BNFL Inc.

ADVANCED MIXED WASTE TREATMENT PROJECT

SOIL SAMPLING AND DISPOSITION PLAN FOR THE TRANSURANIC STORAGE AREA RETRIEVAL ENCLOSURE

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Penny Pink, ES&H Manager	**Date**

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ACRONYMS

AMWTF	Advanced Mixed Waste Treatment Facility
AMWTP	Advanced Mixed Waste Treatment Project
DOE	Department of Energy
EPA	Environmental Protection Agency
ESHPOP	Environmental Safety and Health Program Operating Plan
INEEL	Idaho National Engineering and Environmental Laboratory
ISM	Integrated Safety Management
HWMA	Hazardous Waste Management Act
IWAC	INEEL Waste Acceptance Criteria
LLW	Low-level Waste
MDL	Method Detection Limit
M&O	Management and Operating
MLLW	Mixed Low-level Waste
MOA	Memorandum of Agreement
NE-ID	U.S. Department of Energy, Idaho Operation office
PCB	Polychlorinated Biphenyls
PPE	Personnel Protective Equipment
RCRA	Resource Conservation and Recovery Act
RWMC	Radioactive Waste Management Complex
SDA	Subsurface Disposal Area
SSDP	Soil Sampling and Disposition Plan
TRU	Transuranic
TSA	Transuranic Storage Area
TSA-1	Transuranic Storage Area – Pad 1
TSA-2	Transuranic Storage Area – Pad 2
TSA-R	Transuranic Storage Area – Pad R
TSA-RE	Transuranic Storage Area – Retrieval Enclosure
VOC	Volatile Organic Compound
WAC	Waste Acceptance Criteria

1 INTRODUCTION AND OBJECTIVES

This Soil Sampling and Disposition Plan (SSDP) presents the criteria and basis for the disposition of the soil (i.e., overburden, sideburden, interstitial, and firebreak) surrounding waste containers in the Transuranic Storage Area Retrieval Enclosure (TSA-RE) at the Idaho National Engineering and Environmental Laboratory (INEEL). Although the initial intent was to manage all interstitial and firebreak soil as low-level mixed (LLW) waste, it may be advantageous to sample and analyze these soils to determine the most appropriate disposal path. This soil must be removed by the Advanced Mixed Waste Treatment Project (AMWTP) in order to access and remove the waste containers for characterization and treatment. The SSDP is required by the AMWTP Environmental Safety and Health Program Operating Plan (ESHPOP), and includes a description of the methodology to be used to demonstrate that the soil meets appropriate disposition criteria. This SSDP may be applied to other AMWTP soil, if deemed applicable.

All soil that was placed over the waste containers consisted of clean borrow material excavated from a borrow pit south of the TSA and outside of the Radioactive Waste Management Complex (RWMC) fence (EG&G, 1991). Soil sampling and analysis performed in 1991, 2001, and 2002 (see Section 2.1) showed no evidence of contaminant migration from the waste containers into the soil. From 1991 until the start-up of AMWTP retrieval operations, no activities have been conducted at the TSA-RE that would disturb these soils or introduce any contamination to the soil. Nevertheless, the soil will be surveyed prior to removal to verify that it currently does not contain hazardous or radioactive material above appropriate disposition criteria.

The sampling and analysis process consists of laboratory analysis of soil samples. This soil will be analyzed for specific radiological and hazardous constituents and compared to action levels, low-level waste disposal criteria, and waste acceptance criteria, to determine the appropriate disposition.

Interfaces necessary for the AMWTP affecting U.S. Department of Energy (DOE), Idaho Operations Office (NE-ID), BNFL Inc., and the INEEL M&O contractor are identified in the AMWTP Tri-party Memorandum of Agreement (MOA) (DOE). The MOA also identifies the responsibilities of each party necessary for the successful completion of the AMWTP. Neither the MOA nor this SSDP is intended to include details regarding sampling activities, such as sampling equipment, or sample handling and preservation.

