

Technical and Functional Requirements

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WAG 3 Staging, Storage, Stabilization, and Treatment Facility

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INEEL

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1. INTRODUCTION

The Idaho National Engineering and Environmental Laboratory (INEEL), including the Idaho Nuclear Technology and Engineering Center (INTEC), was placed on the National Priorities List (NPL) in November 1989. A Federal Facility Agreement and Consent Order (FFA/CO) was negotiated with the Environmental Protection Agency (EPA) and Idaho Department of Health and Welfare (IDHW) to direct the cleanup activities at the INEEL.

A comprehensive study, or Remedial Investigation, Baseline Risk Assessment (RI/BRA), was conducted to evaluate the nature and extent of soil and groundwater contamination at the INTEC. The results of the RI/BRA activities indicate that soil at certain release sites and groundwater contamination, pose a potential risk above acceptable levels to human health and the environment.

Therefore, the U.S. Department of Energy Idaho Operations Office (DOE-ID) authorized a remedial design/remedial action (RD/RA) for the INTEC in accordance with the Waste Area Group 3, Operable Unit 3-13, Record of Decision (ROD).

The ROD requires contaminated surface soils to be removed and disposed of onsite in the INEEL CERCLA Disposal Facility (ICDF). The ICDF will be located south of INTEC and adjacent to the existing percolation ponds. The ICDF will be an engineered facility meeting Resource Conservation and Recovery Act (RCRA) Subtitle C, Idaho HWMA, and polychlorinated biphenyl (PCB) landfill design and construction requirements. A support facility, the Staging, Storage, Stabilization and Treatment Facility (SSSTF), will be constructed adjacent to the ICDF.

1.1 Staging, Storage, Stabilization, and Treatment Facility Identification

The SSSTF will be a general purpose ICDF support facility designed to provide centralized receiving, inspection, and treatment necessary to stage, store, and stabilize incoming waste from various INEEL CERCLA remediation sites prior to disposal in the ICDF, or shipment off-site. The facility will consist of a storage/staging building and associated treatment equipment. Operations at the facility will include chemical/physical treatment to prepare ICDF wastes to meet Agency-approved WAC and RCRA land disposal restrictions (LDRs).

1.2 Limitations of the Technical and Functional Requirements Document

This Technical and Functional Requirements (T&FR) Document defines the design requirements for the SSSTF to the extent the requirements are known during it's development. It is not intended to define analysis or evaluation tasks that may be necessary as part of the design activity. Should these analysis efforts

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identify additional requirements necessary to guide or constrain the design, they will be added to the T&FR Document via the program change control process.

1.3 Ownership of the Technical and Functional Requirements Document

The T&FR document is the product of the combined activities of the SSSTF project team. The Waste Area Group (WAG) 3 project engineer has the ultimate responsibility for the content and approval of the document. Updates to this T&FR will be processed in accordance with the SSSTF project and BBWI policies and procedures. Several design and/or constraint parameters are unknown at the time of initial submittal. The requirements identify unique TBDs for these parameters. Table 1.3-1 identifies these TBDs and the associated actions to resolve these unknowns.

Table 1.3-1 TBD Resolution Action Summary

TBD#	Requirement #	Associated Action	Expected Date of Resolution
TBD01	006	Operating Scenario Study	8/22/00
TBD02	016	Operating Scenario Study	8/22/00
TBD03	004	WAG 3 Purge Waste Treatment and Disposal Study	7/14/00
TBD04	038	Waste Storage and Staging Study	8/22/00
TBD05	010	Waste Staging and Storage Study	8/22/00
TBD06	039	Waste Staging and Storage Study	8/22/00
TBD07	012	Waste Staging and Storage Study	8/22/00
TBD08	040	Waste Staging and Storage Study	8/22/00
TBD09		Deleted	
TBD10	015	Operating Scenario Study	8/22/00
TBD11	043	Waste Staging and Storage Study	8/22/00
TBD12	052	Hazard Classification Study	8/22/00
TBD13	030	Hazard Classification Study	8/22/00

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1.4 Definitions/Glossary

Component. Item of equipment, such as pump, valve, or relay, or an element of a larger array, such as computer software, length of pipe, elbow, or reducer.

Environmental Requirement. A requirement related to the environment and, specifically to environmental permitting.

External Staging/Storage. An area designated for waste staging/storage which is open to the outside environment (e.g., an uncovered pad).

Internal Staging/Storage. An area designated for waste staging/storage which is inside a covered facility (e.g., inside a building).

