensure the stopper provides a tight closure before proceeding.

NOTE**:**

Having the level of the liquid in the sample tube lower than outside of the sampler will result in a non-representative sample due to a sample rate that is too fast.

6.4.3 Raise the inner rod to open the sampler **and** slowly lower the sampler into the liquid material at a rate that permits the levels of the liquid on both the inside and the outside of the COLIWASA sampler tube to stay about even.

6.4.4 **When** the sampler hits the bottom of the material, **then** push the inner rod downward to close the sampler.

6.4.5 Hold the sampler closed and slowly withdraw the sampler from the material with one hand while wiping the sampler tube with a laboratory wipe with the other hand.

6.4.6 **If** present, **then** observe phase boundaries through the tube.

6.4.7 Carefully discharge the sampler into either the sample container(s) or a larger collection container (that will be subsampled) by slowly raising the inner rod while the lower end of the sampler is positioned inside the material.

6.4.8 **If** necessary, **then** subsample the liquid from the larger collection of material into the sample containers.

6.4.9 **If** more volume is needed to fill the sample container(s), **then** repeat Steps **6.4.2** through **6.4.8.**

6.4.10 Cap the sample container tightly **and** proceed to Step **6.2.12.**

6.5 Collection of Sludge Samples Using a Gravity Corer

NOTES:

A gravity corer is a metal tube with a replaceable tapered nosepiece on the bottom and a ball or other type of check valve on the top. The check valve allows material to pass through the corer on descent, but prevents a washout during recovery. The tapered nosepiece facilitates cutting and reduces core disturbance during penetration. Most corers are constructed of brass or steel and many can accept plastic liners and additional weights.

Corers are capable of collecting samples of most sludge and sediments. They collect essentially undisturbed samples that represent the strata profile that may develop in sediments and sludge during variations in the deposition process. Depending on the density of the substrate and the weight of the corer, penetration to depths of 75 centimeters (30 inches) can be attained.

Sampler

CAUTION:

Care shall be exercised when using gravity corers in vessels or lagoons that have liners because penetration depths could exceed that of the substrate and result in damage to the liner material.

6.5.1 Attach a pre-cleaned corer to the required length of retrieval line. Solid braided 5 millimeter (3/16 inch) nylon line is sufficient; however, 20 millimeter (3/4 inch) nylon is easier to grasp during hand hoisting. An additional weight can be attached to the outside of the corer, if necessary.

6.5.2 Secure the free end of the retrieval line to a fixed support to prevent accidental loss of the corer.

6.5.3 Allow corer to free-fall through the liquid to the bottom, being careful **NOT** to splash.

6.5.4 Retrieve the corer with a smooth, continuous, hoisting motion, being careful **NOT** to bump the corer, as this may result in some sample loss.

6.5.5 Remove the nosepiece from the corer **and** slide the sample out of the corer into a stainless steel or Teflon coated pan.

6.5.6 Transfer the sample into the appropriate sample container(s) with a stainless steel lab spoon or laboratory spatula.

6.5.7 **If** more volume is needed to fill the sample container(s), **then** repeat Steps **6.5.3** through **6.5.6**.

6.5.8 Cap the sample container tightly **and** proceed to Step **6.2.12.**

6.6 Collection of Viscous Materials Using a Bacon Bomb Sampler

NOTE:

The Bacon Bomb is designed for the withdrawal of samples from various levels within a special container. It consists of a cylindrical body with an internal tapered plunger that acts as a valve to admit the sample. A line attached to the top of the plunger is used to open and close the valve. A removable top cover provides a point of attachment for the retrieval line and has a locking mechanism to keep the plunger closed after sampling. The Bacon Bomb is usually constructed of chrome-plated brass and bronze with a rubber O-ring acting as a plunger sealing surface. Stainless steel versions also are available. The volumetric capacity is 8, 16, or 32 ounces (237, 473, or 946 milliliters).

The Bacon Bomb is a heavy sampler suited best for viscous materials held in large storage tanks or in lagoons. If a more non-reactive sampler is needed, the stainless steel version should be used or any of the samplers could be coated with Teflon.