Following approval of the criteria and general strategy described in this SSDP, plans will be written as needed for tasks related to sample collection, preservation, and analysis.

2 BACKGROUND

This section describes relevant features of the stored waste containers in the TSA-RE and the soil surrounding them. Following background information of the TSA-RE and the soil, a summary of existing soil sampling and analysis data is included.

2.1 Site Background

The TSA-RE is located at the INEEL's RWMC and contains approximately 53,000 m^3 of containerized hazardous and transuranic waste. The waste containers will be retrieved, characterized, treated, and shipped from the AMWTP. The waste, which is in drums, boxes, and bins, was placed on three asphalt pads (TSA-1, TSA-2, and TSA-R). The pads are divided into sections called cells that are a maximum size of about 150 × 150 × 16 feet. The waste containers were neatly stacked and covered with plywood, plastic, and soil, except for some of the containers on TSA-R which were covered with plastic or tarps only. Sideburden soil was then added to reduce the grade angle. Soil was also placed between cells to act as a firebreak. The Retrieval Enclosure was constructed in 1996 to cover and protect the waste. Interstitial soil may be located between containers and the surrounding area.

The overburden soil (the soil on top of the cells) varies from about two to four feet thick. Overburden soil was placed on top of plastic sheeting covering plywood, so it is not in contact with any waste containers. The sideburden soil was placed along the sides of each cell and is isolated from the waste containers by plastic sheeting or tarps. The sideburden soil is not expected to be in contact with any waste containers either. Sideburden soils average approximately 16 feet thick to the top edge of the cells, with slopes of approximately 1.5:1, although some areas have nearly vertical slopes held in place by wooden retaining walls. Firebreak soil between adjacent cells is estimated to be about 4 feet thick. Firebreak soil may be in contact with waste containers. Soil that has fallen into small spaces between or around the waste containers is referred to as interstitial soil.

All soil is estimated to contain 90 percent silty clay and 10 percent clay. There is generally no vegetation growing on the soil, although sparse desert grasses and shrubs were present prior to construction of the Retrieval Enclosure. Localized areas have been compacted by vehicles, but in general the soil has not been compacted, with an estimated density of 95 lbs/ft^3 (EG&G, 1991).

The pads in TSA-RE were each constructed with a lateral slope across the width, and a slight (approximately 1%) slope along the length that forms a shallow sloping trough to prevent water accumulation. The slope also provides a mechanism for the migration of any significant liquid spills or leaks. TSA-1 and TSA-2 were constructed with a downhill slope towards the north, and TSA-R was constructed with a downhill slope to the south. Therefore, although current knowledge of the TSA waste characteristics indicates that there is relatively little free liquid (less than 5% by volume), it is possible that soil contamination resulting from spills or leaks will be detected in the soil on the down-gradient ends of the asphalt pads (e.g., the north ends of TSA-1 and TSA-2).

2.2 Existing Characterization Data

Soil sampling and analysis was performed in 1991 in preparation for the construction of the Retrieval Enclosure (EG&G, 1991). Samples were collected for field screening analysis from 174 locations in the overburden and sideburden soils. In addition, co-located samples were collected from 13 locations for

offsite laboratory analysis. One hundred nineteen samples were collected at approximately 20-foot intervals throughout most of the sideburden, including the north end of TSA-2. Fifty-five overburden samples were collected from random locations throughout the TSA, with emphasis on the soil-covered portion of TSA-R.

Samples were field screened for alpha and gamma activity and for volatile organic compounds (VOCs). Laboratory samples were analyzed for VOCs, polychlorinated biphenyls (PCBs), metals, and specific radionuclides. Methods and analytical results are presented in EG&G (1991).