Low Volume Anomalous Waste. For purposes of SSSTF design, low volume anomalous waste is defined to be waste segregated or created during normal SSSTF waste stream processing that is not acceptable for disposal in the ICDF.

Mission-critical Requirement. A requirement necessary to prevent or mitigate substantial interruptions of facility operations or severe cost or other adverse impacts, or those that are necessary to satisfy DOE programmatic mission considerations.

Other Requirement. A requirement that does not fit in the safety class, safety significant, other safety, environmental, or mission-critical classifications.

Other Safety Requirement. A requirement, not identified as safety class or safety significant, but necessary for a system, structure, and component (SSC) to perform functions considered important to overall facility safety and as part of worker safety or the defense-in-depth safety basis for the facility.

Processing (of waste). For purposes of the SSSTF design, processing of waste will include:

- Receipt documentation and inventory tracking
- Weighing of material
- Verification of material (if necessary)
- Sizing of material (if necessary)
- Treatment of material (if necessary)

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- Interim storage of material (if necessary)
- Transportation of material for disposal
- Generation of waste processing records
- ICDF waste placement documentation and tracking.

Safety Class. A designation applied to SSCs (safety class SSCs) whose failure could adversely affect the environment or safety and health of the public, as identified by safety analyses.

Safety Class Requirement. A requirement identified as necessary for a safety class SSC to accomplish its safety function.

Safety Significant. A designation applied to SSCs (safety significant SSCs) not designated as safety class SSCs, but whose preventive or mitigative function is a major contributor to defense-in-depth, such as prevention of uncontrolled material releases, and/or worker safety as determined from hazard analysis.

Safety Significant Requirement. A requirement identified as necessary for a safety significant SSC to accomplish its safety function.

Special Waste. Waste accepted for disposal that is not compatible with predetermined operating processes.

Staging. Waste to be treated and/or disposed of within sixty days.

Storage. Waste not planned to be treated and/or disposed within 60 days.

Structure. Elements that provide support or enclosure, such as buildings, freestanding tanks, basins, dikes, and stacks.

System. Collection of components assembled to perform a function, such as heating, ventilating, and air conditioning (HVAC) systems, control systems, utility systems, reactor cooling systems, or fuel storage systems.

Temporary. For purposes of SSSTF design, temporary is defined to be the operational period between SSSTF start-up and full ICDF operational capability.

TRU Waste. Waste containing more than 100 nCi/g of alpha-emitting TRU isotopes with half-lives greater than 20 years except for (1) HLW, (2) waste that DOE determines, with concurrence of EPA, does not need degree of isolation

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required by 40 CFR Part 191, or (3) waste that NRC approves for near-surface land disposal in accordance with 10 CFR Part 61.

1.5 Acronyms

The acronyms referenced elsewhere in this document are defined in the following list.

alara	as low as reasonably achievable
AOC	area of contamination
BBWI	Bechtel BWXT Idaho
CERCLA	Comprehensive Environmental Response, Liability, and Compensation Act
CFR	Code of Federal Regulations
CSA	CERCLA Storage Area
DOE	Department of Energy (U.S.)
DOE-ID	DOE-Idaho Field Office
HNu	photoionization detector
HVAC	heating, ventilation, and air conditioning
ICDF	INEEL CERCLA Disposal Facility
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LDRs	Land Disposal Restrictions
NPH	natural phenomenon hazard
OU	Operable Unit
PC	performance category
PCB	polychlorinated biphenyl
PEW	process equipment waste
QA	quality assurance
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action

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ROD	Record of Decision
SNM	special nuclear material
SOW	scope of work
SRPA	Snake River Plain Aquifer
SSC	system, structure, and component
SSSTF	Staging, Storage, Stabilization, and Treatment Facility
STD	standard
T&FR	technical & functional requirements
TBD	to be determined
TRU	transuranic
TSCA	Toxic Substance Control Act
TSR	Technical Safety Requirement
WAC	Waste Acceptance Criteria
WAG	Waste Area Group

1.6 Key Assumptions

The OU 3-13 ROD defines the scope of work for the SSSTF activities. The following assumptions are were created to further clarify and/or define limiting factors and conditions associated with that scope.