Sampler

6.6.1 Remove the lid from the sample container, if necessary.

6.6.2 Attach the retrieval and plunger lines to the sampler.

6.6.3 Measure **and** mark the retrieval line at the desired depth.

6.6.4 Gradually lower the sampler by the retrieval line until the desired level is reached.

6.6.5 **When** the desired level is reached, **then** pull up on the plunger line **and** allow the sampler to fill for a sufficient length of time before releasing the plunger line to seal off the sampler.

6.6.6 Retrieve the sampler by pulling up on the retrieval line, being careful **NOT** to pull up on the plunger line, thereby accidentally opening the bottom valve.

6.6.7 Wipe off the exterior of the sampler body.

6.6.8 Position the sampler over the sample container **and** release its contents by pulling up on the plunger line.

6.6.9 **If** more volume is needed to fill the sample container(s), **then** repeat Steps **6.6.4** through **6.6.8**.

6.6.10 Cap the sample container tightly **and** proceed to Step **6.2.12.**

NOTE:

Solid material may be sampled with a grain thief, trowel, scoop, hand auger, or other approved device, hereafter referred to as "the sampler." **If** the material is suspected to be heterogeneous, **then** discrete samples may be collected at different depths for characterization.

6.7 Collection of Solid Samples

Sampler

6.7.1 Confirm requested analyses and media/material type.

6.7.2 Remove the lid from the sample container, if necessary.

6.7.3 Use the sampler to recover samples from the material.

6.7.4 Place each sample in an approved sample container **and** record unusual conditions of contents (such as color, odor, free liquids, etc.) on the sample data form according to CP3-ES-2700.

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6.7.5 **If** debris is encountered, **then** grab sample portions from the top layers that appear "worst case" by using a sample container **or** a gloved hand to remove a sufficient amount of sample to fill the sample container to its required level **and** document on the sample data form.

6.7.6 **If** a representative sample **CANNOT** be taken with a sampler **or** when sampling concrete and other construction debris, **then** take a grab sample by using a sample container **or** a gloved hand to remove a sufficient amount of sample to fill the sample container to its required level and document on the sample data form.

6.7.7 **If** a sufficient amount of concrete or construction debris **CANNOT** be collected because of the size of the pieces, **then** size reduce the material into small pieces that will fit into the sample container.

6.7.8 Cap the sample container tightly **and** proceed to Step **6.2.12.**

6.8 Post-Sampling Activities

Sampling Lead and/or Sampler

6.8.1 Dispose of sampling equipment according to CP3-WM-1036.

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6.8.2 Inspect the reusable sampling equipment to ensure gross quantities of the sample material have been removed.

NOTE:

NO NCS spacing requirements are necessary for the storage of sampling equipment after inspection has shown the sample material has been removed.

6.8.3 **If** gross quantities of the sample material **CANNOT** be removed from the reusable sampling equipment, **then** handle the reusable sampling equipment as PF waste according to CP3-WM-1036.

6.8.4 Dispose of PF waste generated during the sampling activity according to CP3-WM-1036.

6.8.5 Ensure sample information is documented on the PEMS generated sample data form **or** if applicable, form CP4-ES-2410-F01, *Fissile/PF Waste Sampling Field Sheet*.

6.8.6 Complete the COC forms and sample labels according to CP3-ES-2709.

6.8.7 Complete sections D, E or F, as required, of CP3-ES-1034-F01, *Sample Request Form*.

6.8.8 Handle **and** transport the samples according to CP3-ES-1034.

7.0 ACCEPTANCE CRITERIA

None

8.0 POST PERFORMANCE WORK ACTIVITIES

Sampling Lead and/or Sampler

8.1 Maintain custody of the samples according to CP3-ES-2709 until samples are transferred to the designated SMO laboratory for analysis as soon as possible.

8.2 Ensure that the temperature of the sample(s) is maintained according to CP3-ES-0043, *Temperature Control for Sample Storage*.