The conclusion of the final report on the 1991 sampling effort was that the soil was uncontaminated (below the 1991 action levels) with respect to the contaminants of concern. The results of both field and laboratory analysis were that no radionuclides other than Cs-137 were detected in the soil samples. Cs-137 was present at levels below general INEEL background levels, and its presence was attributed to worldwide nuclear fallout. Metals and PCBs were not detected in the 1991 soil samples. Low levels of VOCs (0-10 ppb in laboratory samples) were detected in localized areas, but were well below the action levels of three times the method detection limit.

The 1991 data were reviewed and analyzed during preparation of this SSDP to ensure that they support the underlying SSDP assumption that the overburden and sideburden soils were clean at that time. Subsequent sampling and analyses by the AMWTP, and the sample results, are reviewed prior to revisions of the SSDP, and revisions made as necessary.

Overburden and sideburden soil sampling was conducted for Pad 2 and Pad R in 2001 and 2002. After review and validation of the sampling results, it was determined that the soil (overburden, sideburden, and interstitial) was nonhazardous and below the action levels for disposition of the soil. Further sampling of the asphalt pad and the soil, ground level around the perimeter of Pad R determined that some part of the asphalt pad and some soil, ground level, had concentrations of radionuclides (i.e., americium and plutonium) that exceed the action limits identified in Table 1, as a result of a previously identified release.

3 SOIL DISPOSITION STRATEGY

This section describes the strategy for disposition of soil removed from the TSA-RE to a location outside of the TSA-RE (T-12, Subsurface Disposal Area (SDA), etc.). An overview of the sampling and analysis plans to support the disposition strategy is contained in Section 4.

Soil samples will be shipped to a qualified laboratory for analysis of specific hazardous constituents and radionuclides (see Table 1). In lieu of analyses, the AMWTP may deem soil to be LLW or mixed waste based upon assay, physical attributes, and process knowledge. Laboratory selection will be accomplished in accordance with the requirements of the AMWTP Quality Assurance Program Plan (BNFL, current version) and appropriate AMWTP Quality Assurance Procedures.

Target hazardous constituents are based on the inventory of waste stored in the TSA-RE. Constituents of concern, for which sample analyses will be performed, are only those constituents identified in the "Advanced Mixed Waste Treatment Project" (Contract No. DE-AC07ID13481), and which would be classified as HWMA/RCRA regulated wastes if found in sufficient concentrations so as to require designation as a HWMA/RCRA regulated waste. The target action levels for organics are based on levels established in 40 CFR 261.24, Table 1, where available, ignitability concentration for F003 Listed organics, or "10 x MDL" if the constituent is not included in Table 1. The MDL refers to a minimum concentration of an analyte that can be measured above the instrument background noise, instrument performance capability, and calibration; sample matrix, sample dilution, or various other factors can interfere with the precision and accuracy of a measurement close to the MDL. For PCBs, the action level is 2 ppm.

For metals, sample results will be compared to the concentrations shown in 40 CFR 261.24, Table 1 as an initial point of evaluation. The TSA-RE soil sample results will also be compared to a control location (e.g., RWMC Spreading Area, T-12) sample results as a second point of evaluation. If the concentration of metals in the TSA-RE soils is less than the RCRA action levels, there is no concern with disposition of the soil outside of RWMC relative to metals. If the concentration exceeds the RCRA levels, but is comparable to the control sample concentrations, the soil can be relocated outside of the RWMC, but within the INEEL boundary, without further sampling or control. If the soil exceeds the control sample concentration, then additional evaluations will be performed as required.

The action levels for radionuclides will be the 1 E-06 risk-based concentrations identified in DOE/ID-10287, Site Verification Plan for the AMWTP Phase 2 Construction, April 16, 1999, which was used to support disposition of the soils from the AMWTP construction site to an area outside of the RWMC, for unrestricted use. Specific isotopes, and the associated risk-based concentrations, are shown in Table 1. The value shown for each isotope is the lower of the Soil Ingestion or External Exposure concentration limits for a residential one hundred-year scenario.