ID	Assumption Description	Drives Requirement Number
A.	The SSSTF will not be designed or operated to treat TRU waste.	n/a
A-1	The SSSTF will not be designed or managed as a TRU waste management facility(generators responsible for TRU determination).	n/a
B.	High temperature organic destruction technologies (e.g., incineration) will not be used. Was not considered a cost-effective treatment as determined in the ROD.	n/a
C.	Deleted.	n/a
D.	The SSSTF will be designed to at least store non-contact handled waste.	029
E.	The predominate form of waste will be bulk soil arriving in dump trucks or roll-on roll-off containers. Other forms of shipment are also acceptable.	035
F.	The SSSTF will routinely treat waste in yearly campaigns that begin	027, and 049

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ID	Assumption Description	Drives Requirement Number
	<p>in March and end in November however, the facility will be operational the remainder of the year. Packaging for offsite disposal and minimal waste acceptance for storage will be required year round. Waste monitoring and management operations will be required year round.</p>	
G.	<p>All secondary waste generated at the ICDF and SSSTF that can be treated to the ICDF WAC and LDRs will be disposed of in the ICDF. Waste not meeting this criteria will be disposed off-site in accordance with the off-site rule.</p>	<p>002,014,043, and 044</p>
H.	<p>Deleted</p>	
I.	<p>The SSSTF will operate 10 hours per day and four days per week.</p>	<p>028</p>
J.	<p>Analytical capabilities at the SSSTF will be limited to screening methods (e.g., HNU, pH, ro2a) required to verify waste shipment profiles. Laboratory analysis for waste characterization will be performed at an external facility.</p>	<p>034</p>
K.	<p>Waste arriving at the SSSTF will be limited to one waste profile per container.</p>	<p>034</p>
L.	<p>Waste generators will provide a waste profile for each waste container prior to shipment to the SSSTF.</p>	<p>034</p>
M.	<p>QA verification of incoming waste profile will be performed. Note: An EDF will be performed to determine specific QA processes.</p>	<p>034</p>
N.	<p>Waste too large to be sized in the SSSTF sizing process shall be segregated at the WAG site. This waste will either be sized reduced at the CERCLA remediation site so that it can be processed at the SSSTF, or it will be disposed of directly in the ICDF without treatment if it meets the ICDF WAC.</p>	<p>002 and 013</p>
O.	<p>The INTEC PEW evaporator is not routinely available for treatment of monitoring well purge water and leachate.</p>	<p>004 and 038</p>
P.	<p>Interim storage of solid and liquid waste will be provided prior to SSSTF construction and within one year of the ROD. Design details of interim storage will not be included in SSSTF Title I or Title II activities because interim storage will be operational before these documents are submitted. Design documentation will be included in the design and operational plans for the interim storage facility.</p>	<p>004</p>

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ID	Assumption Description	Drives Requirement Number
Q.	The SSSTF will not treat soil/debris that is significantly contaminated with organics. Note: An EDF will be performed to select the treatment technology and identify the treatability of organic contaminated waste. Currently consider maximum of 1%.	n/a
R.	SSSTF utility connections will be provided by INTEC to the extent practical.	018, 019, 020, 021, 022, 023, and 024
S.	Deleted	
T.	Waste to be sent to the SSSTF for disposal is defined in Appendix C of the Remedial Investigation/Feasibility Study. The CERCLA Waste Inventory Database (CWID) is based on Appendix C of the Remedial Investigation/Feasibility Study and the ROD. The CWID is subject to approval by the agencies. The CWID will be used to support design activities.	001, 006, 016, 010, 039, 012, 040, 015, 043, and 052
U.	Deleted	
V.	Facility design life will be 30 years. This is consistent with DOE standard practices.	005
W.	The predominant vehicle for liquid waste transfer to the facility will be tanker truck, but other forms of containers are also acceptable.	036
X.	The facility will provide storage of liquid waste, surface water run-off, decontamination liquid, leachate, or liquid from other operations awaiting treatment and/or disposal in the evaporation pond.	038

2. OVERVIEW

Waste soil and debris from multiple INEEL CERCLA actions will be treated and/or prepared for disposal by the Staging, Storage, Stabilization and Treatment Facility in conjunction with the INEEL CERCLA Disposal Facility (ICDF). Current INEEL-wide CERCLA waste projections total about 390,000 m³ (510,000 yd³). The waste includes low-level, mixed low-level, hazardous, and limited quantities of Toxic Substances Control Act (TSCA) wastes. Most of the waste will be contaminated soil, but wood and debris is expected; specific SSSTF and ICDF waste acceptance criteria (WAC) will be developed during remedial design (RD). The acceptance criteria will include restrictions on contaminant concentrations based on groundwater modeling results and the goal of preventing potential future risk to the Snake River Plain Aquifer (SRPA).

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2.1 Staging, Storage, Stabilization, and Treatment Facility Functions

An SSSTF/ICDF functional block flow diagram is provided in Figure 2.1-1. The diagram defines the major functions and subfunctions of the SSSTF/ICDF complex as well as define the flow of waste management operations.