8.3 **If** samples contain radiological material, **then** coordinate with RADCON, **and** release the sample(s) and related COC documentation for further handling according to CP3-WM-9503, *Off-Site Shipments by Air Transport*.

8.4 Prepare samples for shipment off-site according to CP3-WM-9503.

8.5 Submit a copy of the COC forms and sample data forms to the SMO for entry into PEMS.

8.6 **If** unused/excess PF sample material is received from the laboratory, **then** dispose of sample material into accumulation containers according to CP3-WM-1036.

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8.7 When required, place unused/excess sample material into the original waste container according to CP3-WM-1036.

9.0 RECORDS

9.1 Records Generated

The following records may be generated by this procedure:

CP4-ES-2410-F01, *Fissile/PF Waste Sampling Field Sheet*

Forms are to be controlled according to CP3-OP-0024, *Forms Control*.

9.2 Records Disposition

The records are to be maintained according to CP3-RD-0010, *Records Management Process*.

Appendix A – Acronyms/Definitions

ACRONYMS

ACM – Asbestos-Containing Material

COC – Chain-of-Custody

COLIWASA – Composite Liquid Waste Sampler

FLM – Front-Line Manager

HEPA – High Efficiency Filtering System

HF – hydrogen fluoride

IH – Industrial Hygiene

IHWP – Industrial Hygiene Work Permit

JHA – Job Hazard Analysis

NAM – Negative Air Machine

NCS – Nuclear Criticality Safety

NCSA – Nuclear Criticality Safety Approval

PACM – Presumed Asbestos-Containing Material

PEMS – Project Environmental Measurements System

PF – Potentially Fissile

PGDP – Paducah Gaseous Diffusion Plant

PPE – Personal Protective Equipment

PSS – plant shift superintendent

PVC – polyvinyl chloride

RADCON – Radiological Control

RWP – Radiological Work Permit

SAP/SAEP – Sampling and Analysis Plan/Sampling and Analysis Event Plan

SMO – Sample Management Office

SWMU – Solid Waste Management Unit

Appendix A – Acronyms/Definitions continued

TCE – Trichloroethylene

TFSA – Temporary Fissile Storage Area

TSA – Temporary Storage Area

TID – tamper indicator device

DEFINITIONS

COLIWASA – Sampling device typically constructed of glass or Teflon® designed to collect composite waste sample from liquid or light sludge.

Fissile Material – Fissile Material is uranium metal with an enrichment of greater than 0.93 wt. % ^{235}U, or uranium oxide compounds (for example, UO_2, U_3O_8, UO_3) greater than 0.96 wt. %^{235}U, or compounds of uranium and fluorine greater than or equal to 1.0 wt.% ^{235}U and in quantities greater than or equal to 15 g ^{235}U, or materials containing other fissionable radionuclides capable of sustaining a chain reaction in quantities greater than or equal to 1.6% of their maximum subcritical mass.

Core Sampler – A metal sampling tube used to sample solid material.