If laboratory analysis indicates that the soil contains no radionuclides or hazardous constituents at levels above the action levels identified in this SSDP, it will be considered clean. There are no handling, packaging or disposal requirements for this uncontaminated soil. The AMWTP and the NE-ID will agree on a stockpiling location prior to removal of any soil from the TSA-RE. If laboratory analysis results show that any constituents exceed the action levels, the soil will be further evaluated.

If the laboratory analysis indicates any levels greater than action levels, and the sample results meet the criteria for disposal of LLW at the RWMC, then use of an INEEL LLW disposal facility will be the preferred disposition.

If laboratory analysis indicates that the soil does not meet criteria for disposal of LLW at the RWMC, the soil will either be treated at the AMWTF or shipped to an approved offsite facility. This includes soil that contains TRU radioactivity greater than 10 nCi/g transuranic radionuclides or hazardous constituents.

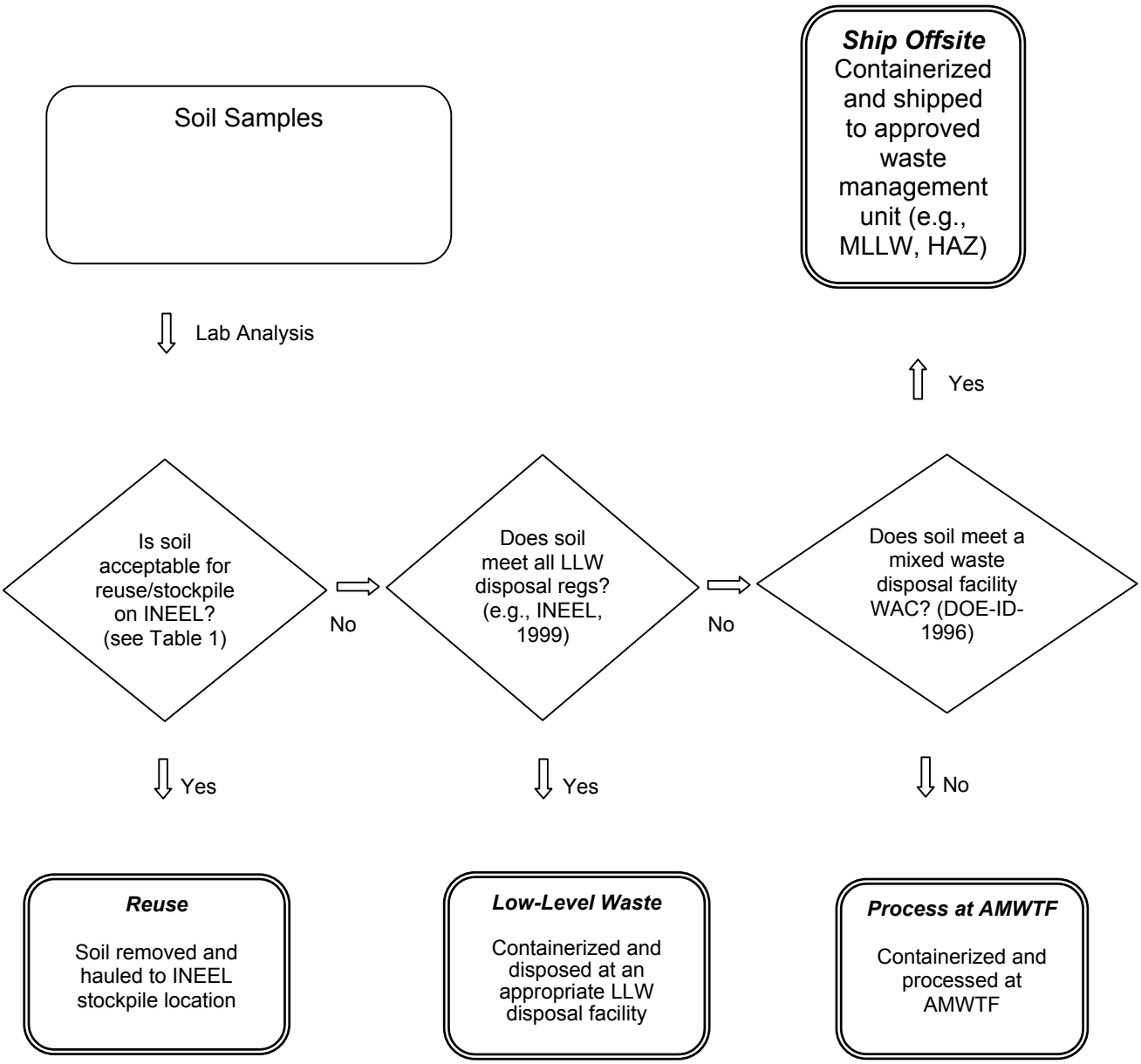

Figure 1. TSA-RE Soil Disposition Flow Chart

Table 1. Target Constituents for the TSA-RE Soil

Organics

Chemical	Listed EPA HWN	Characteristic EPA HWN	Action limit [a]
Acetone	F003		80 mg/Kg
Benzene	F005	D018	10 mg/Kg
Carbon tetrachloride	F001	D019	10 mg/Kg
Chlorobenzene	F002	D021	2,000 mg/Kg
Chloroform	None	D022	120 mg/Kg
1,1-Dicholorethylene	None	D029	14 mg/Kg
1,2-Dichloroethane	None	D028	10 mg/Kg
2-Ethoxyethanol	F005		10 x MDL
Ethyl benzene	F003		0.46 mg/Kg
Ethyl ether	F003		90 mg/Kg
Methyl ethyl ketone	F005	D035	4,000 mg/Kg
Methylene chloride	F001, F002		1.05 mg/Kg
n-butanol	F003		305 mg/Kg