2.1.1 Administrative Function

The administrative function will provide all capabilities necessary to perform administrative operations. These capabilities include; weighting and verification of waste coming into or out of the facility, determination of waste disposition, administering treatment verification and other quality activities, processing and maintenance of required records associated with the waste disposition, and perform overall complex management functions.

The administrative function will be able to weigh and track the WAG waste and materials entering and exiting the facility. The weighing scale will be designed to accommodate a single truck containing either bulk waste or loaded with 13 cubic yard, waste-laden, roll-on/roll-off containers. Once the shipments have been weighed, monitored, inspected, treated (if necessary), and verified, pertinent information will be entered into an ICDF tracking system.

The administrative offices and operations crew quarters will be integrated into the SSSTF design. A structure to house critical personnel to the operation of the SSSTF and ICDF will be located adjacent to the work areas. The space will accommodate operational personnel, administrative personnel, support personnel and Environmental, Safety, Health and Quality (ESH&Q) personnel.

2.1.2 Staging and Storage Function

The Staging and Storage Function will provide the capabilities for interim storage (prior to SSSTF/ICDF operation), off-loading and/or on-loading of waste and supplies, staging waste for treatment and/or disposal (where waste disposition will occur within sixty days), and storage of waste awaiting either treatment and/or disposal (where waste disposition is expected to be in excess of 60 days).

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Interim Storage

The CERCLA Storage Area (CSA) will be provided within the INTEC facility to facilitate consolidation and storage of waste prior to the SSSTF/ICDF Complex becoming operational. The primary mission of this area will be to store existing boxes of soil and other debris from previous remediation activities, as well as provide for storage of other solid and/or liquid waste determined necessary by DOE.

Off-Loading/On-loading

The Staging and Storage Function will provide the capability to off-load solid waste from either bulk transport vehicles or roll-on roll-off containers, unloading and transfer of either liquid tanker vehicles or liquid waste containers, and unloading either bulk and/or pre-packaged reagent containers. Likewise, this function will provide the capability load and/or transfer both solid and liquid waste for final disposition, or waste containers to be used elsewhere to support overall operations.

Staging and Storage

The Staging and Storage Function will meet RCRA storage requirements that provide for hazardous waste control through stringent containment design. The facility will include both internal storage space and contained outdoor storage areas as required for various functions of the SSSTF process. This area will be large enough to accommodate a 60 day staging of waste waiting to be treated. Outdoor storage areas, defined by contained pads, will accommodate, as a minimum, the storage of empty waste transportation containers.

The Staging and Storage Function will provide a temporary contained lay-down area for CERCLA remediation waste. This area will be used to stage incoming waste that does not comply with the ICDF WAC or RCRA Land Disposal Restrictions (LDRs). The staged waste will be placed in a queue and transferred to the treatment process as needed. Waste that cannot be treated to the WAC and LDR requirements with the available treatment processes will be moved into storage. The staging area will provide space for waste that has been sampled and is waiting for analytical results prior to treatment or disposal. Finally, a special waste laydown area will be provided to segregate waste requiring more stringent contamination and exposure controls.

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Water storage will be provided for wastewater delivered from various WAGs by tanker trucks, as well as storage pad run-off and decontamination water. This water will either be used in the stabilization process or transferred to the ICDF evaporation pond.

2.1.3 Waste Treatment Function

The treatment function will stabilize, treat or otherwise prepare INEEL CERCLA waste that does not meet the ICDF WAC or LDRs for final disposal. The incoming waste will be subjected to segregation and sizing operations, including a shredder, as deemed necessary by the appropriate treatment acceptance criteria.

A dual-auger shredder will be used to reduce the waste to the appropriate size for treatment or direct disposal to the ICDF. The dual-auger shredder will be capable of size reducing standard 55 gallon drums, plywood boxes, concrete, rebar, soil, and debris. The shredder will be capable of accepting waste-laden drums and wooden boxes. Once shredded, the material will be deposited onto a mechanical conveyor, which will dispense into day bins for temporary storage until treatment.

An area to collect and store secondary waste storage will be provided. All secondary wastes generated in the course of operating the SSSTF and ICDF will be collected. Secondary waste generated at the SSSTF will either be treated at the SSSTF and disposed of in the ICDF, or packaged and sent off-site for disposal.

An area will be provided to perform packaging of waste for off-site disposal. Waste will be packaged in this area, loaded on flatbed semi-trucks and transported to the facility for disposal.