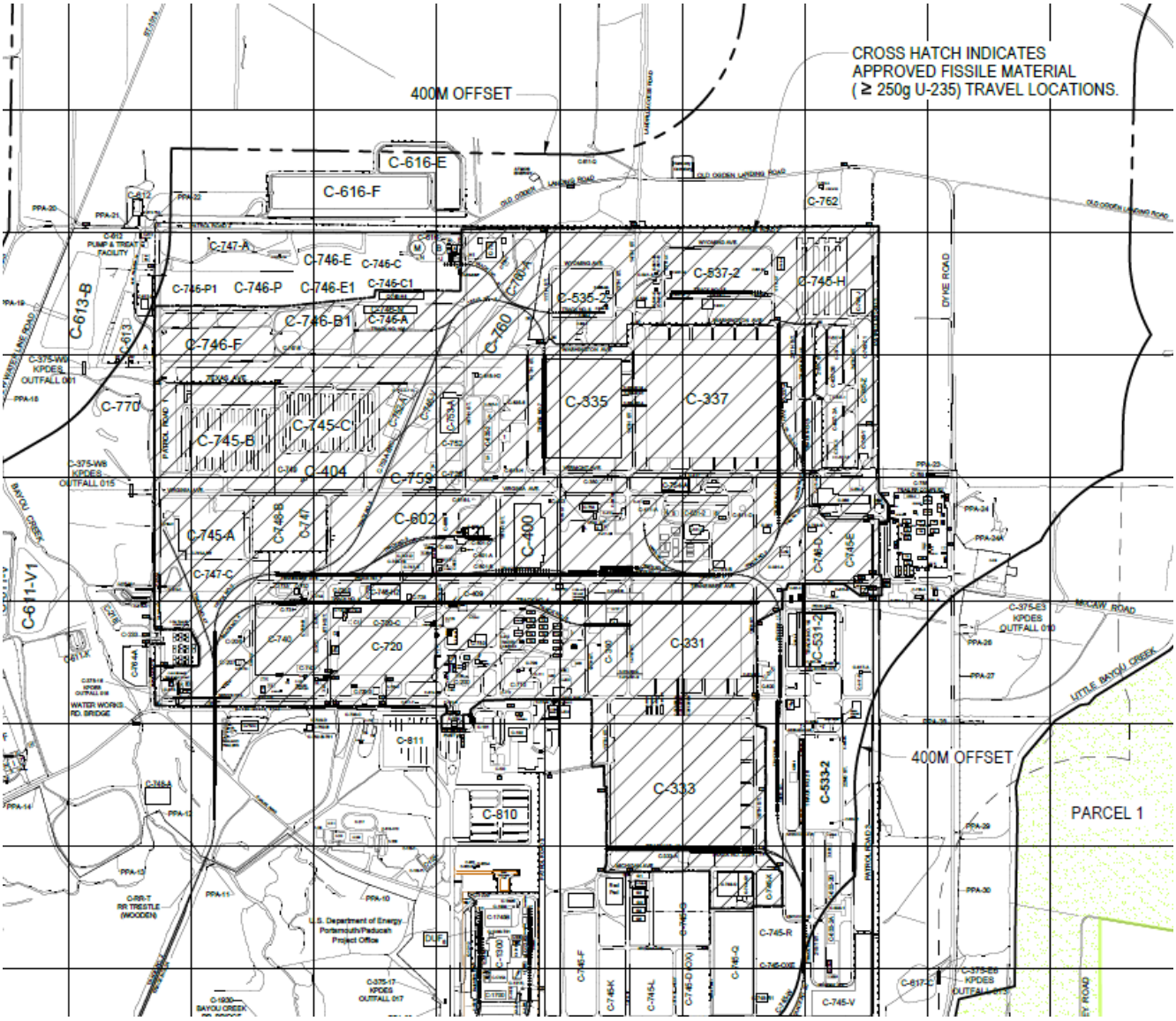
Potentially Fissile – Potentially Fissile is a term given to materials which have the potential to contain fissile material as defined above. Until the actual fissile material content or enrichment is known, the material is required to be treated as if it were fissile material and must be handled in compliance with an approved NCSA.

Representative Sample – A sample that can be used to characterize the parameter(s) of interest (for example, enrichment, uranium concentration, pH, etc.) for the material being tested. For operational and NCS purposes, a sample that conservatively bounds the parameter(s) of interest may be used.

Container – Any portable vessel in which a material (such as, waste) is stored, transported, disposed of, or otherwise handled. Examples of containers include drums, ST-90 boxes, 7A Type A containers, and polyethylene portable tanks.

Debris – Pieces of any of a variety of solid materials present that are **NOT** intended to be analyzed or are **NOT** part of the sampling objective and interfere with sample collection.

Appendix B – Approved Travel Locations for Fissile Material ≥ 250g ^{235}U



APPROVED FISSILE MATERIAL (≥ 250 g U-235) TRAVEL LOCATIONS – SITE PLAN

Travel locations shown. See drawing C5E-FA5810-B01 for full drawing