Nitrobenzene	F004	D036	40 mg/Kg
Polychlorinated biphenyls	None	None	2.0 ppm
1,1,1-Trichloroethane	F001, F002		10 x MDL
1,1,2-Trichloro-1,2,2-trifluoroethane	F002		10 x MDL
1,1,2-Trichloroethane	F002		10 x MDL
Tetrachloroethylene	F001, F002	D039	14 mg/Kg
Toluene	F004		10 x MDL
Trichloroethylene	F001, F002	D040	10 mg/Kg
Xylene	F003		14 mg/Kg

Table 1. Target Constituents for the TSA-RE Soil (Continued)

Metals

Metal	Characteristic EPA HWN	Action Limit[b] (mg/L)
Arsenic	D004	5.0
Barium	D005	100.0
Cadmium	D006	1.0
Chromium	D007	5.0
Lead	D008	5.0
Mercury	D009	0.2
Selenium	D010	1.0
Silver	D011	5.0

Radionuclides

Isotope	TPR-713[d]	Action Limit (pCi/gm)[c]
Am-241		2.9 E+00
Cs-137	2 E+00	2.3 E-01[d]
Pu-238		6.7 E+00
Pu-239/240		2.5 E+00
Pu-241		5.6 E+02
Sr-90		2.3 E+02

a. Action limits for constituents which are characteristic organics (per 40 CFR 261.24, Table 1) or characteristic organic and F-listed (per 40 CFR 261.31) are 20 times the 40 CFR 261.24, Table 1 concentrations. This is because the project will perform total organic analysis instead of TCLP, and the TCLP has a procedural step that incorporates a 20 fold dilution. Action limits for constituents which are only F-listed are 10 times the estimated method detection limit (MDL). TCLP may be used in lieu of total analysis, in which case, the limits identified in 40 CFR 261.24 will be used. Action limits for F003 listed constituents and methylene chloride are 1/20 of the Region IX Preliminary Remedial Goals (PRGs) for industrial soil. The 1/20 concentration was selected as a conservative concentration for methylene chloride and the five potential F003 Listed Organics in lieu of performing a hazard determination/risk assessment for each compound.