Stabilization Treatment

The stabilization treatment function will be a batch plant and will contain the necessary equipment to formulate and mix the grout. Each of the grout ingredients will be air-conveyed from their storage silos to a day bin, while the waste will be fed from a mechanical conveyor. Waste will be fed to a weighing hopper from the sizing area via a mechanical conveyor. The day bins will be on load cells and will stop each ingredient delivery when the target weight has been introduced. The ingredients will unload into a batch hopper and dispense into a swivel chute, which will distribute the grout into a mixing system. At this time, appropriate amounts of water will be added to the grout ingredients and

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the material will be deposited into a hopper that will load transit-mixing trucks with the grout for disposal at the ICDF. The batch plant will be equipped with a wash system so that residual grout may be removed at the end of an operating shift.

A transit mixing truck will be utilized for the mixing of the dry ingredients and water. Dry ingredients will be mixed for homogeneity within the batch plant. These ingredients will unload with appropriate amounts of water into transit mixing trucks, which will further mix the ingredients as they are transported to the ICDF. At the ICDF, the transit mix trucks will unload the grout into the ICDF cells where the grout will set. If necessary, a curing and analysis area will be set aside for waste form verification in support of the ICDF.

Neutralization Treatment

The neutralization treatment function will include a weighing hopper on load cells that can accurately weigh one batch of soil. The soil will be transferred to a mixer, where a sample of the soil will be removed and the pH measured. Stoichiometric quantities of lime will be added to the soil and thoroughly mixed, at which point another sample will be collected to ensure that the pH is within acceptable limits before discharging from the mixer. Lime, or other neutralization agents, will be manually measured and deposited into the mixer, using appropriate personnel and ES&H protection. The neutralized soil will discharge to a mechanical conveyor and fed to the batch plant for stabilization. If feasible, the same mixing equipment will be used for both neutralization and stabilization.

Chemical Treatment

A chemical treatment process will be designed to treat waste that may contain organics and/or materials that are not adequately treated by stabilization. Currently, it is not known what chemical treatment will be employed but chemical oxidation is the probable treatment candidate. A treatment feasibility study will be performed to generate the design basis for this treatment block. Once treated, this material may be transported to the grouting area, if further stabilization is required, or it may shipped to the ICDF for final disposal if the waste meets the ICDF WAC and LDRs.

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2.1.4 Decontamination Function

The decontamination function will be equipped with a high-pressure water sprayer for the decontamination of roll-on/roll-off containers and waste delivery trucks, as well as other equipment used to support operations. If deemed necessary, the roll-on/roll-off containers will be washed with a high-pressure water sprayer and checked for external radiological contamination for purposes of removal from the battery limits of the SSSTF. The pad will be equipped such that the decontamination wash waters will drain to a holding tank located at a water storage pad.

2.2 Staging, Storage, Stabilization, and Treatment Facility Classification

The SSSTF is classified as a Radiological Facility, Hazard Classification 2.

2.3 Operational Overview

Waste meeting the SSSTF WAC will arrive at the SSSTF through a scale/monitoring station. Shipments will be verified and pertinent information entered into the ICDF waste tracking system. Four categories of waste will be processed through the SSSTF: liquid waste that may or may not require treatment prior to disposal, solid wastes for which a treatment process is not available, solid waste that already meets the ICDF WAC and LDRs, and solid waste requiring treatment.

Waste already meeting the ICDF WAC will be sent directly to the ICDF for disposal. However, waste not meeting the ICDF WAC will be treated at the SSSTF prior to disposal in the ICDF. Furthermore, hazardous or mixed waste originating outside the WAG 3 area of contamination (AOC) will be treated at the SSSTF to comply with RCRA land disposal requirements (LDRs) prior to disposal. Waste that cannot be treated to meet the ICDF WAC will be packaged and disposed offsite.

Liquid waste will be pumped directly to the ICDF evaporation pond, transferred to storage tanks located on a water storage pad, or used in the stabilization process. Liquid waste that does not meet the ICDF Evaporation Pond WAC, will either be treated or disposed offsite.

Waste requiring treatment will be staged in a laydown area until delivered to a treatment process on an as needed basis. The waste will be screened and sized prior to stabilization, neutralization or organic destruction. Waste-laden roll-on/roll-off containers and prepackaged waste will be transported from the Staging

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Function to the Treatment Function. The waste will be dumped into a sizing processor. The trucks and/or containers will then proceed to a decontamination area. Following successful waste treatment, the waste will again undergo weighing and verification of ICDF waste acceptance criteria before disposal in the ICDF.

Figure 2.1-1 SSSTF/ICDF Complex Functional Block Flow Diagram