b. Action limits for RCRA metals are from 40 CFR 261.24. Sample results will also be compared to the metal concentration of the control samples prior to final disposition decision.

c. Action limits are risk-based concentrations provided to the INEEL Environmental Restoration Program by the state of Idaho in a letter from Dr. Jeff Fromm to INEEL WAG Managers dated January 3, 1996. Risk-based levels were used to support turnover of RWMC property for the AMWTP Construction (DOE/ID-10687, Site Verification Plan for AMWTP Phase 2 Construction, April 16, 1999).

d. Where risk-based limits are lower than local background levels, defined in LMITCO Technical Procedure, TPR-713, Radioactive Contamination Added Determination, the TPR-713 values are used.

4 SOIL SAMPLING AND ANALYSIS

This section describes features of the sampling and analysis plans to be used for soil at the TSA-RE. Plans to address the following areas will be written prior to sampling.

4.1 Sampling Schedule

Because of safety and operational reasons, soil sampling is currently planned to be done in a series of campaigns, to coincide with soil and waste removal from each of the pad areas in the TSA-RE.

4.2 Sample Collection

The number of samples to be taken from the TSA-RE soils will be determined using the non-parametric approach recommended in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), NUREG 1575, EPA 402-R-97, DOE/EH-0624, August 2000, Rev. 1. Field blanks, trip blanks, QC samples, and samples from biased locations, will be collected as necessary. Control samples were collected from the source where the soil was excavated (in the Spreading Areas southwest of the RWMC). Sample numbers and locations will be defined in the plan.

4.3 Defining the Extent of Contaminated Areas

The analytical results will be evaluated in accordance with MARSSIM (2000) and SW-846 to support decisions regarding management and disposition of the soil, as well as determine the need for additional sampling and analysis, if any. Additional sampling, if necessary, will be designed in accordance with the MARSSIM, and performed in accordance with this SSDP.

4.4 Sample Collection Methods

Discrete samples will be collected using hand augers. Overburden soil samples will be taken from directly above the plywood/plastic cover; sideburden and firebreak samples will be taken from as close as possible to the waste containers, directly over the asphalt pad. Interstitial soil will be sampled according to an approved plan. If necessary, power augers may be used to penetrate to within approximately one foot of the plywood/plastic cover or asphalt pad, at which point samples will be taken. In all cases care will be taken to assure that augers do not penetrate the plywood and plastic cell cover. Soil samples will be transferred to appropriate sample containers and packaged for shipment to an off-site laboratory, in accordance with approved sampling and analysis plans. To ensure compliance with SSDP requirements, all sampling and analysis plans will be approved by the AMWTP Environmental Safety and Health Manager. When sampling is complete, the sample material and auger cuttings will be left on the soil surface, or placed back into the borehole they came from if convenient. Sample material will not be archived.

4.5 Analytical Methods

Verification and quality control samples will be shipped to an INEEL laboratory, or other approved laboratory with appropriate analytical capabilities, for analysis by EPA SW-846 methods for VOCs, SVOC, PCBs and target metals. Laboratory samples will also be analyzed for alpha-, beta-, and gamma-

emitting radionuclides. Data verification and validation will be performed on all laboratory analytical results.

4.6 Decontamination

Decontamination will be performed in accordance with approved sampling and analysis plans. All non-disposable equipment will be decontaminated between uses.

5 HEALTH AND SAFETY

The AMWTP established the necessary work control (i.e., sampling and analysis plans, Job Safety Analysis, Radiation Work Permit, etc.) to help ensure the safety and health of personnel conducting the work activities associated with sampling. Work control is developed and implemented using the Integrated Safety Management (ISM) principles. Safety and health procedures are in accordance with the specific requirements given in the ESHPOP. In particular, the ESHPOP addresses a Radiation Protection Program and Worker Safety and Health which are relevant to TSA-RE soil sampling and disposition.

6 REFERENCES

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